Program and Abstracts of the Annual Conference of the Asia Pacific Stroke Organization (APSO)

Hong Kong, August 30–September 1, 2013

Guest Editors: Lawrence K.S. Wong, Hong Kong
Matthew W.M. Lui, Hong Kong
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Asia Pacific Stroke Conference 2013

Abstracts of the Annual Conference of the Asia Pacific Stroke Organization (APSO)
Hong Kong, August 30–September 1, 2013

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# Scientific Program

## Pre-Conference Workshop 1

**Friday 30 August 2013 • Prince of Wales Hospital**

Lecture Theatre, 2/F, Lui Che Woo Clinical Sciences Building

### Workshop 1 - Neurosonology

**Organizers:** Dr. N.V. Ramani *(Singapore)*, Prof. Disya Ratanakorn *(Thailand)*

**Chairperson:** Dr. Nijasri Suwanwela *(Thailand)*

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<td>08:25 - 08:30</td>
<td>Welcome</td>
<td>Dr. N.V. Ramani <em>(Singapore)</em></td>
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<td>08:30 - 09:00</td>
<td>Ultrasound Physics and Cerebrovascular Anatomy</td>
<td>Prof. Kay Sin Tan <em>(Malaysia)</em></td>
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<td>09:00 - 09:30</td>
<td>Extracranial Ultrasound</td>
<td>Prof. Disya Ratanakorn <em>(Thailand)</em></td>
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<td>09:30 - 10:00</td>
<td>Transcranial Doppler</td>
<td>Dr. Hui-Meng Chang <em>(Singapore)</em></td>
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<td>10:00 - 10:30</td>
<td>Break</td>
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<td>10:30 - 11:00</td>
<td>Transcranial Imaging</td>
<td>Dr. N.V. Ramani <em>(Singapore)</em></td>
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<td>11:00 - 11:30</td>
<td>Advanced Techniques</td>
<td>Prof. Vijay Sharma <em>(Singapore)</em></td>
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<td>11:30 - 12:30</td>
<td>Demo</td>
<td>Dr. Jose C. Navarro <em>(Philippines)</em>, Dr. Yohanna Kusuma <em>(Indonesia)</em></td>
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<td>12:30 - 13:30</td>
<td>Lunch</td>
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<td>13:30 - 16:00</td>
<td>Hands-on</td>
<td>Dr. Lokesh Bathla <em>(India)</em> and All Other Speakers</td>
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### Seminar Room 1, 2/F, Clinical Science Building

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<td>08:30</td>
<td>NSRG Exam MCQ</td>
<td>Dr. Jose C. Navarro <em>(Philippines)</em> and Dr. N.V. Ramani <em>(Singapore)</em></td>
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<td>Neurosonology Lab</td>
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<td>10:00</td>
<td>NSRG Exam Hands-on</td>
<td>Dr. Jose C. Navarro <em>(Philippines)</em> and Dr. N.V. Ramani <em>(Singapore)</em></td>
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<td>Computer Centre</td>
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<td>13:00-19:00</td>
<td>ASN Exam</td>
<td>Prof. Vija Sharma <em>(Singapore)</em> / Prof. Disya Ratanakorn <em>(Thailand)</em></td>
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## Workshop 2 - Intervention

**Chairpersons: Prof. Thomas Wai Hong Leung (Hong Kong), Prof. Bernard Yan (Australia)**

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<td>Neurovascular Anatomy and Dangerous Anastomoses</td>
<td>Prof. George KC Wong (Hong Kong)</td>
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<td>09:25 - 09:45</td>
<td>Selection and Preparation of Ischemic Stroke Patients for Elective Endovascular Treatment</td>
<td>Prof. Thomas Leung (Hong Kong)</td>
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<td>09:50 - 10:10</td>
<td>Interesting Cases and Technical Nuances in Extracranial Stent-assisted Angioplasty</td>
<td>Prof. Simon Yu (Hong Kong)</td>
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<td>10:15 - 10:35</td>
<td>Management of Pseudoaneurysm Associated with Nasopharyngeal Carcinoma</td>
<td>Dr. Raymand Lee (Hong Kong)</td>
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<td>10:40 - 11:00</td>
<td>Tea Break and Exhibition of Neuro-endovascular Tools</td>
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<td>11:00 - 11:25</td>
<td>Evolution of Embolization of Cerebral Aneurysm - A Personal Voyage</td>
<td>Dr. Wai-Man Lui (Hong Kong)</td>
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<tr>
<td>11:30 - 11:55</td>
<td>Stent Placement for Treating Complex Intracranial Aneurysms</td>
<td>Prof. George KC Wong (Hong Kong)</td>
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<td>12:00 - 12:25</td>
<td>Intracranial Stenting - Trouble Shooting</td>
<td>Prof. Simon Yu (Hong Kong)</td>
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<td>12:30 - 13:30</td>
<td>Lunch</td>
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<tr>
<td>13:45 - 14:10</td>
<td>Selecting Patients for Emergency Clot Retrieval</td>
<td>Prof. Bernard Yan (Australia)</td>
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<td>14:15 - 14:40</td>
<td>Challenges in Emergency Cerebral Revascularization</td>
<td>Dr. Sonny Hon (Hong Kong)</td>
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<td>14:45 - 15:15</td>
<td>Break</td>
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<tr>
<td>15:15 - 15:40</td>
<td>Cerebral Re-vascularization Techniques</td>
<td>Prof. Zhong-Rong Miao (China)</td>
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<tr>
<td>15:45 - 16:15</td>
<td>Clot Retrieval for Hyper-acute Stroke</td>
<td>Prof. Med. Martin Wiesmann (Germany)</td>
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# Scientific Program
## Pre-Conference Workshop 3
### Workshop 3 - Stroke Genetics

**Chairpersons:** Dr. Johnathan Rosand (USA), Prof. Martin Dichgans (Germany)

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<td>Lunch</td>
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<td>13:30 - 13:40</td>
<td>Introduction to the International Stroke Genetics Consortium</td>
<td>Dr. Johnathan Rosand (USA)</td>
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<tr>
<td>13:40 - 14:10</td>
<td>Genetics of Ischemic Stroke</td>
<td>Prof. Martin Dichgans (Germany)</td>
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<td>14:10 - 14:40</td>
<td>Genetics of Cognitive Decline</td>
<td>Dr. Sudha Seshadri (USA)</td>
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<td>14:40 - 15:00</td>
<td>Stroke in India: What is Known and Opportunities for Genetics</td>
<td>Prof. Jeyaraj Durai Pandian (India)</td>
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<td>15:00 - 15:20</td>
<td>Break</td>
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<td>15:20 - 15:40</td>
<td>CYP2C19 Polymorphisms and Antiplatelet Effects of Clopidogrel in Acute Ischemic Stroke and Vertebral Artery Stent Patients</td>
<td>Dr. Yun Xu (China)</td>
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<tr>
<td>15:40 - 16:00</td>
<td>Sparse Regression Based Characterization of Stroke Functional Gene Modules</td>
<td>Dr. Feng-Feng Zhou (China)</td>
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<td>16:00 - 16:20</td>
<td>Genetics of Hemorrhagic Stroke</td>
<td>Dr. Johnathan Rosand (USA)</td>
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<td>16:20 - 16:35</td>
<td>Stroke in Australia: What is Known and Opportunities for Genetics</td>
<td>Dr. Jane Maguire (Australia)</td>
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<td>16:35 - 16:55</td>
<td>Stroke in China: What is Known and Opportunities for Genetics</td>
<td>Dr. Li-Ping Liu (China)</td>
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<td>16:50 - 17:10</td>
<td>Joining the ISGC</td>
<td>Prof. Martin Dichgans (Germany) / Dr. Johnathan Rosand (USA)</td>
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### Workshop 4 - Asian Vas Cog

**Chairpersons:** Prof Chris Chen *(Singapore)*, Prof. Koji Abe *(Japan)*

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<td>13:30 - 14:00</td>
<td>Chairpersons: Dr. Niphon Poungvarin <em>(Thailand)</em>, Toshiya Fukui <em>(Japan)</em></td>
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<td><strong>Small Vessel Disease in Thai Elderly</strong> Dr. Vorapum Senanarong <em>(Thailand)</em></td>
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<td><strong>Vascular Dementia in Korea</strong> Dr. Beum Saeng Kim <em>(Korea)</em></td>
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<td>14:00 - 14:30</td>
<td>Chairpersons: Prof. Shinichiro Uchiyama <em>(Japan)</em>, Prof. Byung-Woo Yoon <em>(Korea)</em></td>
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<td><strong>Vascular Dementia in India</strong> Prof. Man Mohan Mehdiratta <em>(India)</em></td>
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<td><strong>Vascular Cognitive Impairment in Mainland China</strong> Dr. De-Hua Chui <em>(China)</em></td>
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<td>14:30 - 15:00</td>
<td>Chairpersons: Prof. Vincent Mok <em>(Hong Kong)</em>, Prof. Chris Chen <em>(Singapore)</em></td>
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<td><strong>CADASIL and CARASIL in Japan</strong> Prof. Koji Abe <em>(Japan)</em></td>
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<td><strong>Vascular Cognitive Impairment in Taiwan</strong> Dr. Ming-Chyi Pai <em>(Taiwan)</em></td>
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<td>15:00 - 15:20</td>
<td>Break</td>
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<td>15:20 - 16:30</td>
<td>Chairpersons: Prof. Man Mohan Mehdiratta <em>(India)</em>, Prof. Koji Abe <em>(Japan)</em></td>
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<td><strong>Strokes in Papez Circuit</strong> Dr. CY Chien <em>(Tainan University)</em></td>
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<td><strong>Impact of White Matter Lesion on Dementia with MRI Hippocampal Atrophy</strong> Dr. Yoshio Omote <em>(Okayama University)</em></td>
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<td><strong>Novel Retinal Imaging Biomarkers of Cerebral Small Vessel Disease</strong> Dr. Saima Hilal <em>(National Singapore University)</em></td>
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<td><strong>Cerebrovascular Pathology in Cognitive and Non-cognitive Symptoms of Alzheimer’s Disease</strong> Dr. Shuko Takeda <em>(Harvard University)</em></td>
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<td><strong>Hypoxia Inducible Factor-1α for Vascular Cognitive Impairment</strong> Dr. De-Hua Chui <em>(Beijing University)</em></td>
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<td><strong>Post-stroke Cognitive Impairment in Korea</strong> Dr. Kyung Bok Lee <em>(Sooh Chun Hyang University)</em></td>
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<td><strong>Blood Pressure Levels and Cognitive Decline in Stroke Patients with Confluent White Matter Changes</strong> Dr. Zhao-Lu Wang <em>(Chinese University of Hong Kong)</em></td>
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<td>16:30 - 17:30</td>
<td>Chairpersons: Dr. Ming-Chyi Pai <em>(Taiwan)</em>, Prof. Shinichiro Uchiyama <em>(Japan)</em></td>
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<td><strong>Concept of Vascular Dementia/VCI</strong> Prof. Chris Chen <em>(Singapore)</em></td>
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<td><strong>Vascular Factors in Alzheimer’s Disease</strong> Dr. Ken Nagata <em>(Japan)</em></td>
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<td><strong>Progression of Vascular Cognitive Impairment</strong> Prof. Vincent Mok <em>(Hong Kong)</em></td>
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<td>S4: Stroke in the Developing Countries</td>
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<td>S7: Stroke Neuroimaging</td>
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<td>Hyperacute Stroke for Nurses ± Quiz for rtpA Credentializing (Optional) 1</td>
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<td>S8: Boehringer Ingelheim Symposium - Updates in Stroke Prevention in Asian Atrial Fibrillation Patients</td>
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<td>S3: Organization of Stroke Services</td>
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<td>S6: Subarachnoid Hemorrhage</td>
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<td>Continuity of Care for Stroke</td>
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<td>H. Lundbeck A/S Evening Symposium</td>
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### Scientific Program

**Main Conference**

**Saturday 31 August 2013 • Hong Kong Convention and Exhibition Centre**

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<td>Chairpersons: Prof. Lawrence KS Wong <em>(Hong Kong)</em>, Prof. Man Mohan Mehndiratta <em>(India)</em>, Prof. Yi-Ning Huang <em>(China)</em></td>
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<td><strong>Stroke Burden and Mortality</strong></td>
<td>Dr. Tak-Hong Tsoi <em>(Hong Kong)</em></td>
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<td><strong>Stroke in Asia Toward 2020</strong></td>
<td>Dr. Niphon Poungvarin <em>(Thailand)</em></td>
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<td><strong>WSO: One World Voice for Stroke</strong></td>
<td>Prof. Stephen Davis <em>(Australia)</em></td>
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<td><strong>S1: Acute Treatment: Thrombolysis</strong></td>
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<td>Chairpersons: Dr. Huy Thang Nguyen <em>(Vietnam)</em>, Dr. Nijasri C. Suwanwela <em>(Thailand)</em></td>
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<td><strong>Solitaire Flow Restoration Device versus the Intra-Arterial tPA in Nonresponder Intravenous Thrombolysis Treated Patients</strong></td>
<td>Dr. Huy Thang Nguyen <em>(Vietnam)</em></td>
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<td><strong>Intravenous Thrombolysis Beyond the Guidelines</strong></td>
<td>Dr. Nijasri C. Suwanwela <em>(Thailand)</em></td>
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<td><strong>Vascular Occlusion and Thrombolytic Treatment</strong></td>
<td>Prof. Vijay Sharma <em>(Singapore)</em></td>
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<td><strong>Stroke Care Improvement Project in China</strong></td>
<td>Dr. Yi-Long Wang <em>(China)</em></td>
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<td>10:30 - 12:00</td>
<td><strong>S4: Stroke in the Developing Countries</strong></td>
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<td>Chairpersons: Dr. Padma Gunaratne <em>(Sri Lanka)</em>, Prof. Jeyaraj D. Pandian <em>(India)</em></td>
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<td><strong>Rehabilitation of Stroke; What is the Best Model for Developing Countries?</strong></td>
<td>Prof. PN Sylaja <em>(India)</em></td>
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<td><strong>How to Organise Stroke Care Services with Limited Resources?</strong></td>
<td>Prof. Jeyaraj D. Pandian <em>(India)</em></td>
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<td><strong>Stroke Thrombolysis in Developing Countries - Is it a Feasible Option?</strong></td>
<td>Prof. Disya Ratnakorn <em>(Thailand)</em></td>
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<td><strong>Burden of Stroke in Developing Countries</strong></td>
<td>Prof. Alejandro II Baroque <em>(Philippines)</em></td>
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<td><strong>S7: Stroke Neuroimaging</strong></td>
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<td>Chairpersons: Dr. Mark Parsons <em>(Australia)</em>, Dr. N.V. Ramani <em>(Singapore)</em></td>
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<td><strong>New MRI Techniques for Cerebrovascular Disease</strong></td>
<td>Prof. Yi-Ning Huang <em>(China)</em></td>
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<td><strong>Neurosonology in Stroke Management</strong></td>
<td>Dr. N.V. Ramani <em>(Singapore)</em></td>
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<td><strong>Debate: The Need for Routine Advanced Imaging in Assessment of Acute Stroke Patients</strong></td>
<td>Dr. Mark Parsons <em>(Australia)</em> vs Prof. Craig Anderson <em>(Australia)</em></td>
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<td>10:30 - 12:00</td>
<td><strong>Hyperacute Stroke for Nurses ± Quiz for rtPA Credentialing (Optional) 1</strong></td>
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<td>Chairpersons: Dr. Jonas Yeung <em>(Hong Kong)</em>, Ms. Stella Ho <em>(Hong Kong)</em></td>
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<td><strong>Introduction of Thrombolytic Agent</strong></td>
<td>Dr. Sonny Hon <em>(Hong Kong)</em></td>
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<td><strong>CT Interpretation and Laboratory Finding Crucial to Thrombolytic Therapy</strong></td>
<td>Dr. Yannie Soo <em>(Hong Kong)</em></td>
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<td><strong>Eligibility Screening and Physical Assessment by tPA Nurse</strong></td>
<td>Mr. Edward Shum <em>(Hong Kong)</em></td>
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<td><strong>Free Paper Presentation 1</strong></td>
<td>Chairpersons: Dr. Niphon Poungvarin <em>(Thailand)</em>, Dr. Dawson Fong <em>(Hong Kong)</em></td>
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<td><strong>OP1-01:</strong> Synergic Effects of Levamlodipine and Bisoprolol on Blood Pressure Reduction, Organ Protection and Stroke Protection in Rats</td>
<td>Prof. Zhiyi MA <em>(China)</em></td>
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<td><strong>OP1-02:</strong> Optimal Cutoff Point for the Vascular Cognitive Impairment Harmonization Standards Neuropsychological Tools for Vascular Cognitive Impairment</td>
<td>Prof. Byung-Chul Lee <em>(Korea)</em></td>
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<td><strong>OP1-03:</strong> High-Density Lipoprotein of Patients with Type 2 Diabetes Mellitus Uregulates Cyclooxygenase-2 Expression and Prostacyclin I-2 Release in Endothelial Cells: Relationship with HDL-Associated Sphingosine-1-Phosphate</td>
<td>Ms. Xunliang Tong <em>(China)</em></td>
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<td><strong>OP1-04:</strong> Lipid Profile Reveals Galactosylceramide Increasing in Atherosclerotic Stroke Patients Approached to Online 2D LC QToF-MS</td>
<td>Ms. Xunliang Tong <em>(China)</em></td>
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<td><strong>OP1-05:</strong> Association of the Functional KL-VS Variant of Klotho Gene with Ischemic Stroke in the Young</td>
<td>Dr. Rita Christopher <em>(India)</em></td>
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<td><strong>OP1-06:</strong> Convexal Subarachnoid Hemorrhage: Clinical Characteristics and Vascular Imaging</td>
<td>Dr. Wanliang Du <em>(China)</em></td>
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<td><strong>OP1-07:</strong> Moyamoya Disease, Moyamoya Syndrome, and Coexisting Diseases in Taiwan</td>
<td>Dr. Chi-Hung Liu <em>(Taiwan)</em></td>
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<td><strong>OP1-08:</strong> Primary Hyperparathyroidism Presenting as Ischemic Stroke Symptoms: Report of Two Cases</td>
<td>Dr. Chun Kong Raymond Chan <em>(Hong Kong)</em></td>
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<td><strong>OP1-09:</strong> Reversible Cerebral Vasocostriction Syndrome in a Patient with IgA Nephropathy and Thrombotic Thrombocytopenic Purpura</td>
<td>Dr. Nabin Sarkar <em>(Singapore)</em></td>
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<td><strong>Otsuka Luncheon Symposium</strong></td>
<td>Chairperson: Prof. Lawrence KS Wong <em>(Hong Kong)</em></td>
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<td>The Optimal Treatment for ICAS in Asia: Final Results of Cilostazol-Aspirin Therapy Against Recurrent Stroke with Intracranial Artery Stenosis (CATHARSIS)</td>
<td>Prof. Shinichiro Uchiyama <em>(Japan)</em></td>
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<td><strong>S2: Stryker &amp; Synapse Symposium - Acute Treatment: Intervention</strong></td>
<td>Chairpersons: Prof. Bernard Yan <em>(Australia)</em>, Dr. Raymond Lee <em>(Hong Kong)</em></td>
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<td>An Overview and Critique of the Recent (IMS 3, SYNTHESIS, MR RESCUE) and Ongoing Trials (EXTEND-IA, SWIFT-PRIME)</td>
<td>Prof. Bernard Yan <em>(Australia)</em></td>
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<td>Mechanical Thrombolysis: European Experience</td>
<td>Prof. Med. Martin Wiesmann <em>(Germany)</em></td>
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<td>The Experience in Acute Stroke Intervention in a Regional Teaching Hospital</td>
<td>Dr. Raymond Lee <em>(Hong Kong)</em></td>
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<td>14:00 - 15:30</td>
<td><strong>S5: Intracerebral Hemorrhage</strong></td>
<td>Chairpersons: Prof. Craig Anderson <em>(Australia)</em>, Prof. Byung Woo Yoon <em>(Korea)</em></td>
<td>S426 &amp; 427</td>
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<td>Ethnic Differences in the Clinical Profile and Management of ICH: the INTERACT2 Study</td>
<td>Prof. Yi-Ning Huang <em>(China)</em></td>
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<td>BP Lowering and Cerebral Perfusion: Are There Any Concerns?</td>
<td>Dr. Ken Butcher <em>(Canada)</em></td>
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<td>Risk Factors of Intracerebral Hemorrhage</td>
<td>Prof. Byung-Woo Yoon <em>(Korea)</em></td>
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<td>BP Management of ICH in Patients Recruited into FASTMag</td>
<td>Dr. Nerses Sansossian <em>(USA)</em></td>
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<td>14:00 - 15:30</td>
<td><strong>S8: Boehringer Ingelheim Symposium - Updates in Stroke Prevention in Asian Atrial Fibrillation Patients</strong></td>
<td>Chairpersons: Prof. Lawrence KS Wong (Hong Kong), Dr. Tak-Hong Tsoi (Hong Kong)</td>
<td>S425</td>
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<td>New Evidence in Asian Population Prof. Shinichiro Uchiyama (Japan)</td>
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<td>Resolving Uncertainties in Treatment with New Oral Anticoagulants Dr. Raymond Wong (Hong Kong)</td>
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<td>14:00 - 15:30</td>
<td><strong>Hyperacute Stroke for Nurses ± Quiz for rtpA Credentialing (Optional) 2</strong></td>
<td>Chairpersons: Dr. Ping-Wing Ng (Hong Kong), Ms. Angela Kwok (Hong Kong)</td>
<td>S428</td>
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<td>Administration and Post tPA Care Ms. Cecilia Leung (Hong Kong)</td>
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<td>Case Sharing &amp; Quiz Ms. On-Lai Tang (Hong Kong)</td>
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<td>Sharing of Thrombolysis Experience in Guangdong Ms. Lin Wei (China)</td>
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<td>Early Mobilization Program for Stroke Patient Mr. Eric Ping-Yuen Chan (Hong Kong)</td>
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<tr>
<td>14:00 - 15:30</td>
<td><strong>Free Paper Presentation 2</strong></td>
<td>Chairpersons: Dr. Padma Gunaratne (Sri Lanka), Dr. Joshua Fok (Hong Kong)</td>
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<td></td>
<td>OP2-01: Intracranial Artery Abnormalities in Small Vessel Diseases: Atheroma, Hypertrophy and Dilation</td>
<td>Dr. Wei-Hai Xu (China)</td>
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<td>OP2-02: Trends in the Incidence of Stroke and Cardiovascular Risk Factors on the Isolated Island of Okinawa: The Miyakojima Study</td>
<td>Dr. Katsunori Isa (Japan)</td>
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<td>OP2-03: Effects of Stress in the Family and Work at Risk of Stroke: 14-Year Epidemiological Studies Based Program WHO “MONICA”</td>
<td>Prof. Valery Gafarov (Russia)</td>
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<td>OP2-04: Haemorrhagic Transformation in Chinese Ischaemic Stroke Patients – A 3-Year Cohort Study</td>
<td>Dr. Richard Li (Hong Kong)</td>
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<td>OP2-05: Effect of Seasonal Variation on Stroke Incidence: Data from Ludhiana Population Based Stroke Registry</td>
<td>Ms. Lydia Sharon Kati (India)</td>
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<td>OP2-06: Cost of Stroke from a Centre in Northwest India</td>
<td>Dr. Gagandeep Kwatra (India)</td>
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<td>OP2-07: Incidence, Risk Factors and Short Term Outcome of Stroke in Young: Data from Ludhiana Population Based Stroke Registry</td>
<td>Mrs. Paramdeep Kaur (India)</td>
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<td>OP2-08: Association Between Socioeconomic Deprivation and Survival After Stroke in China: A Systematic Literature Review and a New Population-Based Study</td>
<td>Dr. Ruo-Ling Chen (UK)</td>
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<td>OP2-09: Impact of Socioeconomic Deprivation on Survival After Stroke: Is There any Ethnic Differences?</td>
<td>Dr. Ruo-Ling Chen (UK)</td>
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<td>15:30 - 16:00</td>
<td><strong>Coffee Break</strong></td>
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## Scientific Program –
Main Conference (con’t)

### Saturday 31 August 2013 • Hong Kong Convention and Exhibition Centre

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<td>S3: Organization of Stroke Services</td>
<td>Chairpersons: Dr. Jose C. Navarro <em>(Philippines)</em>, Dr. Wing-Chi Fong <em>(Hong Kong)</em></td>
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<td>Emergency Care Systems for Stroke in Southeast Asia</td>
<td>Prof. Colin A Graham <em>(Hong Kong)</em></td>
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<td>Role of General Internist in Stroke Thrombolysis services</td>
<td>Dr. Wing-Chi Fong <em>(Hong Kong)</em></td>
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<td>Prevention of Complications</td>
<td>Dr. Jose C. Navarro <em>(Philippines)</em></td>
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<td>Development of Clinical Indicators of Acute Stroke in Japan</td>
<td>Dr. Kazuo Minematsu <em>(Japan)</em></td>
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<td>16:00 - 17:30</td>
<td>S6: Subarachnoid Hemorrhage</td>
<td>Chairpersons: Prof. George Kwok-Chu Wong <em>(Hong Kong)</em>, Dr. Wai-Man Lui <em>(Hong Kong)</em></td>
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<td></td>
<td>Lessons Learned from The Australasian Cooperative Research on Subarachnoid Hemorrhage Study (ACROSS)</td>
<td>Prof. Craig Anderson <em>(Australia)</em></td>
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<td>Endovascular Treatment of Cerebral Vasospasm After SAH</td>
<td>Dr. Martin Dichgans <em>(Germany)</em></td>
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<td>Update on Management Guideline in Aneurysmal Subarachnoid Hemorrhage</td>
<td>Prof. George Kwok-Chu Wong <em>(Hong Kong)</em></td>
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<td>Treatment of Cerebral Aneurysm Using Flow Diverters - A Clinical and Computation Fluid Hemodynamic Study</td>
<td>Dr. Wai-Man Lui <em>(Hong Kong)</em></td>
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<td>16:00 - 17:30</td>
<td>S9: Stroke Rehabilitation</td>
<td>Chairpersons: Dr. Leonard Li <em>(Hong Kong)</em>, Dr. Cathy Stinear <em>(New Zealand)</em></td>
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<td>How Do Physical Activity Levels Change after Stroke, and What are the Benefits of Increasing Physical Activity?</td>
<td>Dr. Marco Pang <em>(Hong Kong)</em></td>
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<td>When are Randomised Controlled Trials of Stroke Rehabilitation Conducted?</td>
<td>Dr. Cathy Stinear <em>(New Zealand)</em></td>
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<td>Brain Computer Interface and Robotics for Stroke Rehabilitation</td>
<td>Dr. Raymond Tong <em>(Hong Kong)</em></td>
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<td>Management of Post-Stroke Pain</td>
<td>Dr. Leonard Li <em>(Hong Kong)</em></td>
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<td>16:00 - 17:30</td>
<td>Continuity of Care for Stroke</td>
<td>Chairpersons: Dr. Tak-Hong Tsoi <em>(Hong Kong)</em>, Ms. Becky Chan <em>(Hong Kong)</em></td>
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<td>Use of Cervical Auscultation to Detect Silent Aspiration in Stroke Patients</td>
<td>Ms. Lok-Chi, Gigi Lo <em>(Hong Kong)</em></td>
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<td>Role of Stroke Nurse and Experience of Nurse Clinic</td>
<td>Ms. May Mok <em>(Hong Kong)</em></td>
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<td>Transitional Care from Acute to Rehabilitation</td>
<td>Ms. Salina Fan <em>(Hong Kong)</em></td>
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<td>Early Supported Discharge Program for Stroke</td>
<td>Ms. Mei-Mei Hui <em>(Hong Kong)</em></td>
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<td>16:00-18:00</td>
<td><strong>Free Paper Presentation 3</strong></td>
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<td><strong>Chairpersons:</strong> Prof. Muzharul Mannan (Bangladesh), Dr. CY Huang (Hong Kong)</td>
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<td><strong>OP3-01:</strong> Comparative Outcome of Stroke Thrombolysis for Patients with and without Chronic Kidney Disease: A Multicenter Study in Taiwan</td>
<td>Mr. Cheng-Yang Hsieh (Taiwan)</td>
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<td><strong>OP3-02:</strong> Thrombolysis and Endovascular Therapy in a Tertiary Hospital in Malaysia</td>
<td>Dr. Mei-Ling Sharon Tai (Malaysia)</td>
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<td><strong>OP3-03:</strong> Neuroprotective Therapy by Edaravone with Intravenous tPA for Acute Ischemic Stroke in the Elderly Patients</td>
<td>Dr. Syoichiro Kono (Japan)</td>
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<td><strong>OP3-04:</strong> Early Effect of Therapeutic Time Window Extension to 4.5 h for Intravenous rt-PA Therapy in Acute Stroke</td>
<td>Dr. Masatoshi Koga (Japan)</td>
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<td><strong>OP3-05:</strong> Keeping It Simple – Manual Aspiration Thrombectomy Is Quicker and Achieves Similar Results Compared to Device Based Thrombectomy</td>
<td>Dr. Syed Zaidi (USA)</td>
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<td><strong>OP3-06:</strong> Outcomes of Mild or Improving Acute Ischemic Stroke with or without Thrombolysis</td>
<td>Dr. Lung-Tat Chan (Hong Kong)</td>
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<td><strong>OP3-07:</strong> Serum Pentosidine, an Advanced Glycation End Product, Indicates Poor Outcomes After Acute Ischemic Stroke</td>
<td>Dr. Toshiki Ikeda (Japan)</td>
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<td><strong>OP3-08:</strong> The Relationship Between the Degree of Cerebral Blood Flow Augmentation by External Counterpulsation and Clinical Outcomes after Acute Ischemic Stroke</td>
<td>Dr. Li Xiong (Hong Kong)</td>
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<td><strong>OP3-09:</strong> Intravenous Thrombolysis for Acute Ischemic Stroke in Hong Kong: An Evaluation of Treatment Safety and Clinical Outcomes in a Regional Hospital</td>
<td>Dr. Raymond, Chun-Kong Chan (Hong Kong)</td>
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<td><strong>OP3-10:</strong> Implementation of the NSW Stroke Reperfusion Program: Increasing Timely Access to Care</td>
<td>Ms. Melissa Tinsley (Australia)</td>
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<td><strong>OP3-11:</strong> Early and Continuous Neurological Improvement After Intravenous Thrombolysis Are Strong Predictors of Favorable Long-Term Outcome in Acute Ischemic Stroke</td>
<td>Dr. Nabin Sarkar (Singapore)</td>
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<td><strong>OP3-12:</strong> Acute Stroke Involving More Than One-Third MCA Territory on Plain CT Brain Should Not be a Contraindication for IV Thrombolysis</td>
<td>Prof. Vijay Sharma (Singapore)</td>
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<td>17:30-19:00</td>
<td><strong>Bayer Evening Symposium</strong></td>
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<td><strong>Chairperson:</strong> Dr. Ping-Wing Ng (Hong Kong)</td>
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<td><strong>A Practical Guide on Stroke Prevention in Patients with Atrial Fibrillation</strong></td>
<td>Prof. Thomas WH Leung (Hong Kong)</td>
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<td>17:30-19:00</td>
<td><strong>H. Lundbeck A/S Evening Symposium - The Frontiers in AIS Research – Recent Findings and Expectations</strong></td>
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<td><strong>Chairperson:</strong> Prof. Lawrence KS Wong (Hong Kong)</td>
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<td><strong>Equipoise in Current Clinical Trials in AIS</strong></td>
<td>Prof. Greg Albers (USA)</td>
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<td><strong>Today’s Clinical Practice and AIS Studies</strong></td>
<td>Prof. Lawrence KS Wong (Hong Kong)</td>
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<td><strong>New Thrombolytics in AIS: Hopes and Expectations</strong></td>
<td>Prof. Robert Medcalf (Australia)</td>
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### Scientific Program

**Main Conference**

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<td>08:00 - 08:30</td>
<td>Registration</td>
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<td>08:30 - 10:15</td>
<td><strong>S10: Large Clinical Trials</strong></td>
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<td>Chairpersons: Prof. Craig Anderson (<em>Australia</em>), Prof. Lawrence KS Wong (<em>Hong Kong</em>)</td>
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<td>CHANCE</td>
<td>Dr. Yi-Long Wang (<em>China</em>)</td>
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<td>CHIMES</td>
<td>Prof. Chris Chen (<em>Singapore</em>)</td>
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<td>INTERACT</td>
<td>Prof. Craig Anderson (<em>Australia</em>)</td>
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<td>Standard Secondary Ischemic Stroke Prevention:</td>
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<td>The SMART Trial</td>
<td>Dr. Bin Peng (<em>China</em>)</td>
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<td>10:15 - 10:45</td>
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<td>10:45 - 12:30</td>
<td><strong>S11: Intracranial Atherosclerosis</strong></td>
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<td>Chairpersons: Prof. Jong S. Kim (<em>Korea</em>), Prof. Yi-Ning Huang (<em>China</em>)</td>
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<td>Epidemiology</td>
<td>Dr. Nijasri C. Suwanwela (<em>Thailand</em>)</td>
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<td>Risk Factors and Stroke Mechanisms</td>
<td>Prof. Yi-Ning Huang (<em>China</em>)</td>
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<td>Single Subcortical Infarction and ICAS in the Era of HR-MRI</td>
<td>Prof. Jong S Kim (<em>Korea</em>)</td>
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<td>Stenting/Angioplasty after SAMPRIS</td>
<td>Prof. Zhong-Rong Miao (<em>China</em>)</td>
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<td>10:45 - 12:30</td>
<td><strong>S14: Stroke Genetics</strong></td>
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<td>Chairpersons: Dr. Jonathan Rosand (<em>USA</em>), Dr. Sudha Seshadri (<em>USA</em>)</td>
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<td>Ischemic Stroke and Atherosclerosis</td>
<td>Prof. Martin Dichgans (<em>Germany</em>)</td>
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<td>Cognitive Impairment/Decline</td>
<td>Dr. Sudha Seshadri (<em>USA</em>)</td>
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<td>Hemorrhagic Stroke and Hypertension</td>
<td>Dr. Jonathan Rosand (<em>USA</em>)</td>
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<td>Pharmacogenetics of Antiplatelet Agents</td>
<td>Dr. Yun Xu (<em>China</em>)</td>
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<td><strong>S17: Collateral Circulation</strong></td>
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<td>Chairpersons: Prof. David Liebeskind (<em>USA</em>), Dr. Ashfaq Shuaib (<em>Canada</em>)</td>
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<td>Collateral Trials: Evidence of Endovascular Benefit</td>
<td>Prof. David Liebeskind (<em>USA</em>)</td>
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<td>Imaging Selection of Collateral Perfusion</td>
<td>Dr. Mark Parsons (<em>Australia</em>)</td>
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<td>Therapeutic Augmentation of Collaterals</td>
<td>Dr. Ashfaq Shuaib (<em>Canada</em>)</td>
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<td>Impact of Collaterals on Acute Stroke in Asia</td>
<td>Prof. Li-Ping Liu (<em>China</em>)</td>
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<td>10:45 - 12:30</td>
<td><strong>Patient Group: Community Stroke Networking</strong></td>
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<td>Chairpersons: Dr. Sonny Hon (<em>Hong Kong</em>), Dr. Yin-Jiu Haw (<em>Taiwan</em>)</td>
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<td>Stroke in India</td>
<td>Prof. Man Mohan Mehdiratta (<em>India</em>)</td>
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<td>Setting Up Neurological Patients Self-help Groups, Service Provision, and Challenges</td>
<td>Hong Kong Rehabilitation Society</td>
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<td>Setting Up Regional Networks for Patient Self-help Group</td>
<td>Neuro United</td>
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<td>Organizing Small Group Activities</td>
<td>Self Help Group for the Brain Damaged</td>
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<td>Survey of Stroke Rehabilitation of HKSA Members</td>
<td>Hong Kong Stroke Association</td>
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<td>“Community-based Stroke Support, a Lessons from a 20-year Journey”</td>
<td>Dr. N.V. Ramani (<em>Singapore</em>)</td>
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<td><strong>Free Paper Presentation 4</strong></td>
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<td>Chairpersons: Prof. Yukito Shinohara (Japan), Dr. Patrick Li (Hong Kong)</td>
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<td><strong>OP4-01:</strong> Influence of CYP2C9 Polymorphisms on Acenocoumarol Maintenance Dose in Patients with Cerebral Venous Thrombosis</td>
<td>Ms. Tanima De (India)</td>
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<td><strong>OP4-02:</strong> Effects of Mental Practice on Functional Mobility in Ambulant Stroke Subjects – A Pilot Randomized Clinical Trial</td>
<td>Mr. Vijaya Kumar (India)</td>
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<td><strong>OP4-03:</strong> Effects of Task Oriented Exercises with Altered Sensory Input on Functional Mobility in Chronic Stroke – A Randomized Controlled Trial</td>
<td>Mr. Vijaya Kumar (India)</td>
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<td><strong>OP4-04:</strong> An RCT Protocol on Efficacy of Deep Knee Flexion Exercises on Improving Activities Involving Deep Knee Flexion and Quality of Life in Persons with Stroke</td>
<td>Mr. Dharani Daran Jaya Kumar (India)</td>
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<td><strong>OP4-05:</strong> Robot-Assisted Arm Training Promotes Motor Recovery in Patients with Chronic Stroke</td>
<td>Dr. Clare Y.L. Chao (Hong Kong)</td>
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<td><strong>OP4-06:</strong> Neuroprosthetic Effect of Peroneal Functional Electrical Stimulation on Correction of Footdrop in Stroke Cases</td>
<td>Dr. Clare Y.L. Chao (Hong Kong)</td>
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<td><strong>OP4-07:</strong> Successful Launching of Robot-Assisted Gait Training Service at an Acute Hospital in Hong Kong</td>
<td>Dr. Polly M.Y. Lau (Hong Kong)</td>
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<td><strong>OP4-08:</strong> Assessment of Neuromodulation and Behavioral Effects by Motor Arm Training and tDCS on Post Stroke</td>
<td>Dr. Shahid Bashir (Saudi Arabia)</td>
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<td><strong>OP4-09:</strong> Early Supported Discharge after Stroke: A Home-Based Physiotherapy Rehabilitation Program</td>
<td>Ms. Ka-Yan Luk (Hong Kong)</td>
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<td><strong>OP4-10:</strong> Transcutaneous Electrical Nerve Stimulation (TENS) Enhances the Effect of Task-Related Trunk Training (TRTT) on Trunk Control and Walking Function in Subjects with Chronic Stroke</td>
<td>Dr. Bill Kin-Shing Chan (Hong Kong)</td>
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<td><strong>OP4-11:</strong> Effectiveness of Virtual Reality in Balance Training in Stroke Rehabilitation: A Pilot Study</td>
<td>Mr. Tsz-Kit Chow (Hong Kong)</td>
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<td><strong>OP4-12:</strong> Efficacy of Computer Gaming in Facilitating Upper Limb Recovery in Stroke Rehabilitation: A Pilot Randomized Controlled Study</td>
<td>Dr. Keng-He Kong (Singapore)</td>
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<td>12:30 - 14:00</td>
<td><strong>BMS &amp; Pfizer Luncheon Symposium</strong></td>
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<td>Chairperson: Dr. Tak-Hong Tsoi (Hong Kong)</td>
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<td><strong>Role of Novel Oral Anti-coagulants for Stroke Prevention in Atrial Fibrillation</strong></td>
<td>Prof. John Donald Easton (USA)</td>
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<td>14:00 - 15:30</td>
<td><strong>S12: Stroke Prevention</strong></td>
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<td>Chairpersons: Prof. Shinichiro Uchiyama (Japan), Prof. Disya Ratanakorn (Thailand)</td>
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<td></td>
<td><strong>Stroke Burden in the Asia Pacific Region: Updates from the GBD 2010 Study</strong></td>
<td>Prof. Valery Feigin (New Zealand)</td>
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<td><strong>Antithrombotic Therapy in Asian Patients with Ischemic Stroke and TIA</strong></td>
<td>Prof. Shinichiro Uchiyama (Japan)</td>
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<td><strong>Stroke Prevention in Patients with Cryptogenic Stroke</strong></td>
<td>Prof. Disya Ratanakorn (Thailand)</td>
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<td><strong>Unique Brain Check-up System in Japan</strong></td>
<td>Prof. Yukito Shinohara (Japan)</td>
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### Scientific Program – Main Conference (con’t)

**Sunday 1 September 2013 • Hong Kong Convention and Exhibition Centre**

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<td>14:00 - 15:30</td>
<td><strong>S15: Vascular Cognitive Impairment</strong></td>
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<td>S426 &amp; 427</td>
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<td></td>
<td>Chairpersons: Prof. Chris Chen (Singapore), Dr. Yi-Long Wang (China)</td>
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<td>Improving the Neuropsychological Assessment of VCI</td>
<td>Dr. Adrian Wong (Hong Kong)</td>
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<td>The Importance of Amyloid PET Imaging in VCI</td>
<td>Prof. Vincent Mok (Hong Kong)</td>
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<td>Cognitive Impairment &amp; Carotid Stenosis</td>
<td>Dr. Tsong-Hai Lee (Taiwan)</td>
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<td></td>
<td>Can VCI be Prevented and Treated?</td>
<td>Prof. Chris Chen (Singapore)</td>
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<tr>
<td>14:00 - 15:30</td>
<td><strong>S18: Uncommon Causes of Stroke</strong></td>
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<td>Chairpersons: Prof. Kay Sin Tan (Malaysia), Prof. Vijay Sharma (Singapore)</td>
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<td>Young Stroke</td>
<td>Prof. Kay Sin Tan (Malaysia)</td>
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<td>CNS Infections and Stroke</td>
<td>Prof. Man Mohan Mehdiratta (India)</td>
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<td>Moyamoya Disease in China its: Clinical Features and Outcomes</td>
<td>Prof. Lian Duan (China)</td>
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<td>Vasospasm</td>
<td>Prof. Vijay Sharma (Singapore)</td>
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<td>14:00 - 15:30</td>
<td><strong>Patient Group: Public Education</strong></td>
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<td>Chairpersons: Dr. Alan Tse (Hong Kong), Dr. Padma Gunaratne (Sri Lanka)</td>
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<td>Public Education in Sri Lanka for Stroke</td>
<td>Dr. Padma Gunaratne (Sri Lanka)</td>
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<td>Community Education Programs</td>
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<td>The Hong Kong Stroke Fund and Public Education Programs</td>
<td>Hong Kong Stroke Fund</td>
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<td>Against Stroke, Act Now! – The Stroke Education Status in Taiwan</td>
<td>Dr. W.J. Fu (Taiwan)</td>
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<td>14:00 - 15:30</td>
<td><strong>Free Paper Presentation 5</strong></td>
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<td>Chairpersons: Dr. Jong S. Kim (Korea), Prof. Raymond Cheung (Hong Kong)</td>
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<td><strong>OP5-01:</strong> Investigation of the Effects of Spinal Pulsed Electromagnetic Field on Spasticity of Lower Extremity and Alpha Motoneuron Excitability in Hemiplegic Patients Using Hmax/Mmax ratio</td>
<td>Ms. Mahshid Abdollahi (Iran)</td>
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<td><strong>OP5-02:</strong> Results of Cilostazol-Aspirin Therapy Against Recurrent Stroke with Intracranial Artery Stenosis (CATHARSIS)-Primary and Subanalysis</td>
<td>Dr. Nobuyuki Sakai (Japan)</td>
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<td><strong>OP5-03:</strong> Present Status of J-STARs and Substudies</td>
<td>Prof. Masayasu Matsumoto (Japan)</td>
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<td><strong>OP5-04:</strong> The Enhanced Control of Hypertension and Thrombolysis Stroke Study (ENCHANTED): Complexity of Set-Up Large International Clinical Trial</td>
<td>Mrs. Xiaoying Chen (Taiwan)</td>
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<td><strong>OP5-05:</strong> The Enhanced Control of Hypertension and Thrombolysis Stroke Study (ENCHANTED): First Year Experience Regarding Possible Selection Bias</td>
<td>Prof. Craig Anderson (Australia)</td>
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<td><strong>OP5-06:</strong> Recanalisation Rates of Low vs Standard Dose rtPA in the Enhanced Control of Hypertension and Thrombolysis Stroke Study (ENCHANTED): Rationale for a TCD Substudy</td>
<td>Dr. Sully Fuentes (Australia)</td>
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<td><strong>OP5-07:</strong> Prehospital Delay and Recognition of Stroke-Related Symptoms by Patients/ Bystanders</td>
<td>Dr. Satoshi Suzuki (Japan)</td>
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<td><strong>OP5-08:</strong> Early Stroke Risk After Transient Ischemic Attack in Patients Without Atrial Fibrillation or Large Artery Disease</td>
<td>Dr. Tomoyuki Ohara (Japan)</td>
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<td><strong>OP5-09:</strong> Primary Analysis of Prospective Transient Ischemic Attack Registry in Korea: Korean TIA Expression (KTX) Registry</td>
<td>Prof. Yong-Seok Lee (Korea)</td>
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<td>15:30 - 16:00</td>
<td>Coffee Break</td>
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<td>16:00 - 16:30</td>
<td>S13: Translational Research</td>
<td>Chairpersons: Prof. Jin-Sheng Zeng <em>(China)</em>, Prof. Raymond Cheung <em>(Hong Kong)</em></td>
<td>S421</td>
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<td></td>
<td>Secondary Lesion at Remote Area Following Focal Cerebral Infarction: A New Target for Stroke Management</td>
<td>Prof. Jin-Sheng Zeng <em>(China)</em></td>
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<td>Pathophysiology and Treatment of Intracerebral Hemorrhage</td>
<td>Prof. Raymond Cheung <em>(Hong Kong)</em></td>
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<td>Translational Research in Intracerebral Hemorrhage</td>
<td>Prof. Su-Ming Zhang <em>(China)</em></td>
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<td>Cell Therapy for the Treatment of Ischemic Stroke</td>
<td>Prof. Guo-Yuan Yang <em>(China)</em></td>
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<td>16:00 - 16:30</td>
<td>S16: Small Vessel Disease</td>
<td>Chairpersons: Prof. Vincent Mok <em>(Hong Kong)</em>, Prof. Martin Dichgans <em>(Germany)</em></td>
<td>S426 &amp; 427</td>
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<td>Hereditary Cerebral SVD</td>
<td>Prof. Martin Dichgans <em>(Germany)</em></td>
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<td>Risk Factors of SVD as Targets for Prevention</td>
<td>Prof. Vincent Mok <em>(Hong Kong)</em></td>
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<td>Cerebral Microbleeds - Relevance and Risk</td>
<td>Dr. Yannie Soo <em>(Hong Kong)</em></td>
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<td>Treatment for Cerebral SVD</td>
<td>Prof. Chris Chen <em>(Singapore)</em></td>
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<td>16:00 - 16:30</td>
<td>S19: Young Investigator Session – Case Presentation</td>
<td>Chairpersons: Dr. Siu-Hung Li <em>(Hong Kong)</em>, Dr. Joshua WM Fok <em>(Hong Kong)</em></td>
<td>S425</td>
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<td>Interesting Stroke Case 1</td>
<td>Dr. Richard Li <em>(Hong Kong)</em></td>
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<td>Interesting Stroke Case 2</td>
<td>Dr. Joshua WM Fok <em>(Hong Kong)</em></td>
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<td>Interesting Stroke Case 3</td>
<td>Dr. Vincent Ip <em>(Hong Kong)</em></td>
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<td>Interesting Stroke Case 4</td>
<td>Dr. Margaret Ma <em>(Hong Kong)</em></td>
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<td>16:00 - 16:30</td>
<td>Free Paper Presentation 6</td>
<td>Chairpersons: Prof. Shinichiro Uchiyama <em>(Japan)</em>, Dr. Joseph MK Lam <em>(Hong Kong)</em></td>
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<td>OP6-01: Voice Recorded Messages from Significant Others as an Adjunct Therapy to Increase the Level of Consciousness of Patients with Reversible Coma</td>
<td>Mr. Martin I. Dacles <em>(Philippines)</em></td>
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<td>OP6-02: Cost-Effectiveness Analysis of Stroke Management Under a Universal Health Insurance System</td>
<td>Prof. Kuchou Chang <em>(Taiwan)</em></td>
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<td>OP6-03: The Changes of Health-Related Quality of Life of Stroke Patients in Mongolia</td>
<td>Dr. Enkhzaya Chuluunbaatar <em>(Mongolia)</em></td>
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<td>OP6-04: Associations Between Social Support, Socioeconomic Status and Depression in Stroke Survivors Who Experienced Economic Transition</td>
<td>Prof. Ruoling Chen <em>(UK)</em></td>
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<td>OP6-05: Outcome and Complication of Carotid Artery Stenting: Multiple Institutes Retrospective Review of 102 Consecutive Patients</td>
<td>Dr. Hiroshi Okada <em>(Japan)</em></td>
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<td>OP6-06: Association between Intima-Media Thickness of Brachiocephalic Trunk and White Matter Hyperintensity in Brain MRI</td>
<td>Dr. Katsunori Isa <em>(Japan)</em></td>
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<td>OP6-07: Poor Outcome in 5-Year Survivors of Stroke with Low Blood Pressure</td>
<td>Prof. A.G. Thrift <em>(Australia)</em></td>
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<td>OP6-08: Influence of Air Pollution on Stroke Incidence in Ludhiana City</td>
<td>Ms. Riya Sarah Thomas <em>(India)</em></td>
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<td>OP6-09: Effect of Sonolysis on a Risk Reduction of Brain Infarction During Carotid Endarterectomy or Stenting. A Prospective Study</td>
<td>Dr. David Skoloudik <em>(Czech Republic)</em></td>
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<tr>
<td>16:00 - 17:30</td>
<td>Free Paper Presentation 7</td>
<td>Chairpersons: Prof. Muhammad Wasay (Pakistan), Dr. John Kwok (Hong Kong)</td>
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<td><strong>OP7-01:</strong> Endothelial Gene Expression and Molecular Changes in Response to Radiosurgery in In Vitro and In Vivo Models of Cerebral Arteriovenous Malformations</td>
<td>Dr. Jian Tu (Australia)</td>
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<td><strong>OP7-02:</strong> Heparin/Collagen Coating on Nitinol Surface for Intravascular Applications</td>
<td>Dr. Wei Huang (Hong Kong)</td>
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<td><strong>OP7-03:</strong> Usefulness of Neuronavigation Guided Endoscopic Evacuation for Supratentorial Intracerebral Hemorrhage</td>
<td>Dr. Takafumi Shimogawa (Japan)</td>
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<td><strong>OP7-04:</strong> Factors Associated with Long-Term Adherence of Antithrombotic Agents After First-Ever Acute Ischemic Stroke</td>
<td>Prof. Hsuei-Chen Lee (Taiwan)</td>
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<td><strong>OP7-05:</strong> Impaired Vasodilatory Reserve on Acetazolamide-Challenged 99Tc-HMPAO SPECT is a Strong Predictor of Stroke Recurrence in Patients with Severe Steno-Occlusive Disease of Intracranial Carotid or Middle Cerebral Artery</td>
<td>Dr. Nabin Sarkar (Singapore)</td>
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<td><strong>OP7-06:</strong> Automatic Quantizing the Middle Cerebral Artery Atherosclerosis inComputed Tomography Images</td>
<td>Dr. Lung Chan (Taiwan)</td>
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<td><strong>OP7-07:</strong> Effects of Assessment, Reorientation and Therapy (A. R. T.) Program in Decreasing Anxiety and Meeting the Needs of Families of CVA Patients</td>
<td>Ms. Daisy U. Algenio (Philippines)</td>
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<td><strong>OP7-08:</strong> Validation of the Mandarin Version of Stroke Impact Scale with Rasch analysis</td>
<td>Ms. Yu-Ching Huang (Taiwan)</td>
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<td><strong>OP7-09:</strong> A Prospective Evaluation of Diagnostic Yield of Transient Ischemic Attack (TIA) in a Nurse-Led TIA Clinic in Hong Kong</td>
<td>Mr. Chung-Tsang Yu (Hong Kong)</td>
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**Conference Information**

**Conference Name**
Asia Pacific Stroke Conference 2013

**Date**

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<td>Friday 30 August 2013</td>
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<td>Sunday 1 September 2013</td>
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**Venue**

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<th>Workshop 1 – Neurosonology</th>
<th>Workshop 2 – Intervention</th>
<th>Workshop 3 – Stroke Genetics</th>
<th>Workshop 4 – Asian Vas Cog</th>
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<td>Lecture Theatre, 2/F, Lui Che Woo Clinical Sciences Building, Prince of Wales Hospital</td>
<td>2/F, Function Room, The Harbourview, 4 Harbour Road, Wanchai, Hong Kong</td>
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<th>Main Conference</th>
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<td>Meeting Room S420series, Level 4, Hong Kong Convention and Exhibition Centre</td>
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**APSO ExCo Meeting**

- **Date:** Friday 30 August 2013
- **Time:** 10:30 – 12:30
- **Venue:** 2/F, Function Room, The Harbourview

**APSO Annual General Meeting**

- **Date:** Sunday 1 September 2013
- **Time:** 07:30 – 08:30
- **Venue:** Meeting Room S425, Level 4, Hong Kong Convention and Exhibition Centre

**Conference Secretariat**

MCI Hong Kong
Suites 2807-9, Two Chinachem Exchange Square, 338 King’s Road, North Point, Hong Kong
Tel: (852) 2911 7931 Fax: (852) 2838 7244 Email: apsc2013@mci-group.com

**Official Language**
The official language of the Conference is English. No simultaneous interpretation will be provided.

**Registration**
Please present the official receipt at the registration counter to collect your conference materials.

**Opening hours of registration counter:**

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<th>Friday 30 August 2013</th>
<th>Saturday 31 August 2013</th>
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<tr>
<td>08:00 – 16:00</td>
<td>07:30 – 18:00</td>
<td>08:00 – 17:00</td>
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(for pre-conference workshop only)

For on-site registration, payment can be made in cash (HK Dollars) or credit card (Visa / Master). Official receipt will be issued and forwarded to respective delegate after the Conference.
Registration fees for on-site registrant of the Conference are as follows:

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<th>Category</th>
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<td>Physicians (Regular Group Countries)</td>
<td>HK$ 4,000 / US$ 540</td>
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<tr>
<td>Physicians (Reduced Member Group A)</td>
<td>HK$ 3,000 / US$ 400</td>
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<tr>
<td>Physicians (Reduced Member Group B)</td>
<td>HK$ 2,000 / US$ 270</td>
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<tr>
<td>Nurses, Allied Health Professionals, Students</td>
<td>HK$ 1,200 / US$ 160</td>
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**Badge**

Color-coded badges will be used during the Conference. For identification purpose and admission to the opening ceremony, scientific sessions and exhibition, delegates are requested to wear their badges which will be available upon registration.

**Certificate of Attendance**

A Certificate of Attendance will be issued to each pre-registered delegate and available for collection at the registration counter during the Conference. For on-site registrants, Certificate of Attendance will be available at the end of the Conference. No certificate will be issued after the Conference.

