A Collaborative Approach to Dose Optimization in Fluoroscopy Guided Lumbar Spine Injection Procedures

The entrance skin dose to patients undergoing lumbar spine injection procedures using fluoroscopy guidance was evaluated. The neuroradiologist practice group performing these procedures expressed interest in identifying opportunities to reduce dose to their patients. As such, technical acquisition parameters and clinical operating techniques used by individual neuroradiologists were observed. Based on these initial observations several opportunities to reduce dose were identified. A meeting was held with all neuroradiologists and the following observations were discussed as options to reduce patient dose:

1. **Reduce fluoro pulse rate from 7.5 p/s to 3 p/s.** Based on simulations with a rando phantom no significant degradation in image quality was expected from this change. The physicians accepted this recommendation.
2. **Angulation of the beam varied tremendously across all studies.** It was recommended that less angulation would result in lower patient dose. The physicians felt the amount of angulation needed was determined by the treatment endpoint and anatomical variations between patients. The physicians did not feel this was something that could be standardized.
3. **The use of magnification modes varied significantly among physicians and patients.** It was recommended that the use of magnification modes be minimized as a dose reduction measure. The physicians agreed that magnification should be minimized however they felt that the magnification needed varied with patient anatomy and procedure difficulty and therefore could not be standardized.
4. **Image acquisition practices varied among physicians.** Some acquired “one-shot” digital images and others used fluoro grab images for documentation in PACS. It was recommended that the acquisition of digital images be minimized and that fluoro grab images be stored instead whenever possible. The physicians accepted this recommendation. All physicians were observed to energize the fluoro beam in short pulses only as needed to visualize needle localization. No changes to this practice were recommended.
5. **The image receptor to patient distance in the A/P and LAT planes was observed to be at maximum during studies.** It was recommended that the image receptors be positioned as close as possible to the patient to reduce dose. The physicians felt repositioning of the A/P plane was limited because of the need for space to manipulate the injection needle. They did agree to bring the receptor in as close as possible and agreed the lateral plane could be positioned very closely to the patient with no adverse outcomes.

Following implementation of the agreed upon changes, patient entrance skin dose was re-measured and the results compared to baseline measurements. Average skin dose measurements were 64% lower in the A/P plane and 79% lower in the lateral plane.