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Radiation Exposure to the Eye with Mini C-arm Use During Hand Surgery

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INTRODUCTION

Fluoroscopic radiation exposure is a potential occupational health risk to the Hand Surgeon, given operator proximity and the relative lack of eye shielding. The association of eye radiation exposure and the early development of cataracts has been previously reported. Mini C-arm fluoroscopy is commonly utilized during routine Hand Surgery. At present, the amount of radiation exposure to the eye, associated with the routine use of mini-C-arm fluoroscopy, is unknown, thus warranting further investigation. The purpose of this study is to test the hypothesis that eye radiation exposure, sustained during routine mini-C-arm use, does not exceed that of previously reported critical radiation dosages to the eye.

MATERIALS AND METHODS

Over a four month period, eye radiation exposure was measured in four board-certified Hand Surgeons utilizing mini C-arm fluoroscopy (OrthoScan, Scottsdale, AZ) during routine surgical procedures. Eye dosimeters were secured to surgical loupes at the level of the orbit. Accumulated radiation dosage was analyzed and compared to control badges on a monthly basis, and background exposure was eliminated (Landauer, Glenwood, Illinois). For each procedure, mini C-arm radiation output was logged, including the dose rate, total accumulated dosage, and total exposure time.

RESULTS

Average monthly eye dosimetry values included the following: dose rate was 0.50±0.03 mGy/sec, total accumulated dosage was 32.16±7.88 mGy, and total exposure time was 75.72±16.36 sec. Average monthly eye radiation exposure values were less than 30 mrem (previously reported maximum eye dosage is 1,250 mrem per month). A total of 46 procedures were performed over the collection period. The most commonly performed procedures included ORIF distal radius fractures (14), metacarpal and phalangeal surgery (9), and basilar thumb arthritis surgery (7). ORIF of the distal radius fracture was associated with higher average exposure time (93.57 sec) and average accumulated dosage (51.73 mGy).

DISCUSSION

Radiation exposure is a well-recognized occupational risk to the orthopedic hand surgeon. Previous studies have investigated the increased risk of radiation exposure to orthopedic surgeons, given the proximity to the radiation source and the relative lack of shielding to critical body parts. These studies have generally focused on large C-arm, with the use of live fluoroscopy, as potential radiation sources. The use of mini-C-arm fluoroscopy by the orthopedic hand surgeon, for fracture and arthritis treatment, is rising. The association of early onset cataracts with the increased radiation exposure of the eye lens has been well-documented. At present, the effect of mini-C-arm fluoroscopy use on the critical dosage to the eye is relatively unexplored, and warrants further investigation.

Our study suggests that eye radiation exposure, from routine mini-C-arm fluoroscopy use, on an average monthly basis, does not approach previously reported critical eye radiation loads associated with cataracts.

SUMMARY POINTS

• The association of early onset cataracts with increased radiation exposure has been previously reported, and the contribution of routine mini-C-arm fluoroscopy use towards the critical eye dosage is unknown.
• ORIF of distal radius fractures was associated with higher average exposure time and accumulated dosage compared to that of other commonly performed procedures.
• Our study suggests that eye radiation exposure, from routine mini-C-arm fluoroscopy use, on an average monthly basis, does not approach previously reported critical eye radiation loads associated with cataracts.

REFERENCES


