

Evaluation of Fluoroscopic Cranial Radiation Exposure for Operating Room Personnel During Spinal Surgery

Laila Malani Mohammad BA MD; James Messegee MD; M. Omar Chohan; Christopher L. Taylor MD, MBA
University of New Mexico, Department of Neurosurgery



Introduction

Radiation exposure to patients and personnel continue as a major concern in the practice of modern spine surgery. Medical personnel using radiation now account for more than half of all radiation workers exposed to man-made sources of radiation. Moreover, cranial exposure remains the only established environmental risk factor for gliomas and meningiomas. We, therefore, sought to determine cranial radiation exposure to the patient, surgeon and operating room personnel during spine surgeries requiring fluoroscopic guidance.

Methods

Forty-seven subjects were enrolled over a one-and-a-half-year period between October 2014 and March 2016 at the University of New Mexico, Department of Neurosurgery. Radiation doses were obtained through electronic dosimeters (Instadose, San Ramon, CA) placed on the surgical cap over the temporal scalp (bilaterally on surgeon and resident assist, unilaterally on surgical scrub on the side facing radiation source) and on the midline of the patient’s exposed cranium.

Cranial Radiation Exposure				
	Badge Dose (mrem)	Mrem/ case	Mrem/ level	Dose/yr (250 cases)
Resident	68	1.4	0.7	361.7
Attending	66	1.4	0.7	251.1
Scrub tech	57	1.2	0.6	303.2
Patient	167	3.6	1.8	N/A

Results

Of the 47 procedures, 39 (83%) were open and 8 (17%) were minimally invasive (MIS) or percutaneous. A total of 91 motion segments were treated, with a mean of 1.9 levels per case (57% lumbosacral, 34% cervical, and 2.1% thoracic). Total fluoroscopic time was 12.9 minutes. Mean dose per case (mrem/case) was calculated for the spine surgeon (1.4), resident assist (1.4), surgical scrub (1.2), and the patient (3.6). All doses were within federal safety guidelines. A spine surgeon would need to perform more than 3,500 cases per year to reach the current federal maximum permissible dose.

Conclusions

There was no difference in cranial radiation exposure between operating room staff during spine surgeries. Moreover, the doses measured at the cranium were within national safety limits. Current protective technologies have significantly reduced the amount of ionizing radiation exposure during routine spine procedures; however, changes in behavior or equipment may further reduce radiation exposure to healthcare workers.

Learning Objectives

By the conclusion of this session, participants should be able to:

- 1) Describe the importance of radiation exposure on the patient, surgeon and operating room personnel during spine surgeries requiring fluoroscopic guidance.
- 2) Discuss, in small groups, the number of surgeries required to reach the current federal maximum permissible dose.
- 3) Identify an effective treatment to reduce radiation exposure during spinal surgery.

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