Minimising intraoperative exposure of ionising radiation to the anaesthesiologist

Sir,

We would like to highlight the dangers of intraoperative exposure to ionising radiation and a novel approach that can be used to reduce such exposure. Ionising radiation (medical exposure) regulations and amendment regulations 2006 and 2011 state radiation protection principles are the responsibility of all healthcare professionals working with radiation in the UK. Recommended occupational exposure should not exceed 100 milli Sievert (mSv) in a consecutive 5 year period and no more than 50 mSv of exposure should occur in any 1-year.[1] Quantities that are measured in Sieverts are intended to represent the stochastic health risk, which is defined as the probability of cancer induction and genetic damage. The Sievert is not used for high levels of radiation, which produce deterministic or non-stochastic effects, which is the severity of acute tissue damage, which is certain to happen. It is estimated that one Sievert carries with it a 5.5% chance of eventually developing cancer from this dose of radiation.[2] Doses >1 Sievert received over a short-time period are likely to cause severe radiation poisoning, possibly leading to death within weeks. A recent study[3] showed that while intraoperative exposure to ionising radiation during both endovascular and interventional radiology procedures were within international safe limits; the median exposure to the anaesthesiologist was as high as 16 μSv per procedure with one single procedure recorded as exposing the anaesthesiologist to 109 μSv. This corresponds to approximately a 0.00003% and 0.0006% chance of eventually developing cancer from this dose of radiation alone. Risk is reduced by limiting the time of exposure, increasing the distance from the source of radiation and by shielding. The layout of operating and radiology procedure rooms should maximise the anaesthesiologists' distance from the radiation source and allow the use of protective shields.[3] We propose a novel approach of utilising the anaesthesia workstation as a barrier to ionising radiation, further protecting the anaesthesiologist. Commonly the layout of the operating room (OR) is such that the anaesthesiologist sits directly between the X-ray source and the workstation. The workstation is usually orientated such that its rear aspect is close up against and facing the rear wall of the OR, and its front aspect is facing the operating area. In suitable cases, we change the layout, such that the workstation is rotated 180°, with the front of the workstation facing the rear wall, but a short distance away from it, allowing the anaesthesiologist to sit between it and the rear wall. The workstation is thus placed between the X-ray source and the anaesthesiologist. This simple change of layout will result in a shielding effect of the anaesthesia workstation between the X-ray source and the anaesthesiologist and could significantly reduce the X-ray exposure over the working lifetime of anaesthesiologists who commonly work in this environment. This layout has been used successfully for many cases over many years by one of the authors (SR) [Figure 1]. It is feasible that anaesthesia workstation manufacturers may choose to add shielding rear doors designed to be protective against ionising radiation that would further increase the protection offered.

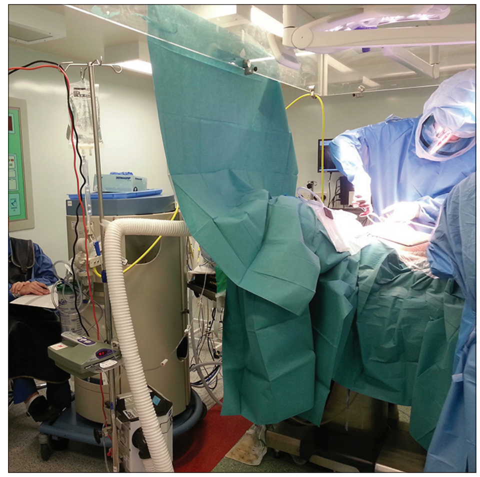

Figure 1: Relative positions of anaesthesiologist, machine and surgical table

We acknowledge that changing the orientation of the workstation is facilitated by the presence of an overhead gantry for compressed gas pipelines and electrical power and that this layout may not be suitable for all operating areas, cases or for all anaesthetists. We also acknowledge that the actual potential of developing cancer from exposed radiation is very small, however, we believe that the reduction in exposed radiation from utilising our proposed reverse layout is worthy of further study. Furthermore, we also recommend, where feasible, the use of commercially available head and side skirt shields that attach to the head and sides of the operating table and drop down to the floor, reducing X-ray exposure that is reflected and scattered from the floor towards the anaesthesiologist. We also recommend the use of thyroid shields and full body protective lead aprons and the regular use of radiation dosimeters. The provision of leaded eye shields or spectacles can also be considered. Where such equipment is not available, a request can be made to the employing hospital with the support of the radiology department.

Further information can be obtained from the Royal College of Radiologists (www.rcr.ac.uk), the Society and College of Radiographers (www.sor.org), the International Commission on Radiological Protection (www.icrp.org) and the International Commission on Radiological Units and Measurements (www.icru.org).

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