Measurement of the Dose of Radiation to the Surgeon During Surgery to the Foot and Ankle

Reference:

Scientific Literature Review

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PODIATRIC RELEVANCE:
Exposure to radiation can become very harmful to the physician in all practices. It is widely recognized that exposure to radiation over many years is associated with an increased incidence of adverse effects, including the development of malignancies. Interest in protection from radiation has recently increased in the medical profession especially in the field of Podiatric Surgery. The objective of this study was to obtain accurate measurements of the effective dose to the skin of the hands during fluoroscopically-guided procedures on the foot and ankle and to estimate the maximum permissible workload of surgery of the foot and ankle that was compliant with the current guidelines concerning radiation.

METHODS:
A prospective study was carried out over a period of 12 months to measure the exposure to radiation of the hands of a dedicated foot and ankle surgeon. The C-arm was used with the radiograph tube below and the image intensifier above, with the surgeon standing on the side of the patient opposite the C-Arm. A thermo-luminescent dosimeter ring (TLD) was used to measure the cumulative dose of radiation. For each case the radiographer recorded the time and range of exposure used during the procedure from the control panel of the image intensifier. At the end of each month, the rings were changed and the exposed devices were sent to a recognized monitoring laboratory for reading. Statistical analysis was performed using Pearson’s coefficient and the paired t-test.

RESULTS:
During the period of study 80 procedures required the use of fluoroscopy (mean 6.8 cases/month). There were 51 elective and 29 trauma procedures. The total screening time was 3028s with a mean time per procedure of 37.4s (0.6 to 197). This correlated positively with the number of procedures performed and with the dose of radiation in both the left ($r = 0.85, p = 0.0005$) and right TLDs ($r = 0.59, p = 0.419$). There was no significant difference in the dose of radiation between the two hands ((t-test, $p = 0.62$). Over the 12-month period the total radiation dose to the operator’s hands was 2.4 mSv. This result is well within recommendations and well below the dose limits set by the ICRP.

COMMENTS:
This prospective study showed valuable and accurate data regarding radiation to surgeons in foot and ankle surgery. To decrease all risks to foot and ankle surgeons, radiological units should undergo periodic calibration checks, surgeons should wear protective devices, increase their working distance from the X-ray beam and limit their duration of exposure to radiation. Therefore, experience and training are key issues for the reduction in exposure of radiation to patients and staff in foot and ankle surgery.