

Differences in radiation exposure between Fluoroscopy- and CT-guidance of lumbar steroid injections

Many patients with radicular pain due to nerve root compression or low back pain related to degeneration of the facet joint respond favorably to imaging-guided spinal therapeutic injections with steroids. Lumbar transforaminal epidural and lumbar facet joint steroid injections can be performed reliably, safely, and quickly with either a fluoroscopy-guided or CT-guided technique.

However it is unknown what is the difference in the level of radiation dose to which both patients and the clinicians are exposed, depending on the imaging modality used to guide the injection. Neither has it been specifically studied whether fluoroscopy-guided injections yield more favorable clinical patient outcomes than CT-guided lumbar spinal therapeutic injections or vice versa.

A group of clinicians from Zurich, Switzerland set out to compare the procedure-related radiation

exposure for patients and interventionalists during fluoroscopy-guided and CT-guided lumbar spinal injections and also the clinical outcomes of the patients in a study involving more than 5000 patients. For the patients, the effective dose for fluoroscopy-guided procedures was calculated in mSv from the dose-area product (in Gy/cm²) displayed on the control panel of the fluoroscopy system; the effective dose in mSv for CT-guided injections was calculated from the dose-length product (in mGy.cm) provided by the protocol of the CT scanner.

For the interventionalists, exposure was measured by two dosimeters, one fixed outside the lead gown at the level of the left breast; the second dosimeter was worn on the dominant hand like a wristwatch.

Clinical outcomes were assessed using a Patient Global Impression of Change (PGIC) scale tool at 1 day, 1 week, and 1 month after the intervention.

The results of the study, have just been published (*Dietrich TJ et al. Fluoroscopy-guided versus CT-guided Lumbar Steroid Injections: Comparison of Radiation Exposure and Outcomes. Radiology. 2019;181224. doi: 10.1148/radiol.2018181224.*)

For lumbar transforaminal epidural injections, it was found that the patient radiation dose exposure was significantly (1.4 times) lower with fluoroscopy-guidance than with CT-guidance; for lumbar facet joint injections the patient exposure was also significantly

lower with fluoroscopy-guidance compared to CT-guidance (3.3 times).

Conversely, the radiation exposure to the body and wrist of the interventional physicians was significantly (between 3.7 times and 10 times) higher for fluoroscopy-guidance compared to CT-guided lumbar spine injections.

These results can be explained as follows: Fluoroscopy-guided lumbar

spine injections necessitate real-time manual guidance and manipulation of the needles; thus, the body, wrist, and hand of the interventionalist is exposed to scattered radiation due to the proximity of the primary x-ray beam. Conversely, CT-guided lumbar spine injections frequently allow steering and manipulation without simultaneous verification of the needle location by the X-ray beam. Another advantage of CT-guided spinal injections is that to minimize the radiation exposure the interventionalist can leave the CT room and go to the control room during image acquisition. Thus, the radiation exposure for the body and wrist of the interventionalist was significantly higher during fluoroscopy-guided than with CT-guided lumbar spinal injections

There was no statistically significant difference in patients clinical outcomes between the guidance methods.

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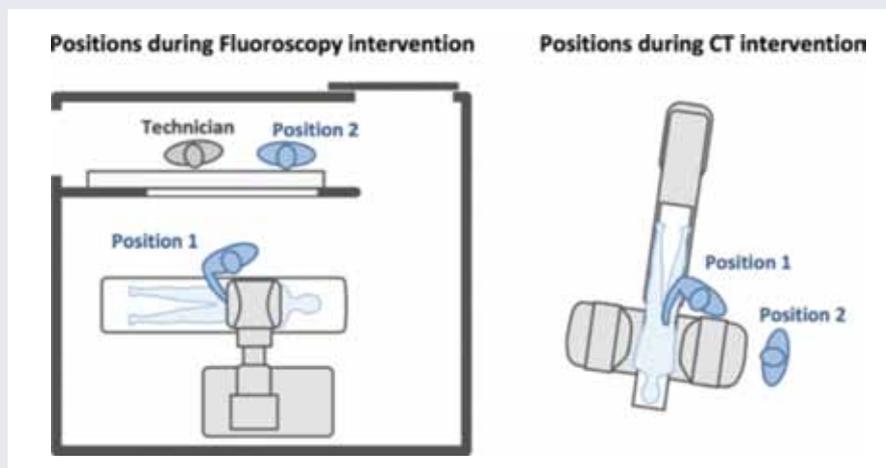


Illustration of imaging-guided injection techniques. Interventionalists stayed within fluoroscopy room (Position 1) or CT room (Position 1, Position 2) during injection procedures to track injection needle path. To respect the "as low as reasonably achievable," or ALARA, principle interventionalists briefly left fluoroscopy room (Position 2) during fluoroscopy if technically feasible, and went to the control room. For CT procedures, the interventionalists' preferable position was at the side of the gantry (Position 2) for most of the image acquisitions because radiation exposure tends to be below a measurable threshold at this location. CT technologists were not inside fluoroscopy or CT rooms during imaging-guided injections. Images reproduced courtesy of Radiology.

Radiation exposure for the patient is lower with fluoroscopy-guidance than with CT-guidance but higher for the interventionalist