**Exhibition**

In conjunction with the Conference, an exhibition featuring the latest products, equipment and educational materials in stroke will be held at the same time in Meeting Room S423 and S424. Admission to the exhibition is free for all registered participants.

**Slide Preview Room**

All invited speakers and abstract presenters are requested to upload their presentation files 3 hours prior to their session times at the Slide Preview Room, located at Meeting Room S430. The opening hours of the room are as follows:

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<th>Saturday 31 August 2013</th>
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<td>07:30 – 18:00</td>
<td>08:00 – 16:00</td>
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**Photo Taking, Audio Recording and Video Shooting**

No photo taking, audio recording and video shooting are allowed in the meeting rooms for this Conference unless permission is granted.

**Beeping Devices**

Please switch off mobile phones and beeping devices (or use the vibrant mode) during the lectures and presentations.

**Coffee Breaks & Lunches**

Registered delegates are entitled to coffee breaks and lunches during the Conference. Coffee breaks will be served at S421 Foyer and Meeting Room S423 and S424, while lunches will be served at Meeting Room S421 on Saturday and Sunday, 31 August – 1 September 2013 during the Luncheon Symposium (12:30 – 14:00). Limited capacity on a first-come-first-served basis.

**Opening Ceremony**

All delegates are invited to attend the Opening Ceremony with important speeches from the host and officiating guests at Meeting Room S421 on Saturday 31 August 2013 (09:30 – 10:00).

**Gala Dinner**

Gala Dinner is scheduled on Saturday 31 August 2013 at Yat Tung Heen, 2/F, Great Eagle Centre, 23 Harbour Road, Wan Chai, Hong Kong (19:30 – 22:00). Ticket could be purchased at the registration counter (HK$ 750 / US$ 100 per person). Limited capacity on a first-come-first-served basis.

**No Smoking Policy**

The Harbourview and Hong Kong Convention and Exhibition Centre are non-smoking facilities. Smoking is prohibited.

**Disclaimer**

Whilst every attempt has been made to ensure that all aspects of the Conference announced will take place as scheduled, the Organizing Committee reserves the right to make changes at any time should the need arise.

**Liability**

The Organizing Committee will not be liable for personal accident and/or loss or damage to the property of participants during the Conference. Participants should make their own arrangements with respect to personal insurance.
### Academic Accreditations

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<th>1 Sep 2013</th>
<th>Max. for whole function</th>
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<tr>
<td>College of Dental Surgeons of Hong Kong (Cat. B)</td>
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<td>College of Ophthalmologists of Hong Kong (Passive)</td>
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### Location Map

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Exhibition Booths:

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2. EVER Neuro Pharma (Asia) Limited
3. Otsuka Pharmaceutical (H.K.) Ltd.
4. Moleac Pte Ltd
5. AstraZeneca Hong Kong Limited
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OP1-01

Synergic Effects of Levamlodipine and Bisoprolol on Blood Pressure Reduction, Organ Protection and Stroke Protection in Rats

Gao-Zhong Huang

Sixth People’s Hospital, Shanghai Jiaotong University, Shanghai/Beijing, China

Aims: Stroke is a major cause of disability and death worldwide. Hypertension is one of the most important risk factors for stroke. The objective of this work was to study the synergic effects of levamlodipine and bisoprolol on blood pressure reduction, organ protection in spontaneously hypertensive rats (SHR) and test the effects of combination with levamlodipine and bisoprolol on stroke in rats.

Methods: Blood pressure was continuously monitored in conscious SHR. For acute study, a single dose of drugs was administered via an intragastric catheter. For chronic study (4 months), drugs were delivered via rat chow. For acute study, a single dose of drugs was administered via an intragastric catheter. Systolic blood pressure (SBP) and heart period (HP) were monitored in conscious rats before and after drug administration. To observe the protection of drugs against ischemic cerebral injury, rats were subjected to middle cerebral arterial occlusion half an hour after drug administration; 24 h later, the infarct size were measured. For long-term treatment study, drugs were delivered via rat chow in stroke prone-spontaneously hypertensive rats (SHR-SP). The survival time of each rat was recorded.

Results: A single dose of levamlodipine (from 1 mg/kg), bisoprolol (from 0.125 mg/kg), and their combinations significantly decreased blood pressure. The levamlodipine-induced tachycardia and the bisoprolol-induced bradycardia were temporized by the combination of these two drugs. Upon chronic treatment, this combination also decreased blood pressure variability and reduced organ damage. SBP was significantly reduced by combination therapy with levamlodipine and bisoprolol both in SHR-SP and SAD rats. Neutralization on heart rate was observed in combination. In SHR-SP, BRS was enhanced in levamlodipine alone and combination. In SAD rats, reduction of SBPV was observed only in combination. In long term treatment study, the lifespan of SHR-SP in combination was notably longer than that in other groups. Both in SD rats with and without SAD, the infarct areas were the smallest in combination.

Conclusion: Levamlodipine and bisoprolol produce synergic effects on blood pressure reduction and organ protection in SHR, combination of levamlodipine and bisoprolol has a better protection on stroke.

OP1-02


B.C. Lee, M.S. Oh, K.H. Yu, C.H. Kim

Hallym University Sacred Heart Hospital, Anyang, Korea South

Background and Objective: In 2006, the National Institute of Neurological Disorders and Stroke and Canadian Stroke Network proposed the Vascular Cognitive Impairment Harmonization Standards (VCIHS) test protocols. However, the optimal cutoff point for cognitive impairment with the VCIHS neuropsychological tool has not yet been determined. We aimed to determine the most efficient cutoff point for the VCIHS neuropsychological tool for diagnosing vascular cognitive impairment (VCI) in stroke survivor.

Methods: The study group comprised 353 post-stroke survivors recruited from the Korean VCHS study. They underwent comprehensive neuropsychological assessments using the 60-minute Korean VCIHS neuropsychological protocol at 3 months after stroke onset. We selected the 2nd, 7th, 10th, and 16th percentile as the cutoff point for detecting impairment and estimated the frequency of VCI at each cutoff point. Additionally, with using each cutoff point, the agreement between various clinical criteria for VCI was compared. The clinical criteria for VCI included the Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM-IV), Alzheimer’s Disease Diagnostic and Treatment Centers (ADDTC), and National Institute of Neurological Disorders and Stroke–Association Internationale pour la Recherche et l’Enseignement en Neurosciences (NINDS-AIREN). Agreement with above clinical criteria for VCI was also calculated by the Kappa statistic.

Results: The frequency of VCI according to the different cutoff points for VCIHS neuropsychological tool varied considerably: 39.7% by the 2th percentile, 58.4% by the 7th percentile, and 62.6% by the 10th percentile, and 71.7% by the 16th percentile. The cutoff point of the 10th percentile for VCHS neuropsychological tool showed the best overall agreement between three clinical criteria: DSM-IV/ADDTC (κ = 0.917), between DSM-IV/
NINDS-AIREN ($\kappa = 0.961$) and ADDTC/NINDS-AIREN ($\kappa = 0.879$).

**Conclusions:** We proposed the tenth percentile for the most efficient cutoff point for the VCIHS neuropsychological tools for diagnosing VCI in stroke survivors.

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**Summary**

**OP1-03**

**High-Density Lipoprotein of Patients with Type 2 Diabetes Mellitus Upregulates Cyclooxygenase-2 Expression and Prostacyclin I-2 Release in Endothelial Cells: Relationship with HDL-Associated Sphingosine-1-Phosphate**

Xunliang Tong

Peking University First Hospital, Beijing, China

**Background:** Dysfunctional high-density lipoprotein (HDL) may have pro-inflammatory effects on the endothelial cells, which causes atherosclerosis in type 2 diabetes mellitus (T2DM). HDL is a major carrier of sphingosine-1-phosphate (S1P) in plasma while potential role of HDL and S1P in T2DM remains unexplored. We hypothesized that diabetic HDL with higher contents of S1P exerts beneficial effects on the vascular system.

**Methods:** Subjects with T2DM with or without ultrasound proved large arteries atherosclerotic vascular diseases and normal controls ($n = 15$ for each group) were recruited in this study. The levels of HDL-associated S1P were determined by UPLC-MS/MS. The protective function of diabetic HDL and S1P was evaluated by measuring cyclooxygenase-2 (COX-2) expression and prostacyclin I-2 (PGI-2) release by human umbilical vein endothelial cells (HUVECs) using western blot and enzyme-linked immunosorbent assay (ELISA), respectively.

**Result:** The levels of HDL-associated S1P were significantly increased in T2DM without atherosclerosis group compared with control group and T2DM with atherosclerosis group (T2DM vs controls: $235.6 \pm 13.4$ vs $195.0 \pm 6.4$ ng/mg, $p < 0.05$; T2DM-As vs T2DM: $212.5 \pm 8.8$ vs $235.6 \pm 13.4$ ng/mg, $p < 0.05$). The diabetic HDL isolated from T2DM patients without vascular atherosclerotic disease exerted greater protective effects on inducing COX-2 expression and PGI-2 release by HUVECs than those of control HDL ($p < 0.05$, $p < 0.01$, respectively). Pertussis toxin and VPC 23019 significantly attenuated HDL-induced COX-2 expression and PGI-2 release. The signal pathway of ERK/MAPK-CREB was activated in this process.

**Conclusions:** Diabetic HDL from T2DM patients without vascular atherosclerotic disease carries higher level of S1P compared with normal HDL, which has the potential to contribute to protective effects on endothelial cells by inducing COX-2 expression and PGI-2 release. These findings provide a new insight of S1P function in T2DM patients, possibly leading to a new therapeutic target.

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**OP1-04**

**Lipid Profile Reveals Galactosylceramide Increasing in Atherosclerotic Stroke Patients Approached to Online 2D LC QToF-MS**

Xunliang Tong, Min Li

Peking University First Hospital, Beijing, China

**Background:** Atherosclerosis was a chronic inflammatory disease with activation of both innate and adaptive immunity. Lipid, especially galactosylceramide was recognized as antigens and stimulator of natural killer T (NKT) cells and produced cytokines release. Lack of methods of human based resources for screening the lipids was involved in immune response related to atherosclerosis.

**Method:** We recruited the atherosclerotic stroke patients with carotid plaque and mild stenosis patients confirmed by ultrasound examination. All the patients were underwent the standard therapy of second prevention of stroke. The plasma isolated form these patients and healthy volunteers was taken for lipidomic analysis by the method 2D LC Q ToF-MS. Through this method, different lipid classes were separated by the first dimensional normal-phase liquid chromatography and different lipid molecular species were separated by the second dimensional reversed-phase liquid chromatography.

**Result:** The differences of lipids metabolism products in human plasma between carotid atherosclerosis patients and control subjects were identified. The numbers of 518 from 17 lipid classes were determined and 489 endogenous lipid species were shown quantitative and qualitative differences. And we successfully identified galactosylceramide and glucoceramide separately, which both have the same molecular weight. Only the levels of galactosylceramide in atherosclerosis patients were significantly increasing, rather than glucoceramide, compared with the controls.

**Conclusion:** This method was applied to identify the lipid products in plasma and making its merits in quantity and quality of the detection of lipids. The increasing levels of Galacer in atherosclerosis groups were revealed that immune responses were important of atherosclerosis exiting and progression. It would be helpful to the well understanding atherosclerosis and further investigation.

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**OP1-05**

**Association of the Functional KL-VS Variant of Klotho Gene with Ischemic Stroke in the Young**

Rita Christopher, Vijaya Majumdar, Dindagur Nagaraja

National Institute of Mental Health and Neuro Sciences (NIMHANS), Bangalore, India

**Background and Objectives:** Genetic variants of Klotho have been reported to be associated with human longevity and atherosclerotic vascular events and risk factors. However, very few studies have explored their association with ischemic stroke. We hypothesized that the functional KL-VS and the exonic C1818T variants of Klotho gene may be associated with ischemic stroke in Indian population.

**Result:**

The results showed that the functional KL-VS and the exonic C1818T variants of Klotho were not associated with ischemic stroke in the Indian population.

**Conclusion:** The results suggest that the functional KL-VS and the exonic C1818T variants of Klotho are not associated with ischemic stroke in the Indian population.
Methods: We enrolled a total of 460 patients with ischemic stroke and 574 age- and gender-matched controls for the study. Genotyping was done by polymerase chain reaction and restriction fragment length polymorphism.

Results: Contrary to other Asian reports, KL-VS variant was polymorphic in our population, with a frequency distribution similar to that of Caucasians. The frequency distribution of the C1818T variant was similar to previous reports in Asians. A differential effect of age on association of Klotho KL-VS variant with ischemic stroke was observed. In subjects aged < 40 years, the KL-VS homozygotes, 352FF and 352VV, had ~1.5-fold (OR = 1.57; 95% CI: 1.02–2.40, p = 0.038) and ~3-fold (OR = 3.29; 95% CI: 1.02–10.56, p = 0.046) higher risk of stroke compared to heterozygotes, whereas in the older group (aged > 40 years) no significant association was observed. The C1818T variant was not associated with ischemic stroke.

Conclusion: We conclude that KL-VS homozygosity could contribute to premature ischemic stroke in India. Larger studies in other ethnic populations are warranted to determine the role of these gene variants in the etiology of stroke occurring in the young.

OP1-06
Convexal Subarachnoid Hemorrhage: Clinical Characteristics and Vascular Imaging
Du Wanliang, Wang Yongjun
Beijing Tiantan Hospital, Beijing, China

Background and Objectives: Non-traumatic cerebral convexal subarachnoid hemorrhage (cSAH) is different from aneurysmal subarachnoid hemorrhage (aSAH). The purpose of this study was to describe the clinical characteristics and vascular imaging and discuss the potential causes of cSAH.

Method: We retrospectively selected patients presented to the neurology department of Beijing Tiantan Hospital, from Dec 2001 to Jan 2013, who presented with cSAH. Data of demographic characteristics, clinical presentations and cerebrovascular imaging were collected.

Results: Fifty-four patients (34 men and 20 women) were included. Mean age was 57.9 years (range 23–85). Thirty-seven patients was admitted to the hospital, in whom the symptoms were headache (n = 14), weakness (n = 13), numbness (n = 8), dysarthria (n = 8), seizure (n = 3), loss of consciousness (n = 2), aphasia (n = 2), blurred vision (n = 1), asymptomatic (n = 1), which was transient (n = 16) or persistent (n = 23). CT or MR showed that hemorrhage mostly located in the central sulcus. Cerebral angiography (MRA, CTA or DSA) was performed in 39 patients. The most common vascular abnormalities were isolated internal carotid artery or middle cerebral artery stenosis or occlusion (n = 21). No aneurysm was found in the field of cSAH.

Conclusions: The clinical manifestations of cSAH were similar to that of ischemic stroke or transient ischemic attack (TIA). Cerebrovascular stenosis or occlusion may be the potential causes of cSAH.
ischemia without abnormal signal in restricted diffusion. MRA did not show stenosis along the circle of Willis, carotid and vertebral arteries. 24-hour Holter examination and echocardiogram were normal. His symptoms resolved gradually after the correction of hypercalcemia by intravenous rehydration therapy. Subsequently elevated parathyroid hormone (19.3pmol/L) was confirmed. Parathyroid scan revealed an abnormal parathyroid gland uptake at the upper pole of left thyroid lobe. A clinical diagnosis of primary hyperparathyroidism presumably due to parathyroid adenoma was made but he refused operation.

Case 2: A 76-year-old man presented with recurrent transient ischemic attack with right facial weakness and slurred speech. He had history of bilateral renal stones causing bilateral hydronephrosis requiring lithotripsy and stenting eleven years ago in private hospital. On admission, there was nothing of note in physical examination. CT brain was normal. He was discharged with Aspirin. Four weeks later, he was readmitted for same symptoms with documented transient isolated right facial palsy at emergency room. CT brain was again unremarkable. There was no stenosis over extracranial portion of internal carotid artery in carotid doppler. However, blood test revealed hypercalcemia (adjusted serum calcium 2.95mmol/L, ionized calcium 1.72mmol/L) and later elevated parathyroid hormone (13.9pmol/L). X-ray showed residual left renal stones. Parathyroid scan showed abnormal parathyroid gland uptake inferior to the right thyroid lobe. Parathyroidectomy confirmed a right parathyroid adenoma. Since after operation, there was no further recurrence of neurological symptoms.

**Small Vessel Disease, Stroke Care Systems & Stroke in Asia**

**OP2-01**

**Intracranial Artery Abnormalities in Small Vessel Diseases: Atheroma, Hypertrophy and Dilation**

W.H. Xu, Li, Niu, Sun, Feng, F. Jin, Gao

Peking Union Medical College Hospital, Beijing, China

**Objective:** Using high-resolution magnetic resonance imaging (HR-MRI), we aimed to investigate the abnormalities of intracranial large artery in relation to cerebral small vessel diseases (SVD).

**Methods:** Routine cranial MRI, magnetic resonance angiography and HR-MRI were performed on consecutive patients with an acute deep brain infarct (DBI) in the territory of middle cerebral artery (MCA), patients with white matter lesions (WMLs), and age-matched controls. The presence and distribution of MCA plaque, and the area of MCA lumen and wall were comparatively analyzed among the groups.

**Results:** A total of 2340 image slices of 260 vessels in 130 subjects (57 with an acute DBI, 28 with WMLs and 45 control subjects) were analyzed. In the patients with a DBI, eccentric plaques were identified on 66 slices of 26 vessels ipsilateral and 62 slices of 24 vessels contralateral to the ischemic lesions. Superior-wall plaques of MCA were more frequently observed ipsilateral than contralateral to the infarcts (69.2% vs. 37.5%, P = 0.025), while ventral-wall plaques were more commonly contralateral than ipsilateral to the infarcts (62.5% vs. 30.8%, P = 0.025). Compared to the controls, larger outer-wall boundary area (P<0.017) and wall area (P<0.001) of MCA were observed in the patients with DBIs and WMLs, while larger lumen was only observed in the patients with WMLs (P < 0.001).

**Conclusion:** MCA superior-wall plaques are associated with acute DBIs. The wall thickening and lumen dilation of MCA in SVD mimic the changes of heart and peripheral arteries in response to chronic hypertension.
OP2-02
Trends in the Incidence of Stroke and Cardiovascular Risk Factors on the Isolated Island of Okinawa: The Miyakojima Study
Katsunori Iseki1, Chikako Sugama1, Koichiro Okumura1, Kunitoshi Iseki2, Kozen Kinjyo2, Yusuke Ohya1
1Department of Cardiovascular Medicine, Nephrology and Neurology, University of the Ryukyus Graduate School of Medicine, Okinawa; 2Okinawa General Health Maintenance Association, Okinawa, Japan

Background and Objective: Rapid deterioration of cardiovascular risk control, especially obesity, has occurred in Okinawa; this may affect cardiovascular disease incidence, including stroke.

Methods: Cross-sectional field studies were conducted in 2 periods, 1988–1991 as the first period, and 2002–2005 as the second period, in the isolated island of Okinawa, Miyakojima. To evaluate population backgrounds related to cardiovascular risk factors, data from the health checkup programs conducted in 1987 and 2001 were surveyed.

Results: Total of 257 patients in the first period and 370 in the second were diagnosed with first-time stroke. The age-adjusted annual incidence rate of first-time stroke of the first and second periods was 124 and 144 per 100,000 standard population of Japan. The age-adjusted annual incidence rate showed an upward trend for brain infarction (50 to 73) and downward trend for brain hemorrhage (61 to 54); however, those trends were not significant. The health checkup surveys illustrated that blood pressure decreased in all age groups during the second survey period. However, the body mass index increased in patients aged 50 years or more. Fasting blood glucose levels of patients aged 30–79 years and non-HDL cholesterol levels of patients aged 50–79 years significantly increased.

Conclusion: In Miyakojima, the incidence of first-time stroke and all of its subtypes did not change significantly between two periods, even though blood pressure decreased significantly in the second period. Metabolic deterioration may be associated with the upward trend in incidence of brain infarction.

OP2-03
Effects of Stress in the Family and Work at Risk of Stroke: 14-Year Epidemiological Studies Based Program WHO “MONICA”
V. Gafarov, E. Gromova, I. Gagulin, A. Gafarova
Collaborative laboratory of Epidemiology of Cardiovascular Diseases SB RAMS, FSBI Institute of Internal Medicine SB RAMS, Novosibirsk, Russia

Background and Objectives: We sought to examine the relationship between stress at family and work and the risk development of stroke among men ages 25 to 64 years.

Methods: Within the framework of program WHO MONICA-MOPSY was examined representative sample of men 25–64 years old (1994 year). Total sample was 657 persons. Stress at family and work were measured at baseline with the use of the MONICA – psychosocial Interview Stress at family and work The incidence of news cases of stroke was revealed at 14-year follow-up. Cox – proportional regression model was used for an estimation of hazard ratio (HR).

Results: Within the first 5 years was observed increase risk of development stroke was higher in 2.5 times (95% CI 1.079–6.18, p < 0.05), 10-years period HR = 2.4 (95% CI 1.37–6.54, p < 0.05); during 14-years was tended to increase the risk of stroke in 2 times (p > 0.05) at the men testing high stress in family in comparison with men, marking moderate stress in family was observed.

Within 5 years was observed increase risk of development stroke was higher in 2.6 times (95% CI 1.7–5.6, p < 0.05) Risk of development stroke the men testing stress at work, within 10-years period HR = 4.4 (95% CI 2.4–8.7, p < 0.05), within 14-years HR = 3.6 (95% CI 0.3–9, p < 0.05) in comparison with men of not testing stressful situations at the workplace.

Those most at risk of stroke have been exposed to men with high levels of stress in the family and at work up to 3–4 times within the first 5 years of observation. Protective factor in reducing the risk of stroke were high educational and professional levels, and stable family situation.

OP2-04
Haemorrhagic Transformation in Chinese Ischaemic Stroke Patients – A 3-Year Cohort Study
R. Li, S. Cheng, E. Yeung, C.N. Lee, M. Auyeung, C.M. Cheung, T.H. Tsoi
Department of Medicine, Pamela Youde Nethersole Eastern Hospital, Hong Kong

Background and Objectives: Haemorrhagic transformation (HT) of cerebral infarct is a complication that may significantly worsen outcome. In this study, we aim to identify its risk factors and prognosis.

Methods: All patients with ischaemic stroke admitted to a Hong Kong regional hospital from 2010–2012 were included in this prospectively collected cohort and analyzed. All patients had baseline computer tomography (CT) brain performed, and those with neurological deterioration had one or more follow up scans. The presence of HT was determined by CT alone, and it was classified into hemorrhagic infarction (HI) and parenchymal haematoma (PH) according to the ECASS classification. Symptomatic HT was defined as deterioration of 4 or more points in NIHSS score. Disability and mortality were evaluated at 28 days from onset, and severe disability was defined as mRS ≥4.
Results: 2,365 patients with ischaemic stroke were identified, and 91 developed HT (3.84%) after a mean duration of 62.7 hours from symptom onset. Male gender (p = 0.03), presence of ischaemic heart disease (p = 0.03), atrial fibrillation (p < 0.01), large cortical infarct (p < 0.01), and use of warfarin (p = 0.03) or alteplase (p < 0.01) were significantly associated with HT. Patients with HT had higher mortality (OR 5.67, p < 0.01) and were more likely to become severely disabled (OR 2.46, p < 0.01). 23 of 91 patients with HT (25.3%) were symptomatic, among which 21.7% were HI and 78.3% were PH. Symptomatic HT was significantly associated with PH (OR 2.84, p = 0.05), and all subjects had mRS ≥4 at 28 days.

Conclusion: The prevalence of symptomatic haemorrhagic transformation in ischaemic stroke is low. Patients with symptomatic HT were more likely to have parenchymal haematoma and poor outcome.

OP2-05
Effect of Seasonal Variation on Stroke Incidence: Data from Ludhiana Population Based Stroke Registry
Lydia Sharon Kat1, Paramdeep Kaur2, Shweta Jain3, Gagandeep Mehmi3, Amber Sharma2, Jeyaraj D. Pandian4
1Medical Student, Christian Medical College, Ludhiana, Punjab, 2Assistant Professor, Community Medicine Department, Christian Medical College, Ludhiana, Punjab, 3Research Co-ordinator, Christian Medical College, Ludhiana, Punjab, 4Professor and Head, Department of Neurology, Christian Medical College, Ludhiana, Punjab, India

Background and Aims: Seasonal variation in stroke has been reported with an increase in both the hospital admissions and stroke mortality in the colder months of winter as compared to summer. The city of Ludhiana has extremes of winter and summer. Hence we aimed to study the seasonal variation in stroke incidence and short term outcome.

Methods: All first ever stroke patients (≥18 years) were included from 1st April 2011 till March 31st 2012. We collected the data from the hospitals, scan centers and general practitioners, using separate questionnaires based on WHO STEPS approach with modifications. The data include stroke onset date, age, gender, type of stroke, symptoms, risk factors and outcome at discharge and 28 days follow-up (modified Rankin Scale, mRS). We categorised winter as (November to March), summer (April till July) and monsoon (August till October).

Statistical Analysis: The statistical measures used were frequencies, descriptive statistics and multinomial logistic regression analysis.

Results: A total 1511 cases were included, the mean age was 59 ±15 years, and 933 (62%) were men. There were significant differences in the incidence rates (per 100,000) of stroke in winter (83.76) versus summer (38.99; p < 0.0001) and monsoon (38.67) versus summer (38.99; p < 0.0001). The odds of having stroke was significantly higher in both men [OR: 2.18 (95% CI: 1.86–2.56); p < 0.0001] and women [2.09 95% CI: (1.71–2.55); p < 0.0001] during winter. The odds of occurrence of hemorrhagic stroke was higher during winter (3.56; p < 0.0001) as compared to summer.

Conclusion: Stroke incidence was greater in winter as compared to other seasons. Hemorrhagic stroke was higher in winter. Decrease in physical activity, uncontrolled blood pressure and poor eating habits would have contributed to the high incidence of stroke in winter.

Acknowledgement: The Indian Council of Medical Research.

OP2-06
Cost of Stroke from a Centre in Northwest India
G. Kwaatra, P. Kaur, G. Toor, D.K. Badyal, R. Kaur, Y. Singh, J.D. Pandian
Christian Medical College & Hospital, Ludhiana, India

Background: Stroke is a major cause of disabilities worldwide. The stroke burden is increasing in developing countries like India unlike the western countries. Numerous studies have been done to determine the economic impact of stroke but there is little data from India. We aimed to study the cost of illness of stroke in our hospital and to correlate the cost with characteristics such as type of stroke, length of hospital stay and stroke outcome.

Methods: This study was done in the Stroke unit and Neurology clinic at Christian Medical College and Hospital, Ludhiana, from April 2009 to October 2011. All first ever stroke patients were enrolled after taking a written informed consent. Direct and indirect costs at admission, 1 month and at 6 months follow up were obtained. The follow up included information about post-stroke modified Rankin scale (mRS), work status, modifications made at home, loan requirement, if any.

Results: 200 patients were enrolled in this study; final analysis was performed on 189 patients (11 patients excluded). The mean age was 58 ± 13 years and 128 (67.7%) were men. The mean overall cost of stroke per patient in our study was Rupees (INR) 80,612 at 6 months. Direct medical cost accounted for 65%, direct non-medical cost for 6% and indirect cost for 29% of the total costs. Poor outcome (mRS>3) (p = 0.001) and length of hospital stay (p = 0.001) and higher income (p = 0.008), were the cost driving factors of total cost at 6 months. There was a decline in the need for loan (1 month 11% vs. 6 months 2%; p = 0.003) at 6 months follow-up.

Conclusions: The direct medical cost or acute hospital care was a major component of cost of stroke. Length of hospital stay, poor outcome and higher income were the cost driving factors of total cost.
OP2-07
Incidence, Risk Factors and Short Term Outcome of Stroke in Young: Data from Ludhiana Population Based Stroke Registry
Paramdeep Kaur, Shweta Jain, Gagandeep Mehm, Amber Sharma, Pritty Titus, Jeyaraj D. Pandian

1Assistant Professor, Community Medicine Department, Christian Medical College, Ludhiana, Punjab; 2Research Co-ordinator, Christian Medical College, Ludhiana, Punjab; 3Biostatistician, Department of Neurology, Christian Medical College, Ludhiana, Punjab; 4Professor and Head, Department of Neurology, Christian Medical College, Ludhiana, Punjab, India

Background and Aims: We aimed to study the incidence, risk factors and short term outcome of stroke in young from the city of Ludhiana.

Methods: All first ever stroke patients (≥18 years) were included from 1st January 2012 till December 31st 2012. Modified WHO STEPS approach was used for data collection. The data includes stroke onset date, age, gender, type of stroke, risk factors and outcome at discharge and 28 days follow-up (modified Rankin Scale, mRS; good outcome: mRS≤2; poor outcome: mRS>2). Stroke in the young was defined as patients between 18 to 49 years of age.

Statistical Analysis: Chi square and Fischer exact test was used.

Result: 1607 patients were recruited and 391 (24%) patients were in the age group 18–49 years. Age specific incidence rate for age group <49 years was 51.3 per 100,000. Ischemic stroke was more common in patients >49 years. Hemorrhagic stroke, CVT and better recovery were seen in younger patients.

Conclusion: Stroke in the young was seen in 24% of our cohort. Diabetes, hypertension and coronary artery disease were more common in patients >49 years. Hemorrhagic stroke, CVT and better recovery were seen in younger patients.

OP2-08
Association Between Socioeconomic Deprivation and Survival After Stroke in China: A Systematic Literature Review and a New Population-Based Study
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Background: China has the largest number of stroke patients in the world. Over the last 30 years it has experienced rapid economic growth and a growing income gap between rich and poor. However, it is not entirely known whether there is a significant impact of socioeconomic deprivation (SED) on survival after stroke in China.

Objective: To assess the impact through a systematic literature review and a new population-based study.

Methods: In 2001–03 we examined a random sample of 3336 residents aged ≥60 years in Anhui, China, with re-interview in one year afterwards. 2978 cohort members (89.3%) were followed up for vital status until 2009. We searched for topic-related articles up to 2012, using PubMed and for Chinese literature the China Biological Medicine Database, China National Knowledge Infrastructure, and others.

Results: In the Anhui cohort 167 participants had stroke at baseline or in one year follow up, of which 64 died during 7 years follow up. After adjustment for age, sex, socio-demography, cardiovascular risk factors, social support, depression and dementia, hazard ratio (HR) for mortality in patients living in rural versus urban areas was 2.17 (1.04–4.50) and in patients with low education of <=primary school 2.04 (1.02–4.06), but increased HRs in low levels of occupation class were not significant. Four published articles were identified, which differently but overall showed an association of SED with mortality. The pooled relative risk of mortality, including the Anhui data was 3.53 (1.34–9.27) in patients with the low education, and 1.60 (1.33–1.92) for income <£100 per month, but not significantly increased for manual occupation.

Conclusions: The evidence suggests the presence of a mortality gradient after stroke for both material and social forms of deprivation in China. Inequalities in survival after stroke persist and need to be taken into account when implementing intervention programs.
Impact of Socioeconomic Deprivation on Survival After Stroke: Is There any Ethnic Differences?

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Background and Objectives: Previous findings of the association of socioeconomic deprivation (SED) with survival after stroke are inconsistent, and little is known about the impact among black and minority ethnic (BME) people living in high income countries.

We examined whether there was an association of SED with stroke survival in England, with ethnic differences.

Methods: We analysed data from 4398 patients (3103 whites, 932 blacks, 253 other minority patients) with first-ever stroke, collected by a population-based stroke register in South London, from 1995 to 2011. SED was measured using the Carstairs index and analysed in its quartile and then sextile. The impact of SED on mortality was examined in Cox regression models.

Results: During 17 years follow up 2,754 patients died. The quartile data showed no significant association of SED with short- and long-term survivals in all patients and in whites. However, blacks with the 4th versus 1st quartile SED had an increased risk of 3- month and 1-year mortality (multivariate adjusted hazard ratio (HR) 1.76, 95% CI 1.06–2.94 and 1.54, 1.00–2.37), and other minority ethnic patients had similar but no significant HRs. Additional adjustment analysis for acute stroke care attenuated the associations for no significant HR. The sextile analysis showed a significant association in all patients; fully adjusted HR for 3-month mortality in those with the 6th sextile SED versus others was 1.23, 1.05–1.44, and for 17-year mortality 1.13, 1.01–1.25. This was observed in whites but not in BME patients.

Conclusions: There is a significant but weak association of SED with increased mortality after stroke in England. While the stronger impact on short-term survival in black patients could be explained by inequality in hospital stroke care, the long-term impact in whites needs more research on its pathways. Further efforts are required to achieve equality in survival among stroke patients.

Comparative Outcome of Stroke Thrombolysis for Patients with and without Chronic Kidney Disease: A Multicenter Study in Taiwan

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Background: Chronic kidney disease (CKD) is prevalent and patients with CKD have increased risk of stroke. Evidences regarding the safety of thrombolytic therapy in acute ischemic stroke (AIS) patients with CKD still remained controversial.

Objective: We compared the safety and effectiveness of thrombolytic therapy in AIS patients with and without CKD.

Methods: Prospectively collected data from six hospitals of Taiwan were used. CKD was defined as estimated glomerular filtration rate (eGFR) < 60 ml/min/1.73 m2. Comparative rates of symptomatic intracerebral hemorrhage (SICH), favorable outcome, and in-hospital mortality after stroke thrombolysis were determined for patients with and without CKD. Favorable outcome was determined as modified Rankin scale score ≤2 at discharge.

Results: A total of 653 patients, including 254 (38%) with and 422 without CKD, were analyzed. Of the CKD patients, 90% were stage 3 (30 ≤ eGFR < 60 ml/min/1.73 m2), 6% were stage 4 (15 ≤ eGFR < 30 ml/min/1.73 m2), and 4% were stage 5 (eGFR < 15 ml/min/1.73 m2). There were no significant differences of SICH (4% vs. 4%, p = 0.68), favorable outcome (35% vs. 40%, p = 0.16), and mortality (9% vs. 8%, p = 0.47) in patients with and without CKD. After multivariate adjustment, CKD remained a non-significant factors associated with SICH, favorable outcome, or mortality. However, onset-to-needle (OTN) time (odds ratio [OR]: 1.01, 95% confidence interval [CI]: 1.00–1.02) and diabetes mellitus (OR: 2.74, 95% CI: 1.03–7.27) were associated with SICH; OTN time (OR: 0.99, 95% CI: 0.99–1.00) and pre-treatment National Institute of Health Stroke Scale (NIHSS) score (OR: 0.854, 95% CI: 0.83–0.88) were associated with favorable outcome; while pre-treatment NIHSS score (OR: 1.16, 95% CI: 1.11–1.22) were associated with mortality after thrombolytic therapy.

Conclusions: For AIS patients with CKD in Taiwan, the outcome of thrombolytic therapy were similar to those without. Patients with CKD should not be excluded from thrombolytic therapy if otherwise eligible according to current guideline.
OP3-02

Thrombolysis and Endovascular Therapy in a Tertiary Hospital in Malaysia

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Background and Objective: Literature on stroke thrombolysis and endovascular therapy in Asia is limited. Our centre commenced acute stroke revascularisation therapy in 2012. Our objective is to evaluate the clinical profile and short term outcome of acute ischaemic stroke (AIS) patients treated with intravenous thrombolysis within 4.5 hours of onset. AIS patients with large vessel occlusion received mechanical thrombectomy within 6 hours of onset.

Methods: All patients with AIS who received intravenous rt-PA and endovascular therapy with Solitaire self-expanding stents from February 2012 to March 2013 were assessed retrospectively from chart review. The data for demography, stroke subtype, vascular risk factors, NIHSS, type of thrombolysis, timing and radiological imaging were collected. The patients with iv rt-PA received a dose of 0.9 mg/kg.

Results: 12 patients received intravenous rt-PA. The mean age was 52 (range 39–78). 75% (n = 9) of patients were male. Major ethnic groups were well represented. Stroke subtypes were large vessel disease (6 patients), cardioembolism (5 patients) and small vessel disease (1 patient). Major risk factors were hypertension, diabetes, ischaemic heart disease and atrial fibrillation. Mean onset to needle time was 200 minutes (range 120–255 minutes). Mean dose of rt-PA received was 64 mg (range 45–80 mg). Mean NIHSS on admission was 15.9 (range 8–34). After one week, 8 patients improved in NIHSS score by at least 4 points. 1 patient had improvement of NIHSS by 4 points, 3 by 6 points, 1 patient by 9 points, 2 patients by 10 points and 1 patient by 12 points. 2 patients did not have improvement in NIHSS. One patient developed pneumonia resulting in respiratory failure and he survived. One patient’s NIHSS was similar to the NIHSS on admission. 2 patients died. One patient had SICH from thrombolysis and died. One patient died from cardiac arrest. Two patients with thrombectomy improved. NIHSS improved by 3 and 9 points in the patients respectively.

Conclusion: The results for our institution were encouraging. Intravenous rt-PA was beneficial as 67% had improvement in NIHSS by ≥4 points at one week. One patient had SICH. Endovascular therapy with Solitaire device was safe and efficacious without clinically significant complications.

OP3-03

Neuroprotective Therapy by Edaravone with Intravenous tPA for Acute Ischemic Stroke in the Elderly Patients

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Background and Objective: A recombinant tissue plasminogen activator (tPA), alteplase, was approved for patients with acute ischemic stroke within 3h of onset in Japan in October 2005 at a dose of 0.6 mg/kg. The aim of this study was to assess safety and efficacy of alteplase in elderly patients in Japan.

Methods: The 129 consecutive patients who admitted to our 5 hospital groups received intravenous tPA within 3h of onset from January 2010 to December 2011, and were divided into 2 groups by the age, less than 80 years (younger group) or more (older group), and with or without edaravone. Clinical backgrounds and outcomes were investigated.

Results: NIHSS on admission was not different in both groups, but NIHSS on 7 days after the onset were significantly higher in the older group (score 8, *p < 0.05) than younger group (score 4), and the ratio of patients with mRS of 4–6 was significantly larger in the older (41.7%, *p < 0.05) than younger (22.2%) groups. However, there was no difference in asymptomatic and symptomatic intracerebral hemorrhage (ICH) rates between the younger and older groups (asymptomatic: 20.2% vs 18.8%, symptomatic: 2.6% vs 2.1%). Patients with edaravone showed a higher recanalization rate (61.9%, **p < 0.01), and a better mRS at 3 months after onset (**p < 0.01) than non-edaravone group.

Conclusions: These data suggest that intravenous alteplase (0.6mg/kg) within 3h of onset was safe and effective even for very old patients at age ≥ 80 years, but resulted in poor outcomes relating not to tPA but to ageing. Furthermore, edaravone may be a good partner for combination therapy with tPA to enhance recanalization and to reduce hemorrhagic transformation.
**OP3-04**

**Early Effect of Therapeutic Time Window Extension to 4.5 h for Intravenous rt-PA Therapy in Acute Stroke**

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**Background and Objective:** The ECASS 3 revealed the safety and efficacy of intravenous alteplase (rt-PA) therapy 3 to 4.5 h after ischemic stroke onset. rt-PA was approved up to 4.5 h at the end of August 2012 in Japan. This study was aimed to investigate early effect of the therapeutic time window extension to 4.5 h.

**Methods:** We reviewed consecutive ischemic stroke patients who received rt-PA between September 2012 and March 2013 (post-extension group) and compared baseline characteristics, initial National Institutes of Health Stroke Scale (NIHSS) score, clinical outcomes including symptomatic intracranial hemorrhage (sICH) and modified Rankin Scale (mRS) score of 0–1 at discharge with those between September 2011 and March 2012 (pre-extension group).

**Results:** As 36 patients (pre-extension group; 15 women, 72 ± 13 y.o.) were treated with rt-PA between September 2011 and March 2012, 50 (post-extension group; 29 women, 77 ± 14 y.o.) were treated between September 2012 and March 2013. The relative increase proportion was 39%. Twenty patients (40%) in the post-extension group were treated after 3 h of stroke onset. Patients in the post-extension group were older (p = 0.048) and tended to more frequently have hypertension (72% vs. 53%, p = 0.067) as compared to those in the pre-extension group. Although median onset-to-treatment time tended to be longer in the post-extension group than in the pre-extension group [139.5 min (IQR 105.75–217.75) vs. 139.5 min (95.25–168), p = 0.095], median door-to-needle time was not different [54.5 min (45.75–73.75) vs. 55.5 min (46–73), p = 0.726]. sICH did not occur in the both groups and mRS 0–1 at discharge was similarly observed (43% vs. 39%, p = 0.732). There were no differences in sex, other vascular risk factors, comorbidities, initial NIHSS and stroke subtype.

**Conclusion:** The extension of the therapeutic time window to 4.5 h enabled us to treat 1.4-fold patients with rt-PA without extension of door-to-needle time.

**OP3-05**

**Keeping It Simple – Manual Aspiration Thrombectomy Is Quicker and Achieves Similar Results Compared to Device Based Thrombectomy**

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**Objective:** In 2012, two stent-retrievers (SRs) for intra-arterial treatment (IAT) of acute ischemic stroke (AIS) were commercialized. Compared to older generation devices, these SRs have shown significant improvement in terms of safety, rate of recanalization and clinical outcomes. At our center, a modified IAT strategy, termed manual aspiration (MA) is also employed whereby a midsize catheter is approximated to the site of occlusion following which vigorous aspiration using a 20cc syringe is performed to suction out the clot thereby achieving recanalization.

We sought to compare treatment times, recanalization rates and outcomes of patients who underwent pure MA thrombectomy versus traditional device based (DB) thrombectomy for AIS.

**Methods:** We reviewed records of AIS patients who underwent IAT at our center from July 2012 – Mar 2013. Patients demographics, risk factors, admission clinical and neuroimaging findings, treatment times and methods, procedure related complications and modified rankin score (mRS) at 90 days were analyzed. For patients who are not yet 90 days since treatment, mRS at hospital discharge was used in the final analysis. Recanalization is considered successful if Thrombolysis in Cerebral Infarction (TICI) grade 2B or 3 are achieved. A favorable outcome is defined as mRS 2 or less at 90 days.

**Results:** Forty four consecutive patients who underwent IAT were identified. There were 26 (59%) females with overall mean cohort age of 65. The median ASPECT score was 9 (IQR 9–10) and median baseline National Institute of Health Stroke Scale Score was 19 (IQR 15–22). Eleven (25%) patients underwent MA only thrombectomy. SRs were deployed in 21 (47.7%) cases. A combination of SRs and MERCI thrombectomy device was used in 8/44 (18.2%) patients. The procedure time for MA only thrombectomy was 54 minutes (95% CI 38.2–68.9) versus 83.8 minutes (95% CI 70.9–96.8) for DB thrombectomy, p = 0.005. Successful recanalization was achieved in 10/11 (90.9%) of MA versus 27/33 (81.8%) of DB thrombectomy patients (p = 0.47). Overall 8/11 (72.2%) in MA group compared to 14/33 (42.4%) in DB group achieved favorable outcomes; however this trend was not statistically significant (p = 0.08).

**Conclusion:** Our results indicate that simple manual aspiration offers a viable and cheaper alternate to device based thrombectomy for intra-arterial stroke treatment. Further randomized studies are warranted.
OP3-06
Outcomes of Mild or Improving Acute Ischemic Stroke with or without Thrombolysis
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Background and Objective: Mild or improving acute ischemic stroke (MIAIS) patients are commonly excluded from intravenous (IV) tissue plasminogen activator (TPA) therapy. They present a therapeutic dilemma as variable outcomes are noted in previous studies. Despite stroke thrombolysis has been established for few years in Hong Kong, little is known about the outcomes of MIAIS patients in Hong Kong. As the underlying stroke pathogenesis of local patients may be different from the Caucasian cohort, local data may serve as a reference for decision making process. This study is to analyze the outcomes of MIAIS patients who presented within 3 hours of symptom onset.

Methods: A retrospective descriptive study on the management and functional outcome of MIAIS patients presented to a regional hospital within 3 hour from symptoms onset, from December 2008 to November 2010 was performed.

Results: There were 209 patients presented within 3 hour from stroke onset and 135 patients were diagnosed to have acute ischemic stroke. Fifty-five (40.7%) patients received IV TPA. Eighty patients were ineligible and half of them were patients with MIAIS. Data of 44 patients with NIHSS score ≤5 were analyzed. About one-quarter of the 37 non-TPA patients had unfavorable outcome (mRS ≥2) at 3-month and 16% of them could not be discharged home directly. One out of the seven TPA-treated patients was complicated by symptomatic intracranial hemorrhage according to the ECASS-3 definition.

Conclusions: MIAIS is one of the major reasons for exclusion from IV TPA treatment. Around one-quarter of non-TPA patients ended up with unfavorable outcome and some needed inpatient rehabilitation service. However, the evidence to support the use of IV TPA in this group of patients is lacking. Further studies may be warranted in order to substantiate the efficacy and safety of IV TPA in MIAIS patients.

OP3-07
Serum Pentosidine, an Advanced Glycation End Product, Indicates Poor Outcomes After Acute Ischemic Stroke
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Background and Objective: An advanced glycation end product has been implicated in a wide range of pathologic conditions including diabetes mellitus, chronic kidney diseases, cardiovascular diseases, or arteriosclerosis. Little is known about its relationship with cerebral ischemia. The authors investigated serum levels of pentosidine and outcomes of patients with acute ischemic stroke.

Methods: Serum pentosidine levels were measured in 83 patients with acute ischemic stroke at initial hospitalization as well as other risk factors of stroke. Outcomes of patients at 30 days from hospitalization were assessed by using modified Rankin Scale score (mRS). Univariate and multivariate logistic regression analyses were performed to analyze relationship between pentosidine and patient outcomes.

Results: In the univariate logistic regression analyses, poor outcomes, defined as mRS more than 2, at 30 days were significantly related to high serum pentosidine (p = 0.001), type of stroke (p = 0.045), old age (p = 0.02), male sex (p = 0.042), and the absence of dyslipidemia (p = 0.02). Deterioration of mRS was significantly correlated with high serum pentosidine (p = 0.003) and creatinine (p = 0.02). Multivariate logistic regression analysis showed that high level of serum pentosidine was the only independent risk factor for poor outcomes (p = 0.004) and deterioration of mRS (p = 0.01) at 30 days.

Conclusions: High level of serum pentosidine indicates poor and worse outcomes 30 days after acute ischemic stroke. This new biomarker is useful for risk stratification of patients with acute ischemic stroke.
contralateral cerebral augmentation index between favorable and unfavorable group at month 3, month 6, year 1 after stroke onset (all P > 0.05). At month 6 and year 1 after stroke onset, the ipsilateral cerebral augmentation index was borderline significantly lower in favorable group than that in unfavorable group (P = 0.072, 0.080, respectively).

**Conclusions:** The study is under power to show a significant relationship between the degree of flow augmentation by ECP and functional outcomes after acute ischemic stroke. The trends indicated that lower cerebral augmentation on ipsilateral to the infarct side by ECP may be related a favorable function outcome after acute ischemic stroke.

**OP3-09**

**Intravenous Thrombolysis for Acute Ischemic Stroke in Hong Kong: An Evaluation of Treatment Safety and Clinical Outcomes in a Regional Hospital**

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**Background:** Stroke is the fourth leading cause of death in Hong Kong. The disability resulted from it is a tremendous burden to stroke survivors and their caregivers. An intravenous thrombolysis services was initiated in our hospital for acute ischemic stroke (AIS) since end of 2008.

**Objective:** We evaluated mainly the safety and outcomes of intravenous thrombolysis given to AIS patients.

**Methodology:** A retrospective review of all eligible and ineligible cases of intravenous thrombolytic therapy for AIS was conducted in the United Christian Hospital. Outcome measures included proportion of patients directly discharged home from acute stroke unit (ASU), functional independence and mortality at 3 months. Safety assessment included incidence of asymptomatic intracranial hemorrhage and symptomatic intracranial hemorrhage. Symptomatic hemorrhage was defined according to the criteria used in the NINDS trial.

**Results:** From November 2008 to April 2013, 272 thrombolytic calls were activated during office working hours. Eighty nine (33%) patients received intravenous thrombolytic treatment in which 78 (29%) patients were given according to the international protocol. In per-protocol analysis (n = 78), 41 (53%) patients were males and the mean age was 69 ± 10 years. The door-to-CT time and door-to-needle time were 25 ± 15 minutes and 68 ± 27 minutes respectively. In assessment of treatment safety (n = 78), seven (9%) patients developed asymptomatic intracranial bleeding whereas 4 (5%) developed symptomatic bleeding. In assessment of 3-month clinical outcomes (n = 70), 39 (56%) patients could achieve functional independence (mRS 0 to 2) at 3 months compared with 26 (37%) patients at baseline upon discharge. Seventeen (25%) patients were physically fit for directly discharged to home from ASU compared with 6 (8%) patients in the age- and sex-matched non thrombolytic controlled group (p = 0.03). The 3-month mortality rate was 9%. Four (6%) patients died of non-thrombolytic related stroke complications, 1 (1%) died of symptomatic intracranial hemorrhage and 1 (1%) died of acute myocardial infarction.

**Conclusion:** Intravenous thrombolytic therapy is an effective and safe treatment to selected groups of Chinese ischemic stroke patients.

**OP3-10**

**Implementation of the NSW Stroke Reperfusion Program: Increasing Timely Access to Care**

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**Background/objectives:** Stroke remains a life threatening, time critical condition. Although intravenous recombinant tissue plasminogen activator (rt-PA) is the most effective hyperacute stroke treatment it is estimated that only 3% of ischaemic stroke patients receive thrombolysis across Australia. Time to symptom recognition and the service delivery in the onset-to-door and door-to-needle periods determine thrombolysis rates and patient outcomes. Arriving at a non-thrombolysing hospital extends onset-to-needle time, and may exclude thrombolysis treatment.

The NSW Stroke Reperfusion Program: Early access to Thrombolysis is a state-wide pre-hospital and hospital programme designed to improve patient access to newly identified Acute Thrombolytic Centres (ATCs) in NSW. With the objective of shortening the time from onset of acute stroke symptoms to the administration of Thrombolysis for eligible patients with ischaemic stroke. Ensuring the right care is given to the right patient, in the right time and right the first time.

**Methods:** The Agency for Clinical Innovation, in partnership with Ambulance Service NSW, clinicians and managers worked collaboratively to develop and implement the model. Utilising a clinical redesign methodology, that comprised robust communication processes, defined scope, local project governance and ownership, with the view to implement the NSW Stroke Reperfusion Program across 20 ATCs in NSW.

**Results:** Through devising, implementing, testing and refining the program we have successfully implemented the program in all 20 ATCs. All ATCs have the ability and appropriate infrastructure in place to administer definitive acute care treatment. The program is currently building capacity for other hospitals to participate in the program to deliver effective hyperacute stroke management.

**Conclusion:** The program has been implemented successfully in all of the ATCs, whereby improvements’ relating to pre-notification, in-hospital reception, assessment and management of stroke patients to achieve early access to safe reperfusion is occurring.
OP3-11
Early and Continuous Neurological Improvement After Intravenous Thrombolysis Are Strong Predictors of Favorable Long-Term Outcome in Acute Ischemic Stroke

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Background: Considerable proportion of acute ischemic stroke (AIS) patients demonstrates changes in their neurological status within first 24-hours of intravenous thrombolysis with tissue plasminogen activator (IV-tPA). We evaluated the relationship between early neurological improvement and functional outcomes in thrombolysed AIS patients at 3-months.

Methods: Data for consecutive AIS patients treated with IV-tPA within 4.5-hours of symptom-onset during 2007–2011 were prospectively entered in our thrombolysed registry. National Institute of Health Stroke Scale (NIHSS) scores were recorded before IV-tPA bolus, at 2-hours and at 24-hours. Early neurological improvement at 2-hours (ENI) was defined as reduction in NIHSS by ≥4 points from baseline or an absolute score of ≥8 points between 2-hours and 24-hours. Early neurological improvement (CNI) was defined as a reduction of NIHSS score by ≥8 points between 2-hours and 24-hours or absolute score of ≤4 points at 24-hours. Favorable functional outcomes at 3-months were determined by modified Rankin scale (mRS) 0–1.

Results: Of the 2460 AIS patients admitted during the study period, 263 (10.7%) received IV-tPA; median age 64 years (range 38–89), 54% male, median NIHSS 17 points (range 3–35) and median onset-to-treatment time 145 minutes (range 57–270). Forty-two (43.5%) patients achieved good functional outcomes at 3 months (mRS 0–1). Factors associated with good outcome at 3 months on univariate analysis were younger age and lower NIHSS score at presentation. After multivariate analysis, lower NIHSS scores at presentation was noted as the only independent predictor of good outcome at 3 months (OR 0.918 95% CI 0.880–0.958 p = 0.001). The presence of ≥1/3 MCA involvement on the initial brain CT scan, as well as the presence of >1/3 MCA involvement on initial brain CT, was noted as the only independent predictor of good outcome at 3 months (OR 0.918 95% CI 0.880–0.958 p = 0.001).

Conclusion: Early and continuous neurological improvement within first 24-hours is strong predictors of favorable functional outcome in thrombolysed AIS patients.

OP3-12
Acute Stroke Involving More Than One-Third MCA Territory on Plain CT Brain Should Not be a Contraindication for IV Thrombolysis

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Background and Purpose: Intravenous tissue plasminogen activator (IV-tPA) remains the only approved therapeutic agent to achieve arterial recanalization in acute ischemic stroke (AIS). Involvement of more than one-third of middle cerebral artery (MCA) territory on initial brain CT is a relative contraindication for IV-tPA and often associated with poor functional outcome at 3-months. We present our results of IV-thrombolysis among these patients.

Methods: Data for consecutive stroke patients treated with IV-tPA within 4.5-hours of symptom-onset were analyzed. Data were collected for demography, risk factors, NIHSS scores and blood pressure levels before IV-tPA bolus. The presence of early ischemic signs involving more than one-third of the MCA on the initial CT scan was measured by Alberta Stroke Program Early CT score (ASPECTS<8 points). Outcomes were assessed by modified Rankin Scale (mRS) score at 3 months.

Results: A total of 97 AIS patients with more than one-third MCA involvement received IV-tPA during the study period. Median age was 70 yrs (range 38–89), 54% male, median NIHSS score 20 points (range 3–30) and median onset-to-treatment time 152 minutes (range 55–270). Forty-two (43.5%) patients achieved good functional outcomes at 3 months (mRS score 0–1). Factors associated with good outcome at 3 months on univariate analysis were younger age and lower NIHSS score at presentation. After multivariate analysis, lower NIHSS scores at presentation was noted as the only independent predictor of good outcome at 3 months (OR 0.918 95% CI 0.880–0.958 p = 0.001). The presence of ≥1/3 MCA involvement on the initial CT scan (ASPECTS <8) was not associated with a poor functional outcome at 3 months (OR 1.495 95% CI 0.881–2.540; p = 0.136).

Conclusions: Patients with acute ischemic stroke involving more than one-third of the MCA on initial brain CT scan, especially if associated with lower NIHSS score, should not be excluded from systemic thrombolysis.

