Background: In clinical interventions, medical practitioners are subjected to relatively high X-ray exposure. Radiation protection equipment is sometimes difficult to use, resulting in potentially high brain doses. According to ICRP Publication 103, radiation-induced cancer sensitivity of the brain is low. However, ICRP Publication 118 highlights the need to increase awareness among medical practitioners that the threshold level for circulating dosimetry might be as low as 0.5 Gy for the brain. In this study, the novel shields HeadPeace™ and MindPeace™ were evaluated for potentially reducing radiation exposure to the neck and head.

Methods: An anthropomorphic phantom (Rando Alderson, CA, USA) dressed in a lead apron of 0.5 mm lead equivalence was exposed to scattered radiation to simulate a clinical situation, where the medical practitioner is exposed from beneath and left. Thermoluminescent dosimeters (TLDs) were positioned at different depths in five different slices (A, B, C, D and E) in the phantom, measuring dose equivalent. Two different measuring set up situations using two different shields, HeadPeace™ and MindPeace™ (patent pending, Ten Medical Design AB, Sweden) of 0.25 mm and 0.5 lead equivalence respectively were evaluated. HeadPeace™ is a head protector, designed to reduce radiation in the upper section of the head. MindPeace™ is a thyroid collar extended in the front and on both sides. A standard thyroid collar and a ceiling-mounted lead glass shield of 0.5 mm lead equivalence were used as comparisons.

Results: Preliminary TLD data showed that MindPeace™ reduce radiation exposure in the throat, chin and ear slices (A, B, C). Some shielding effect using MindPeace™ was also seen in the brain and skull slices (D, E). For the thyroid collar a reduction was only seen in the throat slice (A) and partly in the chin slice (B). HeadPeace™ showed a shielding effect in the skull slice (E) up to 2 cm depth where HeadPeace™ covered the phantom head. As expected, the ceiling-mounted lead glass shield reduced the dose equivalent in all measuring points throughout the phantom head. In slice A there is a shielding effect of the lead apron which influence the radiation ratio.

Conclusions: The most effective radiation protection for the head is a ceiling-mounted lead glass shield, when properly positioned. HeadPeace™ alone (without a lead shield) often does not provide sufficient protection in clinical situations. The combination of HeadPeace™, MindPeace™ and lead glass shield seems to provide comprehensive radiation protection for the head and neck, however, further studies are needed.

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