Lower Cervical Nerve Root Block Using CT Fluoroscopy in Patients with Large Body Habitus: Another Benefit of the Swimmer’s Position

Summary: We describe a method of performing lower cervical nerve root block (CNRB) with CT fluoroscopy in patients with large body habitus using the swimmer’s position. This approach reduces radiation exposure when performing CNRB with CT fluoroscopy in typical patients.

Technique
CNRB was requested in 9 patients (6 male, 3 female) with LBH and lower cervical radiculopathy (single root: 7; 2 roots: 2; C6: 5, C7: 5, C8: 2). Supine scout CT (120 kVp, 250 ± 50 mA, 20–25 cm FOV, 3-mm section thickness) was performed for level confirmation, foraminal location, and trajectory determination, which demonstrated extensive beam-hardening artifacts obscuring the overlying vessels and target foraminal. Adequate visualization of critical structures was confirmed by local contrast accumulation adjacent to the nerve root (0.2–0.3 mL of iohexol, 180 mg of I/mm³; GE Medical Products, Milwaukee, Wis) by CTF. Methylprednisolone acetate 80 mg and bupivacaine 0.25% (2 mL for single root; 3 mL for double root, dose divided) were injected with intermittent CTF visualization of appropriate dilution of the test contrast pocket.

Radiation Exposure with CTF
Theoretical operator/patient radiation exposure during CNRB by CTF was assessed using 2 cylindrical lucite CT phantoms (16 cm diameter [standard neck simulation], 32 cm diameter [swimmer’s position simulation]). Deep patient exposure was evaluated in continuous mode with a phantom center location pencil CT ion chamber and electrometer (Radcal, Monrovia, Calif). Operator exposure was measured at 0.6 and 1.0 m in left/right lateral and center table positions during continuous mode using a micro-R ion chamber survey meter (Inovision, Cleveland, Ohio) and averaged using: 120/140 kVp and 50/100 mA with 20–25 cm FOV and 3-mm section thickness.

Results
CNRB with Swimmer’s Position
All CNRBs were successful and no complications were encountered. Adequate visualization of critical structures was obtained with CTF in the swimmer’s position using only minor modification of standard milliampere (mA) and kilovolt-pascal (kVp) settings because of decreased tissue mass in the CT beam. Low shoulder position increased foraminal access options that avoided the carotid artery and jugular vein (Fig 1F). CTF allowed rapid access to the neural foramen even in those patients with LBH, resulting in short CNRB procedure time. Cumulative CTF time was approximately 15–20 seconds per treated level, and technical procedure time paralleled typical CNRBs performed in the standard neutral position.

Bone/tissue clarity increased with CTF exposure in both neutral and swimmer’s position (Fig 1A–F). Visualization at 140 kVp/100 mA was superior (Fig 1F) but not considered routinely necessary to identify and avoid problem structures. Image quality appeared acceptable, and artifacts were equivalent between the neutral position 140-kVp/100-mA and the swimmer’s position 140-kVp/50-mA exposures (Fig 1C, -E). Moderate artifacts were still present in the neutral position at 140 kVp/50 mA (Fig 1B).
Radiation Exposure at CTF

Patient/operator exposure (Table) increased linearly with increasing milliamperes. Operator exposure was significantly greater at close (0.6 m) compared with routine exposure distance (1.0 m). Operator/patient exposure with the 32 cm phantom at 1 m was lower with 140 kVp/50 mA than with 140 kVp/100 mA or 120 kVp/100 mA.

<table>
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Discussion

Patients with large upper body habitus are challenging to image at the cervicothoracic junction. CNRB is difficult in this region because it is crucial to identify and avoid such vital structures as the carotid artery, jugular vein, and vertebral artery.

The swimmer’s position, similar to the lateral decubitus position, can be effectively used in performing CNRB in patients with LBH with adequate structure visualization and standard root access and CTF times. Even with the swimmer’s position, an increase in CTF dose is generally required for adequate structure visualization. Beam-hardening artifacts were severe in the neutral position and remained compromised in the swimmer’s position at 120 kVp/50 mA (Fig 1A, -D). Surprisingly, image quality was similar between the 140 kVp/50 mA swimmer’s position (Fig 1E) and 140 kVp/100 mA neutral position (Fig 1C) exposures, despite the lower dose at 140 kVp/50 mA. Visualization was markedly improved at 140 kVp/100 mA (Fig 1F) but not necessary to identify and avoid crucial structures. The operator can therefore assess/modify the available parameters, if necessary, and limit exposure. Radiation exposure studies have assessed CTF doses ranging from 10 to 100 mA at 120–140 kVp. In our practice, 120 kVp and 40–60 mA is standard for most uncomplicated CNRB procedures.

CNRB can also be performed with traditional fluoroscopic...
guidance. Advocates prefer this technique because of the continuous visualization of the steroid/contrast mixture during injection for detection of intravascular migration. With confirmation of needle tip position using anteroposterior, oblique, and lateral fluoroscopic images, a similar limitation can occur at the cervicothoracic junction in patients with LBH, particularly in the lateral and oblique positions. In addition, the fluoroscopic approach does not allow direct visualization or avoidance of the carotid artery, jugular vein, or vertebral artery and may present alternative limitations and risks.

Conclusion
CNRBs at low cervical levels can be successfully performed by CT fluoroscopy in patients with LBH using the swimmer’s position to reduce scanned tissue mass and improve trajectory options. CTF parameters can be chosen to limit patient/operator exposure even in these challenging lower cervical locations.

Acknowledgement
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References