OP4-01
Influence of CYP2C9 Polymorphisms on Acenocoumarol Maintenance Dose in Patients with Cerebral Venous Thrombosis

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Background and Objective: Acenocoumarol, a commonly prescribed oral anticoagulant drug, exhibits wide inter-individual variability in response. This study aimed at evaluating the contribution of genetic variations in the drug metabolizing enzyme, CYP2C9, to inconsistency in the anticoagulant response, in patients with cerebral venous thrombosis (CVT) who are co-administered with the anticonvulsant drug, phenytoin.

Methods: 476 acenocoumarol-treated CVT patients (153 males and 323 females) were genotyped for CYP2C9*2 and CYP2C9*3 polymorphisms. Mean acenocoumarol dose required for
maintaining a stable international normalized ratio (INR) was calculated for different genotypes. The effect of co-administration with phenytoin was determined.

**Results:** Patients aged <40 years, postpartum women, alcoholics and women who were on oral contraceptives until a week or less before the thrombotic event, were found to require a significantly higher maintenance dose of acenocoumarol. Similarly, patients co-administered with phenytoin required higher dose compared to those not on phenytoin (3.29 ± 1.20mg/day vs. 2.58 ± 1.26mg/day; p < 0.0001). In patients on stable anticoagulation requiring low (n = 29), medium (n = 192) or high (n = 79) acenocoumarol doses, the CYP2C9*2 allele was independently associated with the low dose group (adjusted OR 19.36; 95% CI 2.4–155.84; p = 0.005). Similarly, CYP2C9*3 allele also independently increased the odds of requiring a low maintenance dose. (Adjusted OR 11.67; 95% CI 2.55–54.24; p = 0.002). Patients co-administered with phenytoin required a higher acenocoumarol maintenance dose (Adjusted OR, 2.65; 95% CI, 1.2–5.8; p = 0.016).

**Conclusion:** This study emphasizes the fact that polymorphisms in CYP2C9 gene and co-medication with phenytoin alter the anticoagulant effect of acenocoumarol.

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**OP4-02**

**Effects of Mental Practice on Functional Mobility in Ambulant Stroke Subjects – A Pilot Randomized Clinical Trial**

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**Background:** 50%–65% of stroke survivors have residual motor deficits; principal among them is hemi paretic gait that limits mobility, increases the risk of falls and promoting sedentary lifestyle. Motor imagery (MI) an active process during which a specific action is reproduced within working memory without any real movements. There are evidences for MI training in enhancing motor learning, neural reorganization and cortical activation in stroke patients. However efficacy of Mental practice training involving lower extremity mobility tasks in ambulant stroke subjects.

**Aim:** To investigate the effect of combining mental practice with physical practice on functional mobility in ambulant stroke subjects.

**Methodology:** 26 hemiparetic patients (≥3 months post-stroke) who can able to walk 10 m with good imagery ability in KVIQ-20 ≥ 60 and Time dependent motor imagery screening test were recruited and randomly allocated into physical practice group (n = 13) and physical+ mental practice group (n = 13). Subjects in both groups underwent task orientated training for lower extremity 45 minutes, 5 days a week for 3 weeks. In addition, the experimental group received 15 minutes of Audio-based lower extremity mobility tasks for MI practice. Functional Gait Assessment (FGA) and Timed Up and Go Test (TUGT) were the outcome measures used to measure functional mobility and compared between the groups. The parametric test results within the group, and between the groups were obtained and statistically analyzed using the student’s paired and unpaired t-test with p < 0.05.

**Results:** Following 3 weeks of training there was a significant difference in FGA and TUG scores in both the groups. Between groups the mean (SD) differences scores of 4.5 (.55) for FGA and 7.3 (.23) for TUGT was statistically significantly (p < 0.05).

**Conclusion:** Results of this preliminary study supports lower extremity MI training provide additional benefits to regular physiotherapy to improve functional mobility in ambulant stroke patients.

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**OP4-03**

**Effects of Task Oriented Exercises with Altered Sensory Input on Functional Mobility in Chronic Stroke – A Randomized Controlled Trial**

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**Background:** Balance impairment in patients with stroke hemiparesis is frequently related to deficits of central integration ofafferent inputs (somatosensory, visual, vestibular). They also exhibit excessive reliance on visual input which lead to challenge their balance in sensory conflict conditions. Our aim was to evaluate the task oriented training (TOT) with sensory manipulation to enhance functional mobility in chronic stroke subjects.

**Methods:** 26 hemiparetic subjects at least 6 months post stroke with Brunnstrom’s recovery stage of 5 or above for the lower limb and Berg Balance Score of 40 or above were randomly assigned control group (n = 13) and in experimental group (n = 13). Task Oriented Training (TOT) focusing on balance and mobility exercises were implemented 5 days a week for 3 weeks with each session 45–60 min duration. TOT were performed under normal conditions by the Control group and in the Experimental group received TOT with manipulations of sensory inputs and provision of sensory conflict for the trunk and lower limb. All the Outcome measures Dynamic Gait Index (DGI), Timed Up and Go Test (TUGT) and Fall Efficacy Scale (FES) were collected before and after 3 weeks by an independent blinded observer. The parametric test results within the group, and between the groups were obtained and statistically analyzed using the student’s paired and unpaired t-test p < 0.05 with SPSS 16.

**Results:** Post training there was a significant improvement in all the outcome measurements for both the groups. However, a highly significant statistical difference was obtained in the between-group analysis of components 3, 4 & 5 of DGI, TUGT and FES with p < 0.05

**Conclusion:** Task oriented exercises with altered sensory input was found to be effective in improving functional mobility in terms of dynamic balance and reduction in their fear of fall levels after 3 weeks of training program.
**OP4-04**

**An RCT Protocol on Efficacy of Deep Knee Flexion Exercises on Improving Activities Involving Deep Knee Flexion and Quality of Life in Persons with Stroke**

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**Background and Objectives:** Many individuals with stroke have expressed their desire to resume activities involving deep knee flexion such as vocation, gardening and sports. However, in stroke rehabilitation literature, training methods for improving deep flexion activities are not commonly reported. The purpose of this study is to evaluate the effectiveness of a rehabilitation strategy to improve deep flexion activities in persons with stroke.

**Methods:** In a two-arm randomized controlled trial (The randomization will be done by Random Allocation Software Version 1.0.0.), a task specific deep knee flexion activity-training program is compared with non specific general lower limb activity training (details will be discussed). 40 participants with chronic stroke seeking stroke rehabilitation treatment residing in the community will be recruited based on the eligibility criteria. The participants will be randomized to one of the 2 groups, deep knee flexion exercise group or general exercise group. The sequence of allocation is concealed from participants and other investigators. The primary outcome is deep knee flexion activity goal attainment and quality of life (social participation domain); secondary outcomes include lower limb muscle strength, fear of fall and functional ambulation status.

**Discussion:** This trial will provide information on the efficacy of the task oriented deep flexion activity training in improving deep knee flexion activities and quality of life in patients with chronic stroke.

**Result:** The comparability of the groups at baseline on all outcome measures will be performed using Wilcoxon Sign Rank Test excluding GAS. Chi Square test will be used for GAS. A level of $< 0.05$ will be used for calculation of statistically significantly difference between the groups. The analysis will be performed using SPSS Version 16.

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**OP4-05**

**Robot-Assisted Arm Training Promotes Motor Recovery in Patients with Chronic Stroke**


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**Background:** Restoration of the upper extremity function after stroke remains unpromising. Evidence suggests that the actual use of the hemiparetic upper limb has greatly reduced in the real life situation for majority of stroke survivors. Robot-assisted arm training is intended to provide high-intensity, repetitive, task-specific, interactive movement to the exercised limb.

**Objectives:** To evaluate the effects of robot-assisted arm training for promoting motor recovery in patients after stroke.

**Methods:** A single-group pretest-posttest quasi-experimental design was adopted. Twenty-two patients (11 males, 11 females) with persistent hemiparesis from a single, unilateral stroke within the past 1 to 5 years participated the study. The mean age was 60.8 ± 17.3 years old. In addition to conventional physiotherapy management, all patients underwent performance-based assist-as-needed robotic arm training that targeted motor function of the affected shoulder and elbow, 3 times per week for 6 weeks. The training consisted robot-assisted arm training during repetitive, planar reaching tasks. Outcome measures included clinical measures of Fugl-Meyer Motor Assessment of Upper Extremity and robotic evaluations on speed, positioning and force of paretic limb movements. Evaluations were done at baseline and at the end of training.

**Results:** On completion of the training, the averaged Fugl-Meyer Motor Assessment of Upper Extremity score increased significantly by 27.55% ($p = 0.011$). For the robot-based kinematic and kinetic data evaluations, the averaged mean speed increased significantly by 34.36% ($p = 0.017$) and peak speed increased by 13.24% but was not significant ($p = 0.108$) after training. The movement smoothness improved significantly by 9.89% ($p = 0.003$) while the joint independence measure increased by 10.48% after training but of short of significance ($p = 0.135$). The isometric shoulder force demonstrated an average of 13.54% improvement ($p = 0.012$) at the end of training.

**Conclusion:** Short-term, goal-directed robot-assisted arm training is effective for promoting motor recovery of the exercised limb segments after stroke. It improves movement smoothness and facilitates a better coordination between individual joint segments in further training sessions and in daily functional performance.
Objective: To determine (1) the immediate orthotic effect and (2) therapeutic carryover effects of a peroneal functional electrical stimulation (FES) on tasks of functional ambulation in stroke survivors.

Methods: Twelve patients with the diagnosis of first stroke and ankle dorsiflexor weakness which led to footdrop during ambulation participated in the study. All of them were fitted with a peroneal neuroprosthesis device. After fitting, all patients underwent gait training on treadmill with the application of the peroneal FES at a self-selected comfortable pace, 20 minutes a day, 3 times per week for 6 weeks. Outcomes measures included the walking speed test as assessed by a 10-meter walkway, the Timed-up-and-go (TUG) Test, the 6-minute walk (6-MW) test and the timed 12 ascending and descending stairs test (“stairs test”). Assessments were done at baseline under the conditions in the order of: (1) no device and (2) neuroprosthetic peroneal FES, and on completion of training with no device.

Results: Functional ambulation with the peroneal FES was found significantly improved, relative to no device, on the walking speed test (27.48%, p = 0.022), 6-MW test (17.37%, p = 0.025), and TUG test (−20%, p = 0.023). Patient tended to walk faster in the stairs test, (mean difference: 5.84 ± 8.19s (−11.46%)), but did not reach statistical significance (p = 0.108). After 4 weeks of training, all gait parameters improved as compared to baseline measurements in condition with no device.

Conclusion: The performance of functional ambulation was enhanced with immediate orthotic and therapeutic carryover effect for the application of neuroprosthetic peroneal FES as compared with no device.

OP4-08
Assessment of Neuromodulation and Behavioral Effects by Motor Arm Training and tDCS on Post Stroke
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Background: Recovery of function after a stroke is determined by a balance of activity in the neural network involving both the affected and the unaffected brain hemispheres. No rehabilitation intervention has effectively improved functional use of the arm and hand in patients with severe upper limb paresis after stroke. We therefore investigated whether potential for transcranial direct current stimulation (tDCS) and bilateral robotic training to enhance gains in motor performance in stroke patients.

Methods: Stroke survivors had sustained a single unilateral stroke 6–36 months previously, had full pain-free passive range of motion of the affected shoulder and elbow and had some voluntary control of the arm underwent a cycling training on an arm ergometer for 30 min a day, during 5 days a week over a period of 3 weeks coupling with cathodal stimulation of the unaffected hemisphere. They were tested 1 weeks before, at the beginning, at the end, and 1 weeks after the end of the training.

Results: In terms of behavioral effects, modest improvements were seen, for example, in grip strength, range of motion, and pegboard performance, The Rivermead Motorik Assessment, Motricity index and the maximum force were correlated significantly (p). Conclusion: This study suggests that activity-based therapies using an arm ergometer or robot prime with tDCS stimulation when used over training periods have the same effect as therapy in decreasing impairment and improving disability in the paretic arm of severely affected stroke patients.
**OP4-09**

**Early Supported Discharge after Stroke: A Home-Based Physiotherapy Rehabilitation Program**

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**Introduction:** In Hong Kong, there are about 25,000 new stroke cases each year, and around 30–40% of stroke survivors are left with significant physical disabilities which place a great demand on the needs of rehabilitation. Stroke patients conventionally receive institution-based rehabilitation. To provide similar rehabilitation outcomes, a home-based rehabilitation program that offers early supported discharge (ESD) from hospital has been implemented for patients with mild to moderate severity of stroke.

**Objectives:** To evaluate (1) the effects of home-based rehabilitation program provided by domiciliary physiotherapy for patients with mild to moderate severity of stroke, and (2) the stress and strain of caregivers.

**Methodology:** Patients admitted to Acute Stroke Unit of Queen Elizabeth Hospital and a home-based physiotherapy rehabilitation program (the PT Home Program) were screened and provided for those patients with 65 ≤ MBI ≤ 94. The PT Home Program included home safety screening, fall risk assessment, exercise programs and caregivers education. Two to four visits were provided in the initial 2 weeks of post-discharge critical support period. Outcome measures included MBI, Modified Rivermead Mobility Index (MRMI), Modified Functional Ambulatory Categories (MFAC) and Berg Balance Scale (BBS). Evaluations were made at the start and end of ESD. The stress and strain of caregivers was assessed by Caregivers Strain Index (CSI) and Community Integration Questionnaire (CIQ). Paired sample t-test (continuous variables) and Wilcoxon signed-ranks test (categorical variables) were used for analysis.

**Results:** From December 2011 to September 2012, 149 acute stroke patients received the PT Home Program with a total of 295 visits provided. The averaged time interval between hospital discharge and the first PT Home Program was 5 days. On completion of the PT Home Program, patients’ averaged MBI score increased by 13.05% (p < 0.001), MRMI score and BBS improved by 13.65% and 14.65% respectively (p < 0.001). The median MFAC was 5 ± 1 at the start and 7 ± 1 at the end of ESD (p < 0.001). Caregivers did not demonstrate a high stress and strain (CSI: 5.72 ± 5.51) and had satisfactory community integration (CIQ: 9.72 ± 5.78).

**Conclusion:** The PT Home program is effective in improving the functional independence, physical mobility and balance control for selected patients. It provides a cost-effective alternative to institution-based rehabilitation. It facilitates an early community re-integration of both patients and their caregivers.

**OP4-10**

**Transcutaneous Electrical Nerve Stimulation (TENS) Enhances the Effect of Task-Related Trunk Training (TRTT) on Trunk Control and Walking Function in Subjects with Chronic Stroke**

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**Background and Objective:** Trunk impairment and impairment in walking are known consequences of stroke. Previous studies have demonstrated that transcutaneous electrical nerve stimulation (TENS) could augment the effects of lower limb task-related training (TRT) and on lower limb functions in patients with chronic stroke. It remains unclear whether TENS could augment the effects of task-related trunk training (TRTT) on trunk control and walking function in subjects with chronic stroke.

**Methods:** This study was a placebo-controlled clinical trial. Twenty-five subjects with chronic stroke were randomly assigned to (1) TENS group (n = 12) or placebo-TENS group (n = 13). All subjects underwent 6-week home-based TRTT concurrent with TENS or placebo-TENS. Trunk performance was evaluated by the trunk impairment scale (TIS) and walking function was evaluated by walking subscale in Motor Assessment Scale (MAS) respectively at baseline, after 3 and 6 weeks of training.

**Results:** When compared with placebo-TENS group, the TENS group showed significantly earlier and greater improvement in TIS scores (p = 0.009) and MAS walking scores (p = 0.002) at week 3. There was no significant between both groups at week 6. Spearman correlation analysis showed that significant positive correlations existed between TIS and MAS walking scores (r = 0.504, p = 0.001).

**Conclusion:** TENS could enhance the effect of TRTT and lead to earlier improvement in trunk control and walking function in subjects with chronic stroke. Significant positive correlation exist TIS and walking function in stroke survivors.

**OP4-11**

**Effectiveness of Virtual Reality in Balance Training in Stroke Rehabilitation: A Pilot Study**

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**Background:** With the emergence of virtual reality and interactive video gaming as a new approach in stroke rehabilitation, commercial gaming consoles have been adopted in many clinical...
settings due to their easy accessibility and low cost. However, evidence of the effectiveness of video gaming on balance training in stroke is limited.

**Objectives:** 1) To evaluate the effectiveness of the virtual reality (VR) game system, Xbox360 Kinect, in balance training in patients with stroke. 2) To investigate the effectiveness of balance training with the game system in ambulation and functional capacity.

**Methodology:** This was a randomized controlled pilot study. Fourteen subjects with stroke (mean age: 69.14 ±2.73 years in virtual reality training (VRT) group; 68.86 ±8.25 years in conventional physiotherapy training (CPT) group) were recruited from outpatient physiotherapy department in Hong Kong Buddhist Hospital. CPT group received conventional physiotherapy training while VRT group received balance training with VR game system in addition to conventional physiotherapy training. Both groups received 1-hour training twice a week for 6 weeks. Evaluations were performed at baseline and at the end of 6-week training. Primary outcome measures included Berg Balance Scale (BBS) and Sensory Organization Test (SOT) whereas secondary outcome measures included 10-meter walk test (10MWT) and Modified Barthel Index (MBI).

**Results:** There was statistically significant improvement in BBS, SOT, 10MWT and MBI (p < 0.05) in both CPT and VRT group after 6-week training. For between-group comparison, significant difference was demonstrated only in SOT except the sub-test of standing on a stable surface with eyes open.

**Conclusion:** This pilot study showed physiotherapy training with low cost VR game system is effective in improving the balance and functional capacity for persons with stroke.

**Opp-12**

**Efficacy of Computer Gaming in Facilitating Upper Limb Recovery in Stroke Rehabilitation: A Pilot Randomized Controlled Study**

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**Background:** Upper limb weakness is a common complication of stroke. The conventional treatment is upper limb exercises performed under the guidance of an occupational therapist. The intensity of exercises is a key determinant of recovery. However, it is not always feasible to provide intensive therapy because of manpower constraints. Exercises using commercially available computer gaming devices is a possible alternative to conventional therapy.

**Aim:** This study aims to compare the efficacy of upper limb exercises using a commercially available computer gaming device (Nintendo Wii) with conventional therapy and customary care in stroke patients receiving conventional stroke rehabilitation.

**Hypothesis:** We hypothesize that computer gaming exercises is equivalent to conventional therapy but superior to customary care in enhancing upper limb recovery.

**Design:** A randomized, controlled clinical trial.

**Participants:** 105 subjects within 6 weeks of a first stroke who fulfill inclusion criteria.

**Interventions:** Subjects will be randomly assigned to 1 of 3 groups of upper limb exercises: (1) computer gaming; (2) conventional therapy; (3) customary care. All interventions will be provided 4 times a week for 3 weeks. All subjects will also receive standard conventional rehabilitation.

**Main Outcome Measures:** The primary outcome will be Fugl-Meyer Assessment of upper limb function. Secondary outcome measures include Action Research Arm Test, Functional Independence Measure, Stroke Impact Scale and Rating of Patient Satisfaction. The measures of upper limb function will be assessed at baseline, completion of intervention and at 1 and 3 months after completion of intervention.

So far, we have recruited 99 out of 105 patients. The preliminary results of the study will be presented at the conference.

**Conclusion:** If the results are as expected, this study will provide preliminary scientific evidence for efficacy of computer gaming exercises in improving arm function and opens the door for a larger multicentre trial to be performed. In the longer term, computer gaming may prove to be an alternative to conventional therapy, one that is cheaper and more enjoyable.

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**OPS-01**

**Investigation of the Effects of Spinal Pulsed Electromagnetic Field on Spasticity of Lower Extremity and Alpha Motoneuron Excitability in Hemiplegic Patients Using Hmax/Mmax ratio**

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**Background and Objectives:** Stroke remains the leading cause of disability in industrialized countries and the main reason of functional impairments in activities of daily living that impair muscle function and results in physical disabilities. Spasticity is the most important limitation in improvement of normal motor function that seen in more than 80% of subacute and 56% of chronic cases. Use of pulsed electromagnetic field on the spinal cord may affect on hyperpolarization of neurons and neural Plasticity. It also can decrease muscle hypertonecity and spasticity in hemiplegic patients after stroke. So, the aim of this study was to investigate the effect of Pulsed Electromagnetic Field Therapy on spasticity and alpha motoneuron excitability using Hmax/Mmax Ratio as an electrophysiologic index in hemiplegic patients after stroke.

**Methods:** The study was done on 30 hemiplegic patients with the age range of 40–60 which referred to Tabasom rehabilitation
results of cilostazol-aspirin therapy against recurrent stroke with intracranial artery stenosis (catharsis)-primary and subanalysis


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Background: The Cilostazol-Aspirin Against Recurrent Stroke with Intracranial Artery Stenosis (CATHARSIS) (Clinical trials.gov identifier: NCT 00333164) was a randomized controlled trial to compare cilostazol plus aspirin with aspirin alone in patients with symptomatic intracranial atherosclerotic disease (ICAD). We present results of CATHARSIS.

Methods: Patients at age of 45–85 years with ischemic stroke after two weeks to six months from onset and >50% stenosis on MRA was randomly allocated either group of cilostazol 200 mg/day plus aspirin 100 mg/day (CA group) or aspirin 100 mg/day alone (A group), who were followed up for two years. Primary endpoint was progression of ICAD after two years. Secondary endpoints included ischemic stroke, all strokes, all vascular events (ischemic stroke, MI, and other vascular events) and new silent brain infarcts.

Results: A total of 165 patients were randomized. Male, hypertension, and diabetes were more frequent in CA than A group. There was no difference in the progression of ICAD between both groups (9.6% [95 CI 3.9–18.8%] in CA group and 7.6% [95% CI 3.8–13.2%] in A group, p = 0.5326). Stroke recurrence occurred in 2.4%/year in CA group and 5.5%/year in A group. Rate of stroke recurrence and new silent brain infarcts were significant lower in CA than A group (adjusted HR 0.344, 95% CI 0.124–0.955, p = 0.040). And also, rate of vascular events and new silent brain infarcts were significant lower in CA than A group (adjusted HR 0.366, 95% CI 0.138–0.970, p = 0.043).

Conclusion: Rates of ICAD progression and recurrent stroke were low in both treatment groups, which could be due to excellent medical management and have reduced statistical power. Rates of stroke recurrence, vascular events, and new silent brain infarcts were lower in CA than A group. Cilostazol may have effect to prevent stroke recurrence, vascular event, and new silent brain infarct.

OP5-03

Present Status of J-STARS and Substudies


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Background and Objectives: MEGA study (Lancet 368: 1155, 2006) clearly showed that treatment with a low dose of pravastatin reduced the risk of coronary heart disease in Japan by much the same amount as higher doses and tended to reduce the risk of ischemic stroke. The clinical trial, Japan Statin Treatment Against Recurrent Stroke (J-STARS) was planned to overcome the lack of evidence concerning secondary prevention of stroke with statin in our population.

Methods: In a multicenter, prospective, randomized, open labelled, blinded-endpoint trial, a half of patients presenting non-cardiogenic ischemic stroke 1–36 months before entry were randomly assigned to standard dose (10 mg/day) of pravastatin, who had to be 45–80 years old and have serum total cholesterol elevated 180–240 mg/dl. A follow-up period is 5.5 years.

Outcome Endpoints: The primary outcome for this study is cerebrovascular events.

Status: A total of 1578 patients were recruited from 123 centers by 2009, and have been in the process of follow-up (mean 4.6 years at March, 2013). Mean age 66.2 years; male 68.9%, hypertension 75.9%, diabetes 23.3%, mean total cholesterol 210.0 mg/dl, LDL 129.5 mg/dl, HDL 53.5 mg/dl. The latest status including substudies (e.g. J-STARS Echo, hsCRP and Genomics) will be presented at the conference.

Analysis: We conducted an interim analysis in 2011. Based on the results, the independent data monitoring committee decided to continue this study. The final analysis will be applied using Kaplan-Meier survival method, log-rank test and Cox proportional hazard model.

Conclusion: J-STARS is already running for pravastatin preventing ischemic stroke patients from any recurrent stroke with safety. This study is registered at Clinical Trials. Gov, number NCT 00221104.

Trial Web Site: http://jstars.umin.ne.jp/
**OP5-04**

The Enhanced Control of Hypertension and Thrombolysis Stroke Study (ENCHANTED): Complexity of Set-Up Large International Clinical Trial

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**Background:** Controversy exists over the optimal dose (0.6 vs 0.9 mg/kg) of i.v. rtPA and level of blood pressure (BP) control in acute ischaemic stroke (AIS). Studies indicate low dose rtPA to be efficacious, and hypertension (>150 mmHg systolic) both ‘before’ and ‘after’ rtPA predicts poor outcomes.

**Aims:** ENCHANTED aims to address whether (i) 0.6 mg/kg rtPA is non-inferior to standard 0.9 mg/kg rtPA, and (ii) early intensive BP lowering (target systolic 140–150 mmHg) is superior to guideline-based recommended BP control (systolic <180 mmHg) on 90-day poor outcome in patients requiring rtPA for AIS.

**Methods:** The trial is being conducted across an expanding global network (>100 sites) to achieve the required sample size (5000; 3300 per treatment arm; >90% power) to achieve its objectives.

**Results:** In the first year (March 2012 to April 2013), 500 patients from 55 sites have participated, which is near the projected recruitment time-target (n = 545). However, the average dose recruitment per site at 12 patients is high. Complex ethics committee, regulatory and contractual approvals for setting up regional/national coordinating centres and hospital sites, and unexpectedly high central infrastructure costs, have challenged the conduct of the study, details of which will be elaborated upon in the presentation. Additional sites are welcome to accelerate recruitment towards the desired target.

**Conclusions:** Academic researchers face increasing administrative and regulatory complexities, and associated high costs, in their efforts to set-up and conduct international multicentre clinical trials. These issues require recognition by researchers, and importantly the funding bodies, who support high quality, high impact research.

**OP5-05**

The Enhanced Control of Hypertension and Thrombolysis Stroke Study (ENCHANTED): First Year Experience Regarding Possible Selection Bias

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**Background:** Controversy exists over the optimal dose of i.v. rtPA and level of blood pressure (BP) control in acute ischaemic stroke (AIS). ENCHANTED aims to determine in rtPA-eligible patients whether: (i) 0.6 mg/kg is non-inferior to 0.9 mg/kg rtPA, and (ii) early intensive BP lowering (target systolic 140–150 mmHg) is superior to guideline recommended BP control (systolic <180–185 mmHg) on 90-day poor outcome.

**Aims:** Due to potential selection bias in the recruitment of patients (e.g. older patients preferentially included into the dosing arm), we assessed the blinded baseline characteristics of participants in the first 12 months of the trial.

**Methods:** ENCHANTED is a quasi-factorial, active-comparative, open, blinded endpoint trial evaluating ‘rtPA dose’ and/or ‘BP control’ in AIS patients fulfilling eligibility criteria for rtPA. An estimated 5000 patients (3300 per treatment arm) are required to provide >90% power to achieve the study aims.

**Results:** Overall, the baseline characteristics of patients (n = 273) were similar between the rtPA arm (av. age 66 yr; male 56%; median [iqr] NIHSS 15 [13–15]) versus BP arm (av. age 65 yr; male 60%; NIHSS 14 [12–15]). Characteristics were also well balanced between treatment arms by ethnic group, but non-Asian patients tended to be older (av. age 75 vs 66 yr) with milder strokes (NIHSS 7 [5–16] vs 12 [7–16]) than Asian patients.

**Discussion:** No major recruitment selection bias is evident overall in early trial participants. However, a trend is emerging for the inclusion of milder AIS non-Asian patients with a lower likelihood of underlying proximal artery occlusion.
OP5-06
Recanalisation Rates of Low vs Standard Dose rtPA in the Enhanced Control of Hypertension and Thrombolysis Stroke Study (ENCHANTEd): Rationale for a TCD Substudy
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Background: The benefit of rtPA in lysing clot and restoring cerebral blood flow in relation to time, dose and baseline vessel occlusion status have not been well described. Low-dose rtPA is an attractive therapeutic option but whether it achieves comparable recanalisation to standard dose rtPA is unknown.

Objectives: Transcranial Doppler substudy to the main ENCHANTED trial will evaluate complete recanalisation rates in patients treated with intravenous standard-dose (0.9 mg/kg) compared with those treated with low-dose (0.6 mg/kg) rtPA.

Methods: Randomised, open, blinded endpoint, controlled substudy. A sample size of 700 patients equally divided between each of the two randomised groups (low-dose rtPA versus standard-dose rtPA) will provide 80% power (alpha = 0.05) to detect 10+% difference in recanalisation.

Results: A start-up phase has commenced across 16 sites in Australia, Asia and South America during 2013.

Conclusion: If low-dose rtPA proved to be safer and equally effective, it would expand the use of a more affordable treatment for ischaemic stroke worldwide. Investigators are welcome to join this substudy that can be incorporated into clinical practice.

OP5-07
Prehospital Delay and Recognition of Stroke-Related Symptoms by Patients/ Bystanders
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Objectives: Prehospital delay is the major cause of treatment delay in stroke. Factors causing prehospital delay have been widely discussed; however, the contribution of specific stroke-related symptoms recognized by patients/bystanders has not yet been clarified.

Methods: A consecutive series of 469 patients hospitalized within 2 weeks of stroke onset was collected. In this study, prehospital delay was defined as the time interval from recognition of stroke-related symptoms to hospital arrival. The prevalence of each symptom/signs recognized by patients/bystanders and physicians and prehospital delay were analyzed. Their effect on prehospital delay, National Institutes of Health Stroke Scale (NIHSS) score, and use of emergency medical service (EMS) was analyzed using univariate analyses. Correlation between prehospital delay and NIHSS score was also examined, and multivariate analyses were done for association with prehospital delay of &le;4 hours or increased use of EMS.

Results: Facial weakness and aphasia were recognized by patients/bystanders only 15.0% and 31.9% of the time, respectively. Aphasia, headache, and nausea/vomiting were associated with earlier hospital visitation without correlation to NIHSS scores. Multivariate analysis revealed that confusion/disturbance of consciousness (OR 7.01, P &lt;0.001), aphasia (OR 6.62, P &lt;0.001), facial weakness (OR 3.24, P = 0.0092), weakness of upper limb (OR 1.68, P = 0.027), and headache (OR 2.31, P = 0.020) were independent factors associated with prehospital delay of &le;4 hours.

Conclusion: Aphasia and facial weakness are difficult to recognize by patients/bystanders; however, they shortened prehospital delay once recognized. Education of the general public is required.

OP5-08
Early Stroke Risk After Transient Ischemic Attack in Patients Without Atrial Fibrillation or Large Artery Disease
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Background and Objectives: Urgent etiologic workup and treatment is emphasized in the management of patients with transient ischemic attack (TIA). However, it is unclear whether TIA patients without atrial fibrillation (AF) or large artery disease (LAD) are at low risk of early stroke occurrence. We aimed to clarify predictors of early stroke occurrence in such patients.

Methods: From April 2008 to March 2013, 387 patients were admitted to our stroke care unit within 48 hours after TIA onset. The urgent etiologic workup revealed that 189 patients have no AF or LAD, and they were enrolled in the present study. LAD was defined as the presence of greater than 50% stenosis or occlusion of the large cerebral arteries ipsilateral to the ischemic lesion. We reviewed medical records to investigate the associations of clinical and radiological characteristics with stroke occurrence within 7 days after hospital admission.

Results: Stroke occurred within the initial 7 days in 14 patients (7.1%) without AF or LAD and in 7.4% of those with. Eleven of the 14 patients were diagnosed as having small-vessel disease etiology. Unilateral weakness (P = 0.034), lacunar syndrome (P = 0.015), high systolic blood pressure (SBP) on admission (P = 0.006), and acute ischemic lesions on diffusion weighted imaging (P = 0.024) were significantly more frequent in TIA patients with stroke occurrence than in those without. In the cox proportional-hazards multivariate analysis, lacunar motor syndrome (pure motor or sensorimotor lacunar syndrome) (hazard ratio = 6.05; 95% CI, 1.60–39.71) and high SBP (hazard ratio [per 10 mmHg increase] = 1.31; 95% CI, 1.07 to 1.60) were independent predictors of the 7-day stroke occurrence.

Conclusion: TIA patients without AF or LAD had a similar 7-day stroke risk to those with AF or LAD. They are cautiously managed against early stroke occurrence, especially if they had lacunar motor syndrome at TIA onset and high SBP.
OP5-09
Primary Analysis of Prospective Transient Ischemic Attack Registry in Korea: Korean TIA Expression (KTX) Registry

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Background: The characteristics of transient ischemic attack (TIA) in Asia might be different from those of western countries. The risk scores for subsequent stroke such as ABCD2 were mostly devised for western cohorts. Thus we conducted a prospective study to describe the clinical and neuroimaging characteristics of TIA patients in Korea.

Methods: We designed a hospital-based, multi-center prospective cohort study. Subjects with TIA over the age of 40 were included if they underwent diffusion-weighted images (DWI) and MR angiography. For primary outcomes, vascular events such as ischemic strokes, myocardial infarctions, and cardiovascular deaths were identified at 48 hours, 7 days, 30 days, and 90 days after index-TIA events.

Results: A total of 500 patients completed follow-up. The mean age was 64.44 ±11.84, and 291 subjects (58.2%) were males. 333 subjects (66.6%) had hypertension, 149 had diabetes (29.8%), and 53 (10.6%) had atrial fibrillation. Large artery atherosclerosis was the most common index-TIA mechanism (32.4%). Lacunar TIA was more common than cardioembolism (18.0% vs. 9.8%). Vertebrobasilar insufficiency was observed in 78 subjects (15.6%). The mean ABCD2 score was 4.27 ± 1.41. The low-risk ABCD2 score comprised 29.0%, intermediate (4–5) 52.4%, and high-risk group (6–7) 18.6%. Acute lesions in DWI were observed in 150 subjects (30.0%). Symptomatic steno-occlusive lesions were observed in 153 (30.6%) and 54 (10.8%) subjects for intracranial and extracranial vessels, respectively.

The cumulative numbers of outcome events were 10 (2.0%), 14 (2.8%), 22 (4.4%), 26 (5.2%) for 48 hours, 7 days, 30 days, 90 days after index-TIA. All outcome events were ischemic strokes except one case with myocardial infarction and subsequent death.

Conclusion: The event rates after TIA were relatively lower than those of previous studies. It is not certain whether these differences were due to the ethnicity or treatment factors. Further analysis for the predictors of outcome events will proceed.

Preventive Stroke Strategies & Stroke Care Systems

OP6-01
Voice Recorded Messages from Significant Others as an Adjunct Therapy to Increase the Level of Consciousness of Patients with Reversible Coma

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Introduction: Hearing is the last sense that deteriorates when a person becomes unconscious. Meaningful auditory stimuli provide emotional arousal that brings about an increase in the level of consciousness.

Methodology: This study aims to determine the effects of the voice recorded messages from significant others as an adjunct therapy to increase the level of consciousness of patients with reversible coma. Using purposive sampling technique, 15 subjects were chosen with the following criteria: (1) in a reversible comatose state, (2) receptive to stimuli, (3) not in comatose state for more than 1 month, (4) no left-sided brain affection, (5) admitted in the stroke unit or medical ward of East Avenue Medical Center, (6) accompanied by relatives, (7) 18 years old and above, (8) relatives able to sign the informed consent. The message lasts for 3–7 minutes and repeated 4 times daily for two weeks. The FOUR Score, GCS and Vital Signs of the patient will be assessed before and after the intervention.

Results and Discussions: Assessments were as follows: FOUR score scale (p = 0.004), GCS (p = 0.000), pulse rate (p = 0.000), respiratory rate (p = 0.000), temperature (p = 0.655), systolic blood pressure (p = 0.196), diastolic blood pressure (p = 0.745). P-value lesser than 0.05, showed a significant result.

Analysis and Conclusion: Voice recorded messages from significant others as an adjunct therapy showed improvement in the level of consciousness and vital signs of patients with reversible coma as evidenced by significant differences found in FOUR score, GCS, RR, PR and some behavioral responses observed such as jerking, groaning, crying, and having the patient’s first movements of the day as verbalized by relatives.
OP6-02
Cost-Effectiveness Analysis of Stroke Management Under a Universal Health Insurance System
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Objective: Cost-effectiveness analysis (CEA) of stroke management was evaluated in three care models: Neurology/Rehabilitation wards (NW), Neurosurgery wards (NS), and General/miscellaneous wards (GW) under a universal health insurance system.

Methods: From 1997 to 2002, subjects with first-ever acute stroke were sampled from claims data of a nationally representative cohort in Taiwan, categorized as hemorrhage stroke (HS) including subarachnoid hemorrhage (SAH) and intracerebral hemorrhage (ICH); or, ischemic stroke (IS), including cerebral infarction (CI), transient ischemic attack/ unspecified stroke (TIA/unspecified); with mild-moderate and severe severity. All-cause readmissions or mortality (AE) and direct medical cost during first-year (FYMC) after stroke were explored. CEA was performed by incremental cost-effectiveness ratios.

Results: 2,368 first-ever stroke subjects including SAH 3.3%, ICH 17.9%, CI 49.8%, and TIA/unspecified 29.0% were identified with AE 59.0%, 63.0%, 48.6%, 46.8%, respectively. There were 50.8%, 13.5%, 35.6% of stroke patients served by NW, NS and GW with AE 44.9%, 60.6%, 56.0%, and medical costs of US$ 5,031, US$ 8,235, US$ 4,350, respectively. NW was cost-effective for both mild-moderate and severe IS. NS was the dominant care model in mild-moderate HS, while NW appeared to be a cost-minimization model for severe HS.

Conclusions: TIA/unspecified stroke carried substantial risk of AE. NS performed better in serving mild-moderate HS, whereas NW was the optimal care model in management of IS.

OP6-03
The Changes of Health-Related Quality of Life of Stroke Patients in Mongolia
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Background: Stroke is a major health burden worldwide and it is a first leading cause of mortality in Mongolia. Even though patients who survived from stroke, the quality of life is still remained the concern. Longitudinal studies are limited in low and middle-income countries.

Objectives: To study the changes of health-related quality of life (HRQOL) during six months after the stroke onset and to identify the factors associated with HRQOL changes.

Methods: Patients completed a questionnaire that included socioeconomic status, WHO-BREF questionnaire for HRQOL, rehabilitation, and caregiver characteristics. Charlson Comorbidity Index, Barthel Index, and Modified Rankin Scale were also measured. Changes of HRQOL were calculated for before discharge and after 6-month follow-up. One-sample t-tests were performed to compare the scores at discharge and after 6 months. Multiple linear regressions were performed to identify the factors associated with these changes.

Results: 240 patients were interviewed at baseline and 125 were successfully followed-up for complete quality of life (QOL) and other measurements after 6 months. The changes of the mean scores improved in physical and environmental domains (p<.05), however, declined in social domain (p<.05). There were no statistical differences in psychological domain and overall HRQOL scores. Factors associated with changes of HRQOL were high activities of daily living scores, patients with caregivers, and patients who received rehabilitations.

Conclusions: Functional status, rehabilitation, and assistance from caregivers were identified as predictors for better QOL in physical and environmental domains. However, there is a need for psychosocial support to the patients who suffered by stroke.

OP6-04
Associations Between Social Support, Socioeconomic Status and Depression in Stroke Survivors Who Experienced Economic Transition
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Background and Objectives: Social support is a valid predictor for improved functional recovery after stroke. Previous studies showed that low social support was associated with socioeconomic deprivation and depression. We examined the associations in stroke patients who experienced economic transition.

Methods: Using a standard method of the GMS-AGECAT we interviewed a random sample of 7,572 people aged ≥ 60 years across 7 provinces of China during 2007–2011. We documented 305 doctor-diagnosed stroke cases, having categorized socioeconomic status and risk factors and diagnosed depression by the GMS-AGECAT algorithm. We scored a patient at the highest level of social support if he positively responded to each of 6 questions: “Being married”, “Living with somebody”, “Having relatives who lived within the same village/street”, “Children/relatives visiting daily”, “Help available when needed” and “Being satisfied with the help”. We took those patients with <=4 score as having low social support (n = 144).

Results: Among 305 patients, averaged age was 73.0 years (SD 7.2), 47.5% women, 54.4% having educational level of <= primary school, 68.9% manual labourers, 46.2% having annual income of <10,000 RMB, and 18.0% having depression. Low social support was associated with urban living (age-sex adjusted odds ratio 4.72, 95% CI 2.85–7.82), high occupational class (3.75, 1.83–7.71 in official and teacher versus peasant) and high annual personal and family incomes, but not with educational level and depression. Depression was signifi-
Conclusions: The associations of low social support with high socio-economic status in stroke patients in China warrant intervention. Compared to The Chinese stroke patients had a lower risk of depression than those in the West, which may be due to high level of social support. Further exploring Chinese culture could maintain high social support and low depression in stroke patients, improving their prognosis.

 OP6-05
Outcome and Complication of Carotid Artery Stenting: Multiple Institutes Retrospective Review of 102 Consecutive Patients
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Background and Objective: After April 1 2008, as for Patients with carotid artery severe stenosis, carotid artery stenting (CAS) could be treated under the health insurance in Japan. CAS offer a viable alternative to carotid endarterectomy for symptomatic and asymptomatic patients with carotid artery stenosis; however, such patients increase. We analyzed outcomes and complications of CAS in multiple institutes retrospective review.

Methods: The clinical variables and treatment outcomes of 102 consecutive patients (109 stents) with carotid stenosis were analyzed. At the time of treatment, the mean age (89 men and 13 women) is 69 years (range, 59–79yrs). Both symptomatic and asymptomatic stenoses were studied in high surgical risk patients as defined by the SAPPHIRE (Stenting and Angioplasty with Protection in Patients at High-Risk for Endarterectomy) trial. Specifically, those patients with clinically significant cardiac disease, recurrent stenosis after carotid endarterectomy, radiation therapy to the neck. All patients were treated under local anesthesia and using embolic protection devices. Demographics, clinical and lesion characteristics, as well as adverse events through a 180-days follow-up were recorded.

Results: Overall 30-day rates of mortality and morbidity (stroke/transient ischemic attack (TIA)) are 0%, 2.8%(3 patients), respectively. There were two ischemic strokes, which combined heart failure or myocardial infarction, and one TIA. Complication rates of hyperperfusion syndrome, hypotension/bradycardia, and re-stenosis are 3.7%, 22%, and 4.6%, respectively.

Conclusions: It is good outcome and a low complication rate to perform CAS in high surgical risk patients presenting with carotid artery disease in this study. It is important to choose treatment depending on the individual state of the patient. In addition, a lot of patients to perform CAS have coronary artery disease, scrupulous attention is necessary for dynamic state, example for hypotension and/or bradycardia. Including perioperative management, we would recommend treatment of carotid artery stenosis with cardiologists.

 OP6-06
Association between Intima-Media Thickness of Brachiocephalic Trunk and White Matter Hyperintensity in Brain MRI
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Background and Objective: Intima-media thickness (IMT) of brachiocephalic trunk (BCT) can be measured by duplex carotid ultrasonography like as common carotid artery (CCA); however, the clinical significance of BCT-IMT has not been studied.

Methods: We reviewed 1109 stroke free participants in the registry of Okinawa general health maintenance association. We compared the association between BCT-IMT or CCA-IMT and deep and subcortical white matter hyperintensity (DSWMH).

Results: BCT-IMT was correlated with CCA-IMT, and showed a similar increase with advancing age to CCA-IMT. The increase in BCT-IMT or CCA-IMT quartiles was correlated with the development of DSWMH, respectively. Multivariate logistic regression analysis indicated that the increase in BCT-IMT was associated with higher prevalence of significant DSWMH (Fazekas grade 2 or 3; per 0.1 mm increase in IMT; OR 1.02, 95% CI 1-1.04; P = 0.04), like as CCA-IMT. The increase in quartiles of BCT-IMT was associated with higher prevalence of significant DSWMH only in subjects with lower CCA-IMT (1st and 2nd quartiles, R2 = 0.18, p < 0.05), not in subjects with higher CCA-IMT (3rd and 4th quartiles). Combinations of CCA-IMT and BCT-IMT quartiles failed to show an additive effect in increasing prevalence of significant DSWMH.

Conclusion: BCT-IMT has a similar clinical profile to CCA-IMT in association with DSWMH. However, CCA-IMT and BCT-IMT did not additively predict DSWMH and distinct mechanisms between CCA and BCT might be involved in thickening of IMT.

 OP6-07
Poor Outcome in 5-Year Survivors of Stroke with Low Blood Pressure
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Background and Objectives: There is recent evidence that low blood pressure may have adverse prognostic effects in those with stroke. We aimed to investigate the association between systolic blood pressure (SBP) and cardiovascular outcomes in long-term stroke survivors.

Conclusions: Low blood pressure is not a predictor of poor outcome in 5-year survivors of stroke.
Methods: Five year survivors of stroke participating in the North East Melbourne Stroke Incidence Study were contacted for a follow-up assessment at 5, 6, 7, 8, 9, and 10 years after stroke. Blood pressure was measured according to the British Hypertension Society protocol. Patients were categorised into quartiles of systolic blood pressure (SBP). We used multivariable Cox proportional hazards regression to assess the association between SBP measurements at 5 years post-stroke and an outcome of all-cause death, acute myocardial infarction (AMI) or recurrent stroke to 10 years post-stroke. Adjustment was made for potential confounding factors including sociodemographic factors, disability, self-reported risk factors and medications.

Results: Patients with a SBP of ≤120 mmHg had a 62% greater risk of stroke, AMI or death than patients with a SBP of 131–141 mmHg (p = 0.018). There were no differences in the risk of all-cause death, AMI and recurrent stroke in patients with SBP 121–130 mmHg (p = 0.536) or SBP ≥142 mmHg (p = 0.323) when compared to patients with a SBP of 131–141 mmHg.

Conclusion: There appeared to be a U-shaped association between SBP and poor outcomes in 5-year survivors of stroke. The findings provide evidence that there is a greater risk of poor outcome in those with both low and high blood pressure.

OP6-08
Influence of Air Pollution on Stroke Incidence in Ludhiana City
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Background and Aim: We aimed to study the influence of air pollution on stroke incidence in Ludhiana city.

Method: All first ever stroke patients in Ludhiana city over 18 years of age recruited from 1st May 2011 till 30th April 2012 were included. We collected the data using WHO STEPS approach with modifications. Air pollution data was collected for the same period from Punjab Pollution Control Board (PPCB) department. The PPCB monitors air quality for respirable suspended particulate matter (RSPM), NO2 and SO2 using a high-volume air sampler. There are four monitoring stations in the city. Eight-hour averaging is done for RSPM and 4-h average is done for NO2 and SO2.

Statistical Analysis: Statistical analysis was performed using SPSS version 16.0 (SPSS Inc., Chicago, IL). The statistical measures used were frequencies, descriptive statistics and Poisson regression method. Pollutants (RSPM, NO2 and SO2) were grouped as quintiles (Q1 to Q5). Risk ratios with 95% confidence interval were calculated.

Result: 1652 stroke cases were included [Ischemic stroke: 1036 (63%)]. The highest risk ratios for the occurrence of stroke in relation to the air pollutants were as follows: RSPM 1.08 in Q2, NO2 0.83 in Q2, and SO2 1.20 in Q5. Risk ratio for Ischemic stroke was RSPM 0.95 in Q5; NO2 0.88 in Q2; and SO2 1.17 in Q5 and risk ratio for Hemorrhagic stroke was RSPM 1.66 in Q2; NO2 0.70 in Q3; and SO2 1.23 in Q5.

Conclusion: We found a strong influence of SO2 on stroke occurrence in this study. Air pollutants can lead to endothelial dysfunction and platelet activation and in addition it can have influence on blood pressure. Our findings open up opportunities for stroke prevention by controlling air pollution.

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OP6-09
Effect of Sonolysis on a Risk Reduction of Brain Infarction During Carotid Endarterectomy or Stenting. A Prospective Study
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Background: Sonolysis is a new therapeutic option for arterial recanalization acceleration.

Objectives: The aim was to confirm risk reduction of brain infarction during carotid endarterectomy (CEA) and carotid stenting (CAS) using sonolysis.

Methods: All consecutive patients 1/ with internal carotid artery stenosis >70%, 2/ indicated to CEA or CAS, 3/ with signed informed consent were enrolled to the prospective study and randomized into 2 groups: Group 1 with sonolysis during intervention and Group 2 without sonolysis. Neurological examination and brain MRI were performed before and 24 hours after intervention in all patients. Occurrence of new brain infarctions (including infarctions >0.5 cm3), 30-day mortality and morbidity were statistically evaluated using T-test.

Results: 147 patients were included in the study. Out of the 70 patients (55 males, mean age 65.5 ± 7.3 years) randomized to sonolysis group (Group 1), 35 underwent CEA (Group 1a) and 35 CAS (Group 1b). Out of the 77 patients (47 males, mean age 65.8 ± 7.9 years) randomized to control group (Group 2), 34 underwent CEA (Group 2a) and 43 CAS (Group 2b). New ischemic brain infarctions on follow-up MRI were found in 22 (31.4%) patients in Group 1; 6 (17.1%) in Group 1a, 16 (45.7%) in Group 1b. In Group 1, new ischemic brain infarctions were found in 33 (42.9%) patients; 10 (29.4%) in Group 2a, 23 (53.5%) in Group 2b (P > 0.05 in all cases). New ischemic brain infarctions >0.5 cm3 were found in 6 (8.6%) patients in Group 1 and in 16 (20.8%) patients in Group 2 (P = 0.019). Symptomatic stroke occurred in 3 patients (1 in Group 1b, 1 in Group 2a, 1 in Group 2b). No adverse events related to sonolysis were observed.

Conclusion: Sonolysis seems to be effective in prevention of large ischemic brain infarctions during CEA and CAS. Supported by IGAMHCR grants NT/11586–5/2010; NT/13498–4/2012. ClinicalTrials.gov NCT01591005.
Endothelial Gene Expression and Molecular Changes in Response to Radiosurgery in In Vitro and In Vivo Models of Cerebral Arteriovenous Malformations

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Background and Objectives: Rupture of cerebral arteriovenous malformations (AVMs) is the major cause of stroke in children and young adults. Radiosurgery offers the potential to treat patients who are surgically untreated but is limited to 2-year latency. There is no early marker to monitor whether the lesion is responsive to radiosurgery. The aim of this study was to examine endothelial gene expression and molecular changes in response to radiosurgery, and identify molecules that offer predictive value in monitoring whether AVMs respond to the treatment.

Methods: A human cerebral microvascular endothelial cell model was applied for endothelial gene analysis as no biopsy human AVM specimens that well responded to radiosurgery are possibly obtained. An AVM animal model was applied to establish a time course of radiosurgery induced soluble endothelial molecule changes in blood. Gene expression of E- and P-selectin, ICAM-1, PECAM-1, VCAM-1, tissue factor, and vWF in human cerebral microvascular endothelial cells was quantified by RT-qPCR at different radiation doses and time-points. Soluble E- and P-selectin, ICAM-1, PECAM-1, VCAM-1, tissue factor, and vWF in a AVM rat model were quantified by ELISA at different time-points post-radiosurgery.

Results: We found that gene expression of E- and P-selectin, ICAM-1, PECAM-1, and VCAM-1 was up-regulated by radiation in a dose-dependent manner (P < 0.05). Gene expression of E- and P-selectin and ICAM-1 was more sensitive to irradiation than that of PECAM-1, and VCAM-1. Radiosurgery induced gene expression of P-selectin, ICAM-1, PECAM-1 and VCAM-1 was linearly correlated with time (P < 0.05). Radiosurgery induced elevation of soluble E- and P-selectin, ICAM-1, VCAM-1, and tissue factor in AVM rat model at different time-points (P < 0.05).

Conclusion: A combination of E- and P-selectin, ICAM-1, VCAM-1, and tissue factor measured at different time-points may serve as an early predictor of responsiveness of AVMs to radiosurgery.

Heparin/Collagen Coating on Nitinol Surface for Intravascular Applications

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Background and Objective: Nitinol stents and mechanical clot retrievers have been used for the treatment of intracranial aneurysms and strokes. The characteristics of nitinol surface play a pivotal role in activating platelets and promoting the adhesion of vascular endothelial cells that consecutively prevents blood clot formation. To improve these features on nitinol surface, masking the stent by covering is needed. Our objective was to cover nitinol surface with heparin to improve blood compatibility and collagen to sustain endothelial cell adhesion.

Methods: Both nitinol sheets and nitinol-wire-braided stents were washed with detergent, H2O, hexane and acetone, treated with 2.5M NaOH at 80oC for 24 hr, and then dip in 2v% 3-Aminopropyltriethoxysilane (APTE) in toluene for 72 hr. A layer-by-layer coating process of heparin/collagen on nitinol surface was performed manually. During the procedure of coating heparin or collagen, the outer surface of nitinol stent was protected by Teflon film for further coating anti-inflammation drug. After coating, the nitinol surfaces were characterized by Auger electron spectroscopy (AES) analysis, contact angle measurement, and Scanning electron microscopy/energy dispersive X-ray spectroscopy (SEM-EDX) analysis.

Results: After coating by Heparin or Collagen, the contact angle of nitinol surface was decreased to 19 or 23 degrees, respectively, from 43 degrees on bare nitinol surface. AES analysis demonstrated the existing of APTE on the nitinol surface after treating with APTE. SEM-EDX analysis demonstrated the existence of heparin after coating the nitinol surface with heparin.

Conclusion: The preliminary results demonstrated the feasibility of covering the nitinol surface with heparin and collagen. The wettablity of nitinol surface was increased (with a decrease of contact angle) by coating with heparin or collagen, which is better for endothelial cells spreading out on the stent surface. More experimental measurements are being carried out to characterize the heparin/collagen coating on nitinol surface for intravascular applications.
Usefulness of Neuronavigation Guided Endoscopic Evacuation for Supratentorial Intracerebral Hemorrhage

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Background and Objective: It is well known that the endoscopic evacuation of supratentorial intracerebral hemorrhage (sICH) is a minimally invasive technique. There are several reports that neuronavigation makes the endoscopic hematoma evacuation safer. The aim of the present study is to describe the usefulness of neuronavigation for the endoscopic evacuation of sICH.

Methods: We reviewed 20 records of patients underwent endoscopic evacuation of sICH between April 2009 and March 2013. Preoperative and postoperative hematoma volumes, Glasgow Coma Scale (GCS), Glasgow Outcome Scale (GOS) and modified Rankin Scale (mRS) were compared.

Result: In 15 patients, an endoscopic hematoma evacuation was performed with neuronavigation, and the entry site and trajectory were planned according to the long axis of the hematoma. The mean preoperative hematoma volume was 47.1 ml. The mean percent of hematoma evacuated was 78.7%. The mean operation time was 76 min. In 11 of the 15 patients the GCS score improved and in 7 of the 15 patients the mRS score improved at discharge. In 5 patients, an endoscopic hematoma evacuation was performed without neuronavigation. The mean preoperative hematoma volume was 40.0 ml. The mean percentage of hematoma evacuated was 60.0%. The mean operation time was 87 min. In 4 of the 5 patients the GCS score improved and in 1 of the 5 patients the mRS score improved at discharge. The patients experienced no rebleeding in both groups.

