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CLINICAL SUMMARY

FLUOROSCOPIC RADIATION EXPOSURE: ARE WE PROTECTING OURSELVES ADEQUATELY?

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BACKGROUND

The authors examine recent data which suggests that surgeons' eyes and hands are exposed to radiation and are at a greater risk of exposure than previously recognized. When fluoroscopy is utilized, the surgeons' hands manipulate and position the extremity for imaging, which occurs in hand surgery more than in other surgical procedures. Hand surgeons and all orthopedic surgeons routinely perform distal radial plate insertion procedures. Distal radial fracture treatment may involve high radiation exposure, making it a good model for studying surgeon safety. More protection may be needed since traditional intraoperative fluoroscopy protection relies on thyroid shields and aprons, but not radiation attenuation gloves and glasses.

OBJECTIVES AND METHODS

An anthropomorphic model equipped with radiation-attenuating glasses, a thyroid shield, an apron, and gloves was used (Figure 1). There was a standardized method for all procedures to include fluoroscopy positioning and settings to 60 kVp. Exposed thermoluminescent dosimeters were placed over the protective equipment at the eyes, thyroid, chest, groin, and proximal phalanx of the index finger. Shielded dosimeters were placed beneath the protective equipment. The exposed finger dosimeter was placed under a standard polyisoprene surgical glove on the left hand.

Three mini and three standard C-arms scanned a model of the patient's wrist continuously for 15 minutes each. Using an open distal radial fracture surgery model, this study examined:

1. Radiation exposure to the eyes, thyroid, chest, groin and hands of a surgeon mannequin
2. The degree to which shielding equipment can decrease exposure
3. How exposure varies with fluoroscopy unit size

