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CLINICAL SUMMARY

RADIATION EXPOSURE OF PATIENT AND OPERATING ROOM PERSONNEL BY FLUOROSCOPY AND NAVIGATION DURING SPINAL SURGERY

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BACKGROUND

The study authors highlight concerns about the increased cancer risk among members of the Scoliosis Research Society associated with radiographic imaging, particularly in the field of spinal injury. They mention an increase in the prevalence of cancer among these individuals referring to a retrospective study in an Italian hospital revealing a 29% cancer incidence in orthopedic surgeons to medical radiation which raises significant alarm. They also comment that this issue becomes more pronounced considering a 600% increase in medical radiation exposure for the US population since the 1980's.

Radiographic Intraoperative imaging is an essential procedure in the treatment of spinal injuries. The hazards caused by ionizing radiation during these procedures raise concern with medical personnel regarding their own, and patient radiation exposure in the operating room (OR).

The health risks associated exposure in the field of spinal surgery are serious. Emphasizing the need for alternative technologies and approaches to mitigate these risks for both patients and medical personnel needs more exploration. The proposed study aims to contribute valuable information for surgeons to make informed decisions regarding imaging techniques with a focus on reducing radiation doses.

OBJECTIVE AND METHOD

Lumbosacral dorsal spinal fusion was performed on thirty-seven (37) patients (19 navigated, 18 fluoroscopy) during this prospective study. Radiation exposure measurement documented different body regions with thermoluminescent dosimeters of both patient and OR personnel which included surgeon, assistant, sterile nurse, and radiology technologist. Comparisons between patient characteristics and radiation exposure was included.

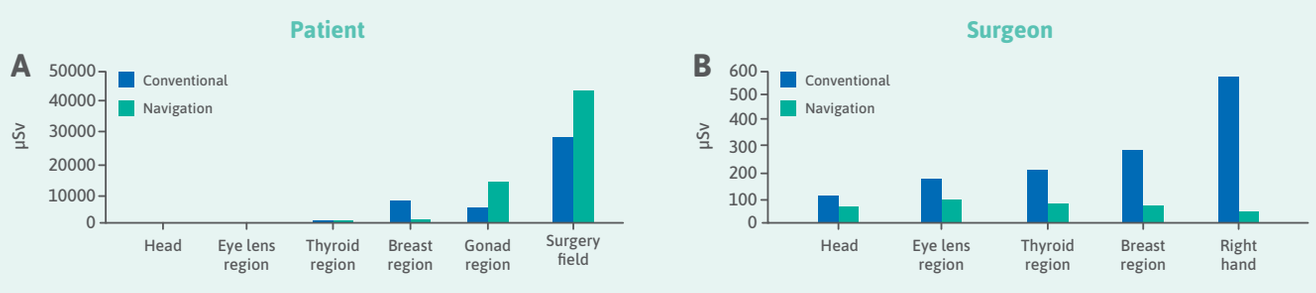
The objective of this study was to:

1. Evaluate the exposure of OR staff and patients to radiation when fluoroscopic imaging is being performed during spinal surgery.
2. Additional attention should be given to various body regions to enable an assessment of the relative risk associated with reaching the maximum radiation dose for the working life of these imaging methods.

