Real-time eye lens dose monitoring during cerebral angiography procedures

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Abstract

Objectives To develop a real-time dose-monitoring system to measure the patient’s eye lens dose during neuro-interventional procedures.

Methods Radiation dose received at left outer canthus (LOC) and left eyelid (LE) were measured using Metal-Oxide-Semiconductor Field-Effect Transistor dosimeters on 35 patients who underwent diagnostic or cerebral embolization procedures.

Results The radiation dose received at the LOC region was significantly higher than the dose received by the LE. The maximum eye lens dose of 1492 mGy was measured at LOC region for an AVM case, followed by 907 mGy for an aneurysm case and 665 mGy for a diagnostic angiography procedure. Strong correlations (shown as $R^2$) were observed between kerma-area-product and measured eye doses (LOC: 0.78, LE: 0.68). Lateral and frontal air-kerma showed strong correlations with measured dose at LOC (AK$\textsubscript{L}$: 0.93, AK$\textsubscript{F}$: 0.78) and a weak correlation with measured dose at LE. A moderate correlation was observed between fluoroscopic time and dose measured at LE and LOC regions.

Conclusions The MOSkin dose-monitoring system represents a new tool enabling real-time monitoring of eye lens dose during neuro-interventional procedures. This system can provide interventionalists with information needed to adjust the clinical procedure to control the patient’s dose.

Key Points

- Real-time patient dose monitoring helps interventionalists to monitor doses.
- Strong correlation was observed between kerma-area-product and measured eye doses.
- Radiation dose at left outer canthus was higher than at left eyelid.

Keywords Interventional radiology \cdot Cerebral angiography \cdot Eye lens \cdot Real-time dose monitoring

Introduction

Fluoroscopy-guided interventional radiological procedures provide enormous advantages over invasive surgical procedures. However, long periods of radiation exposure during complicated interventional radiology (IR) procedures remains a concern. Skin injuries are the most frequently encountered tissue reaction effects from IR procedures [1–4]. Different indirect dose evaluation techniques, such as fluoroscopic time (FT), kerma-area-product (KAP), dose level at the...