Skin Dose Measurements on Patients for Diagnostic and Interventional procedures of the Head: a multicentre study.

Lara Struelens(1), F. Vanhavere(1), H. Bosmans(2), R. Van Loon(3)

(1) SCK-CEN, Belgian Nuclear Research Centre, Boeretang 200, 2400 Mol, Belgium
(2) UZ-GHB Leuven, Radiology Department, Herestraat 49, 3000 Leuven
(3) VUB, Pleinlaan 2, 1050 Brussel

Body of Abstract: In the Euratom 97/43 directive on the protection of the population against the dangers of ionising radiation, special attention is asked for high dose examinations, including interventional procedures. These procedures are characterised by extended fluoroscopy times and they require many radiographic images. In practice, high skin doses can result in deterministic effects such as erythema or temporal epilation.

Present study reports on skin dose measurements on patients undergoing (1) diagnostic angiography procedures of the carotid arteries and (2) interventional cerebral embolisations. The doses were measured in 2 university hospitals and 1 peripheral hospital. For the dose measurements, grids of thermoluminiscent dosimeters (TLDs) are attached on the head of the patient. Also the skin dose at the height of the thorax and thyroid were measured. In total 37 patients are included in the study. The X-ray systems and the clinical procedures were fully documented.

For the angiographic procedures of the carotid arteries, the dose limit of 2 Gy for deterministic effects is far from reached. Typical maximum skin doses for one of the university hospital range from [44 - 265] mGy, located at the backside of the head. In the peripheral hospital the maximum skin doses are located at the chin ranging from [12 - 60] mGy.

For the cerebral embolisations, the risk of reaching the deterministic dose limit is real. The maximum skin dose in the 2 university hospitals range from [619 - 3984] mGy, meaning that for some patients the dose limit was exceeded. This interventional procedure is not carried out in the peripheral hospital.

For the angiographic procedures the dose limit for deterministic effects is far from reached. Nevertheless, it may be a good ALARA principle to promote the role of MR imaging. The distribution of the dose over the skin of the head depends on the examination protocol in the different hospitals. For the cerebral embolisations, however, the dose value and its distribution over the skin of the head depend on the severity and location of the problem. In our limited study of interventional cerebral procedures, skin doses reached the dose treshold for deterministic effects. We recommend to inform the patients about possible deterministic effects and to organize a follow up. To keep these doses as low as reasonable achievable, technical factors such as extra additional copper filtration, pulsed fluoroscopy, etc... could be used. Fluoroscopy time should be kept as low as possible. This may benefit from training and specialization into these specific techniques.