Conclusions: The technique of the endoscopic evacuation with neuronavigation is more useful than without. We can choose the entry site and the trajectory along the long axis of the hematoma more reliably, avoid disorientation, and perform hematoma evacuation more safely with neuronavigation. Our study showed the patients treated with neuronavigation tended to have good outcome.

Factors Associated with Long-Term Adherence of Antithrombotic Agents After First-Ever Acute Ischemic Stroke

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Background and Objective: The use of antithrombotic (AT) medications after ischemic stroke (IS) is recommended to reduce the risk of further vascular events (VE). Nonetheless, medication non-adherence may reduce the effectiveness of therapies. This study aimed to analyze the factors associated with adherence of AT agents two years after first-ever acute ischemic stroke under a universal health insurance system.

Methods: Subjects hospitalized with acute first-ever IS (ICD-9-CM codes 433 to 437) between 2001 and 2005 were identified from insurance claims data of one-million randomly sampled enrollees of the universal health insurance system in Taiwan. Baseline characteristics associated with adherence of AT agents (aspirin, clopidogrel, ticlopidine, dipyridamole, and warfarin) over 2 years after stroke were analyzed by chi-square tests and multivariate logistic regression model. Medication adherence was assessed as the proportion of days covered (PDC) for filled prescriptions, and classified into 3 levels: low (< 40%), intermediate (40–79%), and high (≥ 80%).

Results: 7,341 subjects prescribed with AT agents during initial hospitalization or 1 month after stroke onset and survived at least 3 months were selected to be followed up for 2 years, resulting in low adherence 41%, intermediate 33%, and high 26%. Aged ≥ 80 years, 2004 onset, and occurrence of respiratory distress or infections during initial hospitalization were associated with lower adherence (P < 0.05). While aged 65–74 years, cerebral infarction subtype, the presence of pre-morbid risk factors; took brain imaging or got rehabilitation therapies during initial hospitalization; initially managed in the neurology ward, medical
center or regional hospital, or Taipei region; and occurrence of VE during 2-year follow-up period predisposed to greater AT adherence (P < 0.05).

Conclusions: Only 26% of IS subjects were classified into high AT adherence within 2-year follow-up period. Several potentially modifiable patient, provider, and system-level factors associated with AT adherence maybe targets for future interventions.

OP7-05

Impaired Vasodilatory Reserve on Acetazolamide-Challenged 99Tc-HMPAO-SPECT is a Strong Predictor of Stroke Recurrence in Patients with Severe Steno-Occlusive Disease of Intracranial Carotid or Middle Cerebral Artery

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Background: Intracranial stenosis carries an increased risk for cerebrovascular ischemia. In severe stenosis, cerebral autoregulation may be impaired due to inadequate cerebral vasodilatory reserve (CVR) & intracranial steal phenomenon (reversed-Robin Hood syndrome-RRHS). Identification of patients with inadequate CVR and RRHS may help in identifying high-risk patients.

Methods: In this prospective study, we included patients with symptomatic and severe stenosis of intracranial carotid (ICA) & middle cerebral artery (MCA). CVR was evaluated with transcranial Doppler (TCD) and breath-holding index (BHI).

Results: 126 patients (80 male, mean age 56yrs; range 23–78yrs) fulfilled our TCD criteria for inadequate CVR. HMPAO-SPECT showed impaired CVR in 84 (67%) patients. RRHS noted on TCD in 38 (45%) patients (median steal magnitude 14%; interquartile range, IQR 10) was confirmed by acetazolamide-challenged HMPAO-SPECT (median perfusion deficit 8%; IQR 13%) in 35 (92%) cases (sensitivity 82%, specificity 96% with positive predictive value 96%). A strong relationship between RRHS on TCD and SPECT was noted on ROC curve analysis (area under curve 0.93; 95% confidence interval 0.87–0.98; p.< 0.001).

Conclusions: Among patients with severe intracranial stenosis, intracranial steal phenomenon is associated with high risk of cerebral ischemic events. Acetazolamide-challenged HMPAO-SPECT is reliable in the quantification of vasodilatory reserve for selecting a target group of patients for possible revascularization.

OP7-06

Autonomic Quantizing the Middle Cerebral Artery Atherosclerosis in Computed Tomography Images

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Background: Atherosclerosis is a general ageing process determined by multiple risk factors. Pulse wave velocity (PWV) is a non-invasive method to estimate the degree of the atherosclerotic ageing. We assessed whether the computer tomography (CT) density of middle cerebral artery (MCA) is associated with arterial stiffness by measuring brachial-ankle PWV (ba-PWV). Then, an autonomic quantizing tool was developed based on the correlation of CT density and PWV, to quantify the severity of the atherosclerosis in MCA.

Aim: The purpose of this study is to establish the correlation of MCA density in CT and the PWV. Then, we will develop an autonomic analytic tool to detect the severity of atherosclerosis of MCA.

Method: Totally 634 patients performed both brain CT and PWV examinations in the time of data recruitment. We record the Hu by region of interest from plain brain CT, and their PWV by Collins VP 2000. Then, by using the texture quantification and image enhancement techniques to analyze the brain CT images within Atherosclerosis. After principle component analysis (PCA), some meaningful parameter of patient records, texture features, and texture features with local binary pattern were chosen. Finally, use back propagation neural network (BPN) to evaluate this system. Based on peripheral vascular measurement information to classify cases. 20 normal and 200 abnormal cases were trained, and 14 normal and 57 abnormal cases tested thru neural network.

Results: Patients with CT number 47 Hu will have PWV higher than 1400 cm/s that mean general atherosclerosis. Then we validate our system with accuracy, sensitivity, specificity, and kappa value up to 94.37%, 96.49%, 85.71%, and 0.756 respectively without local binary pattern (LBP), and increased to 98.59%, 98.25%, 100.00%, and 0.936 by using local binary pattern. This system can provide clinicians in the diagnosis of vascular sclerosis more auxiliary.

OP7-07

Effects of Assessment, Reorientation and Therapy (A.R.T.) Program in Decreasing Anxiety and Meeting the Needs of Families of CVA Patients

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Background: The family system may become disrupted when a member becomes seriously ill. During this time, emotional stability and sense of equilibrium must be established and main-
Objective: This study aimed to determine the effect of A. R. T., a nurse-led Family-Centered Care Program in the anxiety level of the family of Cerebrovascular Accident (CVA) patients as well as in meeting the needs of the family specifically the need for information, comfort, assurance and anxiety reduction.

Methods: The study utilized a randomized two-group experimental design. A total of 60 participants consisting of family members of CVA patients admitted in the Neurological Intensive Care Unit (NCU) and Medical Intensive Care Unit (MICU) were included. They were assigned randomly to either control or study group, with 30 participants each. The control group received the routine nursing care whereas the study group received the routine nursing care plus the A. R. T. Program.

Results: Results showed that there was a very significant decrease in the anxiety level of participants who underwent the A. R. T. program (p = 0.010) as compared to those who received the routine nursing care. Furthermore, information needs of patients also showed significant results.

Conclusion: Finding showed that the A. R. T. program is effective in addressing the information needs of the family members of CVA patients as well as in decreasing their anxiety level.

OP7-09
A Prospective Evaluation of Diagnostic Yield of Transient Ischemic Attack (TIA) in a Nurse-Led TIA Clinic in Hong Kong
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Background: Rapid assessment and early treatment of TIA is essential to reduce the risk of ischaemic stroke. A proper evaluation is essential to differentiate the diagnosis from other TIA mimics and can allow proper utilization of healthcare resources.

Objectives: To evaluate the diagnostic yield of our Nurse-led TIA clinic and review the referral pattern from different sources.

Methodology: A Nurse-led TIA Clinic was set up in the United Christian Hospital in Kowloon East Cluster since 2013. A prospective study was conducted to assess the diagnostic yield among patients referred to and screened by Nurse-led TIA clinic.

Result: A total of 148 patients were screened between January and May 2013. The sources of referral included Accident and Emergency department, specialty out-patient clinics, acute stroke unit and acute medical wards. After screening and triage by stroke nurses, neurovascular events were diagnosed in 102 (69%) patients including 57 (39%) patients with TIA and 45 (30%) with ischemic stroke. For 46 (31%) patients with non-vascular conditions, these included syncope in 7 (5%) patients, hypoglycaemia in 6 (4%), migraine in 5 (3%), cervical myelopathy in 4 (3%), seizure in 4 (3%), neuropathy in 4 (3%), dementia in 4 (3%), peripheral vertigo in 4 (3%), non-specific diplopia in 2 (1%), fall with dizziness in 2 (1%), Limb weakness due to musculoskeletal pain in 2 (1%), hoarseness due to upper respiratory tract infection in 1 (1%) and myalgia due to sepsis in 1 (1%).

Conclusion: Nurse-led TIA clinic serves an important role to triage TIA referral. Our referral pattern is similar to those reported in Western clinics (neurovascular events 86%, TIA 55% and ischemic stroke 32% in FAST-TIA study). Early diagnosis of TIA can therefore allow rapid access to diagnostic investigations and appropriate secondary prevention. Expedited referral to different specialties for non-neurovascular events can also be initiated immediately. In summary stroke nurses can utilize the resources effectively and hasten appropriate treatment initiation in both TIA and also non-TIA patients.
**Section 1.**
**Paper Poster Presentations**

(31 August 2013)

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**PP1-01**

Etiopathogenic Mechanisms of Isolated Pontine Infarcts Based on Arterial Territory Involvement

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**Background and Objectives:** Pontine infarcts are classified into four groups including anteromedial, anterolateral, lateral, and posterior territories in terms of the vascular anatomy. Lateral or posterior pontine infarcts, which were perfused mainly by anterior inferior and superior cerebellar arteries, might be associated with embolic mechanisms. The purpose of this study was to determine the etiopathogenic mechanisms based on arterial territory involvement in the pontine infarcts.

**Methods:** Consecutive inpatients with the isolated pontine infarct diagnosed by diffusion weighted magnetic resonance imaging within seven days of symptom onset were studied. Patients with the pontine infarct of two or more vascular territories were excluded. To determine factors associated with topographical location, multivariate logistic regression analyses were performed.

**Results:** A total of 205 patients were enrolled (78 women, median age: 73 years, interquartile range: 65–79 years). All isolated pontine infarcts were divided into anteromedial (73%), anterolateral (14%), lateral (3%), and posterior territory (10%). In univariate analyses, age (P = 0.046), NIHSS score (P < 0.001), the tegmental sign (P < 0.001), and unfavorable outcome at discharge (mRS 3–6) (P = 0.017) were significantly different among four groups. In multivariate analyses using anteromedial infarcts as a reference, atrial fibrillation (OR: 4.17; 95% CI: 1.21–14.1) and previous ischemic stroke (OR: 2.92; 95% CI: 1.09–7.89) were positively and age (OR: 0.55; 95% CI: 0.35–0.81), diabetes mellitus (OR: 0.31; 95% CI: 0.11–0.80) and basilar artery disease (OR: 0.27; 95% CI: 0.08–0.75) were negatively associated with the lateral or posterior pontine infarct. Basilar artery disease (OR: 0.39; 95% CI: 0.14–0.96) and female sex (OR: 0.37; 95% CI: 0.14–0.93) were less frequent in anterolateral infarcts.

**Conclusions:** Baseline characteristics and clinical presentations were significantly different according to topographical location of isolated pontine infarcts. Our results suggest that in lateral or posterior pontine infarcts, cardioembolism is more frequent and basilar artery atherosclerosis is less common compared with anteromedial pontine infarcts.

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**PP1-02**

Pathology and Prognosis of Patients with Basilar Artery Occlusion

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**Background and Objective:** Basilar artery occlusion has high risk of fatal damage by stroke and thereby requires more accurate and aggressive treatment. Basilar artery occlusion has got to be diagnosed frequently because of the development of imaging modality such as MRI and MR angiography. The purpose of this study is to clarify the clinical course of patients with basilar artery occlusion in the last 5 years.

**Methods:** This study is a report of retrospective clinical series. A chart review was performed to include patients who demonstrated apparent basilar artery occlusion in imaging studies. Onset mechanism, selection of treatment, and outcomes were analyzed for all patients.

**Results:** 16 patients were identified. Five patients were female and the mean age was 69 years. All patients suffered severe consciousness disturbance, facial dysplasia, and tetraparesis. As for the onset mechanism, 10 were embolization, 2 were arterial dissection, and 4 were atherosclerosis. A case with arterial dissection was treated with angioplasty and stenting. Another case with atherosclerotic severe stenosis was treated with direct angioplasty. Intra-arterial thrombolysis was indicated for 3 cases. On the other hand, t-PA thrombolysis was indicated for 2 cases. Remaining cases with broad stroke that had already completely developed were treated conservatively. There was no case with hemorrhagic infarction after recanalization or reclosure. All patients showing recanalization of basilar artery prior to the completion of infarction were almost totally independent (mRS 0–1) at their discharge. However, all patients with recanalization after completion of infarction demonstrate poor outcome (mRS 5).

**Conclusion:** Major onset mechanism was embolization, which occupied 62.5%. In managing such a patients, aggressive treatment is highly recommended before the infarction has completely developed because prognosis depends on whether the recanalization occurs prior to the development of infarction or not.
**PP1-03**

**Outcome of Japanese Minor Stroke Within 6 Hours After the Symptom Onset: Fukuoka Stroke Registry**

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**Background and Purpose:** Patients with minor stroke with the initial NIH stroke scale score of 4 or less were often treated without recombinant tissue plasminogen activator (rt-PA). We investigated the outcome of minor stroke within 6 hours after the symptom onset.

**Methods:** Among the consecutive 4455 stroke patients who were admitted within 6 hours after the symptom onset, 963 patients with ischemic lesions on diffusion-weighted image, NIH stroke scale score of 4 or less, and prior modified Rankin scale (mRS) of 0 or 1 were included in the present study. Thirty-four (3.5%) of the 963 patients were treated with intravenous rt-PA. In other 926 patients, we observed a neurological deterioration (a NIHSS score worsening of 1-point) and stroke recurrence during the first 21 hospital days. A good outcome was defined as mRS of 0 or 1.

**Results:** A good outcome 3 weeks and 3 months after admission was observed in 82.2% and 82.3%. Stroke recurrence and neurological deterioration occurred in 3.7% and 9.2% of 926 patients during the first 3 weeks. Atrial fibrillation and diabetes mellitus were less frequent in patients with than without a good outcome. The initial NIH stroke scale score, BUN, creatinine, LDL-cholesterol, glucose, HbA1c, d-dimer, and CRP values were lower, and the initial HDL-cholesterol and estimated GFR (eGFR) values were higher in patients with than without a good outcome. On multivariate analysis, age (OR 0.94, 95% CI 0.92-0.97), the initial NIH stroke scale score (OR 0.60, 95% CI 0.48-0.74), LDL-cholesterol (OR 0.99, 95%CI 0.98–1.00), and D-dimer (OR 0.92, 95%CI 0.85–0.99) were negatively associated with a good outcome 3 weeks after admission.

**Conclusions:** In minor stroke treated without rt-PA, the initial NIH stroke scale score, LDL-cholesterol and D-dimer were associated with the outcome. Indication criteria for intravenous rt-PA in minor stroke should be considered.

**PP1-04**

**Intravenous Thrombolysis for Ischemic Stroke Patients Older Than 80 Years of Age**

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**Purpose:** The aim of this study was to assess the efficacy and safety of alteplase, a recombinant tissue plasminogen activator (rt-PA) in elderly ischemic stroke patients in our hospital.

**Patients and Methods:** Subjects consisted of 94 patients (51 male and 39 female patients, mean age: 72 years old) who had been treated with rt-PA (0.6 mg/Kg) between October 2005 and March 2013 in our hospital. We divided the patients into two groups by age (>80 years [older group] of 30 patients, 12 male and 18 female patients, mean age: 85.4 ± 3.7 years old and <80 years [younger group] of 64 patients (42 male and 22 female patients, mean age: 66.0 ± 11.2 years old). Clinical backgrounds and outcomes were investigated.

**Results:** There was no significant difference in lower extremities The National Institutes of Health Stroke Scale (NIHSS) score on admission, symptomatic intracranial hemorrhage rate, and improvement level of NIHSS 7 days after onset between the both groups. However, upper extremities NIHSS on admission, upper and lower extremities NIHSS 7 days after onset, and modified Rankin Scale (mRS) at 3 months after onset were significantly more severe in older group versus younger group (2.5 ± 1.2, 1.9 ± 1.7, 1.7 ± 1.5, and 3.6 ± 2.1 v.s. 1.9 ± 1.3, 1.2 ± 1.5, 1.0 ± 1.3, and 2.1 ± 2.0; p < 0.05, p < 0.05, p < 0.05, and p < 0.01, respectively).

**Conclusion:** These data suggest that intravenous alteplase (0.6 mg/Kg) was safe and effective, even for elderly patients (>80 years of age), but resulted in poor outcomes relating not to rt-PA but to aging.

**PP1-05**

**Rationale of the Head Position in Acute Stroke Trial (HeadPoST)**

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**Background and objectives:** Positioning a patient ‘lying flat’ (i.e. “head down” to be level with the body) in bed with restricted mobility during the acute phase of ischaemic stroke (IS) may improve recovery and reduce disability, but such a possibility has not been formally tested in a clinical endpoint trial. The Head Position in acute Stroke Trial (HeadPoST) will determine whether compared to sitting up (≥30º head position), lying flat (0º head position) for the first 24 hours of admission is superior on functional outcome in patients with acute stroke.

**Methods:** HeadPoST is a cluster randomised, open, assessor-blinded outcome evaluated (PROBE), controlled trial. Study centres with established acute stroke care programs will be randomly assigned to lying flat (0º head position) or sitting up (≥30º head position). All centres will be required to train staff using special on-line training protocols and introduce the randomised head position according to the protocol. Then each centre will recruit all consecutive stroke patients (IS and intracerebral haemorrhage...
Proteinuria Independently Predict Unfavorable Outcome of Ischemic Stroke Patients Receiving Intravenous Thrombolyis

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Background and Purpose: Patients with chronic kidney disease (CKD) and proteinuria have increased risk of stroke. This study aimed to investigate whether low estimated glomerular filtration rate (eGFR) and/or proteinuria are outcome predictors in stroke patients treated with intravenous recombinant tissue plasminogen activator (IV rtPA).

Methods: We studied 432 consecutive stroke patients who received IV rtPA from January 2006 to December 2012, in Taiwan. Unfavorable outcome was defined as modified Rankin scale ≥2 at 3 months after stroke. Proteinuria was classified as negative or trace, mild, and moderate to severe. With logistic regression analysis, we identified independent factors for unfavorable outcome and hemorrhage after thrombolysis.

Results: Of all patients, 32.7% had mild or severe proteinuria. Patients with proteinuria were older, had higher frequencies of diabetes mellitus, hyperlipidemia, atrial fibrillation, lower eGFR, and greater severity of stroke upon admission. Proteinuria, not low eGFR, was an independent predictor for unfavorable outcome (OR = 2.00 for mild proteinuria, p = 0.035; OR = 2.54 for moderate to severe proteinuria, p = 0.035). However, there was no clear relationship between proteinuria and symptomatic hemorrhage.

Conclusions: Proteinuria is an independent predictor of unfavorable outcome for IV rtPA treated acute ischemic stroke patients, indicating the crucial role of CKD on the effectiveness of thrombolysis.
PP1-08
The Efficacy and Tolerability of Thrombolysis with Alteplase 3 to 4.5 Hours After Acute Stroke in Japanese Patients in Tokai University Hospital
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Background and Objective: The European Cooperative Acute Stroke Study (ECASS) III showed that alteplase administered between 3 and 4.5 hours after the onset significantly improved clinical outcomes in patients with acute ischemic stroke with a higher symptomatic intracranial hemorrhage (SICH) rate, but no change in mortality (N Engl J Med, 2008). Since August 31, 2012, intravenous thrombosis with alteplase within 4.5 hours after the onset has been approved in Japan. However, little is known about the efficacy and tolerability of alteplase within this extended time window 3 to 4.5 hours after acute stroke in Japanese patients.

Methods: Out of 104 patients with acute ischemic stroke admitted to Tokai University hospital from August 31, 2012 to February 28, 2013, 12 patients who underwent rtPA therapy within 4.5 hours after symptom onset were included in this study: 7 in the 0 to 3 h group (33%) and 5 in the 3 to 4.5 h group (66%). We investigated the recanalization, the clinical outcomes (NIHSS) at the time of hospital discharge, and the incidence of SICH at 24 to 72 h.

Results: Mean values of HAS-BLED score in the 0 to 3 h group and the 3 to 4.5 h group were 1.75 and 2.8 points, respectively. No patients suffered SICH in this study. There were no significant differences in the recanalization rate (21% vs. 35%), and mRS score (2.8 vs. 2.6) at the time of discharge between 2 groups.

Conclusions: These results suggest that intravenous rtPA treatment at 3 to 4.5 h of symptom onset remains safe and effective in Japanese patients as same as in the 0 to 3 h group, and were comparable with previous Western studies.

PP1-09
Endovascular Treatment of Ruptured Intracranial Aneurysms in Patients 70 Years of Age and Older
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Background and Objectives: An increasing number of elderly patients are presenting with intracranial aneurysms. In addition to female gender, an older age is associated with a higher risk of developing a subarachnoid hemorrhage (SAH), and these patients often fare more poorly in terms of the long-term outcome. We assessed the clinical outcomes in elderly patients with ruptured intracranial aneurysms (RIAs) who were treated by endovascular procedures.

Methods: We performed a retrospective review of a prospective database of elderly patients treated with coil embolization for RIAs. The clinical outcomes were assessed using the Modified Glasgow Outcome Scale. The rates of procedural complications and adverse events were also recorded.

Results: During a period of 5 years, 162 patients with 183 intracranial aneurysms were treated in our hospital by means of an endovascular approach. Among them, 51 patients (31.5%) with a ruptured aneurysm were aged 70 years or older. These patients aged 70–91 years (mean age, 74 years) were treated by coil embolization for RIAs. Among them, seven had a Hunt and Hess (HH) grade of 1 or 2; 42 had an HH grade of 3 or 4; and two had an HH grade of 5. All patients were treated within 72 hours after initial bleeding. Endovascular treatment resulted in 32 complete occlusions (62.7%), 15 neck remnants (22%), and four body fillings (7.9%). Procedural complications occurred in five patients (9.8%). The outcomes were good or excellent in 17 patients (33.3%). A fair or poor outcomes was observed in 31 patients (60.7%). Three patients (5.8%) who died had an HH grade of 4 or 5. Rebleeding occurred during follow-up in one patient (1.9%).

Conclusions: Coil embolization of intracranial aneurysms is safe and effective in the elderly. The preemboimization clinical condition strongly correlates with the clinical outcome.

PP1-10
Clinical Features of Unruptured Cerebral Aneurysm Managed Without Neurosurgery
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Background and Objectives: Against a social background of increasing longevity and the development of neuroimaging, patients with incidental detection of unruptured cerebral aneurysms (UAN) are increasing, and are often managed by physicians without neurosurgery. Although a large study of UAN in the field of neurosurgery has been performed, little is known about the clinical features and long-term outcomes with management by family physicians.

Methods: To clarify the clinical features of UAN, we evaluated patients who visited our stroke neurology clinic, mainly on referral by family physicians, between 2003 and 2013, and periodically performed follow-up evaluation using magnetic resonance imaging and magnetic resonance angiography of the head. Eighty-six patients (72% women; mean age, 65 ± 11 years; mean duration of follow-up, 52 ± 32 months) with 107 unruptured aneurysms were studied in relation to aneurysm enlargement, surgical procedures, rupture events, and aneurysm-related anxiety during follow-up. Primary event rate was defined as surgical procedure for aneurysm and/or rupture, and evaluated using the Kaplan-Meier method.

Results: Vascular risk factors in subjects were family history (7%), hypertension (57%), diabetes mellitus (9%), dyslipidemia (27%), and current smoking (8%). Mean size of UAN was 4.2 ± 2.8 mm, with 74% under 5 mm in diameter, and multiple UAN in...
24%. Nine UANs showed enlargement (8.4%). Only one elderly patient with a large UAN (14 mm) experienced rupture and died after 86 months. Five cases with strong anxiety and relatively large or multiple UANs underwent clipping surgery during follow-up. Cumulative event rate was 11% during 60 months. The incidence of patients with anxiety decreased from 23% to 17% during follow-up. Most family physicians (73%) were cardiologists or generalists without neurological specialization.

**Conclusion:** It is possible for elderly patients with small UAN to receive sufficient care from non-specific physicians and stroke neurologists.

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**PP1-11**

**Utility of Indocyanine Green Videoangiography in Cerebrovascular Surgery**

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**Introduction:** Recently, microscope-integrated near infrared (NIR) indocyanine green video angiography (ICG-VA) has been widely used in cerebrovascular surgery. ICG-VA is simple and useful method with acquisition of real time high spatial resolution images. In our study, we evaluate the efficacy of intraoperative ICG-VA during the surgery of cerebrovascular disease and also to analyze its limitations.

**Material and Method:** Between August 2011 and Dec 2012, 380 patients with cerebrovascular disease were surgically treated in our institution. We used ICG-VA with half of recommended dose (0.2 to 0.3 mg/Kg). One-hundred nine procedures for acute subarachnoid hemorrhage; 146 were performed on unruptured aneurysms; 79 cases of CEA; 44 extracranial to intracranial bypass surgeries were performed on Moyamoya or atherosclerotic occlusion or complex aneurysm; and 2 surgeries involved AVM. Postoperative DSA and CTA was used to confirm anatomical results included the remnant of aneurysm after clipping, patency of graft, remnant of nidus and recanalized internal carotid artery.

**Results:** Intraoperative ICG-VA demonstrated fully occluded aneurysm sack, no neck remnant, and without vessel compromise in 247 cases (96.8%) of 255 aneurysms. Eight clipping (3.2%) of 255 operations were identified as an incomplete aneurysm occlusion or compromising vessel after ICG-VA. In 78 (98.7%) of 79 patients after CEA, the results were the same as postoperative angiography with good patency. One case (2.2%) of 44 bypass surgeries was identified as a nonfunctioning bypass after ICG-VA, which revised successfully. In the two patients of AVM, ICG-VA was useful for find the superficial feeding arteries and draining veins.

**Conclusions:** ICG-VA is simple and provides real-time information of the patency of vessels including very small perforators within the field of the microscope and has a lower rate of adverse reactions. ICG-VA has the potential for routine intraoperative vascular imaging. However, ICG videoangiography is not a perfect method, so combination of monitoring tools assures the quality of cerebrovascular surgery.

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**PP1-12**

**Suggestion of an Appropriate Aneurysm Clipping Approach via Comparative Analysis Between Surgical Approaches**

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**Objective:** To suggest a method for selecting the surgical approach for aneurysm clipping by comparing 3 widely used surgical approaches.

**Methods:** Among the 147 patients who had undergone aneurysm clipping by the same neurosurgeon at the same medical institution from November 2011 to June 2012, 72 patients with Hunt and Hess grades of level 2 or lower were selected. From those, 10 patients were randomly distributed among the following groups: Group 1 (pterional approach), Group 2 (transciliary supraorbital approach), and Group 3 (modified pterional approach), for a forward prognostication analysis.

**Results:** The total operation time was shortest in Group 3 (p = 0.004), whereas the total estimated blood loss (EBL) volume and red blood cell (RBC) transfusion quantity, as well as the Hct quantity change, were smallest in Group 2. (p < 0.001) The frontal sinus was exposed for only 1 case in group 2. The total operation time, EBL volume, Hct change, and total transfusion quantity significantly influenced early ambulation in older patients (65 years and older) who underwent the transciliary supraorbital or modified pterional approaches. Moreover, the modified pterional approach contributed the most to the improvement in early ambulation time (p = 0.001). Group 2 showed the best results in terms of postoperative pain and cosmetic satisfaction.

**Conclusion:** The keyhole approach (transciliary supraorbital approach and modified pterional approach) yielded clinically and cosmetically superior results in patients with Hunt and Hess and Fisher grades of 2 and lower and provided earlier ambulation in older patients.

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**PP1-13**

**Spinal Epidural Arteriovenous Fistulas of the Sacrum Associated with Progressive Myelopathy and Perimedullary Drainage**

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**Objective:** We describe a case with epidural arteriovenous shunts of the sacrum that showed delayed retrograde drainage into the perimedullary vein and progressive myelopathy.
**Case Report:** An 84-year-old man presented with a 21-month history of progressive sensory and gait disturbances. At the time of admission, we observed paraparesis (Grade 4/5) in both legs and hypesthesia in all modalities from L1 to L5, but we did not observe bladder and bowel dysfunction. Magnetic resonance (MR) images showed T2 signal abnormalities extending from the Th7 cord to the conus, but dilated vessels were not seen on the surface of the cord. A perimedullary vein was enhanced with contrast-enhanced T1-weighted sequences, indicating perimedullary dilated veins posterior to the spinal cord. Three-dimensional computed tomographic angiography revealed a fistula at the sacrum level. In the patient’s third angiography, an injection into the left iliac artery revealed a fistula from the lateral sacral artery at the sacrum level and reflux to the dorsal perimedullary vein that coursed upward to the conus.

**Result:** Embolization was performed by selective catheterization of the left lateral sacral artery and right inferior gluteal artery, and liquid adhesives (17% N-butyl cyanoacrylate and 83% lipiodol) completely obliterated the epidural fistula. MR images that were obtained 2 weeks later revealed normal findings, and the patient’s neurological examination revealed improvement in the power of all muscle groups in the lower limbs over the next 2 weeks.

**Conclusion:** This case may have clinical symptoms and MR imaging signs that are similar to dural arteriovenous fistulas. In addition, the initial spinal angiography was performed in the thoracolumbar region, but it did not reveal a shunt. Therefore, it is necessary to perform spinal angiography in the sacral region and take into consideration the existence of spinal epidural arteriovenous fistulas.

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**PP1-14**

**Early Rebleeding Occurred After Angiographically Successful Coil Embolization of Ruptured Cerebral Aneurysm**

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Recurrent hemorrhage within the acute period from angiographically successfully coiled aneurysm is extremely rare, about 1–2% of known incidence and was associated with high mortality and morbidity. Although the exact pathomechisms leading to early rebleeding are still not definitely understood, uneven distribution of coil masses, or unexpected resolution of thrombus among the strands of coil (inter-coil-loop thrombolysis) are presumed the possible mechanisms.

Here, we report a case of acute serious rebleeding in 48-year-old female with ruptured posterior communicating artery aneurysm which was taken place 3 days after angiographically successful coil embolization, with review of literatures.

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**PP1-15**

**Role of 99Tc-HMPAO SPECT in the Assessment of Cerebral Hemodynamic Parameters After Superficial Temporal Artery-Middle Cerebral Artery Bypass in Patients with Severe Steno-Occlusive Disease of Intracranial Carotid and Middle Cerebral Artery**


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**Background and Objective:** Although superficial temporal artery-middle cerebral artery (STA-MCA) bypass surgery in patients with symptomatic carotid occlusion failed to demonstrate any benefit, its role in symptomatic intracranial steno-occlusive disease has been evaluated scarcely. We evaluated changes in hemodynamic parameters in patients with severe steno-occlusive disease of intracranial internal carotid (ICA) or middle cerebral artery (MCA) who underwent STA-MCA bypass for impaired cerebral vasodilatory reserve (CVR).

**Methods:** Patients with severe steno-occlusive disease of intracranial ICA or MCA underwent transcranial Doppler (TCD) evaluation and CVR assessment using breath-holding index (BHI). Patients with impaired BHI.

**Results:** Of the 126 patients (80 male, mean age 56yrs; range 23–78yrs) that fulfilled our inclusion criteria, 84 (67%) showed impaired CVR HMPAO-SPECT. Fifty (60%) of them underwent STA-MCA bypass while 34 (40%) received best medical treatment. TCD and acetazolamide-challenged HMPAO-SPECT repeated 4 ± 1 months after surgery showed significant improvement in STA-MCA bypass group. TCD BHI improved from a median (IQR) of –0.05 to 1.1 (p).

**Conclusion:** 99Tc-HMPAO SPECT with acetazolamide challenge is a reliable tool for the assessment of cerebral vasodilatory reserve in patients with severe steno-occlusive disease of intracranial ICA or MCA. STA-MCA bypass surgery in carefully selected patients results in significant improvement in hemodynamic parameters and reduction in stroke recurrence.

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**PP1-16**

**Infarction Volume in Patients with Atrial Fibrillation: The Impact of Left Ventricular Stiffness**

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**Background:** Atrial fibrillation (Af) is an important risk factor for stroke, accounting for one fourth of ischemic stroke. In clinical practice, however, a neurologist encounters a wide spec-
trum of stroke due to Af, ranging from negligible symptom to severe stroke leading to death. The stroke severity is closely related with infarction volume that is largely dependent on size of emboli. In the present study, we investigated the predictors of infarction volume in Af patient, focusing on left ventricular (LV) stiffness.

**Method:** A consecutive series of patients with ischemic stroke due to Af were included. Among 102 patients, we excluded the patients without brain MRI and echocardiography. Further, we excluded patient with valve replacement surgery, pacemaker insertion, and other heart diseases. Finally, 81 patients were included for the analyses. Infarction volume on diffusion-weighted image was measured using semiautomated method. Because of skewed deviation, infarction volume was log-transformed. We designated those values >1 SD above the log-transformed mean value as large infarction volume. Given that the ratio of mitral peak velocity of early filling (E) to early diastolic mitral annular velocity (E') (E/E' ratio) is best correlated with LV stiffness in prior studies, we used E/E' ratio as a surrogate maker.

**Result:** Infarction volume ranged from 0.03cm³ to 366cm³ (median 12.23cm³). Twenty-three patients (18.5%) were designated as having a large infarction volume. Risk factor profile was not different between two groups, including age, sex, hypertension, diabetes, coronary artery disease, previous stroke, hyperlipidemia, and smoking. However, mitral deceleration time (ms Bec) (173 vs. 307, p < 0.001) and E/E' ratio (14.3 vs. 20.3, p < 0.001) were greater in patient with a large infarction volume. Linear regression showed a significant association between E/E' ratio and infarction volume (Figure). When divided the patient by median E/E' ratio (13.5), only 1 patient (2.5%) in below median E/E' ratio had a large infarction volume. In contrast, 12 patients (30%) in above median E/E' ratio had a large infarction volume. Multivariable analysis demonstrated that E/E' ratio is independently associated with large infarction volume (adjusted OR per 1 increase of ratio, 1.11; 95% CI, 1.03 to 1.20). Furthermore, area under curve of E/E' ratio in the prediction of large infarction volume was 0.786 (95% CI, 0.698 to 0.875) using receiver operating characteristic curve.

**Conclusion:** We found that LV stiffness is independently related with large infarction volume in acute ischemic stroke related to Af. LV stiffness increases left atrial pressure and gives rise to flow stasis in left atrium which, in turn, may result in larger emboli in left atrium.

**PP1-17**

**A Novel Computerized Touch Panel-Type Test for Screening Cognitive Function of Chronic Ischemic Stroke Patients**

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**Background and Objective:** Cognitive and affective impairments are important non-motor features of ischemic stroke (IS) related to white matter hyperintensity (WMH), including periventricular hyperintensity (PVH).

**Methods:** To confirm the usefulness of a novel computerized touch panel-type test, we investigated cognitive and affective functioning among 142 IS patients and 105 age- and gender-matched normal control subjects.

**Results:** Assessment using the mini-mental state examination (MMSE), Hasegawa dementia scale-revised (HDS-R), and frontal assessment battery (FAB), showed reduced cognitive function in IS patients, with the most severe reduction exhibited by cardiogenic embolism (CE) patients, followed by lacunar infarction (LI) patients, and atherothrombotic infarction (AT) patients. Our novel touch panel test revealed a similar pattern of results. In addition, PVH grading, classified using Fazekas’ magnetic resonance imaging (MRI) method, was also correlated with cognitive decline and touch panel test performance. In contrast, affective function, assessed with the 15-item geriatric depression scale (GDS), vitality index (VI), and apathy scale (AS), was not significantly decreased in IS, and did not correlate with touch panel test results or PVH, although the number of microbleeds was correlated with AS results. The present findings revealed that IS and PVH grading were significantly correlated with decline in general cognitive status (MMSE and HDS-R) and frontal lobe function (FAB). Performance on all touch panel tests was correlated with IS and PVH grading, but was largely independent of depression or apathy.

**Conclusion:** Touch panel tests were easily understood and performed by almost all patients with mild cognitive and motor dysfunction, due to visually clear images and simple methods not involving detailed manual-handling tasks such as writing. Touch panel tests may provide a useful tool for the early screening of cognitive function.

**PP1-18**

**Glucagon-Like Peptide-1 and its Analogue, Exendin-4, Enhance Base Excision DNA Repair Against Oxidative Damage to Protect Rat Cortical Neurons**

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Glucagon-like peptide-1 (GLP-1) is an incretin hormone secreted from L-cells of intestine. Recent studies suggested that function of GLP-1 is not only decreasing blood sugar, but also acts as a neurotransmitter and plays a role in neuronal survival, neurite outgrowth, and protecting synaptic plasticity and memory formation from effects of β-amyloid. Activation of GLP-1 receptors triggers several downstream pathways, including phosphatidylinositol 3 kinase (PI3K), Akt; protein kinase C (PKC), mitogen-activated protein kinase (MAPK); and adenosine cyclase (AC), MEK, and Erk. Several of these downstream signaling pathways lead to phosphorylation of cyclic AMP response element binding protein (CREB). CREB is a transcription factor that mediates long-lasting changes in neuronal structure and function. In recent studies, which demonstrated that the BER protein apurinic endonuclease 1 (APE1), is up-regulated by CREB activated in response to glutamate-induced Ca²⁺ influx and activation of TrkB receptors. Due
to downstream effect of GLP-1 signaling is also activating CREB, that GLP-1 may have roles on protecting neurons against oxidative insults by increasing APE1 expression and base excision repair (BER) efficiency. In this study, we demonstrated that activation of GLP-1 receptors could significantly increase neuronal survival from menadione-induced oxidative DNA lesions (mimic post ischemic stroke) via elevating DNA repair efficiency. Many studies of neurodegenerative diseases and ischemic stroke have also shown that oxidative DNA lesions of mitochondria and nucleus accumulate with disease progression. BER is the major DNA pathway that repairs oxidative lesions, alkylated DNA bases, single-strand breaks and abasic sites in nuclear and mitochondrial DNA. DNA repair is important for proficient neuronal survival, and impaired DNA repair capacity is suggested to play roles in normal aging, aging-associated neurodegenerative disorders, and ischemic stroke. The enhancement of BER efficiency is therefore a potential strategy for therapeutic intervention in ischemic stroke and neurodegenerative diseases.

**PP1-19**

**Human Induced Neuronal (iN) cells; As a Novel Method Preparing Cell Resource for Stroke Therapy**

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**Background and Objective:** Strokes induce neuronal cell death in the human brain, causing a reduction in the quality of life. Induced pluripotent stem cells methods supplying neuronal cells, may provide cures for various neurological diseases including stroke, but its high tumorigenesis have to be overcome for clinical applications.

**Methods:** Recently we and other laboratory reported novel method supplying neuronal cells, by which neurons are directly reprogrammed from human fibroblasts, without passing pluripotent state (Liang et al, Cell 2011; Pan et al, Nature 2011).

**Results:** We successfully converted human skin fibroblasts to human induced neuronal (hiN) cells by viral co-transduction of five neuron specific transcription factors. These hiN cells expressed several neuronal markers such as Tuj1, MAP2 and NeuN with a neuronal morphology. We also confirmed that the hiN cell phenotype can be achieved without expression of the progenitor/stem cell markers Sox2, Pax6, Otx2, or FoxG1 during this direct reprogramming. Of note, we demonstrated that GFP-labeled hiN cells, which were transplanted in utero into embryonic day 13.5 mouse brain, could migrate from the ventricles into various brain regions. And the results of voltage-clamp recordings from hiN cells within acutely prepared brain slices, indicated that hiN cells can make functional neuronal connection with surrounding neuronal circuit in vivo.

**Conclusion:** Taken together, these results suggested that this novel hiN method can supply functional neuronal cells from human skin fibroblasts, without through progenitor/pluripotent state. Here, we propose hiN cells can be safer cell resource for cell transplantation therapy to stroke patients.

**PP1-20**

**Experimental Hemorrhagic Infarction in the Edaravone-Treated Hyperglycemic Rat Brain, Electron Microscopic Studies of Microvasculature**

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**Background:** Even though disruption of blood brain barrier is known as the main mechanism of cerebral hemorrhagic infarction caused by recanalization after vascular occlusion, any clear vascular biology has not been recognized over how blood brain barrier is disrupted. Recent evidence suggests that vascular unit is disrupted by basement membrane damaged indirectly by free radical discharged from vascular endothelial cells, which were damaged from cerebral ischemia and recanalization.

**Methods:** We were able to recognize attenuated effect of edaravone for hemorrhagic infarction macroscopically in the previous report of the translational study in hyperglycemic rats. In this study, we observed microscopically a rat brain of cerebral hemorrhagic infarction model, edaravone-treated hemorrhagic infarction model and only cerebral infarction model. Changes of microvessels in ultrathin sectioning of ischemic rat brain in hemorrhagic infarction were investigated by the electron microscope.

**Results:** Microvessels (with a diameter around 10–20μm) in cerebral cortex of rats was observed by an electron microscope. In addition to the observation of endothelial cells of vessels, the surrounding perithelial cells and basement membrane, an environment in which micro vessels are surrounded by endfeet of astrocytes was observed within the extent that is confirmed morphologically. In micro vessels with hemorrhagic infarction, endothelial cells were damaged with a rippling irregular shape and the localization of basement membranes was disturbed to form double ring-shape. Furthermore, with a finding of detachment from vessels recognized in endfeet of astrocytes, tight junction of endothelial cells has lost its cohesive-ness causing red blood cells to be found occasionally outside of vessels. In contrast, structure of basement membrane was relatively maintained in a group to which edaravone was administered.

**Conclusions:** It has been observed by the electron microscope that cerebral hemorrhagic infarction was attenuated by edaravone.

**PP1-21**

**Clinical and Radiological Features of the Cases with Penetrating Artery Infarcts Showing Progressive Neurological Deficits**

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**Background and Objective:** Although lacunar infarct (LI) and branch atheromatous disease (BAD) causing penetrating artery infarcts (PAI) were defined as vascular pathologies, clinical
discrimination between LI and BAD has been performed by radiological diagnosis, especially in Japan. Furthermore, atheromatous changes at the orifice of the penetrating artery (PA) characterizing BAD often result in progressive neurological deficits (PND) in the acute phase. We investigated the relationships between initial radiological diagnosis and clinical features of PAI showing PND, and how magnetic resonance imaging (MRI) findings of infarcts may change with disease progression.

**Methods:** We studied 258 consecutive patients with acute PAI in the supratentorial region diagnosed as LI or BAD by initial MRI on admission. Supratentorial BAD was defined as infarcts visible on >3 MRI axial slices. Cases other than BAD were categorized as LI. PND was defined as worsening by >1 point in the NIHSS. Changes in infarct with PND were also investigated in 10 cases able to undergo repeat MRI after progression.

**Results:** Patients with PAI were classified and diagnosed as follows: Group A, 44 patients with PND (LI/BAD, 20/24); Group B, 214 without PND (173/41). The prevalence of initial diagnosis of BAD was significantly higher in Group A than Group B (P < 0.05). Nine of 10 cases in Group A with repeat MRI showed an increase in infarct size compared to the initial image. The expansion was in the horizontal direction in all 9 cases, and 4 cases also showed vertical expansion directed toward the orifice of PA.

**Conclusion:** PAI with PND were significantly correlated with radiological diagnosis as BAD on admission. Expansion of the infarct seemed to be in the direction of the neighboring PA territory and orifice of PA. These clinical and radiological features were consistent with the pathological findings of BAD.

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**PP1-22**

**Increased Heart Rates on Ambulatory Blood Pressure Monitoring are Associated with Advanced White Matter Lesions in Ischemic Stroke Patients**

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**Background and Objective:** White matter lesions (WMLs) are common finding in stroke patients, and the most important risk factors are old age and hypertension. Although, many studies have been reported the association between WMLs and ambulatory blood pressure monitoring (ABPM) parameters based on healthy subjects or hypertensive patients, little are known with hypertensive ischemic stroke patients.

**Methods:** From July 2009 to June 2012, a total 169 hypertensive non-cardioembolic ischemic stroke patients within one week were consecutively included and ABPM was applied one or two weeks after stroke onset. The subjects were classified into two groups according to the presence of advanced WMLs and ABPM parameters were compared. Finally, multivariable logistic regression analyses were performed to investigate independent relationship between WMLs and ABPM parameters.

**Results:** Seventy (41%) patients had advanced WMLs. In univariate analysis, higher 24-hour, awake and sleep SBP/DBP levels and 24-hour pulse pressure were associated with advanced WMLs. However, circadian blood pressure parameters such as 24-hour BP variability, morning surge and nocturnal dipping pattern were not associated with advanced WMLs. After adjustment for covariates, old age (OR 1.064, 95% CI: 1.025–1.105), high 24-hour SBP levels (OR: 1.055, 95% CI: 1.028–1.082, P).

**Conclusion:** Besides old age and increased 24-hour SBP, increased heart rate were associated with advanced WMLs in ischemic stroke patients. Beyond increased BP, heart rate also deserves more attention in predicting advanced WMLs in ischemic stroke patients.

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**PP1-23**

**Clinical and Pathological Efficacy of Cilostazol in Stroke-Prone Spontaneous Hypertensive Rats**

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**Background and Purpose:** This study assessed the efficacy of commonly used anti-platelet drugs on stroke, and motor and cognitive functions related to oxidative stress markers and insulin-like growth factor 1 receptor (IGF-1R).

**Methods:** Stroke-prone spontaneously hypertensive rats (SHR-SP) were treated with vehicle, aspirin, clopidogrel and cilostazol from 8 to 10 weeks of age. Physiological parameters, regional cerebral blood flow (rCBF), motor and cognitive functions were evaluated. Spontaneous infarct volume, oxidative stress markers and the IGF-1R positive cell ratio in the hippocampus were immunohistochemically examined. IGF-1R expression in the hippocampus was assessed by western blotting.

**Results:** Cilostazol and clopidogrel decreased the spontaneous infarct volume more than aspirin. Only cilostazol improved motor and cognitive functions with a significant increase (p < 0.05) in the memory-related IGF-1R positive ratio and IGF-1R expression in the hippocampus. Cilostazol reduced oxidative stress markers in affected neurons regardless of blood pressure or rCBF.

**Conclusion:** The present study suggests that a possible pleiotropic effect of cilostazol resulted in the decrease of spontaneous infarct volume and preservation of motor and cognitive functions. The increase of IGF-1R positive cells in the hippocampus could partly explain the preservation of cognitive function in SHR-SP.
PP1-24
High Levels of Serum Alpha2-Macroglobulin are Associated with White Matter Lesions but not with IL-6 in Acute Ischemic Stroke Patients
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Background and Purpose: Alpha2-macroglobulin is thought to be involved in inflammatory reactions as a carrier protein for interleukin-6 (IL-6). IL-6 plays a key proinflammatory role in mediating the association with acute and chronic cerebrovascular diseases. The objective of this study was to evaluate the association between alpha2-macroglobulin and IL-6 in acute ischemic stroke patients and control patients.

Methods: Patients with acute ischemic stroke (n = 159; 93 male and 66 female, 71.6 ± 10.3 years) and patients with no previous stroke (n = 77; 38 male and 39 female, 70.7 ± 9.5 years) were consecutively enrolled in this study. Serum alpha2-macroglobulin levels were measured by nephelometry and serum IL-6 levels were measured by enzyme-linked immunosorbent assay.

Results: Serum alpha2-macroglobulin and IL-6 levels at admission in patients with acute ischemic stroke was higher than those in control patients (230.2 ± 73.7 vs. 205.0 ± 55.8 mg/dl, P = 0.009 and 0.52 ± 0.54 vs. 0.19 ± 0.48 log pg/ml, P < 0.001, respectively). Serum alpha2-macroglobulin levels were positively correlated with age and the severity of white matter lesions (R2 = 0.048, p < 0.001 and R2 = 0.058, p < 0.001, respectively), although there was no significant association between serum alpha2-macroglobulin levels and IL-6 levels. In addition, increased serum alpha2-macroglobulin levels were independently associated with the severity of white matter lesions after multivariate analysis with age, sex, comorbidities and serum IL-6 levels (standardized partial regression coefficient β = 0.102, p = 0.026).

Conclusion: Increased serum alpha2-macroglobulin levels might be involved in pathophysiology of acute ischemic stroke. Furthermore, serum alpha2-macroglobulin levels, which were associated with a high grade of white matter lesions, may reflect the chronic condition of cerebral small vessel disease.

PP1-25
The Future Outcome in Acute Stroke Patients with PAD
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Background: Peripheral arterial disease (PAD) in stroke patients indicates higher atherosclerotic burden and risk of recurrent cardiovascular events. Outcomes in acute stroke patients with PAD and the value of screening for PAD in stroke patients are not well known.

Methods: Hospitalized patients with acute ischemic stroke were screened by measuring the ankle-brachial index (ABI) prospectively. Clinical characteristics, medical histories, cardiovascular risk factors, and the NIH Stroke Scale (NIHSS) were recorded. The Modified Rankin Scale and all clinical events (including recurrent stroke, myocardial infarction, and death) were recorded at 1 month, 6 months, and at study end.

Results: A total of 166 patients were recruited. Thirty-eight patients (22.9%) had an ABI < 0.9. Patients with an ABI < 0.9 were older (OR: 1.1; 95% CI 1.1-1.2), and had a higher fasting blood sugar (OR: 1.0; 95% CI 1.0-1.1). We investigated those risk factors related to ischemic stroke, such as previous stroke history, hypertension, diabetes, heart disease and tobacco smoking by Student t test, Chi-square test, Fisher’s exact test and multivariate regression analysis. Those patients whose ABI < 0.9 (22.9%) compared with that of patients with an ABI ≥ 0.9 (77.1%) have higher Essen Stroke Risk Score (OR: 2.7; 95% CI 0.6-11.3). Multivariate regression analysis showed that ABI < 0.9 and admission NIH stroke scale were independent predictors for future clinical events.

Conclusion: Patients with acute ischemic stroke and a low ABI had poorer stroke out come and a higher rate of cardiovascular events and death. Screening for ABI in acute stroke patients may help to identify patients at high risk of future events.

PP1-26
Rationale of the REstart or STop Antithrombotics Randomised Trial in Asia Pacific (RESTART-AP)
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Background and objectives: Antithrombotic (antiplatelet or anticoagulant) therapy is beneficial in the prevention of vasoocclusive disease in high risk patients. For subjects with intracerebral haemorrhage (ICH), though, any potential benefits of antithrombotic therapy may be offset by the subsequent greater risks of recurrent ICH.

One of the limited strategies available to reduce the risk of ICH associated with antithrombotic therapy is intensive blood pressure (BP) lowering. Maximum protection may be provided by more intensive BP lowering in this patient group.

The REstart or STop Antithrombotics Randomised Trial in Asia Pacific (RESTART-AP) will determine [A] whether restart of antithrombotic agents has an impact on the number of new onset cerebral microbleeds (CMBs) and [B] whether intensive BP low-
Paper Poster Presentations

PP1-27
Health Status of Posr Acuta Stroke Attack Patient in Northern Thailand
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Objective: To identify the prevalence of post-stroke health conditions (post stroke pain, post stroke depression, and post stroke dementia) and quality of life including related factors in patients after acute stroke (cerebrovascular disease).

Material and Method: Descriptive study design, acute phase stroke patients were prospective evaluated with a battery of tests; including Pain Scale, Hospital Anxiety and Depression Scale-Thai version, MMSE-Thai 2002, Clinical Dementia Rating, Clock Drawing Test, and WHOQOL-BREF-THAI at government hospitals in the Northern Thailand during 1 October 2010 – 30 September 2012.

Results: 215 stroke patients were included the study with mean age 62.5 ± 12.3 years. Prevalence of post stroke pain was 44.2%, average pain level was modest, arm and thigh were the most affected site of post stroke pain, and most of them were received pain management. Prevalence of post stroke anxiety and depression were 22.3% and 19.1% respectively. Prevalence of post stroke dementia a few month after stroke was 38.9% and increased to 44.9% in the first 6 months after stroke. Overall quality of life in patients with acute stroke was moderate level (mean score was 65.8%), physical domain was the highest affect factor while environmental domain was the least affected factor to quality of life (mean score were 61.7% and 69.7% respectively). The study results show that ability to perform activity of daily living was related to post stroke depression. Marital status, comorbidity with cardiovascular disease and level of the activity of daily living were statistic significant affected factors (p < 0.05) to quality of life after stroke.

Conclusion: Post stroke pain, post stroke depression, post stroke dementia are common conditions after stroke and quality of life was moderate level in post stroke patients. Awareness and screening for post stroke health conditions should be consider in clinical practice to improve the conditions after stroke.

PP1-28
Epidemiology of Stroke in Indonesia: Community-Based Study in Rural Area of West Java
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Background and Objective: There is lack of data on epidemiology of stroke in Indonesia, especially community-based data. This research was conducted as part of a cohort study of non-communicable diseases in Bogor, rural area of West Java, which aims to get the prevalence of non-communicable diseases including stroke at the beginning of data collection, as well as in the long run, to obtain data on incidence of stroke and other non-communicable diseases in Indonesia.

Methods: In the population, subject with aged over 20 years are examined through a questionnaire which followed with medical history taking and physical and neurological examination by a neurologist to determine whether or not suffered from stroke. Then, the stroke group will be analyzed according to epidemiological characteristics and risk factors.

Results: Of 1720 subjects examined, the prevalence of stroke is 1.9% (32 of 1720) with mean age 49.55 ± 7.74 years. Prevalence of family history of stroke in 16.1% subject. Majority of stroke patients are from lower education, not poor, Betawi ethnic, and factory workers. Main risk factors for stroke are hypertension and diabetes mellitus. In hypertension group, stroke occured in 7.3%, while in non-hypertension group only 0.8%. In diabetic group, 8% had stroke, whereas in non-diabetic group only 1.5%. Other stroke risk factors were history of heart disease, hyperlipidemia and history of heart disease in the family. In 19 of the 32 subjects with stroke, traditional therapies were used.

Conclusion: In this study, the prevalence of stroke is 1.9%, with 16.1% had a family history. The mean age of stroke 49.55 ± 7.74 years, and the incidence of stroke increase in in low education, not poor economic status and factory workers. Stroke risk factors in this study were mainly hypertension and diabetes mellitus.
Bilateral Cerebral Infarcts Due to Bilateral Internal Carotid Artery Occlusion: An Uncommon Complication of Streptococcus Suis Meningitis

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Background: Bacterial meningitis carries high morbidity and mortality rate. The association of ischemic stroke and bacterial meningitis had been discussed in previous studies. We report a case of Streptococcus suis meningitis in an elderly man who developed rare complication of bilateral internal carotid artery thrombosis resulting in bilateral cerebral infarcts.

