Radiation Dose Exposure in Fluoroscopy-guided Lumbar Spine Epidural Steroid Injections

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Introduction. Fluoroscopy-guided epidural steroid injections (ESI) are widely used for managing low back pain (LBP). ESI has associated risks stemming from patient and radiologist radiation exposure. Monitoring radiation dose is mandatory to minimize risks. Radiation doses to patients during ESI have been reported, but there is lack of data on cumulative radiation dose in patients receiving more than one ESI. No universally accepted reference level is available for fluoroscopy-guided spinal pain management.

Aim, Materials and Methods. This study was undertaken to determine radiation exposure during fluoroscopy-guided interlaminar epidural steroid injections. As well as to find factors that may correlate with higher radiation dose or longer fluoroscopy time (FT). Course of three consecutive fluoroscopy-guided ESI was performed in 56 low back pain patients at L4–L5 level. Fluoroscopy time (FT) and dose area product (DAP) were recorded for all patients; correlations between FT and DAP were determined in three consecutive ESI procedures. Depending on pain duration, patients were categorized into three groups: pain duration for two, five, and more than five years. One-way ANOVA was used to compare FT and independent-t test to compare FT in patients younger than 60 and older than 60 years. All procedures were performed by one experienced pain specialist and one radiologist, FT and DAP were recorded automatically by the single-plane fluoroscopy machine.

Results. 48 females and 8 men, mean age 56 years (47–94 years) with LBP anamnesis for mean 4.6 years (min 3 month; max 20 years) underwent three consecutive ESI. Cumulative DAP for three ESI procedures was mean 872.57 cGycm^2 (SD 275.53) and mean FT 70.39 (SD 17.69) seconds (s); strong positive correlation between FT and DAP ($r = 0.755$; $p = 0.01$) is revealed. FT (mean) were during 1st procedure 24.5 s, during 2nd 23.6 s and 22.3 s during 3rd (min time 8 s; max 52 s). Mean DAP were during 1st procedure 294.67 cGycm^2, during 2nd 287.79 cGycm^2 and during 3rd 296.61 cGycm^2 (min DAP 100,23; maximal 753.48 cGycm^2). FT and DAP were positively correlated in each group, respectively at 1st ESI time 0.750 ($p = 0.01$); 2nd 0.797 ($p = 0.01$); 3rd 0.682 ($p = 0.01$). FT or DAP means did not differ significantly between age groups of younger or older 60 years. Significantly ($p = 0.05$) longer first FT was in patients who suffered from LBP symptoms for more than 5 years n = 13 (mean 1st FT 29.38 s); in comparison with those who had anamnesis for LBP less than 1 year n = 13 (mean 1st FT 21 s) and 1 to 5 years n = 30 (mean 1st FT 21.27 s). Significant difference ($p = 0.05$) in mean DAP between mentioned groups is revealed for all three procedures, DAP was higher during all three procedures in those who suffered from LBP longer than 5 years.

Conclusions. In our study, FT is in strong uphill linear relationship with DAP. Mean cumulative dose is 57 times lower than radiation dose threshold for fluoroscopy-guided procedures allowed by Society of Interventional Radiology – Cardiovascular and Interventional Radiological Society of Europe. Also, we conclude that patients with longer anamnesis for LBP have longer FT and higher DAP, which is probably due to more severe degenerative spinal lesions. Our data is comparable and similar to other studies.