RESULTS

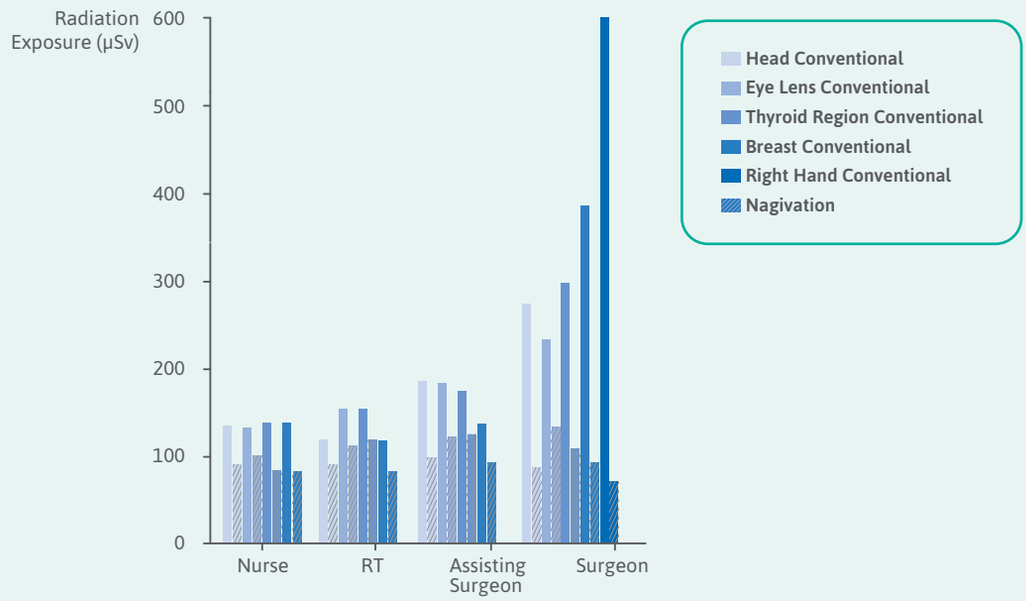
Compared to surgeon and other OR personnel, patients' radiation exposure was higher for all measured body areas with both methods. The O-arm measured the highest radiation values on patients and exposed the highest radiation dose on the surgery field, where the scans are performed and significantly higher dose compared to fluoroscopy was reached (navigation: 43.2 ± 19.4 mSv; fluoroscopy: 27.7 ± 31.3 mSv; p = 0.02). In comparison to these mentioned regions, the other patients' body regions measurement was negligible.

Patient and Surgeon Radiation Exposure Results: C-arm vs O-arm technique



Amongst the OR personnel, the operating surgeon exposure was to the highest radiation dose using fluoroscopy, whilst they have found no difference to other personnel measured exposure during navigation. While navigation guided screw placement did not lead to divergent radiation exposure of the hands compared to other body regions, use of fluoroscopy led to highest surgeon's exposure in this region (right hand: navigation: 49 ± 19 µSv; fluoroscopy 566 ± 560 µSv, $p < 0.001$; left hand: navigation: 44 ± 23 µSv; fluoroscopy 312 ± 222 µSv, $p = 0.002$) followed by thoracic region (navigation: 66 ± 19 µSv; fluoroscopy: 275 ± 147 µSv), thyroid and forehead. Other OR personnel had comparable low radiation exposure doses on all measured body regions with both methods.

Sterile Nurse, Radiology Technician, Assisting Surgeon and Surgeon Radiation Exposure Results: C-arm vs O-arm technique.



CONCLUSION

According to this study, radiation exposure of the surgeon's body is significantly higher than other OR personnel during fluoroscopy guided surgery. This is determined by the surgeons' proximity to the x-ray tube and varies with distance. The surgeons' dominant (in this study, right) hand, used to fix the screw position in the surgery field during fluoroscopy, received the highest radiation dose. Facing increasing rates of radiation exposure due to imaging technology to personnel and patients, the identified risk should be part of the decision on which imaging method is chosen by the surgeon. The data presented in this study may improve risk evaluation, and raises the following points:

1. "Predominant use of navigation technology provides the opportunity of a significant work life dose reduction for the surgeon".
2. "In any method used, distance and accurate protection must be the key elements to reduce the exposure rates below a dangerous value in the long run".

APPLICATION FOR PRACTICE

1

Initial and ongoing training to minimize radiation exposure

2

Apply basic radiation exposure safety principles

3

Use products to reduce radiation exposure

Including, but not limited to:

1. Radiation - Attenuation Surgical Gloves
2. Dosimeter
3. Lead Apron
4. Lead Glasses
5. Thryoid shield

Note: This clinical summary is written by clinicians at Ansell Healthcare Products LLC. Please refer to the actual study for full text information.

Bratschitsch G, Leitner L, Stücklschweiger G, et al. Radiation Exposure of Patient and Operating Room Personnel by Fluoroscopy and Navigation during Spinal Surgery. Sci Rep. 2019;9(1):17652. Published 2019 Nov 27.

To read study article: https://www.nature.com/articles/s41598-019-53472-z

For more information or additional clinical resources, please visit: www.ansell.com/AnsellCARES