Case: A 74-year-old man presented with fever, vomiting and confusion with GCS 14/15 on admission. There was equal limb power, intact extraocular movement and facial symmetry and absence of neck rigidity. Testing of hearing was failed. After obtaining an unrevealing non-contrast CT brain, lumbar puncture yielded turbid CSF which showed markedly elevated WBC 3600/mm³(polymorph 96%) and protein greater than 6000mg/L. CSF glucose level was suppressed at 2.2mmol/L (serum glucose 11.3mmol/L). Intravenous cetriaxone and dexamethasone were commenced for the clinical diagnosis of acute bacterial meningitis. Latex agglutination test was negative but blood culture showed significant growth of Streptococcus suis. Fever subsided with antibiotic treatment. However, his condition further deteriorated 2 days later becoming semi-comatose with GCS 6/15. CT brain revealed right fronto-parietal and left frontal infarcts. MRI brain demonstrated subacute infarct in both anterior parietal lobes and over the watershed area between the middle cerebral artery (MCA) and posterior cerebral artery (PCA) on both sides. The infarcts showed corresponding increased signal in diffusion weighted imaging (DWI). MRA confirmed occlusion of both internal carotid arteries from extracranial portion to carotid siphon. Aspirin was started and he had completed a course of antibiotics. However there was no neurological recovery and he later succumbed due to hospital acquired pneumonia.
**Section 2.**

**Paper Poster Presentations (1 September 2013)**

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**PP2-01**

**Intraventricular Hemorrhage in Hemorrhagic Transformation of Brain Infarction**

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**Background:** Hemorrhagic transformation of brain infarction (HTBI) is an undesirable complication that occurs in 2.2%–44.0% of clinical cases. The pathogenesis of HTBI appears to relate to reperfusion of bleeding from recanalized but ischemically injured vessels. Distinguishing HTBI and parenchymatous hemorrhage on CT scan may be difficult. On CT, HTBI appears as a discontinuous heterogeneous mixture of high and low densities occurring within the vascular territory of the infarct. In contrast, parenchymatous hemorrhage appears as a discrete, homogeneous collection of blood that often exerts mass effect and may extend beyond the original infarct boundaries or even into the ventricles.

**Methods:** Consecutive patients with HTBI admitted in Qa’em hospital, Mashhad during 2010 enrolled an observational study. All of the patients underwent brain CT within 24 hours post event. Presence of intraventricular hemorrhage, heterogeneous patchy or punctuate hemorrhage within infarct zone was evaluated by serial brain CT.

**Results:** Among 37 patients (16 male, 21 female) with HTBI that confirmed with serial brain CT-Scan, 7 patients (18.91%) had intraventricular hemorrhage.

**Conclusion:** Intraventricular hemorrhage may be occurred during HTBI.

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**PP2-02**

**Oculopalatal and Holmes Tremor of All Limbs After Bilateral Pontine Hemorrhage**

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**Background and Objectives:** Hypertrophic olivary degeneration represents the result of a lesion that damages the dentatorubral-olivary pathway. Its clinical presentations are Holmes tremor and oculopallatal tremor. Holmes tremor is described as a resting tremor with marked postural and kinetic components. Oculopallatal tremor is characterized by rhythmic involuntary jerky movements of the eye, soft palate of the throat. We report a rare case of oculopallatal and Holmes tremor of all limbs with respiratory difficulty after bilateral pontine hemorrhage.

**Case:** A 49-year-old woman with a previous history of bilateral pontine hemorrhage transferred our clinic. On physical examination, the patient had a complex impaired conjugate horizontal gaze, and tetraplegia. She was tormented by oscillopsia and tremor of her left upper extremity. Attempts at medical treatment with valproic acid were not effective to control the symptoms. She was readmitted our clinic at 18 months after onset due to developed tremors of eye, face, larynx, palate, and all limbs with respiratory difficulty. Respiratory rate increased up to 34 times per minute at admission. Performed brain MRI showed hyperintensive lesion on T2-weighted image in the right inferior olivary nucleus. We considered the clinical findings as oculopallatal tremor, and Holmes tremor associated with olivary hypertrophy. Gabapentin has been reported to suppress oculopallatal tremor and we added gabapentin 900mg per day to previous medication. Only one day after gabapentin added, oscillopsia, all limbs tremor and respiratory difficulty markedly resolved.

**Conclusion:** Generally published reports focus on oculopallatal tremor with Holmes tremors limited to the upper extremities. Our case is interesting as the Holmes tremor affecting all limbs and resulting in respiratory difficulty. It also demonstrates that gabapentin should be considered as treatment for not only oculopallatal tremor but also Holmes tremor with respiratory difficulty.

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**PP2-03**

**Can the Characteristic “Bottle-Neck” Appearance Predict Clinical Stage or Cerebral Hemodynamics in Moyamoya Disease?**

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**Background and objectives:** The champagne bottle neck sign (CBNS) is a characteristic of carotid ultrasonography (US) in moyamoya disease. We investigated whether the CBNS is related to clinical stage or cerebral hemodynamics in moyamoya disease.

**Methods:** Patients with moyamoya disease who underwent cerebral angiography, carotid US, and SPECT before surgical treatment were enrolled in this study. ICA/CCA diameter ratio was measured using carotid US and <0.5 of this value was defined as positive CBNS. Clinical stage was determined on the basis of angiographic findings (Suzuki’s grade), and cerebral blood flow (CBF) and cerebral vasoreactivity to acetazolamide (CVR) was obtained using SPECT. We investigated the relationship between CBNS, Suzuki’s grade, and cerebral hemodynamics.

**Results:** Twenty seven carotid arteries of 14 patients were analyzed (M/[F]: 5/9, mean age: 42.5 ± 19.3 years). Suzuki’s grades were stage 1 in 3 arteries, stage 2 in 2, stage 3 in 11, stage 4 in 5, stage 5 in 3, and stage 6 in 3. ICA/CCA diameter ratio decreased as clinical stage advanced (0.83 in stage 1–2, 0.51 in stage 3–4, 0.42 in stage 5 and 0.36 in stage 6).
5–6). Although ICA/CCA diameter ratio was not related to CBF, it decreased as CVR reduced. All 12 arteries with a positive CBNS were in Suzuki’s grade 3 or later and impaired CVR in moyamoya disease. Carotid US may help to determine clinical stage and cerebral hemodynamics in moyamoya disease.

Conclusions: The CBNS was related to Suzuki’s grade 3 or later and impaired CVR in moyamoya disease. Carotid US may help to determine clinical stage and cerebral hemodynamics in moyamoya disease.

PP2-04
Cerebral Hemodynamic Differences Between Ischemic Stroke and Brain Injury Patients in the Long Term After Decompressive Craniectomy
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Background and Objectives: Decompressive craniectomy has been used for patients with brain injury and malignant middle cerebral artery (MCA) infarction in order to relieve intracranial hypertension or prevent cerebral herniation. Long term cerebral hemodynamic status after decompressive craniectomy is rarely reported. In this study we aim to compare long term post-craniectomy hemodynamic differences between ischemic stroke and brain injury patients.

Methods: We recruited 12 patients received decompressive craniectomy, 7 ischemic stroke patients due to malignant MCA infarction, 5 patients due to traumatic brain injury. We measured mean cerebral blood flow velocity (CBFV) and pulsatility index (PI) of bilateral MCAs using trancranial Doppler (TCD). M1 segments of bilateral MCAs were insonated at the depth of highest flow velocity between 50–60mm. Data were analysed based on the cranietomy affected or unaffected side.

Results: The median duration from cranietomy to TCD exam was 19 months in stroke group, which was similar in brain injury group (median duration = 16 months). There were no differences of age, sex distribution and cranietomy side between two groups. There was no difference of mean CBFV between stroke and injury patients on either affected side or unaffected side. PI of affected side MCA in stroke group was remarkable higher than affected side PI in injury group (1.08 vs 0.8, p = 0.042). Comparing affected and unaffected side, bilateral mean CBFVs of stroke group were similar but PI of stroke group was higher at affected side, while in injury group PIs were similar but mean CBFV was lower at affected side.

Conclusion: In the long term after craniectomy, PI of stroke patients on affected side remains high, which possibly relates to initial cerebrovascular disease, compared with normalized PI further intracranial pressure in injury group. Lower CBFV at affected side of injury patients may affect poor perfusion caused by atmospheric pressure. Investigations of cerebral hemodynamic after cranietomy may provide important hints for patient selection for beneficial cranioplasty.

PP2-05
A Case of Spinocerebellar Ataxia Type 7 with Moyamoya Disease
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Background and Significance: Spinocerebellar ataxia (SCA) type 7 (SCA7) is a rare autosomal dominant syndrome characterized with progressive cerebellar ataxia and retinal degeneration, account for about 2% in SCA patients. CAG repetition of Ataxin-7 in the chromosome 3 is a key of diagnosis. Moyamoya disease is characterized by stenosis or occlusion of the terminal portions of bilateral internal carotid arteries and by abnormal vascular networks at the base of the brain. Chromosomal abnormality including 6p25, 17q25, 3p24.2–26 of some familial type moyamoya disease has been reported through several study. As we known, there were no reported cases of SCA with moyamoya disease. We experienced a stroke patient who developed moyamoya vessels in SCA 7.

Case: A 42-year-old female admitted for evaluation of gait disturbance and visual impairment which developed from about 20 years ago. Neurological exam revealed limitation of vertical and horizontal eye movement, truncal and extremity ataxia, dysarthria, dysphagia, decreased visual acuity which was limited to finger-counting. Her older brother showed similar symptoms and died at 28 years old. Her mother and the other older brother experienced cerebral infarction. Brain MRI and MRA showed bilateral cerebellar atrophy, left MCA occlusion without symptoms and bilateral ICA stenosis. The gene of patient had been mapped to chromosome 3p12–13, with the pathologic alleles containing 41 CAG repeats which confirmed SCA7. 4 years later, she visited emergency room, because of left hemiparesis. Brain CT angiography showed bilateral ICA stenosis, bilateral MCA and ACA occlusion. Diffusion weighted image revealed acute bilateral hemispheric lesions. Mental status was decreased to stupor on 2nd hospital day. Followed brain MRI showed large territory infarction of the bilateral MCA and ACA. After a few days, the patient died for central herniation.

Conclusion or Comments: In our case, CAG repetition of 3p12–13 may influence occurrence of moyamoya disease. Further research is necessary for relation between SCA7 and moyamoya disease.

PP2-06
Cold Water Exposure and Stroke
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Background and Objective: Seasonal variation in stroke occurrence has been reported. But stroke due to sudden exposure to cold water has not been described. We report two cases of ischemic stroke on sudden exposure to cold water.

Case 1: A 73 yr old male developed sudden left face, arm and leg weakness immediately after taking a dip in the holy waters of...
Amritsar Golden Temple during peak winter. His risk factors include hypertension, diabetes and coronary artery disease. His admission NIHSS was 15. CT head showed right MCA infarct with a midline shift of 1.4 cm for which decompensative hemicraniectomy and dermoplasty was done. ECG showed atrial fibrillation.

**Case 2:** A 48 yr old male developed right side weakness and fell in bathroom while taking bath in cold water at 6am. Initial NIHSS was 16. ECG showed atrial fibrillation. His risk factors were hypertension and dyslipidemia. MRI brain showed left MCA infarct.

**Discussion:** In both cases, stroke occurred when they got exposed to cold water suddenly. The first case was a cold water immersion when the temperature was around 6 celsius while the second had a bath from overhead tank water when there was a steep fall in temperature from 26˚ to 14˚ celsius due to snow fall in Himalayas and local rainfall. An experiment in normal healthy volunteers showed that immersion in cold water increases arterial blood pressure. The incidence of atrial fibrillation (AF) also peaks in winter. The combination of AF, risk factors and sudden exposure to cold water would have triggered the stroke.

**Conclusion:** Cold water immersion or simply an exposure might increase the propensity for stroke in people who are at a higher risk. Hence it is advisable for susceptible individuals to avoid getting exposing to cold water especially during winter.

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**PP2-07**

**Safety and Efficacy of Combined IV TPA and Mechanical Thrombectomy with Solitaire Device in Large Artery Occlusion**

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**Background and Objective:** Intravenous tissue plasminogen activator (TPA) has been in limitation in proximal large vessel occlusion. But, TPA has superior to mechanical thrombectomy due to fast infusion and strong effect of thrombus destruction and prevention of rethrombosis. After all, combined IV TPA and mechanical thrombectomy are ideal procedure if no symptomatic hemorrhage occur. We retrospectively studied efficacy and safety of Combined IV TPA and mechanical thrombectomy with post-procedural CT and patient’s outcome.

**Methods:** This is a single center study enrolling patients treated with Solitaire-assisted thrombectomy between November 2010 and October 2012. Inclusion criteria were severe stroke of National Institutes of Health Stroke Scale (NIHSS) score ≥10, treatment initiation within 3 hours from onset, and an angiographically verified occlusion of Proximal middle cerebral artery or internal carotid artery, distal basilar atery. The primary outcome was recanalization defined as Thrombolysis in Cerebral Infarct (TICI) reperfusion grade 2b/3. Secondary outcomes were symptomatic hemorrhagic transformation (SHT).

**Results:** Fifteen patients were were consecutively enrolled. Successful recanalization was achieved in 9 (60%) patients, SHT occurred in 1 (6.6%) patients. There was no procedure-related complication.

**Conclusion:** Combined IV TPA and mechanical thrombectomy with solitaire device in large artery occlusion can effectively recanalize large vessel occlusion and have safety in symptomatic hemorrhagic transformation.

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**PP2-08**

**Intravascular Large B Cell Lymphoma Presented as Recurrent Ischemic Stroke Symptoms**

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**Case:** A 57-year-old woman was admitted for transient confusion and slurred speech. She did not have fever. There was no limb weakness or numbness. On examination, she was afebrile and oriented. There was no neck stiffness or lymphadenopathy. Neurological evaluation did not reveal any abnormality. She had normal speech and normal pyramidal and brainstem function. Blood test revealed normochromic normocytic anemia (Hb 10.9 g/dL) and elevated serum lactate dehydrogenase (LDH) (911 U/L). CT brain showed multiple small hypodense lesions involving inferior, posterior and superior parts of right parietal lobe and left frontalparietal region, suspicious of multiple cerebral infarcts. Aspirin was commenced for the ischemic stoke. Autoimmune markers including anti-nuclear antibody and anti-neutrophil cytoplasmic antibody were negative.

She developed mild left hemiparesis and left side neglect 4 days after hospitalization. The previous treatment for cerebrovascular accident was continued. The left hemiparesis and left side neglect improved almost completely and she was transferred to the rehabilitation bed. However, three weeks later, she developed recurrent confusion with left hemiparesis and left side neglect. Blood test showed similar results as the first admission but the serum LDH was much more elevated to 2382 U/L. Further laboratory tests including anti-HIV antibody, autoimmune markers, VDRL and screening for paraproteinemia were all negative. MT2 test was normal. MRI brain revealed multiple intracranial lesions involving both supratentorial and infratentorial regions with restricted diffusion noted on DWI. CSF analysis showed mild leukocytosis WBC 12/mm3, lymphocyte 99%, elevated protein 2.087g/L and normal glucose 3.7mmol/L (serum 5.7mmol/L). Echocardiogram was unremarkable. Electroencephalography showed generalised slowing of background without epileptiform discharge. Her consciousness quickly deteriorated and brain biopsy with immunostaining confirmed intravascular large B cell lymphoma. Her condition was medically unfit for systemic chemotherapy or palliative radiotherapy and she was treated with symptomatic therapy. She died three months after presentation.
**PP2-09**

**The Evaluation of Apathy Caused by Frontal Lobe Damage: About Difference in Evaluation between Family Members and Nurses**

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**Background and Objective:** Apathy caused by frontal lobe damage is defined as “lack of feeling, emotion, interest or concern (Marin, 1990),” and is easily mistaken for “laziness.” Recently, such scales as FBI (Frontal behavioral Inventory, Kertesz, 1997) and CAS (Clinical assessment for Spontaneity, Japan society of higher brain dysfunction, 2006) have been developed, and objectivity has been pursued. However, because of the mistakes above, we need to fully consider patients’ personality and lifestyle “before the onset of the disease.” So we asked patients’ families as well as nurses to evaluate, and examined the meaning of placing patients’ families as evaluator. The purpose of this study was to investigate difference between family and nurse in assessing apathy in frontal lobe damage.

**Method:** The participants were Families and primary nurses of frontal lobe damaged patients (48 pairs). Families and Nurses assessed patients Apathy by using the scale of FBI and CAS. The Spearman’s correlation analysis was carried out between answers of nurses and families. The approval of ethical committee of the facilities was obtained.

**Results:** Of the families, 36 (75%) were patients’ spouses, and 23 (47.9%) met the patients every day. The correlation coefficients between “total” scale points of families and nurses were 0.612 (p < 0.01) in FBI and 0.753 (p < 0.01) in CAS, which showed that there were a significant correlation. But when we saw “each” item of CAS, we couldn’t admit any significant correlation in “Greeting (.014)”, “Communicate with others (.104)”, and “Grooming (.265)”. **Conclusion:** When analyze the results of CAS; however the total score of CAS was correlated, there were evaluation gaps between nurses and families in some items. For those reasons, it has been suggested that by the cooperation of nurses and families, more detailed evaluation of Apathy can be achievable.

**PP2-10**

**Nurses’ Practices of Care for Patients with Acute Stroke: Differences among Nursing Units**

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**Background and Objectives:** It is widely recognized that Stroke Care Unit /Stroke Unit (SCU) is effective for improving prognoses and reducing disability following care. However, in Japan, only 8.3% of institutions providing acute stroke care have SCU. The purpose of the present study was to examine nurses’ practice of care for patients with acute stroke, according to their nursing units.

**Methods:** Self-administered questionnaires were distributed to 14,755 nurses working in 419 institutions providing acute stroke care throughout Japan. Questionnaire consisted of “observasion neurological symptoms (ONS)” (33-item), and “cardiorespiratory management (CRM)” (27-item), and “consultation about early rehabilitation (CER)” (1-item) and basic characteristics including nursing unit. Participants with the score more than median of ONS/CRM were defined as Good Practice (GP) group, respectively. GP of CER was defined by starting consultation to physiotherapists within 3 days of hospitalization. Nursing units were classified into stand-alone SCU, mixed units of SCU and Intensive Care Unit (SCU+ICU), stand-alone ICU, and General Medical Wards (GMW). The Odds Ratios (ORs) and 95% Confidence Intervals (CI) of GP were calculated with logistic regression analysis as GMW reference after adjusting for sex and years of nursing experience.

**Results:** Of 7,301 responses (response rate: 45%), 6,589 without incompletely answered the questionnaires were used for analyses. Nursing units of respondents were SCU 12.3%, SCU+ICU 12.3%, ICU 10.8% and GMW 73.7%. The ORs (95% CI) of GP for SCU, SCU+ICU, and ICU (reference group: GMW), were as follows, ONS: 6.5 (4.3–9.8), 1.0 (0.9–1.2), 0.8 (0.7–0.9), GNC: 2.9 (2.1–3.9), 1.7 (1.5–2.0), 1.4 (1.2–1.6), CER: 6.4 (4.4–9.3), 0.8 (0.7–1.0), 0.7 (0.6–0.8), respectively.

**Conclusion:** The present study indicated that only nurses working on stand-alone SCU did better practice of observation of neurological symptoms and consultation of early rehabilitation.
PP2-11
Secondary Prevention in Ischemic Stroke: A Pilot Study of Nurse-Led Stroke Review Clinic (NSRC)

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Background: Nurse-led clinic is feasible to provide fast review of post-stroke patients and to offer continual care after discharge from acute stroke unit.

Objective: To evaluate the effectiveness of a Nurse-led Stroke Review Clinic (NSRC) in secondary prevention of ischemic stroke.

Methodology: A prospective randomized controlled pilot study was conducted in an acute stroke unit. Subjects were recruited and randomized between November 2011 and January 2012. Primary endpoint was the public health care utilizations whereas secondary endpoints included cardiovascular risk factors control (smoking, blood pressure, glucose and lipids), stroke knowledge, medications compliance scale and patients’ satisfaction score. Evaluations of primary and secondary endpoints were carried out at 3 months.

Results: Thirty-seven subjects were recruited into study. Nineteen subjects were randomized to control group and 18 were allocated to intervention group. There were 3 and 7 emergency room attendances in the intervention and control group respectively. Among them, 2 cases from each group were admitted and all cases were not due to ischemic stroke recurrence. Six subjects (29%) from intervention group stopped smoking compared with 1 subject (6%) in control group (p < 0.01). There was no statistical difference in mean systolic or diastolic blood pressure, blood glucose control (fasting blood and HbA1c) and LDL level at 3 months. Medications compliance was better in intervention group than control group. There were 3 and 7 emergency room attendances in the intervention and control group respectively. Among them, 2 cases from each group were admitted and all cases were not due to ischemic stroke recurrence. Six subjects (29%) from intervention group stopped smoking compared with 1 subject (6%) in control group (p < 0.01). There was no statistical difference in mean systolic or diastolic blood pressure, blood glucose control (fasting blood and HbA1c) and LDL level at 3 months. Medications compliance was better in intervention group than control group. There were 3 and 7 emergency room attendances in the intervention and control group respectively. Among them, 2 cases from each group were admitted and all cases were not due to ischemic stroke recurrence. Six subjects (29%) from intervention group stopped smoking compared with 1 subject (6%) in control group (p < 0.01). There was no statistical difference in mean systolic or diastolic blood pressure, blood glucose control (fasting blood and HbA1c) and LDL level at 3 months. Medications compliance was better in intervention group than control group. There were 3 and 7 emergency room attendances in the intervention and control group respectively. Among them, 2 cases from each group were admitted and all cases were not due to ischemic stroke recurrence. Six subjects (29%) from intervention group stopped smoking compared with 1 subject (6%) in control group (p < 0.01). There was no statistical difference in mean systolic or diastolic blood pressure, blood glucose control (fasting blood and HbA1c) and LDL level at 3 months. Medications compliance was better in intervention group than control group. There were 3 and 7 emergency room attendances in the intervention and control group respectively. Among them, 2 cases from each group were admitted and all cases were not due to ischemic stroke recurrence. Six subjects (29%) from intervention group stopped smoking compared with 1 subject (6%) in control group (p < 0.01). There was no statistical difference in mean systolic or diastolic blood pressure, blood glucose control (fasting blood and HbA1c) and LDL level at 3 months. Medications compliance was better in intervention group than control group.

Conclusion: NSRC did not alter the health care utilizations and biomedical parameters at 3 months and the effect on medications compliance was inconclusive. We could demonstrate a significant improvement in smoking cessation and stroke knowledge. Stroke survivors were more satisfied with this post discharge program. The failure of demonstrating a strong positive effect could be due to short duration of follow up and hence we suggest expand our study with a larger sample size and with longer duration of follow up.

PP2-12
Attitude to an Ambulance Call and Knowledge About Early Symptoms of Stroke Among Japanese General Population

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Background and Objective: To promote early arrival at hospital after stroke onset, not only enough knowledge about early symptoms but also awareness of the importance of an ambulance call at onset of stroke should be widely spread. This study was conducted to clarify what fraction of population had both of knowledge of stroke symptoms and understanding the correct action i.e. an ambulance call.

Methods: In March 2013, we conducted a telephone survey about stroke knowledge by random-digit dialing method among 4200 randomly-selected residents aged 40–74 living in two prefectures in west part of Japan; Shiga and Mie. Regarding the questions about ‘early symptoms’ consisting of five correct answers and five dummy answers as multiple-choice items, multiple answers were allowed. Participants’ selecting five early symptoms correctly was defined as ‘good knowledge’. Response to stroke onset was also assessed by a single answer-required question, “How do you act, if you, your family member or one of your friends had a stroke attack?” Participants who chose ‘immediately call an ambulance’ from three choices of reactions were defined as ‘good response’.

Results: Among 4200 participants of this survey, 1189 (55%) had ‘good knowledge’ and 2820 (67%) had ‘good response’. Proportion of ‘good knowledge and good response’ was 38%, ‘good knowledge and poor response’; 17%, ‘poor knowledge and good response’; 29%, and ‘poor knowledge and poor response’; 16%. Of all participants, sex-differential was not observed (men: 39%, women: 38%, p = .43 for chi-squared test). The proportion of ‘good knowledge and good response’ was lower among older respondents only in women (40–49: 40%, 50–59: 40%, 60–69: 40%, 70–77: 35% in men, p = .49; 40–49: 43%, 50–59: 42%, 60–69: 34%, 70–74: 27% in women, p < .01).

Conclusion: The knowledge about symptoms and appropriate response required for early arrival to hospital at stroke onset were considered to be insufficient among Japanese population, especially in elderly women.
**PP2-13**

**Relationship Between Knowledge of Early Stroke Symptoms and Planned Response to Each Symptom Among a General Japanese Population**


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**Background and Objective:** To examine the relationship between knowledge of early stroke symptoms and planned response to each symptom among a general Japanese population.

**Methods:** In March 2013, a telephone survey about knowledge of stroke and planned response to early stroke symptoms was conducted by random-digit dialing method in Shiga and Mie prefectures (west part of Japan). The questions regarding knowledge of early stroke symptoms consisted of five correct answers (sudden speech problems; sudden one-sided numbness; sudden severe headache; sudden dizziness or loss of balance; and sudden visual problems) and five decoy answers as multiple-choice items. Planned response to five correct symptoms was assessed by a single-answer-required question (immediately call an ambulance or not). Of 4,200 randomly-selected residents aged 40–74, 4,147 individuals who did not select all 10 items (including five decoys) as early stroke symptoms were eligible for our analysis.

**Results:** Approximately 80% of participants selected “ambulance call” to sudden severe headache, followed by sudden speech problems (76.9%), sudden one-sided numbness (75.4%), sudden dizziness or loss of balance (66.2), and sudden visual problems (44.3%). The numbers of correct answers about early stroke symptoms selected were positively associated with ambulance call to each symptom. After adjustment for confounding factors, the multivariable-adjusted odds ratios (95% confidence intervals) for ambulance call to sudden severe headache compared with those who did not select correct symptom were 1.32 (0.73–2.36), 1.47 (0.88–2.45), 2.29 (1.51–3.48), 3.28 (2.24–4.81), and 4.57 (3.15–6.63) (p for trend <0.001). Similar results were observed in planned response to other four symptoms of stroke.

**Conclusion:** Our findings suggest that knowledge of early stroke symptoms was positively associated with ambulance call to each symptom.

**PP2-14**

**Effects of Intensive and Moderate Public Education on Knowledge about Risk Factors of Stroke among a General Japanese Population**

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**Background and Objective:** This study examined the effects of intensive and moderate public education on knowledge about risk factors of stroke among a general Japanese population.

**Methods:** During 22 months of intervention period, information on risk factors of stroke was distributed by leaflet 12 times and booklet twice in an intensive intervention area, and by leaflet and booklet once each in a moderate intervention area. None of these was distributed in the control area. Before and after the intervention, a mailed survey was conducted in the three areas. A closed-ended questionnaire including those about risk factors of stroke with six correct answers (heart disease, arrhythmia, transient ischemic attack, hypertension, diabetes mellitus, and dyslipidemia) and six decoy answers as multiple-choice items was mailed to each participant. The differences in the number of correct answers between pre- and post-intervention survey were tested by paired t-test.

**Results:** The respondents of the pre-intervention survey were 5,509 individuals (response rate: 49.0%). A total of 3,855 individuals responded to the post-intervention survey. A response rate of the post-intervention survey therefore was 70.0% in total, 72.5% (1,689/2,329) in the intensive intervention area, 70.0% (1,093/1,562) in the moderate intervention area, and 66.3% (1,073/1,618) in the control area. The mean±standard deviation of the numbers of correct answers were 3.18 ± 1.51 in pre-intervention and 3.28 ± 1.49 in post-intervention in the intensive intervention area (d = 0.10 ± 1.58, p = 0.010), 3.21 ± 1.54 and 3.41 ± 1.52 in the moderate intervention area (d = 0.19 ± 1.58, p < 0.001), and 3.35 ± 1.50 and 3.38 ± 1.42 in the control area (d = 0.03 ± 1.50, p = 0.514). The numbers of correct answers were significantly increased in the intervention areas, whereas no significant difference was found in the control area.

**Conclusion:** Our findings suggest that frequent distribution of leaflets and booklets significantly improve the knowledge about risk factors of stroke.
**PP2-15**

**Knowledge About Early Symptoms of Stroke Among a Japanese Population**

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**Background and Objective:** This study was assessed knowledge about early stroke symptoms of stroke in the pre-intervention survey among the three areas.

**Methods:** This study was a community intervention trial. The three areas were set as an intensive intervention area (Konan area, Shiga prefecture), a moderate intervention area (Otsu area, Shiga prefecture), and a control area (Tsu-city and Yokkaichi-city, Mie prefecture). In March 2013, a telephone survey about knowledge of early stroke symptoms and planned response to early stroke symptoms was conducted by random-digit dialing method among 4200 community residents aged 40–74 in the three areas as the pre-intervention survey. Regarding the questions about early stroke symptoms consisted of five correct answers (sudden speech problems; sudden one-sided numbness; sudden severe headache; sudden dizziness or loss of balance; and sudden visual problems), and five dummy answers as multiple-choice items. Differences in knowledge of the early stroke symptoms between the three areas were determined using the chi-squared test.

**Results:** A response rate was 28.3% in the intensive intervention area, 29.7% in the moderate intervention area, and 27.8% in the control area. The symptoms “sudden speech problem” (94.1% in the intensive intervention area, 94.4% in the moderate intervention area, and 92.6% in the control area, respectively), “sudden one-sided numbness” (88.4%, 89.4%, and 87.6%, respectively), “sudden severe headache” (84.8%, 86.4%, and 86.4%, respectively), “sudden dizziness or loss of balance” (83.1%, 83.4%, and 82.9%, respectively), and “sudden visual problems” (71.7%, 69.1%, and 72.3%, respectively) did not differ significantly among the three areas. Furthermore, the proportion of participants selected all five correct symptoms did not differ significantly among the three areas.

**Conclusion:** In pre-intervention survey, the knowledge about early stroke symptoms among the three areas did not differ significantly.

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**PP2-16**

**A History of Stroke or TIA Does Not Affect Knowledge of Early Stroke Symptoms and Ambulance Calls: The Acquisition of Stroke Knowledge Study**

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**Background and Objective:** Being aware of early stroke symptoms and calling an ambulance when patients with a history of stroke or transient ischemic attack (TIA) recur are important. This study aimed to clarify whether individuals with a history of stroke or/and TIA had knowledge of early stroke symptoms and the correct action at stroke onset.

**Method:** A mail-in survey was conducted for the history of stroke/TIA, knowledge of early stroke symptoms, and actions at stroke onset, involving 5519 randomly selected residents aged 40–79 in three areas in Japan. Participants were asked to choose which of 10 listed symptoms (5 correct answers and 5 decoy answers) were early stroke symptoms. The questions regarding actions at stroke onset included questions whether participants would be immediate ambulance call. Multivariable-adjusted odds ratios (ORs) for the correct choice of all five symptoms and for calling an ambulance in participants with a history of stroke/TIA compared with those without a history were estimated after adjusting for age, sex, areas, and presence or absence of stroke patients living close to the participants.

**Results:** Of the 5519 participants, 2.8% (n = 156) had a history of stroke/TIA. The proportion of participants who selected all five correct symptoms was 25.0% in those with a history of stroke/TIA and 22.9% in those without a history (p = 0.540). The proportions of participants who selected “calling an ambulance” were 71.2% and 81.5%, respectively (p < 0.001). The OR and 95% confidence interval (CI) for the correct choice of all five symptoms was 1.22 (0.84–1.77) in those with a history of stroke/TIA compared with those without a history. The OR and 95% CI for calling an ambulance was 0.60 (0.42–0.87).

**Conclusion:** Our study shows that individuals who experienced stroke/TIA do not have sufficient knowledge about early stroke symptoms and they do not perceive the need for calling an ambulance at stroke onset.
PP2-17
Educational Campaign was Effective for Improving Knowledge of Stroke Symptoms, But Not the Readiness to Call an Ambulance at Stroke Onset

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Background: It is important that the general population be aware of the early symptoms of stroke and ready to call an ambulance immediately after recognizing them, since early arrival to hospitals leads to better outcome of stroke patients.

Methods: A multiple-choice mail-in survey concerning the awareness and the readiness to call an ambulance at stroke onset was conducted in Akita, Kure and Shizuoka, Japan. ‘Awareness’ was defined as selecting all of 5 correct stroke symptoms from 10 listed symptoms with decoy choices. ‘Readiness to call an ambulance’ was defined as selecting ‘call an ambulance’ as an answer to a question about action to take when he/she had suspected stroke. Following this survey, a 2-year educational campaign was conducted in Kure and more frequently in Akita, but not in Shizuoka. Then, the post-intervention mail-in survey was conducted. Those who responded to both pre- and post-intervention survey were classified into 2 groups; those who chose all of 5 correct answers and the rest. McNemar’s test was used to assess the effect of the 2-year educational campaign on the knowledge of stroke symptoms and the readiness to call an ambulance.

Results: Among the 5,540 residents enrolled in the baseline survey, 3,855 residents responded to the post-intervention survey. The knowledge of stroke symptoms improved statistically significantly in Akita (p < 0.001) and Kure (p = 0.013), but not in Shizuoka. No statistically significant change was observed in the percentage of the respondents who chose ‘call an ambulance’.

Conclusions: This study demonstrated a 2-year educational campaign was effective in improving the correct knowledge of stroke symptoms, but had no effect on the readiness to call an ambulance. For the future, public education focusing on an immediate use of emergency call at the onset as well as knowledge of stroke symptoms should be carried out.

PP2-18
Association Between Off-Hour Admission and Functional Outcome After Acute Ischemic Stroke in Korea

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Background and Objectives: Time of hospital arrival in acute ischemic stroke has been shown contradictory results in stroke outcomes. We analyzed the ‘off-hour effect’ on 3 month outcome and death in acute ischemic stroke patients.

Methods: We analyzed hospital based prospective stroke registry data of 12 academic or teaching hospitals between 2008 and 2012. Patients diagnosed with hemorrhagic stroke or lesion negative TIA on DWI or admitted via outpatient clinic and patients arrived 7 days after the onset of symptoms were excluded. We defined working hour admission when patient arrived at emergency department between 8:00AM and 6:00PM from Monday to Friday and between 8:00AM and 1:00PM on Saturday. The rest of hours of admission including legal (statutory) holidays regard as an off hour admission.

Results: Among a total of 7,762 patients (age, 67.6±12.9 years; male, 4546, 58.6%), half of patients were admitted on work hours (50.6%). Patient admitted on off hours were slightly younger and less likely to have a stroke or diabetes and a stroke related disability. Moreover, stroke severity is milder, prehospital delay was shorter in off hour admission group than in work hour group. And also, the use of IV thrombolysis was higher in off hour group. On multivariable analysis, off hour admission was not a predictor for poor functional outcome (mRS; 3–6) and death at 3 months. Additionally, timing of admission was not a determinant for poor functional outcome and death at 3 month in subgroup analysis of patients with IV thrombolysis.

Conclusion: In the hospital setting of widespread multidisciplinary stroke care implementation, off hour admission is not a determinant for poor functional outcome or death at 90 days after ischemic stroke in Korea.

PP2-19
Intracerebral Transplantation of Bone Marrow Stromal Cells Ameliorated tPA-Induced Brain Damage after Cerebral Ischemia in Mice Detected by

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Detection and protection of neurovascular unit (NVU) are essentially important for treatment of acute stroke patients especially in use of tissue plasminogen activator (tPA). In the present study, we conducted in vivo and ex vivo optical imagings for de-
tecting activation of matrix metalloproteinases (MMPs), and evaluated the protective effect of intracerebral transplantation of bone marrow stromal cells (BMSC) obtained from green fluorescent protein (GFP) transgenic (Tg) mice on NVU in tPA-mediated brain damage after transient middle cerebral artery occlusion (tMCAO) in mice. As compared to tMCAO group, tMCAO plus BMSC group showed significant reductions of in vivo and ex vivo fluorescent signals for MMPs at 48 h after tMCAO, with a partial colocalization of BMSC-GFP signals. Intracerebral transplanted BMSC ameliorated MMP-9 activations in immunohistochemistry and Western blot with differentiation into microglial and astroglial cells. Double immunofluorescent study revealed an improvement of NVU disruption in tMCAO plus BMSC group. The present study suggests that intracerebral BMSC transplantation reduced MMP activations and subsequent NVU disruption caused by tPA after tMCAO, and that such MMPs activation and BMSC effect were detectable with in vivo and ex vivo optical imagings.

PP2-20

Heterogeneous Cerebral Vasoreactivity Dynamics in Patients with Carotid Stenosis

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Background and Objective: Cerebral vasoreactivity (CVR) can be assessed by functional MRI (fMRI) using hypercapnia challenges. In normal subjects, studies have shown temporal variability of CVR blood oxygenation level-dependent responses among different brain regions. However, this characteristic variability of CVR has not been studied in patients with carotid stenosis.

Methods: We analyzed the variability of the BOLD CVR dynamics by fMRI with a breath-holding task in 17 subjects with unilateral carotid stenosis before they received carotid stenting.

Results: A great heterogeneity of CVR dynamics was observed when comparing BOLD responses between normal and lesion hemisphere in each patient, especially in middle cerebral artery (MCA) territories. While some subjects (n = 12) had similar CVR responses between either hemisphere, the others (n = 5) had poorly correlated pattern of BOLD changes between lesion and normal hemispheres. In the latter group, defined as impaired CVR, post-stenting perfusion tended to be more significantly increased.

Conclusion: Our data provides the first observation of the divergent CVR dynamics in patients with carotid stenosis. The development of collateral circulation and the derangement of cerebral hemodynamics can be detected through this novel analysis of the different patterns of BOLD changes. The results also help to predict robust increase of perfusion or hyperperfusion after carotid stenting.

PP2-21

Transcranial Doppler Derived Pulsatility Index is a Reliable Marker for Monitoring Intracranial Pressure

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Background and Aim: Transcranial Doppler (TCD) ultrasonography is a sensitive, non-invasive bedside test, which is used to evaluate cerebral blood flow hemodynamics in the major arteries of the circle of Willis. TCD derived pulsatility index (PI), calculated as the difference in blood velocities measured during systole (Vs) and diastole (Vd), divided by the mean velocity (Vm) [(Vd-Vs)/Vm], is believed to be influenced by intracranial pressure (ICP). We aimed to correlate TCD-PI with cerebrospinal fluid (CSF) pressure measurements acquired during standard lumbar puncture (LP) manometry (representing ICP).

Methods: Consecutive patients undergoing lumbar puncture for various diagnoses were included. Opening and closing CSF pressures (P-csf) were measured in all subjects. Stable TCD traces for 1-minute were obtained just before and after LP from both middle cerebral arteries (MCA) using a Spencer’s head frame and a traditional 2MHz transducer (Sonara TCD system, USA). Patients with insufficient temporal acoustic windows on TCD were excluded. Opening and closing PI values were calculated from the TCD spectra by an independent neurosonologist.

Results: A total of 78 subjects (females = 30; males = 48; mean age 47 years, range 20–82 years) were recruited. PI significantly decreased following LP (1.03 vs. 0.96, p = 0.0001) in 53/78 (68%) of subjects and corresponded to 4.5 ± 3.6 cm CSF drop in P-csf. Patients with P-csf greater than 25 cm had significantly higher PI (0.99 in cases with P-csf 25 cm; p = 0.0009). Analysis of 156 matched P-csf and PI values revealed a weak correlation (r2 = 0.136, p).

Conclusion: Absolute PI values can be used to identify patients with extremely high ICP. Changes in serial age-adjusted PI values can be used to monitor changes in ICP.

PP2-22

Internal Cerebral Vein Asymmetry on Follow-Up Computerized Tomographic Angiography After Intravenous Thrombolysis in Acute Anterior Circulation Ischemic Stroke Is Associated with Poor Outcome

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Background: Identifying early predictors of functional outcome after acute ischemic stroke (AIS) is important for planning rehabilitation strategies. We hypothesized that venous drainage would be impaired in patients with acute occlusion of ICA or MCA. Internal cerebral veins (ICV) drain deep parts of brain, run...
parallel to each other and consistently seen on CTA. Even minor asymmetry in their filling can be identified. Since systemic thrombolysis can alter the vascular findings in patients who achieve arterial recanalization, we evaluated the relationship between ICV asymmetry on follow-up CTA and functional outcome.

**Methods:** Consecutive AIS patients treated with intravenous thrombolysis between 2007 and 2010 were included. ICV asymmetry was assessed by 2 independent blinded stroke neurologists/neuroradiologists. Functional outcome was assessed by modified Rankin Scale (mRS) at 3-months, dichotomized as good (0–1) and poor (2–6). Data were analyzed for predictors of functional outcome.

**Results:** Of 2238 patients with AIS, 226 (10.1%) anterior circulation AIS patients received intravenous thrombolysis. Median age 65yrs (range 19–92), 44% males and median National Institute of Health Stroke Scale (NIHSS) 16-points (range 4–32). Hypertension was the commonest risk factor in 173 (76.5%) while 78 (34.5%) had atrial fibrillation. ICV asymmetry on follow-up CTA was assessed in 103 (45.5%) patients. Admission NIHSS score (OR1.08; 95% CI 1.001–1.157, p = 0.048) and ICV asymmetry on follow-up CTA (OR 23.9; 95% CI 5.15–63.99, p) were significant difference between disability rate and mortality. mRS of each group was decreased significantly on 120d, mRS was 3.18 ± 1.94 on admission in study group and 0.09 ± 0.30 on 120d (P < 0.01), mRS was 3.50 ± 1.65 in control group then 1.33 ± 0.89 (P < 0.01). However, mRS in study group was significantly less than that of the control group on 120d (P < 0.01).

**Conclusion:** The results suggest that adult CVST patients were treated immediately with LMWH and Warfarin is safe and effective.

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**PP2-23**

**Safety and Effects of Using Warfarin Early in Adult Patients with Cerebral Venous and Sinus Thrombosis**

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**Background:** Cerebral venous and sinus thrombosis (CVST) is a rare disease which now allows for early diagnosis by MRI and magnetic angiography, and immediate treatment with heparin is recommended. Long-term treatment of CVST need to oral anticoagulation with vitamin K antagonists Warfarin. However, the best time of Warfarin is nuclear.

**Objective:** To observe the safety and effects of using Warfarin early in adult CVST patients.

**Methods:** 29 in-patients with CVST were in the department of neurology and neurosurgery of Huizhou Municipal Central Hospital in January 2004 to July 2011, 27 patients were eligible. The patients were randomly divided into treatment group and control group and two missed follow-up. The patients in the treatment group were treated with low-molecular-weight heparin (LMWH) and Warfarin at same day and control group oral Warfarin in 7d after LMWH. LMWH was stopped when the patients’ INR was 2.0–3.0 for two consecutive days and Warfarin for 4 months.

**Results:** 11 patients were in treatment group and 14 were in control group. The baseline data between two groups were same. 13 patients with intracranial hemorrhage on admission had no new bleeding by CT scan in 7d. On 120d, 11 patients’ mRS in study group were 0 to 2, 10 patients’ mRS in control group 0 to 2 and 2 were died. The two groups were not significantly different between disability rate and mortality. mRS of each group was decreased significantly on 120d, mRS was 3.18 ± 1.94 on admission in study group and 0.09 ± 0.30 on 120d (P < 0.01), mRS was 3.50 ± 1.65 in control group then 1.33 ± 0.89 (P < 0.01). However, mRS in study group was significantly less than that of the control group on 120d (P < 0.01).

**Conclusion:** The results suggest that adult CVST patients were treated immediately with LMWH and Warfarin is safe and effective.

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**PP2-24**

**Cerebral Venous Thrombosis Recurrence with Negative Prothrombotic Markers**

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**Background and Objective:** There are no clear guidelines regarding the duration for anticoagulant therapy after cerebral venous thrombosis (CVT). A negative prothrombotic work-up often influence discontinuing therapy.

**Methods and Results:** A 33 year old male patient presented with five day history of holocranial headache and one episode of generalized tonic clonic seizure. An MRI MRA/MRV showed left transverse and sigmoid sinuses thrombosis with a 55 x 37 mms left temporoparietal hemorrhagic infarct with perilesional edema. There was minimal mid line shift. While on medical treatment, his neurological status worsened with pupillary asymmetry. A left frontotemporoparietal craniectomy with evacuation of haematoma with duroplasty was done. He had an uneventful recovery and was started on oral anticoagulants. Cerebellum was done after 8 months. Protein C (functional chromogenic assay and antigenic assay using ELISA), activated protein C resistance – clot based method, Protein S bound & Free – by ELISA. Antithrombin III (chromogenic assay). Factor VIII level, APTT single staged factor assay, Lupus anticoagulant (Dilute Russell Viper Venom Test) Anticardiolipin antibody by assay, serum Homocysteine level (fluorescent detection in high performance liquid chromatography) Antinuclear antibody (detected using qualitative indirect immunofluorescence assay using Hep 2 cells as substrate) Paroxysmal nocturnal haemoglobulinuria (Ham’s and sucrose lysis test), Fibrinogen levels, Sickle cell preparation, Gene amplification using PCR for Factor V Leiden G1691A mutation, Methylene tetrahydro-folate reductase (MTHFR) C677T Polymorphism, and Prothrombin Gene PTG G20210A Polymorphism were all negative. Patient continued on oral anticoagulants for the next five years. After three months of stopping anticoagulants he had a recurrence of CVT. Superior sagittal sinus thrombosis with bifrontal venous infarction. He improved with medical treatment and was advised life long anticoagulation.

**Conclusion:** With the current workup towards detecting underlying prothrombotic states can we confidently recommend withdrawing anticoagulants after CVT?
HAS-BLED Score and Bleeding Assessment of Anticoagulants in T. Thiraworawong, T. Tantirittisak
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Background: Using vitamin K antagonist oral anticoagulant in cardio-embolic stroke patients was associated with bleeding complications. New bleeding assessment tool, HAS-BLED score were introduced for evaluated risk of bleeding before prescribing antithrombotic drug.

Methods: Retrospective cohort study of cardio-embolic patients in Prasat Neurological Institute between 2006 to 2010 was done.

Severe bleeding complications were defined as any bleeding requiring hospitalization and/or causing a decrease in hemoglobin level of >2 g/L and/or requiring blood transfusion. Intracranial bleeding was defined as a focal neurologic deficit of sudden onset, diagnosed by a neurologist or neurosurgeon, lasting >24 hour and caused by intracranial bleeding. HAS-BLED (Hypertension, Abnormal renal/liver function, Stroke, Bleeding history or predisposition, Labile international normalized ratio, Elderly (more than 65 years), Drugs/alcohol concomitantly) was evaluated in this study.

Results: 158 cardio-embolic stroke patients who received vitamin K antagonist oral anticoagulant (warfarin) were enrolled. 40 patients (25%) had severe bleeding events, 14 patients had intracranial bleeding, 26 patients had extracranial bleeding. In this bleeding group, HAS-BLED score >3 was found in 11/14 (78.57%) intracranial bleeding group and 16/26 (61.53%) patients had extracranial bleeding. Sensitivity, specificity and positive predictive value when HAS-BLED >3 was found in 67.50%, 83.90% and 58.70% respectively. However, only 50% and 34.6% of intracranial and extracranial bleeding respectively had INR > 3 at bleeding onset.

Significant bleeding risk factors were high systolic blood pressure >160 mmHg (P < 0.001), labile INR (P = 0.025), elderly age >65 years (P = 0.002) and higher median HAS-BLED (3.00 vs 2.00; P = 0.001)) were found in the bleeding group more than the non bleeding group.

Conclusion: HAS-BLED score can be used as a predictor for risk of bleeding in the patient who received oral anticoagulant.

Evaluation of Carotid Artery Stenting for the Elderly Patients: 54 Cases More Than 70 Years Old
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Background and Objective: Recently, a validity of carotid artery stenting (CAS) for the elderly patients is evaluated low according to the Carotid Revascularization Endarterectomy versus Stenting Trial (CREST). On the other hand, the elderly patients with cervical internal carotid artery severe stenosis (ICAs) are in a tendency to increase. We evaluated to clinical outcome of CAS in elderly patients.

Methods: The clinical variables and treatment outcomes of 95 consecutive patients (106 stents) with carotid stenosis were analyzed. At the time of treatment, the mean age (75 men and 20 women) is 69.7 years (range, 56–82yrs). Both symptomatic and asymptomatic stenoses were studied in high surgical risk patients as defined by the SAPPHIRE (Stenting and Angioplasty with Protection in Patients at High-Risk for Endarterectomy) trial. These patients are classed in 2 groups: elderly patients more than 70 years old (O group, n = 54) and young patients (Y group, n = 52) and we compared 2 groups.

Results: CAS was attempted in 106 ICAs, and technical failure didn’t occur in these cases, resulting in a technical success rate of 100%. In O group, overall 30-day rates of minor and major stroke are 5.6%, 0%, respectively. In Y group, overall 30-day rates of minor and major stroke are 5.8%, 1.9%, respectively. In O and Y groups, overall 30-day rates of myocardial infarct and death are 3.7%/0%, 0%/1.9%, respectively. Complication rate of hyperperfusion syndrome is 1.9% in both groups.

Conclusion: Periprocedural clinical outcome of CAS for the elderly patients with ICAs is equal to that of young patients. CAS for the elderly patients may be a feasible and safe procedure.

Ratio of LDL cholesterol to HDL cholesterol in Ischemic Stroke
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Background: High values of low-density lipoprotein (LDL) cholesterol to high-density lipoprotein (HDL) cholesterol (L/H-cho) ratio and non-HDL cholesterol (nH-cho) level are known about their roles in the development of cerebral infarction or their significance as risk factors for first episode of cerebral infarction.

Subjects and Methods: We evaluated 277 patients presenting with a first episode of cerebral infarction from January–
October 2012. L/H-cho ratios and nH-cho levels were determined at admission. Subjects were divided into groups with L/H-cho ratio < 1.5, 1.5 to < 2.0, 2.0 to < 3.0, and ≥ 3.0 for analysis of differences in incidence of cerebral infarction. Logistic regression was used to examine differences in prognostic value between L/H-cho ratio and nH-cho level.

**Results:** An L/H-cho ratio of 1.5 or greater was associated with statistically significantly higher rates (P < 0.01) of atherosclerotic cerebral infarction and cardiogenic cerebral embolism in patients with a history of treatment for hypertension or diabetes mellitus, regardless of the presence or absence of lipid abnormality. This finding suggests that L/H-cho ratio has predictive value for cerebral infarction. On the other hand, no statistically significant difference was noted between patients with normal and abnormal nH-cho levels, suggesting that its use as a prognostic factor for cerebral infarction is of questionable value.

**Conclusion:** Our analysis indicates that L/H-cho ratio greater than 1.5 is a risk factor for first-ever cerebral infarction. Consequently, therapeutic measures to maintain the ratio below 1.5 may be effective to reduce the risk of developing cerebral infarction.

**PP2-28**

**Brachial Ankle Pulse Wave Velocity Is Associated with Cerebral Microbleeds in Acute Stroke Patients**

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**Background and Objective:** High brachial-ankle pulse wave velocity (baPWV) is known to be associated with white matter hyperintensities (WMHs) and silent brain infarction, however, an association of baPWV and cerebral microbleeds (Mbs), which is a surrogate marker to predict brain hemorrhage, remains unknown. We investigated whether baPWV is associated with the presence of Mbs in patients admitted with acute ischemic stroke.

**Methods:** We reviewed 51 patients of acute ischemic stroke from April 2008 to April 2013, and divided into those with Mbs (22%, 11/53) and without Mbs (78%, 40/53). We compared clinical characteristics including baPWV between two groups.

**Results:** Patients with Mbs compared to those without Mbs had greater baPWV (median (IQR), 20.86 (17.54–29.87) vs. 18.71 (15.49–22.48) m/sec, P = 0.039) and, conversely lower LDL-cholesterol (92.0 (79.0–105.0) vs. 111.0 (90.0–130.5) mg/dl, P = 0.030) and HDL-cholesterol (45.0 (38.0–48.0) vs. 49.0 (40.0–59.0) mg/dl, P = 0.065). Multiple stepwise regression analysis proved that only baPWV (P=0.041) was independently associated with the presence of Mbs.

**Conclusion:** In acute ischemic stroke patients, baPWV was significantly associated with the presence of Mbs in the present study.

**PP2-29**

**The Association of Prestroke Intensive Glycemic Control with the Initial Severity of Acute Ischemic Stroke**

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**Background and Objective:** Recent studies demonstrated that intensive glucose lowering in high risk patients with type 2 diabetes increased mortality and did not significantly reduce major cardiovascular events. Furthermore, intensive insulin therapy in the first 24 hours of stroke was related to larger infarct growths. This study aimed to know whether the pre-stroke intensive glycemic control is associated with the initial severity of acute ischemic stroke.

**Methods:** We reviewed 1235 consecutive patients with acute (< 7 days) ischemic stroke who had type 2 diabetes in Seoul National University Bundang Hospital from Mar 2004 to Dec 2010. The hemoglobin A1c (HbA1c) at admission were categorized into: < 6.0% (strict control), 6.0–7.0% (standard control), 7.0–8.0%, ≥8.0%. The stroke severity was presented with National Institute Health Stroke Scale (NIHSS). The association between HbA1c and NIHSS was analyzed by multiple linear regression model adjusting age, male, systolic blood pressure, hemoglobin, WBC count, total cholesterol, current smoking, previous antithrombotics and initial glucose. The same regression models were obtained in each stroke subtype of Trial of Org 10172 in Acute Stroke Treatment (TOAST) classification.

**Results:** The mean NIHSS scores were 8.81 ± 8.0 for HbA1c <6.0, 6.02 ± 6.2 for HbA1c 6–7, 5.40 ± 5.7 for HbA1c 7–8, and 5.02 ± 5.1 for HbA1c >8. In multiple linear regression analysis, HbA1c <6.0 was significantly associated with higher initial NIHSS score compared with standard control (β 0.136, P < 0.001), HbA1c <6.0 was also correlated with higher NIHSS in the same models for each TOAST subgroup: β 0.157, P = 0.001 in LAA (N = 535); β 0.002, P = 0.98 in SVO (N = 211); β 0.228, P = 0.001 in CE (N = 233); β 0.194, P = 0.02 in Undetermined Negative (N = 152).

**Conclusions:** This study suggests that pre-stroke intensive glycemic control should be highly correlated with worse initial stroke severity compared with standard glycemic control in all stroke subtypes except SVO. More studies including the measurement of infarct volume are needed for the influence of pre-stroke glycemic control on the severity of acute ischemic stroke.
**PP2-30**

**Relationship of Body Mass Index and Long-Term Mortality for Acute Ischemic Stroke Patients Treated with Thrombolysis**

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**Background:** Obesity is an established risk factor for ischemic stroke and coronary disease. Recently, a few data suggest that obese and overweight stroke patients have significant better long-term survival rates (obesity paradox). This study was to investigate the independent association between body mass index (BMI) and mortality for acute ischemic stroke patients treated with intravenous-recombinant tissue plasminogen activator (IV rtPA) and/or intra-arterial thrombolysis (IAT).