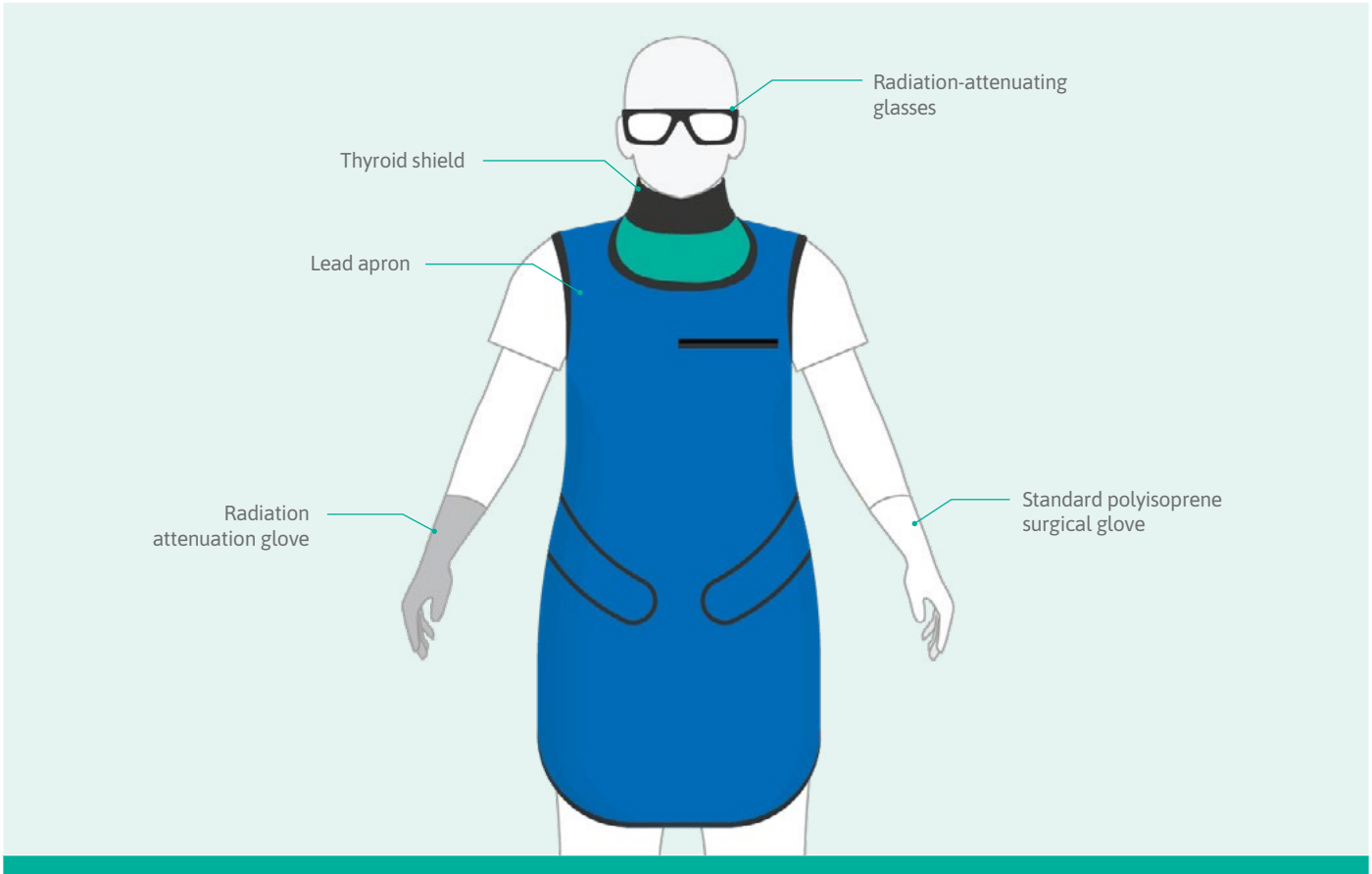


Figure 1: An anthropomorphic model with radiation-attenuating glasses, thyroid shield, apron, and gloves.

RESULTS

The **hands showed statistical significance with exposure** averaging 31 µSv/min (range, 22 to 48 µSv/min), which was **13 times higher than other recorded exposures (p < 0.0001).** Eye exposure averaged 4 µSv/min, 2.2 times higher than the mean thyroid, chest, and groin exposure.

Table 1: Radiation exposure for exposed and shielded anatomic location

Mean (Standard Devitation) (µSv/min)	Location	Eye	Thyroid	Chest	Groin	Hand
	Exposed	4.1 (4.3)	1.6 (0.8)	2.0 (1.7)	1.9 (2.1)	**31.0 (9.2)**
	Shielded	0.8 (1.1)	1.2 (0.3)	1.3 (0.0)	1.3 (0.0)	**9.1 (2.7)**
	P Value	0.12	0.18	0.18	0.27	**0.0001***

**Statistically significant difference*

Results showed:

Radiation gloves reduced hand exposure by **69.4%**

Radiation glasses decreased eye exposure by **65.6%**

CONCLUSION

Surgeons' hands receive the most radiation exposure during distal radial plate fixation under fluoroscopy. Given the uncertainty about the long-term effects of hand exposure to radiation, personal protective equipment may help to reduce the potential cumulative risk of long-term subclinical exposure. This study found that the use of radiation-attenuating surgical gloves reduced hand exposure by nearly 70%. This is a simple and effective intervention for reducing radiation exposure, especially for procedures that require more fluoroscopy use.

APPLICATION FOR PRACTICE

To reduce radiation exposure to surgeons' eyes and hands, this study recommends wearing both radiation-protective glasses and gloves. Additionally, the study suggests wearing protective equipment for the thyroid, chest, and groin during fluoroscopy procedures.

Routine protective equipment to mitigate exposure

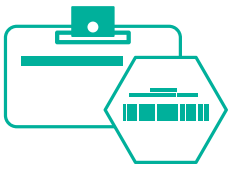
1

Radiation-attenuating gloves and glasses should be considered to reduce scatter radiation exposure by almost 70%

2

Protective shielding, including a lead apron and thyroid shield, should be routinely worn

3



Dosimeters should be worn with protective shielding to monitor exposure limits

Note: This clinical summary is written as an abbreviated version by clinicians at Ansell Healthcare Product LLC. Please refer to the full text version for complete information.

Hoffler CE, Ilyas AM. Fluoroscopic radiation exposure: are we protecting ourselves adequately? J Bone Joint Surg Am. 2015 May 6;97(9):721-5.

Link to access full text article: https://journals.lww.com/jbjsjournal/Abstract/2015/05060/Fluoroscopic_Radiation_Exposure__Are_We_Protecting.4.aspx

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