Ultra low radiation imaging

see also Low dose computed tomography.

To compare radiation exposure between ultra-low radiation imaging (ULRI) with image enhancement and standard-dose fluoroscopy for patients undergoing minimally invasive transforaminal lumbar interbody fusion (MIS TLIF).

Although the benefits of MIS are lauded by many, there is a significant amount of radiation exposure to surgeon and operating room personnel. Our goal with this work was to see if by using ultra-low dose radiation settings coupled with image enhancement, this exposure could be minimized.

An institutional review board approved, prospective, internally randomized controlled trial was performed comparing ultra-low dose settings coupled with image enhancement software to conventional fluoroscopic imaging. In this study, each patient served as their own control, randomly assigning one side of MIS-TLIF for cannulation and K-wire placement using each imaging modality. Further, the case was also randomly divided into screw placement and cage placement/final images to allow further comparisons amongst patients. Radiation production from the C-arm fluoroscope and radiation exposure to all operating room personnel were recorded.

Twenty-four patients were randomly assigned to undergo a single level MIS-TLIF. In no case was low radiation imaging abandoned, and no patient had a neurologic decline or required hardware repositioning. Everyone in the operating room-the physician, scrub nurse, circulator, and anesthesiologist-all benefited with 61.6% to 83.5% reduction in radiation exposure during cannulation and K-wire placement to screw insertion aided by ULRI. In every case but the anesthesiologist dose, this was statistically significant ($P < 0.05$). This benefit required no additional time ($P = 0.78$ for K-wire placement).

ULRI, when aided by image enhancement software, affords the ability for all parties in the operating room to substantially decrease their radiation exposure compared with standard-dose C-arm fluoroscopy without adding additional time or an increased complication rate [1].

1)
Wang TY, Farber SH, Perkins SS, Back AG, Byrd SA, Chi D, Vincent D, Karikari IO. Internally Randomized Control Trial of Radiation Exposure Using Ultra-low Radiation Imaging Versus Traditional C-arm Fluoroscopy for Patients Undergoing Single-level Minimally Invasive Transforaminal Lumbar Interbody Fusion. Spine (Phila Pa 1976). 2017 Feb 15;42(4):217-223. doi: 10.1097/BRS.0000000000001720. PubMed PMID: 28207655.

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