**Methods:** During 8 years, 315 of 352 patients treated with IV rtPA or IAT were included. The study patients were divided into 4 groups according to BMI: underweight (25kg/m2). Neurologic severity was estimated by NIHSS and mRS. Information for long-term mortality and mRS was collected until July, 2012. We compared baseline characteristics including demographics, systolic blood pressure, LDL, total cholesterol, glucose level at admission, stroke subtypes, thrombolytic methods, and risk factors like diabetics, hypertension, atrial fibrillation and dyslipidemia.

**Results:** In underweight stroke patients, age, NIHSS and mRS on admission were significantly higher compared to that of other BMI groups. Similarly, mRS at discharge of underweight stroke group was significantly higher than mRS at discharge of other BMI groups. Overweight and obese patients had a significantly higher incidence of hypertension than underweight patients. Long-term mortality rate in underweight patients seemed to be higher compared to that of other BMI groups, however it was not significant.

**Conclusions:** Based on BMI, underweight stroke patients do not have significantly worse long-term survival rates compared to patients with other BMI.

**PP2-31**

**Recurrent Amaurosis Fugax in a Patient with Carotid Stump Syndrome**

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**Background:** Amaurosis fugax (AF) or monocular blindness refers to a transient loss of vision in one eye. These symptoms are usually regarded as thromboembolism from an atherosclerotic steno-occlusive disease of the proximal internal carotid artery (ICA). Other causes of transient loss of vision include migraine, optic neuropathy, intrinsic eye disease, and microemboli from occluded carotid stump syndrome. We report the case of a 54-year-old man with occlusion of the proximal ICA who presented with repeated episodes of AF in the ipsilateral eye.

**Case:** A 54-year-old man with a history of smoking presented to the out-patient clinic complaining of repeatedly developing visual impairment in his right eye that has been persisted for 5 days. The onset was abrupt, and the symptoms usually lasted 1 to 2 minutes and it appeared 10 to 20 times per day. He had no headache and ocular pain. There were no neurologic deficits. Brain MRI showed old lacunes in the pons. Diagnostic cerebral angiography showed total occlusion of the right proximal ICA with retrograde leptomeningeal collateral flow of contralateral distal middle cerebral artery from the left anterior cerebral artery and posterior circulation. Brain CT perfusion showed decrease in regional cerebral blood flow and delay of mean transit time in the right MCA territory. Transcranial Doppler ultrasonography detected reversal of blood flow in the ipsilateral ophthalmic and anterior cerebral artery. After the administration of aspirin and clopidigrel, his visual symptoms disappeared. And there has been no recurrence of ischemic symptoms during follow-up of 4 years.

**Conclusion:** We suggested that possible emboli through the right external carotid artery from the site of ipsilateral proximal ICA occlusion might cause AF and antiplatelet drug is sufficient for this type of stroke patient.

**PP2-32**

**The Synergistic Effects of Mirror Therapy and Functional Electrical Stimulation on Hand Function in Severe Stroke Patients**

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**Background and Objectives:** Mirror therapy and functional electrical stimulation (FES) are simple and less costly, and patients can perform these by themselves. Studies reported that mirror therapy made significant improvements in the Brunnstrom stage as well as functional independence measure scores of subacute stroke patients. FES makes improvements in the motor function of patients with hemiparesis such as reduced spasticity, strengthened muscles. Our study was performed to investigate the synergic effects of mirror therapy and functional electrical stimulation on hand function in severe stroke patients.

**Methods:** Thirty patients with severe hemiplegia after stroke were included (13 males and 17 females). Ten patients had FES applied and simultaneously underwent mirror therapy. Ten patients had FES applied only, and ten patients underwent mirror therapy only. Each treatment was done five days per week, 30 minutes per day, for four weeks. FES was applied on the surface of the extensor digitorum communis, flexor carpi radialis, biceps brachii, and triceps brachii for hand and arm motion. Muscle tone, Fugl-Meyer assessment were evaluated before and after treatment.

**Results:** There were significant improvements in the Fugl-Meyer assessment score, as well as power of wrist and hand in all groups after treatment. The mirror combined with FES group showed significant improvements in the Fugl-Meyer scores of hand, wrist, arm, coordination and power of wrist flexion compared to the other groups. However, the power of hand flexion, extension, wrist extension showed no significant differences.
among the three groups. Muscle tone also showed no significant differences in the three groups.

**Conclusion:** This study showed that there is a synergic effect of mirror therapy and FES on hand function. Therefore, a hand rehabilitation strategy combined with FES and mirror therapy may be more helpful for improving hand function in stroke patients than FES or mirror therapy only.

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**PP2-33**

**Factors Influencing Community Ambulation and Participation in Ambulation Dependent Activities in Stroke Patients – A Qualitative Study**

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**Objectives:** 1) To find out the factors acting as barriers for ambulation in community. 2) To find out the factors restricting patients from participating in community that is ambulation dependent.

**Background:** Mobility in the community is very essential to participate in community. There are lot of factors which influence the ambulation and participation in community. Thus the aim of the study was to find out the factors responsible for restricting the patients from walking and participating in ambulation dependent activities in community.

**Design:** A Qualitative phenomenological study design.

**Setting:** The setting for qualitative research is the field. The field is the place where individuals of interest live, where they experience life. So the inquiry was conducted in the physiotherapy rehabilitation departments and patients home.

**Method:** Interview guide was framed and open ended questions were asked to the participants. Interview guide focussed on the following areas that are Walking Outside, Neighbourhood Areas, Community Participation, Family Support, Personal Factors, and Healthcare Professionals. The responses were recorded in a voice recorder. The data collected was then transcribed and analysed for emergent themes.

**Result:** This study has provided some insight into various factors influencing the patients following stroke for restricting them to walk in the community and participating in ambulation dependent activities. The themes emerged were Bodily/ Physical Problems, Insecurity, Dishonor/ Indifference, Individual attitudes of health professionals, Societal attitudes, Dynamism of environment, Lack of interest in work, Secondary reasons. Thus the Factors such as physical problems, safety concerns in the context of roads, feeling of insecurity from people and environment, feeling of indifference to them by the society, changed societal attitudes towards themselves following stroke, influence of healthcare professionals, complexity in environment, no interest in work and certain directly unrelated reasons came out influencing community ambulation and participation in ambulation dependent activities.

**Conclusion:** Rehabilitation professionals should address these areas.

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**PP2-34**

**Characteristics of Three Types of Partial Weight Supported by Lower Body Positive Pressure During Treadmill Walking for Participant with Stroke**

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**Background and Objective:** Body weight supported treadmill training (BWSTT) is enable participant’s partial weight to decrease at therapist’s discretion. We investigated the characteristics of muscles activities in lower extremity during treadmill walking for single subject after stroke.

**Methods:** Participant was male, aged fifties had left hemiplegia after stroke. Electromyography (EMG) corrected the muscle activities of vastus lateralis (VM), biceps femoris long head (BF), tibial anterior (TA) and gastrocnemius (GC) during treadmill walking with BWSTT by lower body positive pressure (LBPP). Amount of partial weight supporting were set zero percent (full weight bearing, FWB), twenty-five percent (25% BWS) and fifty percent (50% BWS) of body weight. Corrected values of EMG were standardized with five percent interval width and took statistics in multiple comparisons with tukey method.

**Results:** We dealt 0% as baseline muscle activities by EMG. 25% BWS indicated collective decrease of muscle activities whereas curve and pattern were maintained. 50% BWS showed intermingled with increase-decrease of curve and pattern statistically.

**Conclusion:** We investigated the characteristics of muscle activities during BWSTT with LBPP. EMG showed significant differences especially between 25% BWS and 50% BWS. 25% BWS kept curve and pattern of muscle activities than FWB whereas 50% BWS collapsed.
EP-01

Thrombolytic Treatment for Acute Ischemic Stroke: A 6 Month – Experience at Ratchaburi Hospital

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Background: Intravenous rt-PA with in 4.5 hours after the onset of symptoms in patients with acute ischemic stroke is effective treatment. The risk of early fatal and symptomatic intracranial hemorrhage is increased, but these hazards are offset by reduction in the proportion of patients who are dead or dependent.

Methods: Consecutive patients with acute ischemic stroke who presented within 4.5 hours of onset were screened under stroke fast track program. Those who were eligible were treated with intravenous recombinant tissue plasminogen activator (rt-PA). General and neurological examinations together with the National Institute of Health Stroke Scale (NIHSS) was recorded prior to and after the treatment at 1h, 24h, on discharge and at 3 months. In addition, Modified Rankin Scale (MRS) after 90 days, Hemorrhagic brain lesion and death within 3 months were also recorded.

Results: 21 patients or 2.9% of patients with acute stroke received intravenous thrombolysis. The mean onset-to-needle time was 175 min (range 105–260 min) and mean door-to-needle time was 83 min (range 44–130 min). The mean pretreatment NIHSS was 15.6 and 5 patients had stroke in the middle cerebral artery territory. Major neurological improvement, defined as improving of the NIHSS > 4 points or NIHSS of 0 points at 24h, was observed in 11 patients (52%). 3 Patients of Intracerebral hemorrhage (Non-fatal) were 1 symptomatic and 2 asymptomatic.

Conclusion: Thrombolysis with with rt-PA was effectively applied in routine management of stroke patients with acceptable efforts, Including severe cases were treated. Under these circumstance, outcome and complication rates were comparable to those of multicenter trials.

EP-02

Impact of Very Early Rehabilitation on Safety and Functions Regain Post Acute Stroke in ASU


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Background: Very Early Rehabilitation (VER) is a distinctive characteristic of care in our Acute Stroke Unit (ASU). It emphasizes on early functional mobilization for target patients at ≤ 24 hours admission to ASU post acute stroke, whose physiological parameters are within the set limits.

Objectives: 1. To implement and evaluate the VER on its feasibility, safety, primary & secondary outcomes; 2. To determine the length of stay (LOS) from various associated factors.

Methodology: A prospective, pre-vs-post test study employed. The primary daily living and ambulatory independency outcomes were Modified BI 100, Modified Rankin Scale (MRS) and Modified Functional Ambulatory Categories (MFAC). The secondary safety outcomes included adverse events, like death, falls, early neurological deterioration and post stroke complications.

Results: 103 acute stroke patients were screened and 64.4% (n = 65) were suitable for VER recruitment. Mean time to start VER was 17.0 hours. 80% were ischemic stroke (n = 52) and 30.5% (n = 20) had a NIHSS ≥ 5. All the primary daily living and ambulatory independency outcomes were significantly improved after VER (p < 0.001). 70.8% patients achieved daily living independency (MRS ≤ 2) & 69.2% achieved ambulatory independency (MFAC ≥ 5).

The secondary safety outcomes were low. 9.2% (n = 6) had post-acute stroke complications included chest infection, joints pain and urinary tract infection. They occurred in severe stroke patients (Mean NIHSS 9.75). The LOS in ASU was low (Mean 5.38 days).

The stepwise multivariate regression analysis showed LOS was associated with NIHSS and MRS post VER (p < 0.001). This model predicted 46.1% correctly. Each additional point on the LOS would increase by approximately. 1931 where N1 is the NIHSS and 0.795N2 where N2 is the MRS post-VER.

Conclusion: VER is feasible, safe & may lead to clinical benefit, which is contributed by closed collaboration among multidisciplinary professions. Further rehabilitation manpower allocation and researches to achieve and review the VER beneficiaries is highly recommended in the future.
EP-03

Two Cases of Spontaneous Spinal Epidural Hematoma Developing Hemiplegia; Another Contraindication for Intravenous Tissue Plasminogen Activator Therapy for Acute Ischemic Stroke

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Intravenous tissue plasminogen activator (tPA) treatment for acute ischemic stroke has been widespread use in Japan since 2005. Active hemorrhage must be ruled out before the injection of tPA.

Two cases of spontaneous spinal epidural hematoma developing hemiplegia are presented. In one case, tPA therapy was considered.

**Case 1:** A 67-year-old hypertensive male suffered from mild neck pain followed by severe right hemiparesis on X/X/2007. He was transferred to our emergency room one hour after the onset and the NIHSS was 10. A CT scan of his head and MRI, including diffusion weighted images, were both normal. Intravenous tPA therapy was initially considered, but not performed as MRA showed no causative abnormalities. Cervical MRI next day revealed C2-Th1 epidural hematoma. The hematoma evacuation operation was performed two days later, and he recovered almost completely.

**Case 2:** A 74-year-old female suffered from neck pain and severe left hemiparesis on Y/Y/2003. She was referred to our hospital with a tentative diagnosis of cerebral infarction. Neurological signs were consistent with the Brown-Sequard syndrome. Cervical MRI revealed C4-C6 epidural hematoma, which was evacuated 4 days later. Only mild hemiparesis remained 2 months later.

Because the occurrence of spontaneous spinal epidural hematoma is rare, it is not easy to diagnose it in the many patients presenting with sudden onset of hemiplegia. The presence of neck pain and the lack of facial paresis may be important signs in the discrimination of cervical lesion from stroke.

EP-04

Strategy of Percutaneous Endoscopic Gastrostomy in Stoke Patients with Dysphagia in Sydney South West Area

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Objective: To compare the results of aspiration pneumonia and upper digestive tract bleeding before and after percutaneous endoscopic gastrostomy (PEG) of acute stroke patients, and to evaluate and predicate risk of death that can help to decide PEG by means of critical parameter score system.

Methods: A total of 52 patients undergoing PEG feeding due to persistent deglutition disorders during the period of 6 months were retrospectively consecutive studied. Parameter means as critical points were created as scoring system, and the scores were calculated to analyse the difference between survival group and death group.

Results: No statistic difference was found in rates of aspiration pneumonia [50.0%(26/52) vs.34.6% (18/52), x² = 2.52, P = 0.164] and upper gastrointestinal hemorrhage[5.8% (3/52) vs.7.7% (4/52), x² = 0.15, P = 1.000] between before PEG and after PEG. There was significant difference in total scores between the death group (16 cases) and survival group (36 cases) (10.9 ±0.3 vs.9.4 ± 0.2, t = 3.81, P = 0.001).

Conclusions: PEG can’t reduce morbidity of aspiration pneumonia and upper gastrointestinal hemorrhage. Scoring system may guide clinicians for selecting patients for PEG.

EP-05

Bedside Dysphagia Screening After Acute Stroke: Incidence, Screening, and Clinical Outcomes

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Background: Dysphagia is a common finding in the clinical setting of a patient with acute stroke, which can give rise to a risk of aspiration, pulmonary infections, fluid depletion, and malnutri.

Therefore, early identification of dysphagia is crucial to avoid these adverse health consequences.

Objectives: To determine the incidence and clinical outcomes of acute stroke patients with dysphagia admitted at a tertiary hospital in Cebu City from December 2011 to July 2012.

Study Design: Prospective, single center, descriptive study.

Materials and Methods: The study population included all patients aged 18 years old and above admitted at a single tertiary hospital from December 2011 to July 2012 due to an acute stroke, whether an ischemic infarct or hemorrhage who underwent dysphagia screening test within 24 hours of admission and with no previous documented dysphagia. Patients who passed the screening test were fed orally and those who failed were inserted with nasogastric tube for feeding and oral medications.

Results: A total of 74 patients with acute stroke admitted at a tertiary hospital in Cebu City from December 2011 to July 2012 were enrolled in this study. Out of the total 74 respondents, 38 patients passed the dysphagia screening test and 36 patients failed. Eight (22%) of the 36 patients developed pneumonia, and only one patient died of pneumonia.

Conclusion: Early identification of dysphagia with a simple and inexpensive bedside screening procedure can certainly decrease the risk of pneumonia to develop among patients who have failed the dysphagia screening test, as well as reduces mortality and overall healthcare expenditure.
EP-06

Post Iv-tPA Clot Burden Score in CT Angiography is Predictive of Iv-tPA Failure

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Background and Purpose: Iv-tPA failure due to the low recanalization rate is rationale for additional strategies such as intraarterial (endovascular) therapy or ultrasound-enhancement of thrombolysis. We evaluated predictive value of post iv-tPA Clot Burden Score (CBS) in CT angiography for iv-tPA failure.

Methods: All patients who underwent iv-tPA therapy at St. Marianna University were reviewed. Acute ischemic stroke patients without administration of tPA but underwent CT angiography were also reviewed as control. Baseline characteristics including findings of the initial CT scan and duplex carotid ultrasonography and CT angiographic findings obtained after tPA administration were obtained. We defined iv-tPA failure when the NIHSS score does not decrease 4 points and over at Day-3. The Alberta Stroke program early CT score (ASPECTS) and CBS were measured using post iv-tPA CT angiography source image (CTA-SI).

Results: A total of 137 patients, including 35 patients treated with t-PA, with a mean age of 75.2 ±12.4 years, were studied. In the iv-tPA group, CTASI-ASPECT and CBS after tPA administration were significantly correlated with a decrease in NIHSS score during the first 3 days (p = 0.017 and p = 0.070). The end-diastolic (ED) ratio of both common carotid arteries before administration of tPA did not relate to iv-tPA failure. A significant correlation was also observed between mRS after 1 month of treatment and CBS (P = 0.000). Area under the ROC curve for the correct diagnosis of iv-tPA failure is 0.74 for CBS and 0.706 for CTASI-ASPECTS. CBS

Conclusion: Early and accurate prediction of iv-tPA failure is needed to establish additional strategies. CBS and CTASI-ASPECTS can be used to select a subgroup of patients with iv-tPA failure.

EP-07

Emergency Microsurgical Embolectomy in Acute Ischemic Stroke with Diffusion-Negative MRI

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Although Diffusion-weighted imaging (DWI) is highly sensitive and specific for the detection of acute ischemic injury, there are increasing reports that it may fail to demonstrate an acute stroke.

Here, we present a 64-year-old woman who was admitted 3 h after ischemic symptom with a false-negative DWI. However, we could detect the right MCA territory infarction through PWI and angiography and did an emergency microsurgical embolectomy for an occluded middle cerebral artery (MCA).

This suggested that diagnoses of acute ischemic strokes that are made based only on DWI is very dangerous for making decisions of the appropriate treatment. Although the endovascular mechanical embolectomy failed in treating the occluded MCA, we were able to successfully treat our patient with the second treatment option of a microsurgical embolectomy.

EP-08

Can Serum Lactate Dehydrogenase Level Predict Stroke Size in Acute Stroke Patients?

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Background and Objective: Since lactate dehydrogenase (LDH) is an intracellular enzyme, any process causing injury to the cells will result in the release of LDH. This released LDH will cause an increase in the blood levels of the enzyme. To investigate whether serum LDH level can predict stroke size, we have evaluated serum LDH level at admission in the patients with acute stroke.

Methods: In our Brain Attack Center, 1153 acute stroke patients (918 ischemic stroke and 235 cerebral hemorrhage) were admitted in January 2011 to December 2011. Among them, 208 patients (84 female and 124 male, median age 76 (minimum 14 to 96)) who admitted within 24 hours after their onset and who were evaluated LDH at their admission, were retrospectively examined in this study.

Results: There were 62 patients with cerebral hemorrhage and 146 patients with ischemic stroke (40 cardioembolic stroke; 32 atherothrombotic stroke; 28 lacunar stroke; and 46 undetermined etiology). Serum LDH levels were no difference between gender (p = 0.098) and no linear association with age (p = 0.405). Stroke size or hemorrhage size was the smallest in lacunar infarction and the largest in cardioembolic stroke (p < 0.001). Serum LDH level was significantly higher in the patients with cerebral hemorrhage than the patients with lacunar infarction (p = 0.005). However, serum LDH level was not associated with stroke size (p = 0.353).

Conclusion: Our results showed that serum LDH level was significantly increased in cerebral hemorrhage patients, but the serum LDH level could not predict the stroke size or hemorrhage size.
Clinical Characteristics Differences Between Patients with Ischemic Stroke Associated with Vertebral Artery Dissections and Those Who Have Vertebral Artery Dissection Without any Types of Stroke

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Background and Purpose: In Japan, brain infarction associated with cerebral artery dissection occupies 0.4% of all stroke and 6.4% of stroke in young adult. Recent imaging technology have revealed vertebral artery dissection (VAD) isolated from any ischemic or hemorrhagic stroke. We investigated the clinical features of vertebral artery dissection with ischemic stroke and those without any stroke.

Methods: We studied clinical features of 54 patients (39 males, mean age 53 years) with unilateral VAD, 33 patient had ischemic stroke (IS group) and 21 patient did not have any stroke (Non IS Group), from July 2004 to October 2011.

Result: In the IS group, higher were systolic blood pressure (mean 153 vs. 138mmHg, P = 0.01), higher diastolic blood pressure (89 vs. 81mmHg, P = 0.03), serum glucose (116 vs. 95mg/dl, P < 0.01), plasma D-dimer (1.0 vs. 0.4 μg/ml), suffering dyslipidemia (63 vs. 33%, P = 0.03) than in the Non IS group. Multivariate analysis demonstrated that high serum glucose (OR,1.06; 95% CI,1.07–1.13, P < 0.01) and high plasma levels of D-dimer (OR,15.9; 95% CI,1.98–255.1, P < 0.01) were independently associated with ischemic event. In vascular imaging, the IS group had more frequently occlusive VAD (52% vs. 5%, P < 0.01) and vertebral lesions in non-dominant side of vertebral artery (82% vs 48%, P < 0.01) than the Non IS group.

Conclusion: It seems that the ischemic stroke with VAD is associated with higher values of glucose and D-dimer and vertebral lesions with occlusion and in the non dominant side.

Socioeconomic Impact of Stroke in Northwest India

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Background and Objective: We aimed to study the socioeconomic impact of stroke.

Method: This study was carried out in the Stroke unit and Neurology clinic at Christian Medical College and Hospital, Ludhiana, from April 2009 to October 2011. All consecutive first ever stroke patients were recruited after obtaining informed consent. At admission data collected include demography, socioeconomic status, and family structure, living situation, income and stroke characteristics. During 1 and 6 months follow-up the following details were obtained: outcome (modified Rankin Scale mRS), changes in living, work and financial situation.

Statistical Analysis: Chi-square and Fisher’s exact tests were used to study the relationship between categorical variables.

Results: 200 patients were enrolled in this study and 189 were included in the final analysis. The mean age was 58 ± 13 years and 128 (67.7%) were men. Out of 189 patients, 102 (54%) were living in a joint family and majority of the patients 137 (72.5%) had 2 or <2 earning members in their family. Seventy three patients (38.6%) were working full time prior to the stroke and 114 (60.6%) belonged to lower income category (≤Rs 15,000). Only 47 (25%) patients had health insurance. Majority 173 (91.5%) were living in their own house/flat. At 6 months follow-up the change in work situation was less (1 month 77.6% vs. 6 months 59%; p = 0.001). The need for support for stroke patients (1 month 63.3% vs. 6 months 38%; p = 0.001), the impact on care givers income (1 month 58.2% vs. 6 months 33%; p = 0.01) and the chances of taking loan (1 month 11% vs. 6 months 2%; p = 0.003) decreased at 6 months follow-up.

Conclusions: There is a socioeconomic impact of stroke; however the jointfamily system and the support from the relatives enable the stroke survivors to cope well.

Experience of Intraarterial Thrombolysis with Streptokinase in Acute Ischemic Stroke. Uzbekistan Results

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Background and Objectives: The high price of tissue plasminogen activator restricts its wide application in thrombolytic therapy of acute ischemic stroke (AIS). The purpose was to evaluate the efficacy and safety of intraarterial thrombolytic ther-
apy (IATT) with streptokinase in patients with AIS due to middle cerebral artery (MCA) occlusion.

Methods: Cerebral angiography (CA) was performed on «Philips Alura FD20». Standard Seldinger technique was applied in IATT. After angiographic detection of artery occlusion IATT with Streptokinase in dose 50000–200000 units was applied. 30 patients (17 male, 13 female, aged 22–85 years, average age 58 ± 14.8) were investigated. All patients were selected by National Institute of Neurological Disorders and Stroke recommendations. National Institutes of Health Stroke Scale (NIHSS) and modified Rankin scale (mRs) were used.

Results: MCA occlusion was detected by CA in all patients. NIHSS average score at admission was 14.7 ± 3.9, 286 ± 36.5 minutes elapsed from symptom onset. We observed clinical improvement of neurological symptoms. 8 patients (26.6% p < 0.001) had excellent outcome (mRs score 0 to 1), 17(56.6% p < 0.001) a good outcome (mRs score 2), 5-(16.6% p < 0.01) poor outcome (mRs score 3 to 4). In these patients brain ischemic zone was detected on control CT. In group with excellent and good outcomes 3 patients had asymptomatic hemorrhagic transformation (HT) with small petechiae along the margins of infarct zone.

Conclusions: IATT with streptokinase performed under CA control can be considered as effective and safe method in patients with AIS. Thrombolysis-related HT is a marker of successful re-canalization.

EP-12
Diverse Outcome of Thrombolysis for Acute Ischemic Stroke Patient with Atrial Fibrillation
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Background and Objectives: Atrial fibrillation (AF) related infarction was often severe and easier hemorrhagic transformation. We investigated clinical characters, image markers and patient outcome in stroke patients with and without AF post t-PA therapy.

Methods: We retrospective studied 116 ischemic stroke patients receiving t-PA. The patients were divided into two groups (AF and non-AF group). NIHSS scores was obtained before and 7 days after t-PA infusion. Brain CT was done before t-PA infusion and recorded dense artery sign and cortical effacement. The outcome at 7 days and 30 days was compared by Modified Rankin Scale (mRs).

Conclusion: Ischemic stroke patients with AF had more diverse outcome. Dense artery sign in brain CT was associated worse outcome and low NIHSS indicated good outcome.

EP-13
Growth Hormone Deficiency in Elderly Patients with Ischemic Stroke
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Introduction: Pituitary dysfunction is a known complication of traumatic brain injury and subarachnoidal hemorrhage. However there are few data about pituitary dysfunction as a complication of ischemic stroke.

Method: This study was designed as a retrospective observational study. The subjects were clinically hemiplegic individuals with a subacute ischemic stroke under 6 months in rehabilitation units in Pusan National University Hospital. We excluded the patients with decompressive cranioplasty and previous endocrine diseases such as hypopituitarism. Finally, Ten females over 65 years (mean age; 74.83 ± 6.40 years, Group A) and 11 postmenopausal females (mean age; 56.67 ± 4.93 years, Group B) were enrolled. We measured pituitary hormones, stroke severity and functional ability.

Results: In group A over 65 years old, five patients (50%) presented with some degree of pituitary dysfunction with decreased IGF-1, which of less than 175 mcg/L is a good clinical marker for growth hormone deficiency. Abnormal IGF-1 levels were found in 5 patients (45%) of group B. Functional abilities such as MMSE and mRs (modified Rankin scale) was not different between group A and B.

Conclusions: These results showed no significant prevalence of pituitary dysfunction in elderly patients with ischemic stroke. However, we suggest that patients who suffer from ischemic stroke should undergo pituitary testing, when considering the high prevalence of growth hormone deficiency of this study.

EP-14
A Case Study: The Use of Mirror Therapy in Stroke Case with Type 1 Complex Regional Pain Syndrome
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Background: Hemiplegic upper extremity is a common and disabling consequence of stroke that can lead to activity limitation. In addition to hemiplegic upper limb, it had been reported that there is an incidence of 12–32% stroke upper limb complicated with complex regional pain syndrome (CRPS). Common symptoms of CRPS include pain, joint stiffness, skin changes and edema. Stroke complicated with CRPS is challenging in rehabilitation. In order to treat stroke with CRPS, there is emerging evidence of mirror therapy that can improve both motor recovery of a hemiplegic upper limb and symptom relief of CRPS.

In this study, the effects of mirror therapy on a case with stroke and type 1 complex regional pain syndrome were investigated. The practical use and the effects of the treatment were examined.
EP-15
Effect of Spinal Pulsed Electromagnetic Field on Hmax/Mmax Ratio in Hemiplegic Patients After Stroke
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Background and Objectives: Stroke remains the leading cause of disability in industrialized countries and the main reason of functional impairments in activities of daily living that impairs muscle function and results in physical disabilities. Spasticity is the most important limitation in improvement of normal motor function that seen in more than 80% of subacute and 56% of chronic cases. Use of pulsed electromagnetic field on the spinal cord may affect hyperpolarization of neurons and neural plasticity. It also can decrease muscle hypertonecity and spasticity in hemiplegic patients after stroke.

Methods: The study was done on 30 hemiplegic patients with the age range of 40–60 which referred to Tabasom rehabilitation centre at least 6 months after the first occurrence of stroke. Grouping patients were done randomly and sequential by the time of referring. Patients were placed in one of three groups by lottery: test group (magnetotherapy+routine physiotherapy), sham group (placebo magnet+routine physiotherapy), control group (only routine physiotherapy). Each group consisted of 10 patients and all 3 groups had routine physical therapy program of lower limb (functional electrical stimulation for dorsi flexor muscles for 20 minutes, mat exercise in order to hypertonecity inhibition including rolling to both sides, quadruped position, kneeling, stepping and weight bearing on the affected side for 30 minutes treadmill walking for 10 minutes). Further this plan, test group was received pulsed electromagnetic field for 20 minutes in prone position. To evaluate the effectiveness of hypnosis in the treatment off magnet was used in sham group before the first treatment session and after the last treatment session and collected data were analyzed in SPSS 16.

Result and Conclusion: Although exact mechanisms of spinal cord stimulation is unknown, it is believed that stimulating dorsal part of epidural space provides complex electric field and may produce descending inhibitory signals in posterior column of spine.

EP-16
Fluoroscopic Investigation of Diaphragm Movement in Acute Stroke Patients
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Objective: It is unknown whether acute/subacute stroke affects functional properties of the diaphragm by disrupting corticospinal pathways. Dysfunction of the diaphragm may cause hypoventilation, and could result in hypoxia and pneumonia. Therefore, we investigated movement of the diaphragm in acute/subacute stroke patients by fluoroscopy.

Methods: The subjects were 7 first-ever stroke patients with unilateral involvement of the middle cerebral artery territory (males 5, females 2; mean age 64.71 ± 13.73 y; ischemic 4, hemorrhagic, 3; right hemiplegia 2, left hemiplegia 5; mild-moderate paralysis 4, severe paralysis 3: period from onset less than 30 days). Diaphragmatic excursion was measured by real-time X-ray fluoroscopy during quiet and deep breathing.

Results: There were no significant differences in the diaphragmatic excursion between the affected and unaffected sides during quiet or deep breathing. There were slight differences in patients between mild-moderate and severe paralysis on both sides.

Conclusions: The diaphragm on the affected side in acute/subacute stroke patients moved up and down during breathing as much as on the unaffected side, but the extent of the diaphragmatic excursion in patients with severe paralysis may be less than that in patients with mild-moderate paralysis.

EP-17
The Effect of Low-Frequency Repetitive Transcranial Magnetic Stimulation in Patients with Bilateral Hemiplegia
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Background: Recent studies suggest that both low-frequency repetitive transcranial magnetic stimulation (LF-rTMS) to the contra-lesional hemisphere and intensive occupational therapy (OT) may enhance the recovery of motor functions of patients with hemiplegia after stroke. LF-rTMS to the contra-lesional hemisphere reduced interhemispheric inhibition towards...
the lesional hemisphere, leading to facilitation of beneficial functional reorganization in the lesional hemisphere. However, the effect of LF-rTMS in patients with bilateral hemiplegia after stroke has not been fully elucidated yet. Here, we report two cases of bilateral hemiplegia patients for which LF-rTMS was applied after stroke.

**Materials and Methods:** LF-rTMS was performed in two patients with bilateral hemiplegia attributable to ischemic stroke of bilateral corona radiata. Patients were both male and aged 62 and 76 years. Both of two patients, a motor function of the left upper extremity were poorer than the right. LF-rTMS was performed in a chronic stage of stroke, 1 Hz rTMS targeted on the left primary motor area. Stimulus intensity was set at 90% of resting motor threshold of the first dorsal interosseus muscles. Each session consisted of 1300 pulses, and OT for 60 minutes. LF-rTMS and OT were repeated two sessions per day for two weeks. Motor function of upper extremity was assessed by Brunnstrom stage, Wolf motor function test (WMFT), Fugle-Meyer assessment (FMA) store, and The Simple Test for Evaluating Hand Function (STEF) before rTMS and after completion of two-week LF-rTMS.

**Results:** There were improvements of motor functions of left side in both patients; one patient showed improvement in all parameters and the other showed improvement in FMA score and WMFT. Both patients did not have adverse effects by rTMS.

**Conclusion:** Although this study is limited in number of patients and lacks in controls, our results suggest that LF-rTMS may be used in bilateral hemiplegia as well as hemiplegia.

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**EP-19**

**Effects of rTMS and Occupational Therapy on Upper Limb Function in a Hemiparetic Stroke Patient**

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**Background:** It has been reported that the excitability of ipsilateral corticospinal tract in contralesional hemisphere increased at voluntary contraction on the affected hand in patients with stroke hemiplegia, as compared with healthy subjects (Renner 2005). However, it was not clear about the relevance of the motor functional recovery in hemiplegic stroke patients. The purpose of this study was to investigate the effect of LF-rTMS and occupational therapy (OT) for the evaluation of ipsilateral motor evoked potential (ipsMEP) in contralesional hemisphere in a case of chronic stroke hemiplegia.

**Materials and Methods:** The patient was 50-years-old female who had been attacked by the left frontal intracerebral hemorrhage 72 months ago. 1 Hz rTMS was applied to the contralesional hemisphere over the primary motor area, and the intensity of stimulation was set at 90% of resting motor threshold. One session was rTMS consisted of 1300 pulses and OT in 60-min. Total sessions were thirty three sessions throughout during 21 days. The motor function was evaluated for the Fugl-Meyer Assessment (FMA), Wolf Motor Function Test (WMFT), and motor evoked potential (MEP) at resting and voluntary contraction. Each test was evaluated in before and after the invention.

**Results:** Pulp pinch force; 2.5, 5.0 kg, FMA score; 47, 58 points, WMFT performance time; 686, 447 sec, resting MEP amplitude; 147.4, 754.6 uV, voluntary contraction MEP amplitude; 359.8, 935.4 uV. The perception of the superficial sensation was improved.

**Conclusion:** It was considered that excitatory increase of ipsilesional M1 by the inhibition of contralesional M1 caused not only the improvement of the motor function for the plastic change of the corticospinal tract, but also of the somatosensory perception for the excitatory increase of primary sensory area (S1) by transcortical projection from M1 to S1. LF-rTMS and OT also might be effective in the improvement of sensory disturbance.
EP-20

Effect of Low Frequency Repetitive Transcranial Magnetic Stimulation and Occupational Therapy on Upper Limb Function in Hemiplegic Stroke Patients

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Background: It has been reported that the activity of the contralesional hemisphere reduced after low frequency repetitive transcranial magnetic stimulation (LF-rTMS), and the performance of the affected hand improved in patients with stroke hemiplegia (Nowak 2008). Also, the study has shown the efficacy of both LF-rTMS and intensive occupational therapy (OT) to motor functional recovery (Kakuda 2010). However, there were few reports that examined the plastic change of ipsilesional hemisphere neurophysiologically. The purpose of this study was to investigate the effect of LF-rTMS and OT for the evaluation of motor function and motor evoked potential (MEP) in patients of chronic stroke hemiplegia.

Methods: Subjects were seven patients with chronic stage stroke hemiplegia who could be obtained informed consent. 1 Hz rTMS was applied to the contralesional hemisphere over the primary motor area (M1), and the intensity of stimulation was set at 90% of resting motor threshold. One session was rTMS consisted of 1300 pulses and OT in 60-min, and each patient received twenty two sessions throughout during 14 days. The measures for motor function of affected hand before and after the treatment were the Fugl-Meyer Assessment (FMA), the performance time of Wolf Motor Function Test (WMFT), and MEP at voluntary contraction. We compared the mean of each measurement before and after the treatment. Statistical analysis was assessed by means of Paired t-test with the significance threshold set at P 0.05.

Results: WMFT log performance time decreased, and also FMA and MEP amplitude increased significantly after the treatment, relative to the respective values before it (P 0.05).

Conclusion: The motor function improved and the MEP amplitude increased significantly after the intervention. From the result, it was suggested that LF-rTMS and OT might be provided the plastic change of neurergic excitability including M1 in ipsilesional hemisphere.

EP-21

Hyperthyroidism & Dysphagia in a Post Stroke Patient – A Speech Language Pathologist’s Insight

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Background and Objective: Dysphagia is well believed to be commonly caused by Neurogenic and Organic Etiologies. However, in cases where there are no ascertaining etiologies, understanding the nature of dysphagia becomes an enigma which denies effective intervention. The objective of this report is to highlight the fact that dysphagia could also be caused by hyperthyroidism and the importance of considering thyroid status for understanding unexplained dysphagia in patients with stroke.

Case Report: A 61 year old man, with left thalamic hemorrhage who exhibited clinically normal speech and swallowing in the initial evaluations, developed sudden dysphagia with speech and cognitive decline, muscle weakness, tremors and ptosis after 2 months post stroke. Subsequent dysphagia assessment revealed severe swallowing dysfunction and was advised to continue enteral feeding. Dysphagia therapy showed no significant improvement. Neurological examination showed no new infarctions or infections in the patient. On SLP physical examination, a mass was felt bilaterally in the anterior neck regions and Thyroid Function Test (TFT) was requested. TFT revealed hyperthyroidism. Dysphagia began to ameliorate significantly with Thyroid treatment.

Discussion: Hyperthyroidism is associated with adverse cardiovascular events including stroke. Dysphagia secondary to stroke is common whereas secondary to thyrotoxicity is rare which made the profile of our patient. Dysphagia in such cases could be caused by muscle atrophy secondary to thyrotoxicosis which causes disturbances in the neuromuscular function and Oropharyngeal peristalsis.

Conclusion: Understanding the nature of dysphagia helps in planning effective intervention and aids in clinical decision making regarding mode of feeding the patients. Dysphagia arising from Hyperthyroidism often presents atypically and is easily overlooked but when treated is highly responsive. In light of this clinical experience we recommend thyroid function tests in unexplained dysphagia.
EP-22

Acute Cerebral Aneurysm Re-Bleeding During CT Angiography

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Re-bleeding from a ruptured cerebral aneurysm often causes severe disability or even death. The purpose of this study is to identify the clinical characteristics and radiological features of patients with subarachnoid hemorrhage (SAH) who had active contrast extravasation during CT angiography (CTA).

We have retrospectively reviewed 103 consecutive cases of aneurysmal SAH treated in the past three years. Active extravasation of contrast medium during 3-dimensional CTA was observed in 3 cases.

In those cases, the intervals between the initial onset of SAH and re-bleeding during CTA were 35, 55, and 90 minutes. The incidence was 8.8% in 34 cases in which CTA was done within 2 hours.

Their pre-CTA neurological status had not been bad (WFNS grade 2). Rapid deterioration occurred in two cases: 30 minutes after CTA in a ruptured ACA aneurysm case and after 50 minutes in a PCA aneurysm case.

In an MCA aneurysm case, no significant deterioration was seen, and the extravasation could not be definitely diagnosed by reconstructed images of the arterial phase alone. The finding of expansion of extravasated contrast medium in the venous phase was helpful.

One patient died quickly; the other two underwent surgery, and their final modified Rankin Scale scores were 4 and 5.

Discussion: Aneurysmal re-bleeding can occur during CTA in a hyperacute stage, and is not necessarily accompanied by immediate clinical deterioration. Comparison of an early phase with a late phase is important in obtaining a correct diagnosis of contrast extravasation in CTA.

EP-23

Combined Treatment with OA-PICA Bypass for the Aneurysm of the Vertebral Artery and Its Branches

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Background: Complex aneurysm of the posterior circulation can be treated with clipping surgery or endovascular coiling. However, several numbers of patient with complex aneurysm will not ineligible for conventional treatment and these patients require alternative strategy such as combined treatment. Here, the authors report their experiences with six consecutive cases of this kind of aneurysm and discuss a significant role of bypass technique for treatment of these complex aneurysms.

Methods: During the past 6 years, 7 cases of aneurysm arising from vertebral artery or its branches were treated with OA-PICA bypass. In this study, we analyzed clinical information, characteristics of aneurysms and results of operation.

Results: There are three VA aneurysms and four PICA aneurysms. Four of them were ruptured aneurysms. And two cases were recurrent aneurysms after endovascular embolization. OA-PICA bypass was performed before clipping or trapping of the aneurysm in all patients. Postoperative angiography revealed patent OA-PICA bypass in 6 patients (86% success rate for bypass). And aneurysms were completely obliterated in four cases. Two of three residual aneurysms were treated with additional endovascular coiling after the operation. All patients recovered without neurologic deficits postoperatively.

Conclusion: An OA-PICA bypass with trapping of aneurysm is an important technique for treatment of complex aneurysm of the vertebral artery or its branches.

EP-24

Endovascular Coil Embolization Assisted with Enterprise Stent for Wide-Necked Unruptured Intracranial Aneurysms: Safety and Efficacy

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Background and Objectives: The objective of this study was to evaluate its safety and efficacy of stent-assisted coil embolization for wide-necked unruptured intracranial aneurysms (UIAs) based on the results observed in consecutive patients in a single center.

Methods: This study included 116 patients (male 29, female 87, mean age; 55.4 years) with 121 UIA lesions who were treated by means of stent-assisted coil embolization from November 2008 until December 2010. A single stent type (Enterprise, Johnson & Johnson) was used. The clinical and radiological results were evaluated. Results) Embolization was successful without complications in 94% of patients. Six patients had procedure-related thromboembolic events resulting in neurologic symptoms in 4 cases, and transient angiographically visible asymptomatic thromboembolism in 2 cases. Angiographic aneurysm occlusion was complete in 30.5%, small neck remnant in 49.5%, and residual contrast filling in 19.8%. Dual antiplatelet agents were given at least for 6 months. Thromboembolic stroke developed in 3 patients during follow-up. All occurred after discontinuation of clopidogrel and/or aspirin. Magnetic resonance angiography (MRA) follow-up was performed at least 6 month after the coiling on all patients. The mean follow-up duration was 13.4 months (range 6–34 months). Eight patients (6.6%) demonstrated recanalization in MRA. Recoiling was performed in 1 patient (0.8%). The other 7 patients with a minor recanalization were conservatively followed.

Conclusions: Enterprise stent-assisted coil embolization for the treatment of UIAs appears to be effective and safe. Future studies including controlled prospective trials and careful follow-up are required to assess its indications and efficacy on a long term basis.
**EP-25**

**Estrogen Deficiency Reduces Cellular Structural Protein Synthesis in a Cell Model of Aneurysm in Postmenopausal Women**

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**Background and Objective:** The higher incidence of subarachnoid hemorrhage in menopausal and postmenopausal women is associated with greater rate of aneurysm rupture in this population. This may related to the lack of 17ß-estradiol that induces protective effects to cerebrovascular system. This study aims to examine the interactions between 17ß-estradiol and its receptors in a cell model of aneurysm.

**Methods:** Estrogen receptor alpha (ERα), estrogen receptor beta (ERβ) and G protein coupled estrogen receptor (GPER) were identified immunocytochemically in human cerebral vascular endothelial cells. The interaction between 17ß-estradiol and its receptors was assessed using proximity ligation assay. Proteomic analysis was performed to examine protein expression profiles in comparison of normal and estrogen deficiency conditions.

**Results:** ERα, ER β and GPER were identified in nucleus, cytoplasm and cell membrane. The interaction between 17ß-estradiol and the receptors were in a dose-depend manner. The expression of cellular structural proteins (vimentin, epiplexin, plectin, talin-1, and alpha actinin-1 and 4) declined in estrogen deficiency condition.

**Conclusion:** Our findings suggest that lack receptors signaling in estrogen deficiency may lead to decline in the synthesis of cellular structural proteins, and contributing to aneurysm formation. Identification of estrogen receptor subtypes, and their signaling networks in human cerebral vascular endothelial cells offers the potential to develop estrogen-like compounds with greater specific action on the cerebral vascular system, without the estrogen-dependent effects on reproductive organ, to prevent brain aneurysm in menopausal and postmenopausal women.

**EP-26**

**A Report for the Successful Treatment of Blood Blister-Like Aneurysm in Internal Carotid Artery by Trapping with High-Flow Bypass**

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**Objective:** Blood blister-like aneurysm is known to occur rarely, accounting for 0.4–2.7% of intracranial aneurysm. Although it occurs rarely, as a neurovascular surgeon, there will be the moment to encounter this disease entity. On the other hand, its difficulties lying in thin, fragile wall and poorly defined neck render the treatment to be challenging.

The authors report the experience of this condition with successful following treatment.

**Case Report:** A 38-year-old male patients transferred from other hospital with sudden-onset of severe headache. On admission, the patient exhibited no neurological deficit except for somnolent consciousness. CT scan showed diffuse subarachnoid hemorrhage (SAH) and a large hematoma in both frontal base accompanying intra-ventricular hemorrhage in 4th ventricle (Fisher Grade 4). Cerebral angiography revealed a 3.3 x 1.5 mm aneurysm at non-branching sites in the supraclinoid portion of the right internal cerebral artery (ICA). A preoperative hemodynamic evaluation of the cerebral circulatory collateral capacity was performed by means of balloon occlusion test with SPECT and demonstrated very lack of reservoir capacity. Four days after admission, the patient underwent trapping/extra-crani-intracranial (EC-IC) bypass using saphenous vein graft. During surgery, partial frontal lobectomy was required for controlling the intracranial pressure both for operation and post-operative period care. After surgery, the patient maintained in sedative state for 7 days for lowering brain metabolism, thus preventing ischemia. The patient made an uncomplicated recovery for the surgery and underwent an uneventful clinical follow-up for more than 7 months.

**Conclusion:** here, the authors emphasize the value of trapping of an ICA aneurysm combined with high-flow EC-IC bypass for the definitive treatment of blood blister-like aneurysm.

**EP-27**

**Retrospective Survey about Complication and Patient Satisfaction after Endovascular Coil Embolization for Unruptured Intracranial Saccular Aneurysm**

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**Background Objective:** The purpose of this study was to evaluate the complications and to determine patient satisfaction after endovascular treatment for unruptured intracranial saccular aneurysms (UIAs).

**Methods:** This retrospective study was approved by the institutional review board. During the period between Aug. 2008 and Sep. 2012, 125 patients were treated by endovascular embolization for unruptured intracranial saccular aneurysms. After informed consent was obtained, 112 patients were sent a questionnaire regarding treatment effectiveness and patient satisfaction.

**Results:** The response rate was 87.5% (98/112). Endovascular coil embolization was completed in 98 aneurysms. Procedure-related complications occurred in 10 aneurysms (10.2%): 6 ischemic, 3 hemorrhagic and 1 other. Other complications occurred in 30 patients (30.6%): 17 alopecia, 15 bleeding tendency and 3 inguinal hematoma. In all, 89 (90.8%) patients reported being satisfied with their treatment. Patient satisfaction was closely correlated with clinically successful long-term outcome of treatment.

**Conclusions:** Endovascular coil embolization for unruptured intracranial saccular aneurysms is an effective and safe procedure, with high clinical success rate and degree of satisfaction.
**EP-28**

**Multiple Intracranial Aneurysms Associated with Behcet’s Disease: A Case Report**

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**Background and Objectives:** Behcet’s disease is a multisystem inflammatory disorder characterized by recurrent oral and genital ulcers and also uveitis. Its origin is still unknown, but vasculitis is the major pathologic characteristic. The common vascular lesions associated with Behcet’s disease are aneurysm formation, arterial or venous occlusive diseases, and varices. Arterial aneurysms mostly occur in the abdominal aorta, femoral arteries and in the pulmonary arteries. But, intracranial aneurysms with behcet’s disease are extraordinarily rare lesions.

**Methods and Results:** In our case, we present a 41-year-old female patient with behcet’s disease who suffered severe headache due to subarachnoid hemorrhage and her brain computed tomography showed multiple aneurysms. We also present a wide literature review of intracranial arterial aneurysms associated with behcet’s disease.

**Conclusion:** In spite of the rairity of Behcet’s disease, we should not underestimate this critical disease and adequate choice is needed.

**EP-29**

**Therapeutic Strategies of Sylvian Fissure Arteriovenous Malformation**

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**Background and Objectives:** Arteriovenous malformation (AVM)s related to the sylvian fissure are difficult to manage surgically. The purpose of this study is to report our experiences in sylvian fissure AVMs.

**Methods:** From October 1999 to December 2012, 16 patients with sylvian fissure AVM were treated (11: microsurgery, 3: microsurgery + endovascular embolization, 2: microsurgery + stereotactic radiosurgery). Preoperative status was assessed by Spetzler-Martin Grade, and the postoperative result was evaluated by modified Rankin scale.

**Results:** Complete removals of the AVMs were confirmed with postoperative angiography in all cases. Morbidity and mortality related to the treatment were 12.5% and 0%. Within 6 month, all patients were functioning independently without newly developed neurological deficits. 11 patients who had preoperative neurological deficits improved postoperatively.

**Conclusion:** In the treatment of sylvian AVMs, we should consider multimodality approach and adequate choice is needed for the satisfactory outcome.

**EP-30**

**Incidental Middle Cerebral Artery Aneurysm Operation Through Small Temporal Craniotomy and linear Scalp Incision**

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**Objective:** Middle cerebral artery bifurcation aneurysm (MCAB) locate in superficial area from brain cortex and can do clipping with dissection of distal sylvian cistern without basal cistern opening. The authors try to clipping of incidental MCAB aneurysm through Small Temporal Craniotomy and linear Scalp Incision.

**Methods:** The authors have operated on consecutive 25 cases of incidental MCAB aneurysms using this surgical method from 2009 to 2012. Scalp incision with temporalis muscle start from 1cm below anterior temporal hair line upward to 8–10cm along the shenoid ridge. Then, about 3cm mini-roung bone flap with one burr hole is made. After reflection of round dural flap, dissection of sylvian fissure was proceeded just 1/3 of distal sylvian cistern. MCAB or M2 segment is located at that area. Clipping of aneurysm is the same as conventional aneurysmal clipping procedure.

**Results:** Excellent postoperative neurological conditions were achieved without any morbidity or mortality. In one case, temporary wrinkling disturbance of forehead appeared due to frontal branch injury of facial nerve.

**Conclusion:** This operative technique provide an adequate space to access the MCAB aneurysm and offer better approach related morbidity than conventional pterional approaches in the treatment of incidental MCA aneurysms. This approach is best choice of clipping of incidental MCAB aneurysm.

**EP-31**

**Cisternal Irrigation Therapy Against Cerebral Vasospasm After Aneurysmal Subarachnoid Hemorrhage: The SIMC Experience**

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**Background and Objective:** Cerebral vasospasm (CVS) after subarachnoid hemorrhage (SAH) remains as a major cause of morbidity. Cisternal irrigation is one of therapeutic options after surgical intervention, and has been reported to be effective to prevent cerebral vasospasm. The purpose of this study was to access the our therapeutic results of cisternal irrigation therapy after surgical repair for aneurysmal SAH.

**Methods:** The medical chart of 246 patients with subarachnoid hemorrhage who underwent both acute craniotomy for ruptured aneurysm repair and cisternal irrigation with mock CSF con-
Remote Cerebellar Hemorrhage After Clipping of Intracranial Aneurysm in Old Patients
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Remote cerebellar hemorrhage (RCH) following supratentorial surgery is a rare complication but is not unfamiliar one anymore. Most of patients with RCH after supratentorial surgery has a benign clinical course, but some of them bring about significant neurological morbidity or mortality. Although the exact pathomechanisms leading to RCH are still not definitely understood, there is growing consensus about central role of substantial cerebrospinal fluid (CSF) loss during surgery and venous hemorrhage in origin.

We present three cases of RCH after clipping of intracranial aneurysm in older patients with a benign clinical. In addition to perioperative loss of CSF, preexisting hypertension and brain atrophy could influence the occurrence of RCH in older patients.

Cerebral Revascularization for Treatment of Complex Intracranial Aneurysm
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Introduction: Either microsurgical clipping or endovascular coiling is the standard treatment strategy of intracranial aneurysms. However, in complex situation such as giant or dissecting aneurysms, revascularization surgery is very useful method to complete the treatment of aneurysms. In this study, the safety and efficacy of revascularization surgery in the patients with complex aneurysms were evaluated retrospectively.

Material and Method: We retrospectively reviewed 42 cerebral aneurysms that were unable to be clipped or coiled alone from January 1995 to December 2012. Most aneurysms (33/42, 79%) were large or giant sized and 54.7% (23/42) had non-saccular morphology. Common locations included the middle cerebral artery (19/42, 45%), internal carotid artery (13/42, 31%), posterior circulation (8/42, 19%), and anterior cerebral artery (2/42, 5%).

Results: Thirty-three patients (78.5%) received extracranial-intracranial (EC-IC) bypasses and 9 patients (21.5%) received intracranial-intracranial (IC-IC) bypasses; including 18 pedicle bypasses, 15 interposition bypasses (saphenous vein graft in 12, radial artery graft in 2, superficial temporal artery graft in 1) and 9 in-situ bypasses. Follow-up angiographic imaging was not performed in four patients; two patients died and two patients were lost after discharge. Total bypass patency rates were 89.5% (34/38); acute graft failure was developed in two, and late graft failure in two. One patient died and 2 patients were permanently disabled as a result of complications related with operation (surgical mortality, 2.4%). At late follow-up (mean duration, 28 months), good outcomes (Glasgow Outcome Scale score 5 or 4) were measured in 36 patients (86%) overall.

Conclusions: Cerebral revascularization is an effective treatment tools for complex intracranial aneurysms that are unable to be clipped or coiled alone. Also continuous training of vascular neurosurgeons for bypass surgery is needed to treat complex aneurysms with acceptable complication rate.
but he is suffering mild visual field defect (right homonymous hemianopsia).

**Conclusion:** We report a rare case of a recurrent ICH caused by a transverse-sigmoid sinus DAVF, which was successfully treated microsurgically.

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**EP-35**

**Endovascular Treatment of Ruptured Dissecting Vertebral Artery Aneurysms Benefits of Acute Stage Parent Artery Embolization**

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**Introduction:** The purpose of this study is to evaluate the effect of acute stage endovascular treatment of ruptured vertebral artery dissecting aneurysms (VADA) and the predictors of outcomes.

**Clinical Material and Methods:** Between April, 2005 and September, 2012, we treated 33 patients with ruptured VADA by endovascular internal vertebral artery trapping in our hospital. There were 16 males and 14 females with a mean age of 58.5 years (age range, 32–91 years). The location of dissecting artery were distal to posterior inferior cerebellar artery (PICA) (n = 21), proximal (n = 8), and involved PICA (n = 4).

**Results:** Complete obliteration of dissecting aneurysms (internal trapping) was achieved in 31 (93.9%) of 33 patients and 2 cases revealed recanalization. 4 cases of PICA–involved type underwent balloon occlusion test and sufficient collateral flow from superior cerebellar artery (SCA) was identified. Clinical outcomes were favorable (mRS 0–2) in 18 (54.5%), 7 (21.2%) had severe disability, and 8 (24.2%) patients died. Risk factors related to outcomes were: preoperative Hunt-Hess, World Federation of Neurological Surgeons scale, presence of hydrocephalus, presence of low cranial nerve palsy, rebleeding, and time of endovascular procedures. Acute stage embolization did not affect clinical outcome, but reduced the risk of rebleeding and inpatient stay.

