PHYSIOLOGICAL BASIS OF ACUTE CARE

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Central Nervous System

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INTRODUCTION

Whilst all systems are important for the continuation of life, the brain may be considered to be the most essential for meaningful intact survival. In acute care therefore, preservation of the needs of the brain is of paramount importance and these include the need for oxygen as well as energy source in the form of glucose.

FUNCTIONAL ANATOMY

Brain tissue is the biggest component in the skull. It weighs 1400 g and consists of neuronal tissues, intracellular and extracellular water. The blood–brain barrier that is formed by tight junctions between adjacent cerebral capillary endothelial cells maintains a tightly controlled environment in the brain appropriate for nerve cell function. It is permeable to O₂, CO₂ and water but less so to low molecular weight ions or proteins to meet the need to maintain constancy in the brain milieu.

About 150 mL of cerebrospinal fluid (CSF) is present in equal proportions in the intracranial and spinal compartments. It is produced constantly at a rate of 0.3 mL/min (500 mL/day) by an energy dependant active process in the choroid plexus within the lateral and fourth ventricles and reabsorbed into the venous circulation via the arachnoid villi situated within the walls of the sagittal sinus. CSF is iso-osmolar compared to plasma and has a lower pH of 7.32. The protein and glucose content are lower than in plasma but the concentrations of sodium, chloride, magnesium and CO₂ are higher.

The brain is supplied with blood via the internal carotid and vertebral arteries which join to form a circle called the Circle of Willis, and venous drainage is by cerebral sinuses and internal jugular veins. Normally, there is about 150 mL of blood in the skull, of which 100 mL is within the venous system.

CEREBRAL BLOOD FLOW AND METABOLISM

The brain is only 2% of body weight but accounts for 20% of the total body basal oxygen consumption and 25% of basal glucose consumption. The global cerebral blood flow (CBF) is about 50 mL/100 g/min which equates to 15% of
Physiological Basis of Acute Care is a short, easy-to-read-book that features:

- Chapters that link the management of life such as Basis of Life and Physiology of Death for frontline providers.
- Chapters covering important organ systems from airway to kidney, including energy, heat and acid-base balance.
- Special chapters on maternal-foetal, paediatrics, elderly and obesity.
- Clinical implication and application sections within each chapter for students to relate to clinical practice.
- Medical illustrations by Frank Netter, the foremost master of medical illustration.
- 58 fully coloured illustrations, diagrams and charts to enhance learning and understanding.

Also features:

- Content reviewed by international and Malaysian academicians.
- Foreword by Dr Angela Enright, President, World Federation of Societies of Anaesthesiologists (WFSA), United Kingdom.

“This book achieves its objectives of presenting simple, basic physiology in an uncomplicated manner.”

– Michael FM James, Professor and Head, Department of Anaesthesia,
University of Cape Town, South Africa

“This book is simple and enjoyable to read, and presents the subject in a systematic fashion.”

– Thiam Aun Lim, Professor, Anaesthesiology Unit,
Universiti Putra Malaysia, Malaysia

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