Detection of intravascular injection during cervical transforaminal epidural block : a comparison of digital subtraction angiography and real time fluoroscopy

Jihyo Kim, Saeyoung Kim

Department of Anesthesiology and Pain Medicine, Kyungpook National University Hospital, Daegu, Korea

1. Introduction

Transforaminal epidural block (TFEB) with local anesthetics and steroid is an effective treatment option of spinal radicular pain. It is reported that TFEB is more effective than interlaminar epidural blocks due to closer to the dorsal root ganglion with small volume of injectate. However, during TFEB intravascular injection should be avoided, which can cause fatal neurologic deficits such as spinal infarction and cerebral infarction. To reduce complications of intravascular injection, use of imaging modality such as real-time fluoroscopy (RTF) or digital subtraction angiography (DSA) has been recommended.

The incidence of intravascular injection during TFEB with RTF guidance depends on spinal level. The previous studies using RTF demonstrated that the incidence of intravascular injection of cervical TFEB is higher than that of lumbosacral TFEB. In a retrospective study, Mclean et al. reported that DSA could improve the detecting rate of intravascular injection in cervical TFEB, compared to RTF for different participants. Until now, there is no study comparing DSA and RTF for same participants during cervical TFEB prospectively. The present study, therefore, was designed to investigate whether there is a difference between RTF and DSA in the detection of intravascular injection during cervical TFEB.

2. Methods

After IRB approval, We prospectively examined 137 cervical TFEBs. Inclusion criteria of this study were patients over 18 years of age, patients with radiating pain from spinal stenosis and herniated nucleus pulposus. Exclusion criteria were pregnancy, allergic to contrast media, patient refusal, and patients with persistent contraindication to nerve block such as coagulopathy and infection of the injection site.

Under fluoroscopic guidance, TFEB was performed using a Quincke type, 25 G, 9 cm spinal needle (Taechang Industrial Co., Kongju, Korea). For TFEB, the patient is placed in a supine position on a fluoroscopic table with head slightly extended. The fluoroscope (Ziehm vision, Ziehm imaging, Nuremberg, Germany) is rotated obliquely to the ipsilateral side to supply the view of the neural foramen with maximum transverse width. At the skin entry site 1% lidocaine was infiltrated. The spinal needle was advanced toward the posterior aspect of the intervertebral foramen until the tip reached the superior articular process at the division between the caudal and middle thirds. Then the needle was advanced 2–3 mm into the foramen no further than halfway across the facet column on the anteroposterior fluoroscopic view. After the confirmation of final needle position using biplanar fluoroscopy, 2 ml of nonionic contrast media (Omnipaque 300, GE Healthcare, Little Chalfont, Buckinghamshire, UK) was injected at the rate of 0.5ml/sec under RTF. 30 seconds later, 2 ml of nonionic contrast media was injected at the rate of 0.5ml/sec under DSA. Intravascular injection was defined as contrast media spreading out through the vascular channel during injection of contrast media under RTF and DSA. If intravascular injection was observed, the needle position was changed.

References

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3. Result

Level	Number of injections	Number of intravascular injection on RTF (%)	Number of intravascular injection on DSA (%)
C3	3	2 (66.7%)	2 (66.7%)
C4	6	1 (16.7%)	1 (16.7%)
C5	16	5 (31.3%)	5 (31.3%)
C6	46	20 (43.5%)	23 (50.0%)
C7	49	11 (22.4%)	13 (26.5%)
C8	15	3 (20.0%)	3 (20.0%)
Total	137	42 (30.7%)	47 (34.3%)

A total of 137 cervical TFEBs were performed on 128 participants. There were no complications during cervical TFEB. The mean age of participants was 51.7 years (range, 28-84 years). 42 intravascular injections detected in an overall intravascular injection rate of 30.7% using RTF. And, 47 intravascular injections detected in an overall intravascular injection rate of 34.7% using DSA. However, the detection rate of intravascular injection in RTF was not statistically different compared to that in DSA ($p=0.064$).

4. Discussion

DSA is an imaging technique that can clearly visualize the blood vessels from surrounding bones or dense soft tissues by subtracting the pre-contrast image from the image after injecting contrast. In addition, DSA has disadvantages such as additional radiation exposure to physicians and patients and the high cost of the new and upgraded fluoroscopic equipment. DSA was reported to increase the effective radiation dose incurred by 2.3 ~ 4.3 fold for TFEB compared to conventional fluoroscopy. In a recent meta-analysis in 2015, it was suggested that DSA guidance was more effective to detect intravascular penetration than RTF during lumbosacral TFEB.

From our findings, there is no significant difference in detecting intravascular injection during cervical TFEB between RTF and DSA. But, in present study, DSA detected an additional 2 intravascular injections at C6 and 3 intravascular injections at C7 compared RTF. In the clinic field, C6 and C7 were commonly performed levels during cervical TFEB. Therefore, further studies about the cervical level and intravascular injection are needed.

5. Conclusion

In lumbosacral region, DSA was known to improve the detecting rate of intravascular injection during TFEB compared to RTF. However, in present study, DSA did not improve the detection rate of intravascular injection during cervical TFEB compared to RTF. And, DSA was known to increase the additional radiation exposure to physicians and patients. Therefore, further studies to evaluate whether employment of DSA can be ideal for cervical TFEB are needed.