**Conclusion:** In our experience, internal trapping of the dissected segment with a coil prevented rebleeding safely and effectively without significant procedural complications, and had a good follow-up outcome.

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**EP-36**

**Image-Based Computational Simulation of Flow Dynamics in Intracranial Aneurysms for Clinical Application**

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**Background and Objective:** Hemodynamics is a fundamental factor in the formation, progression and rupture of intracranial aneurysms. However, hemodynamic parameters of interest are difficult to measure in vivo. Our objective was to demonstrate that computational fluid dynamics (CFD) combined with three-dimensional (3D) digital subtraction angiogram (DSA) can provide such hemodynamic information in a patient-specific manner.

**Methods:** A 63-year-old woman presented with symptoms due to a giant unruptured ophthalmic internal carotid artery (ICA) aneurysm. A 47-year-old woman presented with symptoms due to a small unruptured left cavernous segment ICA aneurysm. Both patients were examined by a biplane 3D DSA machine, which provided high resolution volumetric image data from which the lumen geometry was extracted and 3D vascular tree was constructed. The image data and a representative flow rate waveform were provided as boundary conditions for CFD simulation of the 3D pulsatile velocity field in the aneurysms.

**Results:** The pulsatile blood flow fields in two different aneurysms were obtained. CFD analysis revealed that the patterns of flow velocity and wall shear stresses in the giant and the small aneurysms were different. High speed flow was found entering the aneurysm at the distal end of the neck in the giant aneurysm, which produced high wall shear stresses on the aneurysm sac wall on that side. However, in the small aneurysm, both blood flow speed and wall shear stress were less than the normal adjacent vessel. Higher vorticity values were found in the giant aneurysm, while lower in the small aneurysm. Detailed comparisons were performed.

**Conclusion:** The image-based CFD analysis was used to provide key hemodynamic information for prospective studies of aneurysm growth and rupture in both giant and small intracranial aneurysms. Such detailed information may be useful for the surgical management, endovascular planning, and treatment of intracranial aneurysms.

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**EP-37**

**Secondary Hemorrhage and Blood Auto-Aggressive Reaction in Clinical Stroke**

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**Aim:** Study aimed at establishing the significance of blood immune response for matrix metalloproteinase-9 (MMP-9) expression and for secondary hemorrhage in acute ischemic stroke.

**Patients and Methods:** A total of 35 acute ischemic stroke patients were studied. Patients were selected with initial NIHSS = 15. Control comprised 15 age-matched healthy individuals. Visualization performed by conventional CT on admission and on 7th day of stroke. Risk-factors of stroke studied retrospectively.

At 24th hour of stroke the blood immune reaction studied in the mixed culture of autologous lymphocytes (MCAL). The number of blast-transformed lymphocytes calculated in light microscope. Plasma levels of MMP-9 detected by enzyme-linked immunosorbent assay (ELISA). Data processed by non-parametric statistics.

**Results:** Secondary CT scanning found the hemorrhagic transformation of ischemic brain in 6 cases among 14 patients with grave course of disease (NIHSS>15 against NIHSS ≤15 at 7th day)
and with significantly high blood level of MMP-9 against other patients \((p < 0.05)\) and control \((p < 0.01)\). Blood count of blast-transformed lymphocytes in MCAL found to be elevated in patients with grave course of stroke against other patients and control \((p < 0.05)\). Spearman’s rank correlation showed the positive relationship between the blood number of blast-transformed lymphocytes in MCAL and blood MMP9 content at 24 hours of stroke \((r = +0.37, p < 0.05)\). Multivariate logistic regression found the significance of chronic social stress for mean predicted probability of blood auto-aggressive response in clinical stroke \((p < 0.05)\).

**Conclusion:** Blood auto-aggressive response in acute stage of ischemic stroke positively correlates with blood high MMP-9 expression and with secondary hemorrhage.

### EP-38

**Protective Effect of Artemether on Focal Cerebral Ischemia in Rats**

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**Background:** Cerebral ischemia, a cerebrovascular accident, is characterized by a sudden functional loss of a particular part or region of the brain, due to impaired cerebral blood supply. It is either caused by occlusion or hemorrhage in one of the main artery supplying blood to the brain. Cellular membrane is vulnerable to the oxidation by reactive oxygen species because of high concentration of unsaturated fatty acids in their lipid components. ROS generation promote highly damaging hydroxyl radical activity after transient brain ischemia in the rat. ROS mediated injury contributed to brain damage Oxidative stress also affects the blood brain barrier integrity. So, Lipid peroxidation is major factor in the pathophysiology of ischemia.

**Objective:** The aim of this study was to observe the neurological protective effects of artemether on focal cerebral ischemia-reperfusion (I/R) injury in rats.

**Method:** Male SD (250 &plusmn; 20g) rats received right middle cerebral artery occlusion for 60 min and artemether was administered prior and post to ischemia. The rats were decapitated 24hrs after reperfusion. The neurological deficit score, infarct volume of brain, brain water content and blood brain barrier integrity were measured; malondialdehyde (MDA) level and GSH (Glutathione) level in serum in brain were detected after administration.

**Result:** Artemether significantly reduce the neurological deficit score; infarct volume, blood brain barrier dysfunction, decrease brain water content, MDA content and increased the level of the antioxidant enzyme glutathione (GSH).

**Conclusion:** These finding suggest that artemether has protective effect on cerebral ischemia in rats.

### EP-39

**Platelet Inhibition by Adjunctive Cilostazol in Patients of Carotid Artery Stenosis Treated with Carotid Artery Stenting**

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**Background and Objective:** Optimal antiplatelet inhibition is essential in patients carotid artery stenosis undergoing carotid artery stenting (CAS). Clopidogrel resistance was associated with increased periprocedural thromboembolic complications from neurovascular stent-placement procedures. The addition of cilostazol on dual antiplatelet therapy has been reported to reduce platelet reactivity and to improve clinical outcomes after percutaneous coronary intervention in previous studies. This study was undertaken to evaluate the impact of adjunctive cilostazol in patients with CAS.

**Methods:** Platelet function was assessed by light transmittance aggregometry, VerifyNow assay. Sixty four consecutive patients underwent CAS, received clopidogrel (75mg daily) and aspirin (100mg daily) more than 4 weeks before treatment. Between 2010 and 2011 (period 1), 28 patients underwent CAS under standard dual antiplatelet medication despite of the value of preoperative platelet function. Between 2011 and 2013 (period 2), 36 patients were prospectively assessed preoperative platelet function and receive adjunctive cilostazol (200mg daily; triple antiplatelet therapy) in patients with clopidogrel resistance \((n = 13)\) before the treatment. Frequencies of new ipsilateral ischemic lesions on diffusion-weighted imaging a day after CAS and ischemic or hemorrhagic events within 30 days were assessed.

**Results:** Clopidogrel resistance developed in 12 patients (43\%) in period 1 and 13 patients (36\%) in period 2 \((P = 0.615)\). In period 2, adjunctive cilostazol significantly decrease of P2Y12 reaction units and % inhibition before and after cilostazol addition \((P = 0.006, P = 0.004, \text{respectively})\) and there was significant difference in P2Y12 reaction units between the groups. New ipsilateral ischemic lesions were significantly suppressed in period 2 \((2 of 36 patients; 5.6\%) \text{than in period 1} (7 of 28 patients; 25\%, P = 0.034), however, there was no significant difference in hemorrhagic and thromboembolic event between the groups.

**Conclusions:** Adjunctive cilostazol (triple antiplatelet medication) reduces the rate of clopidogrel resistance and intensifies platelet inhibition as compared with standard dual antiplatelet medication group.
EP-40
One-Year Outcome of Young Adults with Lateral Medullary Infarction
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Objective: Few studies have compared stroke mechanisms and prognosis in lateral medullary infarction (LMI) between young and old patients. Here, we investigated the differences in risk factors, etiologies, and prognosis between young and old patients with LMI.

Methods: Patients with acute LMI who were admitted within 7 days from symptom onset were investigated. Neurological outcomes were measured using Barthel Index (BI) and Modified Rankin Scale (mRS) at 3 months and at 1 year. We performed magnetic resonance (MR) or conventional angiography to evaluate vascular pathologies.

Results: Of the 106 patients included in the study, 37 were considered young patients (age, 18–59 years) and 69 were considered old patients (age, 60≥ years). The most common etiologic mechanism observed in this study was large artery atherosclerosis, which was observed in both the groups (young group, 45.9%; old group, 75.4%). Arterial dissection and small vessel occlusion were common in the young age group (29.7% versus 2.9% in dissection; 24.3% versus 8.7% in small vessel occlusion). Pneumonia was significantly high in the unfavorable group (p = 0.009). Multivariable logistic regression identified age (OR = 1.06; 95% CI = 1.01–1.12) as a significant predictor of favorable outcome (mRS ≤1) at 1 year.

Conclusions: This retrospective study suggests that young patients with LMI have an improved clinical outcome, and arterial dissection and small vessel disease are frequent vascular pathologies in young patients.

EP-41
Inter-Observer Reproducibility of Signal Intensity Ratio on MR Angiography to Evaluate Hemodynamic Significance of Intracranial Arterial Stenosis
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Background and Objectives: Changes of signal intensities (SIs) across intracranial arterial stenosis (ICAS) on magnetic resonance angiography (MRA) may reflect hemodynamic impact of the lesion. We evaluated the inter-observer reproducibility of an index termed signal intensity ratio (SIR), developed in a previous study to represent the changes of SIs across ICAS on MRA.

Methods: Symptomatic ICAS on MRA were retrospective recruited. Two observers respectively evaluated the images and calculated the SIR as follows, blinded to each other’s readings: SIR = (mean post-stenotic SI – mean background SI)/ (mean pre-stenotic SI – mean background SI). Statistical analyses were performed to evaluate the inter-observer reproducibility of this index.

Results: A total of 102 symptomatic ICASs were enrolled, with 36 (35.3%) lesions of 50–69% MRA stenoses, and others being 70–99% stenoses or flow void on MRA. Overall, mean SIRs were not significantly different between the two observers (0.92 ± 0.17 versus 0.93 ± 0.17; mean difference −0.006 ± 0.09; P = 0.496 for paired t-test). Pearson correlation coefficients were >0.80 for all analyses, indicating strong linear correlations between SIRs by the two observers. Bland-Altman analysis for SIRs of all cases showed no systematic bias between the two observers. For different cut-points ranging from 0.75 to 1.00, the kappa statistics were mostly >0.6 and inter-observer agreements were all >80%, implying substantial agreement between observers.

Conclusion: SIR was demonstrated to be highly reproducible between observers in the present study. Future studies are warranted to further explore the role of this index in comprehensive evaluation and risk stratification of symptomatic ICAS.

EP-42
New Impact of Hyperuricemia and Chronic Kidney Disease for the Patients with Carotid Endarterectomy
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Background and Purpose: Uric acid is the product of purine metabolism. It is known that hyperuricemia, defined as high level of blood uric acid, is the major etiological factor of gout. A number of epidemiological reports have increasingly linked hyperuricemia with cardiovascular and neurological diseases. Chronic kidney disease (CKD) is an important risk factor for development and progression of atherosclerosis. The objective of the current study was to investigate the contribution of hyperuricemia and chronic kidney disease to hyperperfusion syndrome (HPS) after carotid endarterectomy (CEA).

Methods: Between 2008 and 2012, 60 patients undergoing CEA were included in this study. Hyperperfusion syndrome was defined as a hemorrhagic neurological deficit (or seizure) occurring after cerebral revascularization, localized ipsilateral to the treated artery (Coutts et al.2003). Over 7.5mg/dl of blood uric acid was defined as hyperuricemia. Chronic kidney disease was defined as an eGFR under 60. We compared these factors between HPS and non-HPS together with other risk factors (hypertension, hyperlipidemia, and diabetes mellitus).

Results: Hyperuricemia was observed in 28.3%(17/60) of the patients. Chronic kidney disease was observed in 16.7%(10/60) of the patients. Hypertension, hyperlipidemia, and diabetes mellitus were observed in 66.7%(40/60), 75%(45/60), 31.7%(19/60). Hyperperfusion syndrome was observed in 8.3%(5/60). In HPS group, all patients (100%, 5/5) suffered hyperuricemia, CKD, and hypertension (21.8%, 9%, 63% in non-HPS group). Hyperlipidemia, and diabetes mellitus were observed in 60%(3/5), and 20%(1/5) in HPS group (76.3%, 32.7% in non-HPS group).
Conclusions: Patients with hyperuricemia, CKD and hypertension increased the risk for HPS after CEA. We suggest more strict postoperative management should be needed against these patients.

EP-43
Association between MIF Gene Polymorphisms and Carotid Artery Atherosclerosis
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Background and Objectives: Atherosclerosis is a chronic inflammatory disorder. Macrophage migration inhibitory factor (MIF) is a potent cytokine that plays an important role in the regulation of immune responses. Polymorphisms including five- to eight-repeat CATT variants ((CATT)5–8) and G-173C in the promoter region of the MIF gene are associated with altered levels of MIF gene transcription. The purpose of the study is to investigate the relationship between promoter polymorphisms of the MIF gene and the severity of carotid artery atherosclerosis (CAA).

Methods: The severity of CAA was assessed in 593 individuals with a history of ischemic stroke by using sonographic examination, and the MIF promoter polymorphisms of these individuals were genotyped.

Results: The carriage of (CATT)7 (compared to genotypes composed of (CATT)5, (CATT)6, or both), carriage of C allele (compared to GG), and carriage of the haplotype (CATT)7-C (compared to genotypes composed of (CATT)5-G, (CATT)6-G, or both) were significantly associated with an increase in the severity of CAA.

Conclusion: Polymorphisms in the MIF gene promoter are associated with CAA severity in ischemic stroke patients. These genetic variants may serve as markers for individual susceptibility to CAA.

EP-44
Is It Justified to Perform Intraoperative Neurophysiological Monitoring of Carotid Endarterectomies
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Background and Objectives: Carotid endarterectomy reduces the risk of recurrent stroke for patients with haemodynamically significant carotid stenosis when compared to medical treatment, but the benefit is dependent on a low perioperative stroke and mortality rate. The use of intraoperative monitoring aims to decrease the incidence of perioperative stroke by detecting hypoperfusion during operation, and guide decision for shunt placement to reduce the risk of cerebral ischaemia.

The carotid endarterectomies in our hospital uses selective shunting based on intraoperative monitoring by electroencephalography (EEG) and transcranial Doppler (TCD). The aim of this study is to review the outcome of our carotid endarterectomies and to determine whether the provision of such labour intensive monitoring is justified to reduce the perioperative complication of stroke.

Methods: This was a retrospective review of the 52 consecutive carotid endarterectomies performed from 1999 to June 2011, all performed under general anaesthesia. The main outcome measures were the occurrence of significant changes on EEG or TCD monitoring to warrant shunting or modification of the procedure, and the immediate perioperative stroke rate.

Results: 37 endarterectomies had both EEG and TCD monitoring, and 15 with EEG monitoring only. Three patients (5.8%) had intraoperative EEG / TCD changes suggestive of significant hypoperfusion which resulted in shunting or modification of the operation. None of these patients developed perioperative stroke. 49 patients had no significant changes on monitoring, two of which had immediate postoperative stroke but were not massive perfusion related stroke ipsilateral to the territory of the clamped ICA.

Conclusion: We conclude that it is justified for intraoperative monitoring to be done in our hospital to decrease the risk of stroke for carotid endarterectomies performed under general anaesthesia, since it is shown to be useful to prevent perioperative stroke due to haemodynamic insufficiency from clamping of the carotid artery during surgery.

EP-45
Longstanding Abnormal Eye Movements and Balance Dysfunction After Pure Lateral Medullary Infarction
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Background and Objective: Although pain and abnormal sensory symptoms are the most common sequelae of lateral medullary infarction (LMI), some patients have persistent abnormal eye movements and vestibular dysfunction after survival of LMI. Longstanding sequelae of ocular motor and vestibular dysfunction have not been assessed and neither for the influence of those abnormalities on active daily living.

Methods: We analyzed ocular motor and vestibular function tests in 24 LMI survivors with various durations (1–10 years). Patients with concomitant involvement of the cerebellum were excluded. Nystagmus (spontaneous, headshaking, and gaze evoked), head tilt, skew deviation, ocular torsion, subjective visual vertical (SVV), saccadic abnormalities, vestibulo-ocular reflex (VOR) abnormality using rotation chair test, and caloric response were evaluated. Patients with at least one of abnormal ocular motor or vestibular function tests were 16 and normal group was 8. Korean
dizziness handicap inventory (KDHI) score for the functional status was compared between abnormal and normal groups.

**Results:** During acute stage of LMI, all the patients of abnormal group presented severe vertigo and disequilibrium with typical clinical signs of LMI. The direction of nystagmus in acute stage changed to the ipsilesional side or disappeared in chronic state. Abnormal ocular motor and VOR include saccade (n = 13), torsional GEN (n = 11), ocular torsion (n = 11), SVV tilt (n = 10), VOR abnormality (n = 14), caloric weakness (n = 6). KDHI score did not show significant difference between two groups. Follow up MRI in 3 patients of abnormal group showed disappearance of the previous lesion.

**Conclusions:** Ocular motor and VOR abnormality frequently persisted in the patients after pure LMI and can be a clue for the recognition of previous LMI. The pattern of VOR abnormality and direction of nystagmus suggests the compensatory mechanism after LMI.

Disturbance in balance function by KDHI score is not helpful distinguishing LMI survivors with abnormal ocular motor and VOR.

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**EP-46**

**Adherence of Antithrombotic Agents Two Years After First-Ever Acute Ischemic Stroke**

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**Background and Objective:** The use of antithrombotic (AT) medications after ischemic stroke (IS) is recommended to reduce the risk of vascular events (VE). However, the long term use of AT agents is not well demonstrated in clinical practice. This study aimed to demonstrate the adherence of AT agents two years after first-ever acute IS under a universal health insurance system.

**Methods:** Subjects hospitalized with acute first-ever IS (ICD-9-CM codes 433 to 437) between 2001 and 2005 were identified from insurance claims data of one-million randomly sampled enrollees of the universal health insurance system in Taiwan. Time-trends of using AT agents including: aspirin, clopidogrel, ticlopidine, dipyridamole, and warfarin within 2 years after stroke were analyzed. Medication adherence was assessed as the proportion of days covered (PDC) for filled prescriptions.

**Results:** 8,946 IS were identified with AT agents prescribed in 80% during acute hospitalization. 7,341 subjects with AT agents prescribed within 1 month after onset and survived at least 3 months were selected to be followed for 2 years. The average PDC during 2-year follow-up period were 55% in total, with 56% in cerebral infarction (CI), 46% transient ischemic attack (TIA), and 50% unspecified (P <.001). Within 6 months, a sharp decline of adherence rates from 84% to 56%, 74% to 42%, and 77% to 47% was found in CI, TIA and unspecified, respectively. From 7 to 24 months, there was a slow yet continuous decline of adherence from 55 to 41%, 40% to 34%, and 46% to 38% in CI, TIA and unspecified, respectively.

**Conclusions:** The adherence rate of AT agents after IS might be lower than expected with rapid decline in the first six months and less decline in the subsequent 18 months. Further explorations of strategies to keep up the adherence rates and ameliorations of those factors hindering the adherence of AT agents are warranted.

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**EP-47**

**Bilateral Restless Leg Syndrome Due to Unilateral Primary Hemorrhage in the Basal Ganglia**

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**Background:** Restless Legs Syndrome (RLS) occurs in about 10% patients with acute ischemic strokes involving the basal ganglia, pons, lateral thalamus, internal capsule or corona radiata. We describe a patient who developed bilateral RLS after a right basal ganglia hemorrhage.

**Case Description:** A 58-year-old lady, previously known hypertensive, presented with left-sided weakness of sudden-onset. Upon arrival, she was drowsy and had blood pressure 170/110mmHg. Neurological evaluation revealed left hemiplegia, left hemianopia and dysarthria. Brain computed tomography (CT) showed a right basal ganglia hematoma with peri-lesional edema. Her level of consciousness improved during next 2 days. However, she complained of a progressively increasing need to move both lower limbs. This sensation was episodic, increased during periods of inactivity and she described relief after making the movements. RLS worsened at night, resulting in frequent awakenings during sleep. An electroencephalogram showed right hemispheric slowing but no ictal activity was noted during the leg movements. Blood tests, particularly thyroid function and renal function, were unremarkable. Electrophysiological studies demonstrated no peripheral neuropathy. She was treated with aggressive blood pres-
Painless Acute Aortic Dissection Presented with Transient Right Hemiparesis Followed by Shock: A Case Report

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It is not easy to diagnose acute aortic dissection (AAD) presenting with neurological symptoms without chest pain in an acute phase. We report a case of painless AAD which developed transient hemiparesis and then unexpectedly fell into shock.

**Case:** A 55-year-old hypertensive female was admitted 1.5 hours after developing right hemiplegia and aphasia. At that time, her blood pressure was 122/70 and she had already become asymptomatic. Her MRI showed left lacunar infarct in DWI. MRA revealed a left internal carotid artery occlusion (ICA0), which seemed to have been present prior to admission. She did not complain of chest pain throughout.

Seven hours later, she suddenly became comatose, and her systolic blood pressure dropped to 60mmHg. Through examination of enhanced chest CT scans, we diagnosed DeBakey II type AAD, complicated by cardiac tamponade.

Emergency replacement of the ascending aorta was carried out. The dissection was found to extend up to the orifice of the innominate artery.

A left decompressive craniectomy was necessary three days later. Following rehabilitation for right hemiparesis and aphasia, she became ambulatory and her regained satisfactory speech.

**Discussion:** We have retrospectively determined that her initial symptoms were caused by cerebral hypoperfusion, which occurred not only because of the left ICA0 but also the masked AAD. Reports that lone right-sided hemiparesis is much less frequent than left in AAD cases delayed our diagnosis. Rapid diagnosis of painless AAD still remains a challenge to doctors engaged in intravenous thrombolytic treatment for acute ischemic stroke.

Vital Exhaustion and Long-Term Risk of an Arterial Hypertension and Stroke in Female Population in Russia

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**Background and Objectives:** To study the effect of vital exhaustion (VE) on relative risk of an arterial hypertension (AH) and stroke in female population of 25–64 years during 16 years in Russia.

**Methods:** Under the third screening of the WHO “MONICA-psychosocial” (MOPSY) program random representative sample of women aged 25–64 years (n = 870) were surveyed in Novosibirsk. Questionnaire “MOPSY” was used to measure vital exhaustion (VE). From 1995 to 2010 women were followed for 16 years for the incidence of AH and stroke.

**Results:** The prevalence of high level of VE (HVE) in women aged 25–64 years was 31.2%. Women with HVE had negative behavioral habits: less likely follow the diet (χ² = 18.4 n = 8 p < 0.05) and in 2-times more often had become less active during the year (χ² = 10.3 n = 4 p < 0.05) compared to those with lower levels of VE. AH was developed in 59.6% and stroke — in 5.1% of women over 16 years of study. Risk of AH was 99-fold higher in women 25–64 years with HVE (95.0% CI: 1.03–3.87; p < 0.05) within first 5 years of study; after 10 years it was significant only for groups aged 35–44 years (HR = 2.32; 95.0% CI: 1.73–7.30; p < 0.05) and 45–54 years (HR = 2.34; 95.0% CI: 1.94–5.84; p < 0.05). Within 16 years of follow-up women with VE had 3.34-fold risk of stroke (95.0% CI: 1.02–10.93; p < 0.05) compared to those without VE. There was a tendency in increasing of AH and stroke rates incidence: in married women; in those with secondary specialized education; in first-line managers with VE. Significant increase of AH rates was in easy physical laborers with VE (χ² = 4.73, df = 1, p = 0.03) compared to those without VE.

**Conclusions:** The prevalence of VE in women aged 25–64 years is more than 30%. Women with VE had unfavorable lifestyle and higher relative risk of AH and stroke over 16 years of follow-up, especially married ones with manual occupation or first-line manager.
EP-50

Atrial Fibrillation Is an Independent Risk Factor of Poor Stroke Outcome and Mortality in Chinese Ischaemic Stroke Patients

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Background and Objectives: From local data, the prevalence of atrial fibrillation (AF) increased from 16% to 25% in ischaemic stroke patients over the past decade. This study aims to investigate the clinical characteristics and outcome of AF-related ischaemic stroke.

Methods: All patients with ischaemic stroke enlisted in the stroke registry of a Hong Kong regional hospital over a 3-year period (2010–2012) were analyzed on baseline demographics, presence of cardiovascular risk factors, AF, use of anticoagulation, and outcome. CHADS2 and CHA2DS2-VASc scores were calculated in each individual. Poor stroke outcome was defined as mRS score ≥3 in one month. Mortality was determined on discharge and six-months from stroke onset. Multivariate analysis was used to identify the risk factors of poor stroke outcome and mortality.

Results: 2,365 patients with ischaemic stroke were identified, of which 570 (24.1%) had AF. AF patients were older (79.7 vs 72.3 years, p < 0.01), more likely to have cortical infarct (OR 3.84, CI 3.15–4.67, p < 0.001) and had higher risk of developing hemorrhagic transformation (OR 3.9, CI 2.57–6.0, p < 0.001). 398 patients (69.8%) had known AF. Among them, the mean CHADS2 and CHA2DS2-VASc score prior to stroke admission were 2.7 and 4.4 respectively. 17.3% were on anticoagulation. After adjusting for gender and other risk factors, atrial fibrillation (OR 1.76 CI 1.41–2.22 p < 0.0001), age (OR 1.07 per year increase, CI 1.05–1.09, p < 0.0001) and presence of congestive heart failure (OR 2.36, CI 1.46–3.81 p = 0.002) were found to be independently associated with poor stroke outcome. AF was also predictive of mortality (OR 1.58, CI 1.22–2.05 p < 0.001).

Conclusion: Atrial fibrillation is an independent risk factor of poor stroke outcome, as well as in-hospital and 6-month mortality. Measures to increase anticoagulation are warranted in AF patients.

EP-51

Acute Ischemic Stroke with Low Admission Blood Pressure

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Background and Objectives: Blood pressure (BP) is usually elevated in patients with acute stroke. Some reports indicated that low admission BP was associated with poor outcome, but the reason is still unknown. The aim of the study was to describe the clinical features and prognosis of stroke patients with low admission BP.

Methods: The subjects were 58 patients with an initial systolic BP below 120 mmHg (male: female = 34: 24, mean age 69.7±16.5 years) among 758 patients of acute ischemic stroke admitted to our hospital between 2010 and 2012.

Results: The ischemic stroke was comprised of cardioembolic 30 (52%); lacunar 2 (3%); large artery atherosclerosis 0 (0%); other/undetermined 15 (26%); and cryptogenic 11 (19%). Forty seven% of patients had a history of hypertension, 16% diabetes mellitus, 12% coronary artery disease, and 40% arterial fibrillation. Twelve patients (23%) among 53 patients received echocardiography had a decrease in left ventricular ejection fraction (LVEF). Eight patients (14%) had a malignant tumor. Twenty patients (34%) had poor outcome (modified Rankin Scale grade of 5–6 at discharge). Low LVEF was associated with poor prognosis.

Conclusion: Cardioembolic stroke is the most common subtype of stroke with low admission BP. That is why the stroke with low BP is more severe and have poor outcome. In addition, concurrent malignancy might influence the poor prognosis.

EP-52

Troponin T Serum Level is Not Associated with the Location and Volume of Acute Brain Infarction: Results of the HISTORY Study

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Background: The cTnT is frequently elevated in AIS patients. However, the relationship, if any, between the cTnT level and brain infarction remains to be established.

Objectives: The aim was to investigate the possible correlation between the location and volume of brain infarction and the cardiac troponin T (cTnT) serum level in acute ischemic stroke (AIS) patients.

Methods: The study consisted of consecutive AIS patients admitted within 12 h of stroke onset. The location and volume of the acute ischemic lesion was assessed with magnetic resonance imaging at admission and after 24h. Standard laboratory tests, including cTnT and repeated electrocardiograms, were performed at admission and after 4h. Correlations between the cTnT level and brain infarction was examined. The location and volume of brain infarction and baseline parameters were tested with a Spearman correlation coefficient. Univariate and multivariate logistic regression analysis (LRA) were used to determine the possible predictors of cTnT elevation.

Results: Out of the 200 enrolled patients, elevated cTnT was present in 71 (36%). No correlation was found between the cTnT serum levels and the location (P > 0.05) nor volume of brain infarction (r = 0.05, P = 0.48). LRA identified creatinine (OR: 1.26 per 10 μmol/L increase; 95% CI: 1.043–1.524), NT-proBNP (OR: 1.05 per 100 μg/L increase; 95% CI: 1.018–1.093) and male gender (OR: 3.674; 95% CI: 1.025–13.164) as significant independent predictors of pathological elevation of cTnT.
Conclusions: Although elevated cTnT serum level is relatively frequent in AIS patients within the first 12h of stroke onset, it is not related to the location or volume of brain infarction.

Trial registration information: ClinicalTrials.gov NCT01541163.
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EP-53

Dabigatran as Bridging Therapy During Warfarin Optimization in Ischemic Stroke

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Background and Objective: Parenteral heparin is widely used to provide anticoagulant cover while optimising oral anticoagulation (OAC) with warfarin. Newer OACs attain therapeutic effect very quickly. This study explores the use of dabigatran during warfarin optimization among acute ischemic stroke patients.

Methods: Ischemic stroke patients were included if aged >18 years, OAC clinically indicated, neurologically stable, able to self-administer OAC or with help, reliable care-giver available, agreeable to OAC with warfarin, willing to come for consultations. They were excluded if they had haemorrhagic conversion, active bleeding, unsafe for warfarin. Dabigatran 110 mg BD was administered simultaneously with warfarin till INR>2.0 (case). Those who agreed to receive warfarin but not dabigatran were controls. Time to attain target INR and bleeding complications were recorded.

Results: There were 8 cases and 4 controls. Compared to the controls, cases were all male (vs all female controls, p = 0.0005), tended to be younger (mean age 65 ± 12.1yr vs 74.5 ± 10.25yr, p = 0.20), with similar proportions of hypertension (62.5% vs 75%, p = 0.67), hyperlipidemia (50% vs 75%, p = 0.41), diabetes mellitus (12.5% vs 25%, p = 0.58) and smoking (12.5% vs 25%, p = 0.4). The indication for OAC among cases was atrial fibrillation (AF)(75%) and basilar thrombosis (25%); among controls it was AF (100%). Mean time to attain target INR was not statistically different (5.6 ± 2.57dy vs 7.0 ± 4.24dy, p = 0.57). Among cases, aPTT increased in tandem with INR increase; in 2, it exceeded twice baseline aPTT while INR remained within target range. INR did not change dramatically after cessation of dabigatran except in 1 case. One case suffered gross hematuria. No subject had recurrent ischemic events.

Conclusions: Overlapping dabigatran with warfarin during initiation of OAC with warfarin is feasible in the in-patient setting. Prospective studies with larger numbers are needed.

EP-54

Atrial Fibrillation: A Major Contributor to Stroke Severity and Poorer Outcome in Acute Ischaemic Stroke Patients in Malaysia

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Background and Objective: Atrial fibrillation (AF) is an independent risk factor for stroke. The presence of AF carries a poorer outcome among stroke patients. This study was conducted to investigate the clinical profile, risk factors and clinical outcome in AF-associated acute ischaemic stroke (AF-AIS) compared to ischaemic stroke patients without AF and to determine the prevalence of AF among ischaemic stroke patients.

Methods: This is a prospective, observational cohort study on 100 consecutive ischaemic stroke patients carried out in a teaching hospital in Malaysia over a period of 2 months. A total of 195 patients were admitted under the neurology service during the study and 100 consecutive ischaemic stroke patients identified on admission and followed up.

Results: The mean age on admission was 62.23 and the AF-AIS cohort had a higher mean age (66.8 vs 61.53). Prevalence of AF was 15% (n = 15) in our cohort of stroke patients. 60% of the AF-AIS were male and the major racial groups were Chinese (46.7%) and Malays (33.3%). 9/15 (60%) of AF-AIS were diagnosed before admission and 2 out of them were not on anticoagulation therapy. Other medical comorbidities were hypertension (61.9%), diabetes (60%), and dyslipidaemia (53.3%). The AF-AIS cohort had a higher previous history of ischaemic heart disease (46.7% vs 17.6%), [p < 0.05, OR 4.08 (95% CI = 1.28–12.99)]. There were more total anterior circulation stroke syndromes in AF-AIS (33.3% vs 1.2%) [p < 0.005, OR 66.25 (95% CI = 6.16–712.55)]. Previous history of stroke was similar in both groups (26.7% vs 28.2%). Mean Modified Rankin score on admission and discharge were higher among AF-AIS; 4.47 and 4.3 respectively as compared to 3.66 and 2.85 among stroke patients without AF with p < 0.005. The mortality rate was higher, 33.3% of the AF-AIS died during their hospital stay with [p < 0.0005, OR 42 (95% CI = 4.45–396.46)].

Conclusion: AF-AIS is associated with higher level of disability and increased risk of mortality among stroke patients in Malaysia. Anticoagulation in patients with AF can be improved.
Cognitive Outcome in Multiple Silent Lacunar Lesions and Stroke in Geriatric Patients

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Background: Cognitive deficit among elderly patients with poststroke lesions (PSL) was established during last years, but is the multiple silent lacunes (MSL) represents the basis of vascular dementia in late life still controversially.

Objectives: The aim of this study was assessment of cognitive disturbances among poststroke patients with one ischemic lesions and multiple silent lacunar lesions in cardiovascular patients.

Patients and Methods: Prospective study of 147 (mean age 71.4) patients was carried out. The patients were divided in two groups: 1 group (85) moderate stroke patients with PSL. Type, side and site of stroke was assessed by conventional MRI. Stroke severity was evaluated according to NIHSS at acute stage and 3 month poststroke. II group (62)-patients with cardiovascular diseases MSL, who had MSL in MRI. Cognitive function was investigated in both groups by neuropsychological battery (letter fluency, Stroop test, Wisconsin Card Sorting Test, digit span, letter number sequencing), MMSE, Hamilton Depression Rating Scale (HAM-D) before discharge and 3 months later.

They were compared due to vascular risk factors, clinical, demographic and radiological variables. Statistical evaluation was performed by SPSS.

Result: From 85 PSL patients dementia was diagnosed in 13 (15.2%) cases, depression in 24 (28.2%). This group often had damage of the left hemisphere, prevalence of ischemic with basal ganglia lesions. No one from the 65 MSL patients had dementia, but 29 (44.6%) had mild cognitive impairment and 36 (55.3%) had depression.

Conclusion: Patients with MSL had more percent mood disorders and subclinical cognitive impairments, which may have high-risk group for dementia.

The Relationship Between MMP-9 and TIMP-1 with Cognitive Impairment in Stroke Patients

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Objective: To investigate serum level of matrix metalloproteinase-9 and tissue inhibitor of metalloproteinase-1 in cognitive impairment stroke patients.

Methods: Stroke patients were divided into cognitive impairment group and control group according to MMSE score. Healthy controls were included as normal group. Serum MMP-9 and TIMP-1 were measured by ELISA.

Results: MMSE in the cognitive impairment group (n = 42) was (24 (6)). MMSE in the control group (n = 81) was 29 (2). MMP-9 level was significantly increased in cognitive impairment group and control group, comparing with normal group (P < 0.01, P).

Conclusions: MMP-9 decreased in cognitive impairment patients. And TIMP-1 increased in cognitive impairment patients. They may be biomarkers for vascular dementia.

EP-57

Effect of Cilostazol on Autoregulatory Dysfunction and Platelet Activation in Diabetic Rats

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Objectives: Diabetes leads to autoregulatory dysfunction in smaller arteries, such as cortical branches of middle cerebral artery, as a result of endothelial damage. Recently, cilostazol, a phosphodiesterase-3 inhibitor, has been clinically used for secondary prevention of ischemic stroke, especially in patients with diabetes. The aim of the present study is to investigate the effect of cilostazol on autoregulatory responses and endothelial nitric oxide synthase (eNOS) phosphorylation as well as platelet activation in Otsuka Long-Evans Tokushima Fatty (OLETF) rats as a model of diabetes, and to compare with in control (LETO) rats.

Methods: Animals were divided into 3 groups: OLETF rats orally given either cilostazol (20–30 g/day for 6 months; n = 13) or vehicle (n = 23), and LETO rats (n = 13). We performed cerebral microangiography in anesthetized rats under mechanical ventilation using monochromatic synchrotron radiation at SPring-8 and radiographically visualized vasodilation in cortical arteries in response to intravenous administration of acetylcholine (30 pmol/kg/min). The levels of total and phosphorylated eNOS protein in cortex were evaluated by Western blotting.

Results: Arterial diameters in small cortical branches were 166 ± 21, 181 ± 38, 186 ± 32 μm in cilostazol-treated OLETF, vehicle-treated OLETF and LETO rats, respectively. In response to acetylcholine, arteries in CB were significantly dilated in cilostazol-treated OLETF (180 ± 35 μm) and LETO rats (215 ± 37 μm), but not in vehicle-treated OLETF rats (147 ± 15 μm). Cilostazol-treated OLETF rats had a significantly higher ratio of phospho-eNOS/total eNOS protein than LETO rats. Cilostazol also increased VEGF protein in striatum of OLETF rats. There was no effect of cilostazol on platelet activation such as WBC-Platelet complex, platelet clump, etc. in this model.

Conclusions: Our results indicate that cilostazol has the potential to improve autoregulatory response in cortical small cerebral arteries by increasing eNOS phosphorylation in patients with diabetes, and may act as a neurovascular protectant independent of anti-platelet actions.
EP-58

The Neuroprotective Effects of (S)-3,5-Dihydroxyphenylglycine Preconditioning in Acute Ischemic Stroke Rats

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Introduction: Ischemic preconditioning is an avenue of preventive medication anticipated to be highly effective in protecting and reducing the ischemic induced neuronal damage. It was proposed that preconditioning with pharmacological agents could selectively activate the cerebral protection mechanism. Recent studies have demonstrated certain degree of neuroprotection elicited by (S)-3,5-dihydroxyphenylglycine ((S)-3,5-DHPG) preconditioning on the organotypic hippocampal slice cultures exposed to toxic level of N-methyl-D-aspartate (NMDA).

Objective: To investigate the neuroprotective effect of (S)-3,5-DHPG in vivo using acute ischemic stroke rat model.

Methods: 1, 10 or 100 μM of (S)-3,5-DHPG was administered intrathecally 2 hours prior to the middle cerebral artery occlusion stroke induced procedure which were subjected to the Sprague Dawley adult male rats. Twenty four hours after the stroke procedure, the neurological functions were evaluated by the stroke severity grading scores and foot false test. The rats were sacrificed for HSP-70 protein analysis. Each slice of hemisphere were stained by 2% solution of 2,3,5-triphenyltetrazolium chloride and measured the area of infarction and calculated the volume of infarction. The average infarct volumes of two ischemia groups were 22.28 ± 7.31 mm³ in the 30-minute group and 77.22 ± 11.49 mm³ in the 60-minute group. Cerebral infarctions were found in the 10 subjects exposed to transient ischemia ipsilaterally (5 mice from 30-minute occlusion group, 5 from 60-minute occlusion group), whereas no focal infarction was noted in mice from the sham group (n = 5).

Results: Pretreatment with 1 or 10 μM of (S)-3,5-DHPG in stroke rats showed significant improvements in the neurological functions ($P < 0.05$). All doses of (S)-3,5-DHPG significantly reduced the cerebral infarction volumes ($P < 0.001$) as compared to the control stroke rats. However, only 1 and 10 μM of (S)-3,5-DHPG significantly reduced the NSE serum level ($P < 0.001$) as compared to saline-treated stroke rats.

Conclusion: Preconditioning with specific doses of (S)-3,5-DHPG showed to be neuroprotective on the neurons against subsequent acute ischemic insult in vivo.

EP-59

The Semi-Quantitative Analysis of Hippocampal HSP-70 Expressions Depending on the Duration of Ischemic Time and the Volume of Cerebral Infarction in Mice

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Background and Purpose: Increased expression of heat shock protein 70 (HSP-70) in the brain has been documented in association with a variety of insults, including ischemia, and is suggested to play a role in cell survival and recovery after ischemic injury. This study investigated the expression of hippocampal HSP-70 regarding different ischemia duration and the volume of infarction after experimental ischemic stroke in the mice.

Methods: Focal cerebral ischemia in mice (n = 15; sham = 5, 30min = 5, 60min = 5) was induced by occluding the middle cerebral artery (MCA) using a modification of the intraluminal filament technique. Mice were killed 24 hours after the operation, and their brains were processed in two ways; the bilateral hemispheres were sectioned in 3 slices with 1.5mm thickness in-between, and brain tissues from bilateral hippocampi were promptly extracted for HSP-70 protein analysis. Each slice of hemisphere were stained by 2% solution of 2,3,5-triphenyltetrazolium chloride and measured the area of infarction and calculated the volume of infarction. The level of HSP-70 using western blot and mRNA of HSP-70 subtypes (hsp70.1, hspa1a, hspa1b) were also measured using RT-PCR from the hippocampus to analyze their significance.

Result: Cerebral infarctions were found in the 10 subjects exposed to transient ischemia ipsilaterally (5 mice from 30-minute occlusion group, 5 from 60-minute occlusion group), whereas no focal infarction was noted in mice from the sham group (n = 5). The average infarct volumes of two ischemia groups were 22.28±7.31 mm³ in the 30-minute group and 38.06±9.53 mm³ in the 60-minute group respectively with statistical significance ($p = 0.032$). Western-blot showed that HSP-70 in hippocampal tissues has increased in the infarction groups (30- and 60-minute occlusion groups) when compared to the sham group. However, no statistical difference in the level of HSP-70 between two infarction groups was noted. RT-PCR results also demonstrated no relationship between the mRNA expressions of HSP-70 subtypes (hsp70.1, hspa1a, hspa1b) and occlusion time as well as infarction volume.

Conclusions: We postulated that HSP-70 expression would be higher in more severe cerebral ischemia. However, our results represented that there was no significant difference in the HSP-70 expression between the 30- and 60-minute occlusion groups, despite the positive statistical difference in the infarction volumes. Furthermore, mRNA of HSP-70 subtypes (hsp70.1, hspa1a, hspa1b) was expressed in disregard of both vascular occlusion duration and cerebral infarction volume. We may need to investigate the adequate in-vitro methods and collect additional data to enhance statistical value.
**EP-60**

**Cerebral Amyloid Angiopathy**

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**Case Report Definition:** Cerebral amyloid angiopathy (CAA), also known as congophilic angiopathy, is a form of angiopathy in which amyloid deposits form in the walls of the blood vessels of the central nervous system, causing a hemorrhagic stroke.

**Anamnesis:** A 67-year patient was admitted to the Intensive Care Unit. One week ago he changed psychologically, became sluggish, disoriented to time, to space and people, with light headache. Brain CT scan showed left frontal intracerebral hematoma (ICH) which measured 5x4 cm.

**Previous Diseases:** stroke 3 years ago and asymptomatic ICH, subarachnoid haemorrhage 3 months ago and subdural hematoma without previous head trauma, without coagulopathy, concerning status — mildly confused and mild headache. Arterial normotension, no nicotine neither alcohol abuse.

**Radiologic Examinations:** Brain CT scan and after contrast application: frontal left ICH with perifocal oedema. On the 50th day of illness brain MR with MR angiography showed possible cerebral amyloid angiopathy as signs of hyperintensity in T2 measured time and FLAIR techniques, haemosiderin deposits near the edge of hematoma and cortically in the area, all the time signs of subdural and subarachnoid bleeding, and smaller right parietal hematoma.

**Therapy:** Conservative: hypertonic saline, corticosteroids, antihypertensives, antidepressants.

**Conclusion:** The patient was discharged home hampered mobility, psychologically changed, depressive, yet disoriented in time, to space and people. Antiagregants excluded from therapy. Recommended examination of blood pressure and moderated physical therapy. After 6 weeks control: excellent revival.

Does diagnosis of CAA is only of academic importance?

**Methods:** We collected 325 subjects ranged from January 2008 to February 2013, who was admitted in Peking University First Hospital and with the discharge diagnosis of lacunar infarction. We evaluated the white matter lesions (WML) and lacunar infarction (LI) using MRI, measured the kidney function using the adaption of MDRD equation. We analyzed the association between WML and CKD in 325 subjects with MRI, relationship between LI and CKD in 175 subjects which was excluded the subjects with cerebral large vessels stenosis.

**Results:** (1) In 325 subjects, 2 subjects without WML, 142 patients (43.7%) had mild WML, 120 patients (36.9%) with moderate WML, and 61 patients (18.8%) with severe WML, CKD (p = 0.018) and the advanced CKD stage (p < 0.001), elevated serum creatinine (p = 0.026) are related with WML. (2) In 175 subjects, 75 subjects (42.9%) without LI, 25 patients (14.3%) had a single LI, 75 patients (42.9%) had multiple LI, CKD (p = 0.030) and elevated serum creatinine (p = 0.008) are related with LI. (3) In 175 subjects, old LI found in 63 patients (36.0%), and new LI in 37 patients (21.1%), the rest without LI, the relation was not statistically significant with CKD and serum creatinine elevating. (4) After the logistic regression analysis, the presence of CKD or elevated serum creatinine were independent risk factors of WML (OR = 3.886, 95% CI: 1.122–13.456), and LI (OR = 1.030, 95% CI: 1.005–1.051).

**Conclusions:** CKD or elevated serum creatinine is an independent risk factor of WML, LI in Chinese hospital-based population.

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**EP-62**

**Brain Infarction Due to Anti-Neutrophil Cytoplasmatic Antibody (ANCA)-Associated Vasculitis**

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We will report two cases of brain infarction due to anti-neutrophil cytoplasmatic antibody (ANCA)- associated vasculitis (microscopic polyangiitis; MPA).

**Case 1:** A 73-year-old man was hospitalized with difficulty of walking caused by a mild left hemiparesis. He had a history of hypertension and lacunar infarction. Magnetic resonance images (MRI) demonstrated an acute infarct in the right caudate nucleus, which was treated with an intravenous infusion of low-molecular weight heparin. During his hospitalization, he developed low grade pyrexia accompanied by elevated blood leukocyte count and serum C-reactive protein levels. The focus of infection could not be identified, and the pyrexia persisted despite the use of broad-spectrum antibiotics. Ten days after admission he developed right hemiparesis due to new multiple small infarcts in the right parietal and left occipital lobes and bilateral corona radiata. Further investigation revealed the presence of a high titer of myeloperoxidase (MPO)-ANCA (57 EU), which lead to the diagnosis of MPA. Steroid therapy suppressed the inflammatory responses, and prevented further recurrence.
**Case 2:** A 64-year-old man with hypertension developed right hemiparesis. MRI showed acute lacunar infarct in the left corona radiata. Cilostazol was given for secondary prevention. Three months later, the right hemiparesis was worsened by an acute infarct in the left internal capsule. As a result, cilostazol was changed to clopidogrel. Several months later, he developed a rash on his trunk and interstitial pneumonia. Although steroid therapy was effective, he ceased receiving the treatment. A year later, he developed nephrotic syndrome. Skin and renal biopsies showed MPA; however, MPO-ANCA had not been elevated during the course of his disease. Repeated small infarction, especially in the territories of perforating arteries, is a characteristic of stroke caused by MPA. Steroid therapy rather than anticoagulation may be effective to prevent the recurrent stroke associated with MPA.

**Conclusion:** Our analysis identified a subgroup of patients who benefited from surgery, hence depicting functional benefit which is important in decision making. Our scoring system can be used in the emergency setting to predict those patients who will benefit from surgical intervention because of its practicality, rapidity and ease of use. It is a simple yet comprehensive tool which can be easily used by physicians to minimize ambiguity in decision making for patients with spontaneous intracerebral haemorrhage.

**EP-64**

**Splenium of Corpus Callosum Hemorrhage as a Cause of Neurogenic Pulmonary Edema – A Case Report**

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**Background and Objective:** The fulminant form of the neurogenic pulmonary edema (NPE) associated with acute brain injury other than subarachnoid hemorrhage was seldom reported. We describe a case of fulminant NPE caused by a splenium of corpus callosum hemorrhage and review the literature on the pathophysiology, clinical presentation, and management of this syndrome.

**Methods and Results:** A 70-year-old man had abrupt onset of spontaneous splenium of corpus callosum hemorrhage presented with a fulminant picture of dyspnea and profuse pinkish frothy sputum. Chest roentgenogram revealed an acute pulmonary edema. Cardiac enzymes values were normal as well as electrocardiograph recording. The pulmonary edema was deemed neurogenic because of their rapid onset after brain injury and exclusion of external blunt chest injury, resuscitative injury, and cardiac damage.

**Conclusions:** Neurogenic pulmonary edema is a common complication of a variety of CNS insults. Many cases may be subclinical or mild, or may be mistaken for aspiration pneumonia. Thus, physicians should be encouraged to consider this clinical entity when caring for patients with acute respiratory failure after neurologic emergencies.

There have been a number of mechanisms proposed for the formation of NPE. Several anatomic sites, including the medulla and hypothalamus, have been the focus of attention. In the present clinical case, the splenium of corpus callosum hemorrhage compressing bilateral hypothalamus that was responsible for the sympathetic storm that evoked the NPE.

**EP-63**

**The R-STEP SCORE: A Rapid Scoring System For Intracerebral Haemorrhage Patients: Our Step Towards A Simple and Systematic Decision Making Tool For Medical or Surgical Management**

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**Background and Objectives:** Several grading scales for intracerebral hemorrhage using clinical and imaging parameters that predict outcome have been published but to our knowledge, there is no study comparing functional outcomes in patients who were managed either conservatively or surgically. We conceptualized a scale using known predictors and identified a subgroup of patients who had benefited after surgery denoting good functional outcome.

**Methods:** Charts of 429 consecutive patients with spontaneous intracerebral haemorrhage at our hospital from 2008–2011 were reviewed. Clinical, imaging parameters and outcomes using the Glasgow Outcome Scale (GOS) score were tabulated. Strongest predictors were determined using multivariate logistic regression analysis and a predictor scale was devised with cut-off values determined using receiver operating characteristics and Youden Index. Internal validation was done through bootstrap techniques.

**Results:** Age (p = 0.07), volume (p ≤ 0.0001), location of hematoma, (p = 0.18), intraventricular extension (p ≤ 0.01) and GCS score (p ≤ 0.01) were determined as the strongest outcome predictors and were assigned specific ranges on our score. Functional outcomes were significantly better for surgery than conservative treatment at a scores of 5–8 (Youden Index = 0.60, sensitivity 76.6%, specificity 83.1%, AUC = 0.861). Internal validation through bootstrapping showed close results to the original analysis. (AUC = 0.864).
**EP-65**

**Alcohol Aggravates Hematoma Hemolysis, Oxidative Stress and Neural Inflammation in Intracerebral Hemorrhage-Induced Brain Injury**

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**Background and Objective:** Spontaneous intracerebral hemorrhage (ICH) accounts for 15 to 30% of all strokes, and is associated with high morbidity and mortality. Alcohol intoxication has been shown to be associated with worse ICH outcome, indicating important role of alcohol in ICH pathogenesis. This study aimed to investigate the effects of ethanol pretreatment on the severity of ICH-induced brain injury, and to unravel the important causative factors responsible for the increased severity of the injury.

**Methods:** Rats were intraperitoneally injected with 3 g/kg ethanol an hour before ICH. ICH was induced by intra-striatal infusion of collagenase (0.23 U/microliter).

**Results:** Early on day 1 post ICH, ethanol pretreatment caused greater brain injury: marked hematoma hemolysis, early formation of cerebral edema, increased microglial activation, excessive reactive oxygen species (ROS) production and subsequent activation of glutathione peroxidase. The ethanol pretreated ICH (EtOH-ICH) rats showed higher mortality (up to 64%) as compared with non-ethanol pretreated ICH (NS-ICH) rats. Marked neurological impairment and reduced body weight were also noted in these ethanol pretreated ICH rats. On day 3, NS-ICH rats regained weight and started to recover from neurological deficits, while EtOH-ICH rats continued to lose weight and suffered from neurological deficits.

**Conclusion:** The prior administration of ethanol results in greater augmentation of striatal injury in rats, as manifested by marked hematoma hemolysis, excessive oxidative stress, microglial activation, hematoma expansion, and edema formation. Our study provides a feasible model to understand the dynamic process of ICH after alcohol drinking, and sheds light in management of patients consuming alcohol before ICH attack.

**EP-66**

**Lobar Cerebral Hemorrhage Due to Amyloid Angiopathy: Correlation Between Pathological Evidence and Outcome**

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**Background and Objectives:** Cerebral amyloid angiopathy (CAA) contributes to lobar intracerebral hemorrhage in older patients. Diagnosis of CAA refers to the Boston Criteria, which requires that "definitive" cases be confirmed by pathologic evidence. The purpose of this study was to investigate the incidence and outcome of pathologically proven CAA patients.

**Methods:** The medical chart of 19 consecutive lobar hemorrhage patients with radiographic characteristics of CAA by Boston criteria, who underwent craniotomy and hematoma evacuation between 2011–2012 was retrospectively reviewed. Cortical vessels at the site of corticotomy was histopathologically investigated for amyloid deposition. The outcome has been established by the modified Rankin Scale (mRS).

**Results:** Six patients (31.5%) were histologically diagnosed with CAA. Remaining 13 patients with "probable" CAA were considered as hypertensive bleeding. There is no difference in patient age (mean 78.5 vs 73.6 y.o), hematoma volume (mean 76.6 vs 67.0 ml), and mRS at discharge (mean 3.7 vs 4.4). The post-operative bleeding occurred in 1 patient with CAA (16%), but there was no surgery-related morbidity.

**Conclusions:** Neurosurgery can be performed safely in patients with possible CAA-related lobar hemorrhage. The proportion of definitive case are relatively low and pathological results does not influence the presentation and outcome.

**EP-67**

**Cases Series Analysis of Intracranial Hemorrhage During Dabigatran Therapy**

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**Background and Objective:** The RE-LY trial showed that the incidence of intracranial hemorrhage was lower in patients treated with Dabigatran than in those with Warfarin. However, characteristics of intracranial bleeding in patients with dabigatran therapy. Then we studied case series analysis of intracranial hemorrhage in Dabigatran treatment.

**Method:** We report four times of intracranial hemorrhage in three subjects during Dabigatran therapy.

**Results:** Case 1 was 80 years female. She developed gait disturbance and chronic subdural hematoma was detected by CT examination during dabigatran 110mg bid treatment which was continued for the following 6 days. However, the hematoma did not expand nor reduced. Then, dabigatran was stopped and APTT was 46.3 and 41.6 seconds before and 24 after prothrombin complex concentrate injected. She fully recovered after burr-hole evacuation. Case 2 was 87 years female developing chronic subdural hemorrhage (CSDH) during dabigatran 110 mg bid with APTT of 41.6 seconds. Dabigatran was stopped and she recovered fully after burr-hole evacuation performed on the next day. Case 3 was 87 years female. She developed intracranial bleeding twice, traumatic subarachnoid hemorrhage and cerebral contusion with hemorrhage after head injury during dabigatran 110mg bid therapy. Nei-
ther of hematoma expand after stopping dabigatran and she recovered.

**Conclusion:** It seems that in patients with intracranial bleeding during dabigatran treatment hematoma is hard to expand and outcome is good irrespective of presence or absence of prothrombin complex concentrate intravenous injection.

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**EP-68**

**Bilateral Asynchronous Transient Limb Shaking Due to Bilateral Carotid Occlusion**

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**Background and Aim:** Transient unilateral limb shaking is a known manifestation of reduced cerebral perfusion due to severe steno-occlusive disease of internal carotid artery (ICA). We describe a case of bilateral transient limb shaking in a patient with bilateral ICA occlusion.

**Case Description:** A 81-year old hypertensive female presented with sudden-onset of left-sided weakness. She was suffering from gastroenteritis for past 2 days. On examination, she was mildly dehydrated, drowsy with blood pressure (BP) 107/63mmHg and left hemiparesis (power grade 2, NIHSS 14 points). She was having involuntary jerking of both sides, occurring independently. Movements were aggravated in sitting position (with no postural BP drop) and during sleep. Magnetic resonance imaging (MRI) of brain showed acute infarcts in right lentiform nucleus, corona radiata and deep watershed areas of right cerebral hemisphere. Old infarcts were seen in both internal watershed regions. MR angiography and cervical duplex sonography showed complete occlusion of both ICAs in the neck. Electroencephalography showed mild diffuse bilateral slowing without any epileptiform activity. Transcranial Doppler (TCD) showed blunted flow in both middle cerebral arteries (MCA) and 30% reduction in flow velocities upon assuming sitting position. Her BP medications were stopped and she was treated with generous intravenous fluids, nasal oxygen (despite normal blood gases and oxygen saturation) and kept in ‘lying flat’ position most of the time. Her level of consciousness and limb shaking improved gradually and she tolerated prolonged ‘lying flat’ position by day-6. With gentle rehabilitation, she could walk with assistance by 3-months.

**Conclusions:** Patients with transient limb shaking, especially when orthostatic, should be evaluated for hemodynamically significant steno-occlusive disease of the carotid arteries. Timely diagnosis and appropriate therapeutic measures may help in preventing early clinical worsening and recurrence.

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**EP-69**

**Cerebral Venous Thrombosis (CVST): Study of Four Filipino Patients and Literature Review**

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**Research Design:** Case series study.

**Background:** Cerebral venous sinus thrombosis (CVST) is rare, with an estimated 3–4 cases per million annual with the introduction of venography. CVST is believed to be more common in women. Most cases of cerebral venous sinus thrombosis are due to hypercoagulability. Other important risk factors include pregnancy, primary antiphospholipid syndrome, hereditary thrombophilias (C and S protein deficiency, antithrombin III deficiency).

**Objective:** To present four Filipino patients with radiologically-proven Cerebral Venous Sinus Thrombosis (CVST) and discuss their demographic, etiologic and clinical characteristics and clinical outcomes.

**Methods:** A retrospective and descriptive analysis of the medical records of four patients with CVST, who were admitted to a single tertiary hospital during the period of June 2012 to August 2012.

**Results:** Four patients were identified with a mean age of 36.25 years old. The youngest patient was 22 years old. All of the patients were women. Two of the cases had previous use of oral contraceptives. The most frequent clinical manifestations were headache as seen in all patients (100%), dizziness (50%), vomiting (25%), motor weakness (50%) and seizures (25%). Three patients (75%) presented with Thrombophilia-Protein C deficiency.

Subarachnoid hemorrhage (SAH) associated with cerebral venous thrombosis (CVT) is rarely reported in the literature. Cranial CT Scan revealed Subarachnoid hemorrhage in 50% of the patients while Parenchymal Hemorrhage was present in the other 2 cases. Superior sagittal sinus (50%) and transverse sinus (50%) were the most common locations of the thrombosis. All cases received oral anticoagulation with Warfarin. All patients were discharged stable and without any neurologic deficits and adverse outcomes.

**Conclusions:** Venous sinus thrombosis may present to the physician in a number of clinical presentations. Diagnosis can be confirmed by imaging and angiography. Early recognition of the condition and investigation of appropriate therapy probably reduces mortality and morbidity.
EP-70
Clinical Outcomes of All Adult Patients Admitted for Acute Cerebrovascular Disease at Perpetual Succour Hospital
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**Background:** Stroke is the second leading cause of death worldwide and is the leading cause of long term disability. Stroke outcomes reflect quality of stroke care.

**Objectives:** This study was made to determine the clinical outcomes of stroke patients in terms of length of stay, medical complications and discharge disposition in a tertiary hospital facility without an existing stroke unit.

**Methods:** The medical records of 309 adult cerebrovascular disease patients over 15-month duration were reviewed. Patient demographics, risk factors, chief complaints, stroke types, location and severity, hospital accommodation, medical complications, length of stay and discharge disposition were obtained. Association between NIH scores, degree of carotid artery disease, length of hospital stay, and discharge disposition were statistically analyzed.

**Results:** Cerebrovascular disease prevalence was 2.52 percent. Majority of patients were males (51.78 percent). Mean age on presentation was 62.84 ± 13.06 years. Females had a significantly higher age of onset (64.67 ± 13.32 years) than males (p = 0.02). Hypertension was the most common risk factor (82.20 percent) often with concomitant comorbid illnesses. Hemiparesis was the most common chief complaint (41.75 percent). The most common stroke type was ischemic (77.67 percent) and the Middle Cerebral Artery distribution was most commonly affected (62.82 percent). The mean NIH score was 6.34 ± 6.09. The mean length of stay was 7.87 ± 8.78 days. There was a direct association between the mean NIH score and length of stay (p = <0.0001). There was a significant correlation between degree of carotid artery disease, NIH scores and length of stay (correlation coefficient 0.185, p = 0.001). Most patients were admitted to regular rooms or wards (82.85 percent) and these patients had significantly lower mean NIH scores than those admitted to the ICU (p = <0.0001). Majority of the patients were discharged improved (91.91 percent) and these patients had significantly lower mean NIH scores and length of stay (correlation coefficient 0.185, p = <0.0001). There was a significant correlation between the degree of carotid artery disease, NIH scores and length of stay (p = <0.0001). There was a significant correlation between degree of carotid artery disease, NIH scores and length of stay (correlation coefficient 0.185, p = <0.0001). Only 46.13 percent were referred for rehabilitation. The most commonly encountered medical complication was healthcare-associated pneumonia (51.22 percent).

**Conclusion:** The average length of stay was 7.87 ± 8.78 days and this had direct association with the mean NIH score. Patients who died had higher mean NIH scores (17.83 ± 7.51). The most commonly encountered medical complication was healthcare-associated pneumonia.

EP-71
Cerebrovascular Stenosis and Chronic Kidney Disease
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**Background and Objectives:** The cerebrovascular atherosclerosis is a crucial cause of stroke, and many studies have indicated the relationship between atherosclerosis and chronic kidney disease (CKD) through carotid intima-media thickness. We evaluated the extent of cerebrovascular stenosis and CKD to investigate the association between kidney function and cerebrovascular stenosis.

**Methods:** We collected 419 subjects ranged from January 2008 to February 2013, who was admitted in Peking University First Hospital who undergone intra- and extracranial vessel examination. We evaluated the cerebrovascular stenosis using carotid duplex ultrasound, TCD, MRA, CTA and DSA, measured the kidney function using the adaption of MDRD equation. Then we analyzed the association between the degree and extent of vessel stenosis and CKD in 419 subjects.

**Results:** (1) In 419 subjects, 222 subjects (53.0%) without cerebrovascular stenosis, mild cerebrovascular stenosis found in 63 patients (15.0%), moderate cerebrovascular stenosis found in 63 patients (15.0%), severe stenosis in 44 patients (10.5%) and occlusion in 27 patients (6.4%), CKD (P = 0.002) and the advanced CKD stage (P).

**Conclusions:** CKD is an independent risk factor of cerebrovascular stenosis and extracranial vascular stenosis.

EP-72
Post Stroke Depression in Chiangmai Neurological Hospital
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**Background and Purpose:** Depression is the most common psychological complication following stroke. Post stroke depression effects patient’s ability to participate in post-stroke rehabilitation programs and associated with increased risk of suicide and mortality rate.

**Methods:** Three years retrospective study from 1,017 medical records of acute stroke patients who admitted in stroke unit of Chiangmai Neurological Hospital during January 2009 – January 2012 was done. Two hundred and thirty patients with inclusion criteria were enrolled to identify the prevalence of post stroke depression as well as to access the relationship between demographic factors, stroke characteristics and post stroke depression. Data was collected over demographic and stroke related factors and underwent psychiatric and cognitive evaluations by psychotherapist. Description of categorical variables like sex, age, marital status, employment status, stroke lesion, depression were presented as numbers, frequencies, means, percentages and standard deviations. Analysis to determine the relationship between post stroke
depression and demographic variables and stroke characteristics were performed by exact probability test. P-value < 0.05 was considered as significantly associated.

**Results:** The prevalence of post stroke depression in Chiangmai Neurological Hospital was 20.4% (n = 47), mostly were mild depressive level and moderate dependency in activities of daily living. Mean duration of post stroke study was 4.91 days after stroke onset. Post stroke depression was significantly associated with hypertension and ischemic lesion location (P-value< 0.05) but was not associated with age, gender, marital status, level of education and monthly income.

**Conclusions:** Post stroke depression occurs in one fifth of the stroke patients. It is associated with hypertension and lesion location in the brain. Early detection for post stroke depression can prevent poor result in outcomes on functional recovery.

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**EP-73**

**Neurogenic Pulmonary Oedema in Frontal Lobe Ischaemic Infarction. Report of an Uncommon Case**

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**Case Presentation:** An 80 year old gentleman with past medical history of COPD and hypertension underwent Thrombolysis for L PACS two hours following onset of symptoms. Chest radiograph six hours post-thrombolysis had suggested pulmonary veinous-congestion and interstitial oedema but he remained asymptomatic and clinically stable.

He developed rapid onset dyspnoea, tachypnoea and tachycardia sixteen hours following thrombolysis. Examination showed bilateral rales. Repeat chest radiography revealed no cardiomegaly or consolidation. ECG showed a sinus rhythm, serum troponin showed non-specific elevation and interval changes. ABG revealed normal pH, normocapnoea and normocarbia. Neurogenic pulmonary oedema (NPO) was suspected, and treatment with bolus frusemide showed a good clinical response. The patient remained afebrile, but a minimal rise in inflammatory markers was observed and the patient received antibiotic treatment for possible co-existing lower respiratory tract infection.

**Discussion:** Up to 70% of cases of NPO is in context of Cerebral haemorrhage, most commonly Subarachnoid haemorrhage and traumatic brain injuries. Non-haemorrhagic causes approximate 2% including Status Epilepticus, ECT, Cerebral gas embolism. Most reported cases involving ischaemic stroke involve the posterior fossa circulation, particularly the cerebellum. Only one previous case reported NPO in a patient suffering substantial left cerebral infarct, with midline shift evident on CT 37 hours following admission. Rise in CRP and mild leukocytosis maybe observed in NPO, but brain injury patients are at an extremely high risk of aspiration pneumonia, and treatment may be instituted in clinical context.

**Conclusions:** NPO is uncommon in anterior fossa ischaemic stroke, being more often associated with cerebellar ischaemia. Temporal evolution of symptoms may not correlate radiographic evidence of progression of oedema in NPO.

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**EP-74**

**Development of an Effective Communication Board as an Augmentative and Alternative (AAC) Device for Patients in the Intensive Care Unit and Acute Stroke Units of a Tertiary Hospital**

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**Background and objectives:** Intubated or expressively aphasic patients present with major barriers in communication. Creating a communication device via a simple, well adopted and user-friendly board containing the different needs, wants, requests and questions of these patients is an effective way of bridging the gap of miscommunication with their health care provider.

**Methods:** A four-phased, prospective, systematic study was conducted, involving analysis of different parameters of communication of target patients via survey and focused group discussion, physical creation of a communication board, implementation to target patients, attaining feedback, board reassessment, and finally revision of the final board for further use and external validation.

**Results:** Survey and focused group discussion at our institution revealed the most common parameters of communication of our target patients. We created a communication board tailored-fit to determined parameters and implemented its use. Feedback responses showed a statistically significant increase in satisfaction among target health care practitioners.

**Conclusion:** Our research showed that creation of culturally tailored communication board as an alternative and augmentative tool is an effective way to improve communication between an intubated or expressively aphasic patient and their health care provider. We recommend further validation and local translation for better adaptability among different institutions in the country.

**References**

EP-75
Relationship Between Facilities of Tissue Plasminogen Activator (tPA) Therapy and Nurses’ Practice of Observation for Neurological Symptom in Institution of Acute Stroke

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Background and Objectives: It was demonstrated that nurses working on stand-alone Stroke Care Unit/Stroke Unit (SCU) did better practice of observation of neurological symptoms than other nursing units. However, it is difficult to take care for patients with acute stroke restrictedly in SCU. The purpose of the present study was to examine the relationship between facilities of tissue plasminogen activator (tPA) therapy and nurses’ practice of observation for neurological symptom in several nursing units.

Methods: Self-administered questionnaires were distributed to 14,755 nurses working in 419 institutions providing acute stroke care throughout Japan. The (response rate was: 45%), 6098 with data of tPA record. We analyzed the remaining 5435 questionnaires after excluding the incomplete ones. Questionnaire consisted of “observation neurological symptoms (ONS)” (33-item). Participants with scores higher than the median of ONS were defined as good practice group. Participants were classified according to their nursing units such as stand-alone SCU, mixed units of SCU and Intensive Care Unit (SCU+ICU), stand-alone ICU and General Medical Wards (GMW). The Odds Ratios (ORs) and 95% Confidence Intervals (CI) of good practice group were calculated with logistic regression analysis adjusted for sex and years of nursing experience in each nursing unit; poor practice group was set as reference.

Results: Among 5434 nurses, 54.8% had good practice of ONS and 84.0% had facilities of tPA therapy. Nursing units of respondents were SCU 3.1%, SCU+ICU 12.3%, ICU 10.6% and GMW 74.0%. The ORs (95% CI) of good practice for with/without record of tPA in nursing units were SCU: 4.4 (0.7–26.6), SCU+ICU: 2.3 (1.3–4.1), GMW: 1.5 (1.3–1.8).

Conclusion: The record of tPA indicated better practices of neurological symptoms than other nursing unit. However, it is difficult to take care for patients with acute stroke restrictedly in SCU. The purpose of the present study was to examine the relationship between facilities of tissue plasminogen activator (tPA) therapy and nurses’ practice of observation for neurological symptom in several nursing units.

EP-76
Our Stroke Class Approach to Improve Participants’ Understanding

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Background and Objective: We have been conducting a stroke class once a month since 2010 for patients and their families to expand their knowledge on stroke. Doctors and nurses lectured on stroke during each class. A questionnaire survey showed that participants’ understanding was inadequate. Thus, we changed the approach in the stroke class and examined its effectiveness.

Methods: First, we designed an ACT-FAST card the same size as a business card for participants to keep in their wallet. We explained the symptoms of face drooping, arm weakness, and speech difficulty and how to check them. The participants were then asked to practice the procedures. Second, we performed a skit and showed the participants how to carry ACT-FAST into practice. Finally, we examined the participants’ understanding levels by conducting a questionnaire survey as done previously, and compared the results before and after introduction of the skit.

Results: The percentage of participants who understood the symptoms of ACT-FAST increased from 24% to 72% for face drooping, from 38% to 82% for arm weakness, and from 55% to 80% for speech difficulty. With respect to the most appropriate initial action at the onset of stroke, the percentage of participants who answered, “Call an ambulance” increased from 65% to 87%. Those who answered, “See a doctor later” decreased from 29% to 10%. The participants’ satisfaction with the class reached 82% after introduction of the skit, and they stated, “The skit gave us useful tips to understand ACT-FAST”.

Conclusion: The understanding level of stroke improved by spontaneous participation in the stroke class and the adoption of a skit.

EP-77
The Influence of Outdoor Temperature on Stroke Occurrence: A Hospital-Based Study

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Background and Objectives: Winter peaks in stroke occurrence have been observed in various regions in the world; however, the influence of weather on stroke onset still remains controversial. We examined the influence of outdoor temperature on stroke onset using records from our hospital.

Methods: This hospital-based study was conducted at Ota Memorial Hospital (OMH) located in Fukuyama, Japan. This city has a humid subtropical climate with very warm summers and cool winters. OMH treats 70% of stroke patients in the area. The number of stroke hospitalizations per day was collected from 2010 to
2012 (1096 days). We defined a high occurrence day based on the number of stroke patients admitted per day; 5 or more patients with ischemic stroke (IS), 2 or more patients with intracerebral hemorrhage (ICH), and one or more patients with subarachnoid hemorrhage (SAH). Weather data for Fukuyama were collected from a meteorological bureau database and included daily mean outdoor temperature and the temperature difference from the previous day. We examined the association between the incidence of high occurrence days and temperature factors using the Cochran-Armitage trend test.

**Results:** The average number of strokes per day was 2.5 for IS, 0.7 for ICH, and 0.2 for SAH. The incidence of high occurrence days of IS was significantly associated with higher mean temperatures and wider temperature increases from the previous day (p = 0.049, p = 0.034). Days with lower mean temperatures and wider temperature decreases from the previous day showed a significant association with higher occurrence days of ICH (p < 0.001, p = 0.011). There was no significant association between the incidence of high occurrence days and temperature factors for SAH.

**Conclusion:** The present study indicated that the frequency of IS was higher with higher outdoor temperature. We should promote public awareness regarding prevention of stroke during the summer as well as winter.

**EP-78**

**Multidisciplinary Stroke Early Supported Discharge Program: Outcome and Safety**


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**Introduction and Objective:** Significant proportion of patients with acute stroke received inpatient rehabilitation, leading to long length of stay. Stroke Early Supported Discharge (SESD) Program had been implemented since Dec2011. All the acute stroke patients in Acute Stroke Unit, would be screened by SESD team. Timely home based rehabilitation and carers’ training would be provided to the directly discharged patients. Outpatient rehabilitation could be followed after home based training. This study reviewed the outcome and safety measures after the introduction of SESD program.

**Method:** Individual outcome data was prospectively collected and reviewed, while the overall direct discharge rate, length of stay and unplanned readmission rate were retrieved from hospital database.

**Results:** From Dec2011 till Sept 2012, 283 patients were recruited into the SESD program. Their mean age was 70. Half of the patients had Modified Barthel Index (MBI) less then 85. After the program was implemented, the proportion of acute stroke patients directly discharged from acute hospital, was significantly increased from 43.5% to 49.2% (p = 0.005). The MBI and Berg Balance Scale (BSS) were significantly improved after home based rehabilitation as compared with their baseline upon discharge. (mean MBI from 81.2 to 91.9, p < 0.001, mean BSS from 40.4 to 46, p < 0.001). Although they were discharged directly with disability, their unplanned readmission rate was 9.3%, which was lower than that of all the stroke patients (12.3%) in the same period (p = 0.16). After the implementation of the program, the average total length of stay of ischaemic stroke was reduced by 1.3 day.

**Conclusions:** The SESD program was effective to facilitate direct discharge of acute stroke patients. Timely allied health home visit and outpatient training had ensured adequate stroke rehabilitation outside hospital setting. Low unplanned readmission rate had confirmed the safety of the program.

**EP-79**

**Magnetic Resonance Imaging (MRI) Findings in Patients with Brain Small Vessel Disease**

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**Background:** Cerebral small vessel disease (SVD) affects small perforating arteries, causing both lacunar infarction (LI) and confluent white matter lesions (WML). Small vessel disease or lacunar infarct is one of the major stroke subgroups. Lacunar syndromes may be divided into two groups: the classic group (pure motor hemiplegia, pure sensory stroke, ataxic hemiparesis, dysarthria-clumsy hand syndrome, sensorimotor stroke) and the miscellaneous group, including all other lacunar syndromes. We have evaluated risk factors, clinical syndromes, topography, and laboratory findings of 101 consecutive patients with symptomatic lacunar infarcts diagnosed by magnetic resonance imaging.

**Methods:** We analyzed 101 patients with clinical lacunar infarct syndrome who were referred to the neurology department of Qa’em hospital, Mashhad in the northeast of Iran. We assessed clinical features, sex, age, risk factors, radiologic findings and laboratory data of these patients.

**Results:** The pure motor hemiparesis (53.5%) constituted the most usual lacunar syndrome. Mean age of the patients was 63.7 ± 8.5%. Diabetes mellitus was seen in 14 (13.9%) and hypercholesterolemia in 41 (40.6%) of patients. There were significant differences among ataxic-hemiparesis syndrome and hypertriglyceridemia and CVA history. There was a significant difference between miscellaneous syndromes and valve disease history. Also, there was significant correlation between WML and smoking. Thirty percent of the lesions were detected by CT scan.

**Conclusion:** Sixty percent of the cases were associated with white matter signal changes. Diabetes mellitus were found in 14% of patients. Hypertriglyceridemia, CVA history and valve disease history were associated with some subgroups, but more investigations should be performed for precise assessment of other risk factors.
Complete Homonymous Hemianopia Due to Cerebral Infarction of the Lateral Geniculate Body: A Case Report with Diffusion Tensor Image Findings

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Background: The human lateral geniculate body (LGB) is the thalamic visual center linking the retina to the striate cortex. The human LGB has dual blood supplies from the anterior choroidal artery of the internal carotid artery and the lateral posterior choroidal artery of the posterior cerebral artery. Thus, complete homonymous hemianopia caused by cerebral infarction of the LGB is extremely rare.

Case Report: A 63-year-old man with a history of diabetes mellitus presented due to a sudden visual field defect. He had no other vascular risk factors or focal neurological deficits. Five days later, complete right homonymous hemianopia was detected by Humphrey automated perimetry. Brain MRI and DWI revealed an infarction at the left LGB. MRA revealed no obstruction or stenosis. Diffusion tensor image (DTI) showed decreased fractional anisotrophy value in the left occipital subcortical area (right, 0.436; left, 0.384). The density of optic radiation decreased more on the right side in tractography than on the left side.

Discussion and Conclusion: Quadruple sectoranopia can be caused by lesions in the medial and lateral portions of the LGB which are supplied by the anterior choroidal artery. The lateral posterior choroidal artery supplies the central part of the LGB. Thus, occlusion of this artery produces a wedge-shaped homonymous hemianopia or horizontal sectoranopia.

However, despite the LGB lesion, our patient showed a complete homonymous hemianopia probably due to involvement of the whole LGB through occlusion of a variant vessel that supplied the whole LGB rather than simultaneous occlusion of 2 vessels. The patient’s DTI findings were well consistent with his clinical features.

References

EP-81
Territorial Location of Cerebral Infarcts on Imaging in Patients with First Ever Stroke with Diabetes

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Objective: The study was aimed to evaluate vascular territories of infarcts involved in patients with stroke for the first time with diabetes on CT and/or MRI of brain.

Methodology: This cross sectional descriptive study was carried on a total of 100 adult patients with first ever stroke consecutively reported in the Department of Neurology, BIRDEM General Hospital, Dhaka, over a period of six months.
Results: The mean age was 61.45 years and majority (35%) belongs to age group of 50–59. Ten (10%) subjects had age above 80 years. Male were 68% and 32% were female. Majority (89%) of the subjects had hemiplegia following acute stroke. Aphasia (71%), headache (39%), convulsion (23%), vomiting (18%) and cranial nerve palsy (17%) were also found. Preexisting risk factors were hypertension (72%), dyslipidaemia (59%), smoking (56%) and alcohol abuse (2%). Among the study subjects 4% had peripheral vascular disease, 8% neuropathy, 9% nephropathy and 25% retinopathy. CT scan and/or MRI brain showed parietal lobe lesion in 57% cases. Majority (76%) had infarcts in middle cerebral artery territory. Involvement of anterior and posterior cerebral territory was found in 7% and 5% subjects respectively. Vertebro-basilar arterial system involvement was observed in 6% cases. 4% subjects had involvement of both middle and posterior cerebral arteries. Both anterior and posterior arterial territory infarcts were found in 2% cases. Doppler study of neck vessels revealed atherosclerotic change in 54%, presence of homogenous plaque in 25% cases. Complete occlusion of internal carotid artery and vertebral arterial flow was found in three and two subjects respectively.

Conclusions: In conclusion most of the diabetic subjects with first ever ischemic stroke had involvement of middle cerebral artery and Doppler study of carotids may play important role in planning further management.

EP-82
Brain Diffusion-Weighted Image Findings in the Brain Embolism of Advanced Cancer Patients
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Background and Objectives: Nonbacterial thrombotic endocarditis (NBTE) is a causative disorder of embolic stroke in patients with advanced cancer. However, almost cases are diagnosed as embolic stroke by unknown source in consequence of difficulty to perform transesophageal echocardiography in such a severe condition. Typical index of embolic stroke associated with NBTE was previously reported to have multiple, widely distributed, small and large embolic lesions on brain MRI, which is distinct from that with infective endocarditis. We studied brain MRI findings of embolic stroke with unknown source in patients with advanced cancer.

Methods: We reviewed 66 cases of embolic stroke from January 2003 to March 2013 and classified according to embolic source; NBTE, unknown source in patients with advanced cancer (Un), aortogenic (Ao), and cardioembolic (Ce): and compared embolic lesions on diffusion-weighted imaging according to their pattern; single vascular territorial small lesions (<30mm, Ss), single vascular territorial large lesions (>30mm, Sl), multiple vascular territorial small lesions (Ms), multiple vascular territorial large lesions (Mi), multiple vascular territorial small and large lesions (Msl).

Results: NBTE (2/2, 100%) and Un (6/11, 55%) had Msl pattern most common in contrast to Ao (0/22, 0%) and Ce (5/33, 16%), p 0.0128 vs. Un). Ao had Ss (15/22, 68%) or Ms (5/22, 23%); and Ce had Sl (11/31, 35%) or Mi (4/31, 13%), respectively.

Conclusion: Embolic stroke with unknown source in patients with advanced cancer can be considered as NBTE of having their typical index on brain MRI which is distinct from those of other embolic mechanisms.

EP-83
Is Arterial Spin Labeling MRI useful for Differential Diagnosis Between Stroke and Its Mimics?
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Background and Objectives: Neurologists sometimes encounter a case, which is difficult to be differentiated between stroke and its mimics, particularly epilepsy, in emergency room. In this study, we investigated whether the combinational examination of diffusion-weighted imaging (DWI) and arterial spin labeling (ASL), a new MRI technique evaluating cerebral blood flow (CBF), is useful for differential diagnosis of acute stroke.

Methods: Eighty-one patients (average age 71.5+12.5 y.o., M/F 43/38) with stroke-like symptoms who underwent both DWI and ASL on admission in Kyushu Rosai Hospital were included.

Results: Fifty-four patients had positive DWI findings, while 27 had negative. Among the DWI-positive patients, 6 patients showed an increase in focal CBF on ASL, 26 showed a decrease in focal CBF, and 22 showed no abnormality. The 6 patients with a focal CBF increase were finally diagnosed with epilepsy (n = 3), reversible posterior leukoencephalopathy syndrome (n = 1), or brain infarction with recanalization of the occluded artery (n = 2). In contrast, all the DWI-positive patients without a focal CBF increase (n = 48) were diagnosed with brain infarction. On the other hand, among the 27 DWI-negative patients, 2 patients showed an increase in focal CBF, 9 showed a decrease in focal CBF, and 16 showed no abnormality on ASL. The 2 patients with a focal CBF increase were diagnosed with epilepsy (n = 1) or brain infarction with recanalization (n = 1). The 9 patients with a focal CBF decrease were diagnosed with brain infarction (n = 2) or stroke mimics other than epilepsy (n = 7). Patients with no abnormality on ASL were diagnosed with brain infarction (n = 3) or stroke mimics other than epilepsy (n = 3).

Conclusion: All the patients with a focal CBF increase on ASL were finally diagnosed with epilepsy or brain infarction with recanalization, regardless of DWI findings. ASL may be useful for differentiating stroke from its mimics, especially epilepsy, in the acute phase.
**EP-84**

**Measurement of Carotid Plaque Volume with VOCAL™II Technique by 3-Dimensional Ultrasound**

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**Background and Objectives:** Measurement of carotid plaque volume and its progression are important tools for research and patient management. In this study, we investigate the observer reproducibility in the measurement of plaque volume as determined with VOCAL™II technique by 3-dimensional (3D) ultrasound (US). We also investigate the effect of plaque size and position on measurement reproducibility.

**Methods:** Sixty five 3D US patient images of plaques (range, 53.5 to 1008.5 mm$^3$) were measured by VOCAL™II technique. The intraclass correlation coefficient (ICC) was applied to determine observer variabilities.

**Results:** Intra-observer variability was small as reflected by ICCs of 0.985 and 0.957 for 2 observers. The ICC value generated between the 2 readers was 0.931, indicating that inter-observer variability was small, too. Subgroup analyses showed that inter-observer variability was lower for CCA plaques than ICA plaques (ICC 0.998 VS 0.882).

**Conclusion:** Intra- and inter-observer variabilities were small for measurement of Carotid Plaque Volume with VOCAL™II technique by 3-Dimensional Ultrasound.

**EP-85**

**Parenchymal Reperfusion Marker (PARM) in Post-Gadolinium FLAIR Image After Carotid Stenting**

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**Background:** Hyperperfusion or reperfusion syndrome was a rare complication after carotid revasculization. It can be diagnosed with specific clinical symptoms and imaging studies including conventional and perfusion MRI. Here, we report a case of reperfusion injury after carotid stent in significant stenosis of the left carotid artery with no hyperperfusion lesions on MR perfusion imaging.

**Case:** A 66-year-old woman underwent a stent insertion for severe (70%) asymptomatic left common carotid artery stenosis. Next day, she started to complain of dull nature and lasting headache. 7 days later, she developed sudden seizure and right hemiparesis. On arrival at emergency room, her blood pressure was 200/150 mmHg. Neurologic examination revealed drowsy mental status and right-sided hemiparesis. There were no abnormal laboratory findings including full blood count, inflammatory markers, coagulation studies, renal, glucose, liver, serum/urine cupper level and thyroid biochemistry. Radiologic evidence of infarction in left hemisphere was not observed on brain diffusion-weighted image. Carotid duplex ultrasonography and CT angiography revealed a patency of stented site in the left carotid artery. Perfusion MRI showed no evidence of hyperperfusion. However, extensive vasogenic edema in left hemisphere was found. Post-gadolinium fluid-attenuated inversion recovery (FLAIR) image showed parenchymal pearl-like high signal intensities [Parenchymal Reperfusion Marker (PARM)] and leptomeningeal enhancements [so-called HyperAcute Reperfusion Marker (HARM), although not hyper-acute stage]. Her blood pressure was stabilized with oral anti-hypertensive medications. Her hemiparesis gradually subsided and completely disappeared two weeks later.

**Conclusion:** This case report showed specific findings on post-gadolinium FLAIR can reflect a reperfusion injury through blood-brain-barrier disruption.

**EP-86**

**Organizing Intracerebral Hematoma Mimicking Brain Tumor**

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**Background and Objective:** Intracerebral hemorrhage generally presents with acute neurological deficits. However, there were few case reports of patients with intracerebral hemorrhage who had clinical presentation and imaging findings mimicking brain tumor.

**Method:** To report the pathologically proven case of organizing intracerebral hematoma with clinical and neuroimaging resembling brain tumor.

**Case Report:** The patient was a sixty-four-year-old man who presented with sudden onset of mild right hemiparesis and gradual recovered in one week. Noncontrast CT scan demonstrated hypodensity lesion at left periventricular area suggesting acute ischemic stroke. He had history of atrial fibrillation and currently taking warfarin. He also has past history of Grave’s disease, diabetes mellitus and hypertension. Two weeks after his initial presentation, he developed progressive right sided weakness which progressed over 3 weeks. Physical examination revealed right hemiparesis of grade 2/5 (MRS). There was no aphasia or sensory impairment. The patient was alert and oriented. CT scan of the brain demonstrated a small hyperdense lesion at the left cingulated gyrus with enhancement of the surrounding sulci and falx cerebri. There was also marked vasogenic edema around the lesion extending to the subcortical white matter at the left frontoparietal lobe. MRI showed ill defined solid cystic mass at left frontal parasagittal region with adjacent intraparenchymal hemorrhage and large area of perilesional edema. Due to progressive nature of symptoms and possibility of tumoral hemorrhage, a stertotic needle biopsy was performed. Pathological examination of the biopsy showed numerous preserved and degenerated red blood cells, scattered necrotic tissue without tumor cell. The pathological diagnosis was organizing hematoma. Patient was treated con-
sawb and the right hemiparesis gradually improved within 2 months.

**Conclusion:** Unusual presentation of organizing intracerebral hematoma should be aware in patients with progressive focal neurological deficit with evidence of intracerebral hemorrhage on MRI scan with tumor like appearance.

**EP-88**

**ASL and DSC MRI for the Evaluation of Intracranial Large Artery Stenosis**

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1Singapore Bioimaging Consortium, A*STAR, 2Div. of Neurology, National University Hospital, 3Dept. of Pharmacology, National University of Singapore, Singapore

**Background and Objective:** Stroke patients with intracranial large artery stenosis or occlusion have compromised cerebral blood flow (CBF) [1]. To better characterize stenosis, we applied pseudo-continuous Arterial Spin Labeling (pCASL) MRI for quantification of CBF, dynamic susceptibility contrast (DSC) for measuring mean transit time (MTT), and compared with arterial transit time (ATT) estimated by Flow Encoding Arterial Spin Tagging (FEAST) [2].

**Methods:** 13 patients (5 unilateral M1 occlusion, age = 51–70; 7 unilateral mild/severe M1 stenosis, age = 53–79) were recruited. MRI was collected on a 3T scanner (Siemens, Germany). PCASL was acquired using GE-EPI of TR/TE = 4000/18ms, labeling duration = 1738ms, postlabeling delay = 1500ms, and voxel = 3x3x5mm3. FEAST was acquired by pCASL with TR/TE = 3200ms/37ms, labeling duration = 1574ms, postlabeling delay = 800ms, and bipolar gradient (b = 10s/mm2) in readout. Afterward, DSC was conducted with GE-EPI of TR/TE = 1400ms/32ms, with i.v injection of Gadovist. Data analysis was performed using FSL and MATLAB. DSC-MRI was analyzed using SPIN (http://www.mrc.wayne.edu/). All data was motion corrected, smoothed, and nonlinearly registered to MNI152 template. Lesion was manually drawn based on FLAIR image. The affected vascular territory was partitioned into lesion and lesion-excluded areas, and the contra-lesional territory was used as control.

**Results:** Of the 286 patients admitted to our tertiary center with acute vertigo, 6 (2.1%) suffered from acute Nodular infarction. Similar to other ischemic strokes, nodular infarcts occurred in all age-groups (mean age 66.5 years; range 37–88) and most cases suffered from various cardiovascular risk factors. All cases presented with severe giddiness of sudden-onset and walking was severely impaired due to imbalance. Most of the cases demonstrated nystagmus at rest that became worse on head-shaking. None of the patients suffered from hearing difficulties, tinnitus, pain or ear discharge. Absence of dysarthria, cranial nerve palsy, long tract signs and truncal ataxia were the striking features. Importantly, dysmetria or other cerebellar signs were not seen in any case. Magnetic resonance angiography did not reveal any significant arterial stenosis in the vertebro-basilar circulation. In all cases in our series recovered completely at 3 months from symptom-onset.

**Conclusions:** Sudden onset of giddiness is the commonest presentation of isolated ischemic infarction of the Nodulus. In presence of multiple cardiovascular risk factors, a high index of suspicion for the diagnosis of nodular infarct is needed in patients presenting with severe vertigo if the head impulse test is negative.

**Table 1.** Mann-Whitney U test results of affected vascular territories1 and lesioned area (for Abstract EP-88)

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<thead>
<tr>
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<th>Affected vascular territory excl. lesion</th>
<th>Lesioned area</th>
<th>p value</th>
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<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>Std. Dv.</td>
<td>Mean</td>
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<tr>
<td>Occlusion (n = 5)</td>
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<td>CBF ratio</td>
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<td>ΔMTT (ms)</td>
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<td>ΔATT (ms)</td>
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<td>Stenosis (n = 7)</td>
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<tr>
<td>CBF ratio</td>
<td>0.90</td>
<td>0.13</td>
<td>0.33</td>
</tr>
<tr>
<td>ΔMTT (ms)</td>
<td>99</td>
<td>724</td>
<td>605</td>
</tr>
<tr>
<td>ΔATT (ms)</td>
<td>194</td>
<td>342</td>
<td>454</td>
</tr>
</tbody>
</table>

1Target vascular territories: leptomeningeal/ perforator vessels in the areas supported by Middle Cerebral Artery; *p < 0.05 (one-tailed test); Std. Dv.: standard deviation.
control. CBF was normalized by value in control. The MTT and ATT were subtracted by the value in control. Statistical significance was assessed using Mann-Whitney U-test.

Results: Fig. 1 represents CBF, MTT, and ATT maps of a stenosis and an occlusion patient. In both groups, CBF was significantly decreased (Table 1). Interestingly, the occlusion group exhibited significantly longer ΔMTT in the lesioned area (p<.05), while no difference in the stenosis group. ΔATT showed similar trend but with lower significance.

Conclusion: Territorial CBF was significantly reduced in both stenosis and occlusion patients while MTT and ATT were prolonged only in occlusion patients, consistent with severe blockage of blood supply. Therefore both kinds of transit times could be served as biomarkers for differentiation between occlusion and stenosis.

References:

Fig 1. CBF, MTT, and ATT maps (from left to right) of patients with M1 occlusion (top) and stenosis (bottom). Arrows indicates the location of lesions (for Abstract EP-88).

EP-89
Causes and Clinical Manifestations of Patients with Cerebral Venous Thrombosis in Iran
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Background: Cerebral venous thrombosis (CVT), which is the thrombosis affecting cerebral veins and sinuses, is a rare condition, responding for less than 1% of strokes. The diagnosis may be late or neglected due to the great clinical spectrum of symptoms, various forms of initial presentation and unspecific signs of neuroimaging. The involvement of young women is important, which can be attributed to the use of oral contraceptives as he main risk factor and should be routinely investigated.

Methods: In this descriptive study, all of the included patients were followed according to the clinical manifestations and diagnostic tests. Collected information include: age, gender, clinical presentation, diagnostic efforts and treatment results.
After completing the patients’ data in a 21-months period, statistical evaluations were done by SPSS software 11.5 version both descriptively and analytically. After following the patients with clinical suspicion of cerebral venous sinus thrombosis and performing excluding criteria, 30 patients maintained in the study.

Results: Cerebral sinus thrombosis is more prevalent in females, but our study showed the opposite. This can be because of different etiologies in Iran such as trauma and drug abuse. The most prevalent symptoms and signs were headache and papilledema, respectively.

Conclusion: It is shown in our study that the primary diagnosis, because of unspecific and symptoms variety, is difficult that makes the sinus thrombosis “a thousand faces disease”. So, primary diagnosis is varied and in fact is consisted of patient’s differential diagnosis. Pregnancy and OCP are the most prevalent etiologies; meanwhile infection is still one of common etiologies.

EP-90

Cerebral Venous Thrombosis in Malaysia; A Case Series from a Major Tertiary Hospital in Kuala Lumpur

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Background and Objective: Cerebral venous thrombosis (CVT) is an uncommon cause of stroke worldwide. The objective is to evaluate the characteristics of patients with CVT as well as clinical and radiological features with clinical outcome.

Method: We retrospectively reviewed the charts of eleven patients of various ethnic groups with CVT at University Malaya Medical Centre. Patients’ demographics, clinical presentation, radiological findings, treatment, clinical deterioration and Modified Rankin Scale (MRS) on discharge were reviewed.

Results: Eleven patients who presented between 2007 and 2012 to a tertiary hospital in Malaysia were recruited. Patients confirmed with diagnosis of CVT by CT scan venography or magnetic resonance venography (MRV). Majority of the patients were Malaysians (3 Indians, 2 Malays, 2 Chinese), and there were also non-Malaysians comprising of 2 Indonesians, 1 Thai and 1 Myanmar patient. The mean age was 25.3 (range 12–64). There were eight female and three male patients. Most of the patients had idiopathic CVT. Risk factors include malignancy (1 leukaemia and 1 brain tumour), infection (1 pulmonary tuberculosis and 1 meningitis), and oral contraceptive pills (2 patients). 5 patients had idiopathic CVT. Interestingly, none of the patients were pregnant or in puerperium.

Majority (10 patients) had headache as presenting complaint. The other symptoms are vomiting (4 patients), nausea (3), visual blurring (3), and seizures (3). The most common locations were superior sagittal sinus and transverse sinus.

4 patients had intracerebral haemorrhage (ICH). None of the patients died. The MRS on discharge at 0 point was observed in 3 patients, 1 point in 2 patients, 3 point in 2 patients and 4 point in 4 patients. The 2 patients with infection had MRS of 0 at discharge.

Conclusion: We are presenting an interesting case series of multi-ethnic group representing the population in South East Asia. Most of the patients had idiopathic CVT. The CVT patients with infection had good functional outcome on discharge.

EP-91

Case Series of Cerebral Sinus Thrombosis: Epidemiology, Treatment and Outcomes

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Background: Cerebral venous sinus thrombosis is an underestimated cause of stroke. It is associated with significant mortality and morbidity.

Objectives: This clinical series aim to study the epidemiology, clinical presentation, radiological imaging, clinical course, outcomes of this disease.

Methods: We included cases with diagnosis of cerebral sinus thrombosis during the period 31/3/10 to 30/4/13. Primary outcome was expressed with Glasgow Outcome scale (GOS).

Results: There were a total of 15 patients, 6 male and 9 female. The mean age was 43.3 (range 25–66). The median follow-up time was 24.5 months (range 1–57 months). There were 4 cases with acute presentation (symptom onset <1 day) and 11 cases with subacute or chronic presentation.

Overall the mortality rate was 13%. All patients were treated with anticoagulation.

For the group of subacute or chronic presentation (n = 11), 9 (81.8%) subjects presented with headache, 3 cases (27%) had seizure, 1 (9%) presented with hemiparesis, 1 (9%) had intracranial haematoma on CT scan, and none had impaired consciousness. 10 (90%) subjects had no deficit on last follow up (GOS = 5); 1 subject had right hemiparesis (GOS = 4). For identifiable risk factor, 1 case had positive family history, 2 had prothrombotic conditions, 1 was post excision of brain metastasis, and 1 had CNS infection. Among the cases with acute presentation (n = 4). All of them had impaired consciousness, hemiparesis on presentation, intracranial haematoma on CT scan and extensive superior sagittal sinus involvement. 2 (50%) subjects had seizure on presentation. 2 (50%) subjects died within 3 days; they only received anticoagulation treatment. 2 (50%) had decompressive craniectomy with external ventricular drain done. No risk factor was identified for this group of patients.

Conclusion: The group of patients with acute onset of symptoms had poor outcome. For this group of patient, early diagnosis, prompt treatment that involved multidisciplinary approach should be considered.
Clinical Presentations and Outcomes of Cerebral Venous Thrombosis in Hong Kong

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Background: Cerebral venous sinus thrombosis (CVST) is a rare type of stroke with variable presentation. Delayed diagnosis and treatment can result in devastating morbidity and mortality. There is scarcity of reports on the CVST in Hong Kong Chinese population.

Objective: To review the clinical presentations and outcomes of all patients with CVST diagnosed between 2000 and 2012.

Method: A retrospective review was conducted in two Kowloon east cluster hospitals (United Christian Hospital and Tseung Kwan O Hospital).

Results: Thirty-six patients with neuroimaging confirmed CVST were identified. Thirty-five patients were admitted through emergency department and 1 patient was managed in outpatient clinic. The mean age was 49 ± 17 years. Nineteen (53%) patients were males. The median onset to admission time was 1 (0–16) day, admission to confirmed diagnosis time was 6 (0–52) days and length of stay was 22 (2–122) days. The commonest reported symptoms were headache (53%), vomiting (28%) and seizure (25%). CVST was diagnosed by digital subtraction angiography (17%), CT venogram (42%) and MR venogram (42%). Transverse sinus (61%), superior sagittal sinus (47%) and sigmoid sinus (39%) constituted the most frequently involved locations of thrombosis. For etiology, most cases were idiopathic (28%) but previous or active history of nasopharyngeal carcinoma was found in 14% subjects. Thirty-two (89%) patients received anticoagulation and the remaining patients either refused or there was contraindication for anticoagulant. Among those received anticoagulation with compliance to follow up neuroimaging (n = 27), twenty-one (78%) patients achieved partial or complete recanalization (30% partial and 48% complete recanalization). The mortality rate during acute phase was 9%. Twenty-eight (80%) patients achieved functional independence (mRS 0–2) upon discharge.

Conclusion: The clinical profiles of cerebral venous disease patients in Hong Kong Chinese population are similar to those reported in Caucasians except we found that nasopharyngeal carcinoma is more prevalent in the etiology of our cohort. The prognoses in terms of functional status and recanalization rate are favorable.

Ringing Ear after Cerebral Venous Sinus Thrombosis

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Background and Aim: Intracranial dural arteriovenous fistula (DAVF) is an uncommon lesion. DVAFs are usually acquired, present later in life than cerebral arteriovenous malformations and usually remain clinically silent. We present clinical and imaging findings of a patient who developed pulsatile tinnitus in left ear due to DAVF, 9-months after an extensive cerebral venous sinus thrombosis.

Case Report: A 53 years old woman presented with pulsatile ‘hissing sounds’ in her left ear for about 2 weeks. The sounds were persistent and of mild intensity. She denied any hearing impairment, pain or discharge from the ear. She had suffered from an extensive cerebral venous sinus thrombosis about 9 months ago, involving the left transverse and sigmoid sinuses with extension into the ipsilateral internal jugular vein. Treatment with anticoagulant therapy had resulted in rapid and complete clinical recovery. Her current neurological examination was unremarkable. Examination of the ears, including hearing tests, did not reveal any abnormal findings. No new parenchymal lesions were noted on computed tomography of the brain. Digital subtraction angiography after a left external carotid contrast injection revealed a Cognard type IIA left tentorial DAVF along the sigmoid sinus. Our patient refused any endovascular intervention. Her mild pulsatile tinnitus has not changed in severity or character and she did not develop any new symptoms during past 16 months. Furthermore, no changes in the size or drainage patterns of the DAVF were noted on a recent catheter angiography.

Conclusions: Venous hypertension is believed to open numerous microscopic vascular connections within the dura that may mature further into direct shunts between the arteries and veins. Pulsatile tinnitus may occur when a DAVF in the petrous temporal region drains into the larger sinuses like transverse or sigmoid sinus. DAVF should be considered as a possible diagnosis in patients with ear symptoms.

Bifrontal Encephaloduro (Periosteal) Synangiosis Combined with Multiple Burr Hole Surgery for Pediatric Moyamoya Disease

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Background: It is well known that bifrontal encephalogaleoarteriosynangiosis (EGS) can induces significant improvements in the ACA territories of pediatric moyamoya patient. Encephaloduroarteriosynangiosis (EDAS) is standard surgical meth-
Methods: The authors describe a new method of surgical revascularization of pediatric moyamoya disease, bifrontal encephaloduro(periosteal)synangiosis (EDS) combined with multiple burr hole surgery.

Results: Under general anesthesia, with the patient in supine position, head kept neutral and slightly flexed. A bicornal skin flap was elevated and peristeum was left attached to the skull. Bifrontal EDS was done as same manner as EGS except that galea was not used. Dural defect was covered by peristeum. After bifrontal EDS, multiple burr holes were made on both sides. Dura was opened through the burr holes. Elevated peristeal flap was laid over the exposed brain. Scalp was closed in two layers.

Conclusion: Bifrontal EDS with multiple burr hole surgery is simple and effective treatment method for pediatric moyamoya disease. It can induce improvement of ischemia of the ACA and MCA territories and done in single session and better cosmetic outcome than multiple burr hole surgery alone.

Background and Objectives: Stroke remains a leading cause of death throughout the world. Aspirin as therapy for stroke is known to have many side effects, for instance: gastric bleeding, liver damage, and resistance. Methanolic extract of Ixora coccinea flowers is expected to have potential effect in the control of thrombotic associated conditions. Thus, it can be considered as an alternative therapy for ischemic stroke. This study aims to investigate the effect of methanolic extract of Ixora coccinea flowers on antiplatelet aggregation activity in human blood and antithrombotic activity in rats.

Methods: In this study, in vitro and in vivo tests were carried out. Antiplatelet aggregation assay was performed in vitro using adenosine diphosphate (ADP) as an agonist. Platelet-rich plasma (PRP) of 450 microl was incubated at 37 C for 4 minutes with 10 microl extract. ADP 10 microM of 50 microl was then added. The test was performed using an aggregometer. Data obtained were analyzed using ANOVA and linear regression to determine IC50 value. In antithrombotic assay, rats were randomly assigned to distinct group subjected to the following treatments: 50, 100, and 500 mg/kg/BW extract. Treatments were given orally once a day for 14 consecutive days. Ephineprine of 1mg/kgBW was injected intravenously to induce thrombosis. In vivo data were analyzed by chi square analysis.

Results: Methanolic extract of Ixora coccinea flowers significantly inhibited platelet aggregation. In vitro dose of 1000 microgram/mL showed 98,25% antiplatelet aggregation effect as compared to control group (p < 0,05).

Conclusion: Methanolic extract of Ixora coccinea flowers possesses antiplatelet and antithrombotic activities that can potentially contribute to the prevention and treatment of ischemic stroke.
**Materials and Methods:** Male Sprague-Dawley rats (250–300 g) were used in early stage of ischemic stroke. Animals were maintained by Institutional Animal Care and Use Committee guidelines. MCAo rat model was established by modified Longa method. After surgery, infarct volume was measured by TTC staining. Also, indicators of oxidative stress (MDA, ROS) and antioxidant activity (CAT) were measured by ELISA.

**Results:** In the analysis of infarct volume, aspirin (2mg/kg) and aspirin (2mg/kg) + ginkgolide (2mg/kg) group showed neuroprotective effects against MCAo and aspirin (20mg/kg) group. The increase of catalase capacity by aspirin and ginkgolide treatment induced decrease of H2O2, ROS and MDA expression. Indeed, the combination treatment of aspirin and ginkgolide showed higher anti-oxidant capacity against aspirin only treatment.

**Conclusion:** The combination treatment of aspirin and ginkgolide showed increased neuroprotective effect against single treatment of aspirin. Thus, ginkgolide could be considered as a functional adjuvant in aspirin therapy.

**EP-98**

**Regression of Lenticulostriate Collaterals in Moyamoya Disease Patient After Direct Extra-Cranial Intra-Cranial (EC-IC) Bypass – A Case Series**

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**Background and Objectives:** Moyamoya disease was characterized by having lenticulostriate collaterals around the basal ganglion to compensate the stenotic internal carotid artery/ middle cerebral artery. These moyamoya vessels were fragile and prone to aneurysm formation. These abnormalities may result into intracranial haemorrhage. Successful EC-IC bypass helped to improve the ischaemic symptoms. But the effect on subsequent haemorrhage was not clearly established. We aim to study the change of lenticulostriate collateral vessels in Moyamoya disease patient after direct EC-IC bypass.

**Method:** Medical records were reviewed retrospectively. Computed Tomography (CT) perfusion was used to measure the cerebral blood volume (CBV) over the basal ganglion, which was regarded as the surrogate marker for the amount of lenticulostriate collateral vessels.

**Results:** 6 patients, with Moyamoya disease treated by direct EC-IC bypass, were identified in the Department of Surgery, Queen Mary Hospital. Early follow-up CT perfusion showed regression of moyamaya vessels in 2 patients after direct EC-IC bypass.

**Conclusion:** Regression of moyamaya vessels did occur in Moyamaya disease patients after direct EC-IC bypass.

**EP-99**

**Aspirin Resistance and Silent Brain Infarcts in Asymptomatic Aspirin Users**

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**Background:** It has been reported that aspirin resistance was correlated with severity and mortality in patients with symptomatic ischemic stroke. However, the relationship between aspirin resistance and silent stroke is unclear.

**Methods:** From 2006 to 2009, we recruited 84 stroke-free aspirin users, including those with ischemic heart disease or atrial fibrillation. Silent brain infarcts (SBI), microbleeds (MB) and white matter hyperintensities (WMH) were determined by brain MRI. Platelet reactivity was reported as aspirin reaction unit (ARU). Aspirin resistance was defined as ARU ≥ 550.

**Results:** 9 (12.0%) patients had SBIs and 10 (13.3%) had MBs. Aspirin resistance was detected in 5 (6.0%) patients. Aspirin resistance, atrial fibrillation, presence of MBs and severe WMH were associated with the presence SBIs in chi-square tests (P < 0.05). ARU value was higher in patients with SBIs than those without (513.2 ± 74.0 vs. 448.4 ± 47.7, P < 0.05), which was the only significant factor after adjustment (OR 1.016, 95% CI 1.000–1.031; P < 0.05). Patients with lower ARU value or longer duration of aspirin usage did not present with more MBs (P > 0.05).

**Conclusion:** Aspirin resistance may be an indicator of silence brain infarcts in asymptomatic aspirin users.
Chronic kidney disease (CKD) is an established risk factor for cardiovascular diseases. Stroke, on the other hand, is not only a major player in cardiovascular disease, but it also has strong two-way relationships with CKD. Moreover, subclinical cerebral abnormalities are also associated with CKD. But despite all these connections, the cerebro-renal interaction has so far not received much attention. This book includes easily understandable reviews on brain, stroke and kidney by both experts in nephrology and neurology. Examined are underlying concepts for cerebro-renal interaction, risk of clinical and subclinical brain damage in CKD patients, primary prevention and acute/chronic management for stroke patients with CKD and end-stage kidney disease. This book promotes not only further understanding and a multidisciplinary collaboration between nephrologists and neurologists, but it is also of interest for neurosurgeons and cardiologists.
After decades of focusing on how to alleviate and prevent recurrence of acute CNS injuries, the emphasis has finally shifted towards repairing such devastating events and rehabilitation. This development has been made possible by substantial progress in understanding the scientific underpinnings of recovery as well as by novel diagnostic tools, and most importantly, by emerging therapies awaiting clinical trials. In this publication, several international experts introduce novel areas of neurological reorganization and repair following CNS damage. Principles and methods to monitor and augment neuroplasticity are explored in depth and supplemented by a critical appraisal of neurological repair mechanisms and possibilities to curtail disability using computer or robotic interfaces. Rather than providing a textbook approach of CNS restoration, the editors selected topics where progress is most imminent in this labyrinthine domain of medicine. Moreover, the varied background and origins of the contributors lend this book a truly global perspective on the current state of affairs in neurological recovery.

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