

LETTERS TO THE EDITOR

Contrast Spread Technique

Dear Editor:

Loss Of Resistance (LOR) technique (Dogliotti's principle)¹ is well known and widely used, and so is Contrast Spread (CS) technique. This is what Dr. Donald L. Renfrew wrote in his description of how to perform cervical and thoracic epidural steroid injections, with the help of fluoroscopy, more than a decade ago: "When the needle is just behind the spinal canal inject 0.2 to 0.3 mL of nonionic contrast material and confirm position in the posterior soft tissues. Advance the needle very slowly with one hand while pressurizing the syringe (LOR) with the other. When a thin line of CSs along the posterior epidural space, immediately stop advancing the needle!"²

CS technique is intuitively used by many Pain Practitioners to identify epidural space, together with LOR technique, especially with cervical epidurals. However, LOR technique is not as reliable in the upper spine as it is in the lower spine as:

1. The ligamentum flavum is not fused at midline up to 60–70%, thus increasing the risk of false LOR;^{[1]³}
2. The ligamentum flavum is thinner at the cervical spine and it is easier to miss LOR;
3. Epidural space is thinner (1.5–2 mm at C5–C6 and 2.5–3 mm at C7–T1 level at midline and becomes progressively less existent further toward the periphery from the midline);⁴ [2,3]
4. Fluoroscopic visualization of the needle depth is not always possible due to shoulders obstructing the view with lateral fluoroscopy;
5. The Contralateral Oblique View circumvents the problem with shoulders and allows the practitioner to visualize needle depth when performed properly but cannot identify epidural space entry (LOR and CS techniques can);
6. Finally, the consequences of placing the needle too deep are not as forgiving as with lower spine injections due to the proximity of the spinal cord. (ASA closed claims database 2005–2008: 51 procedure related complications and among them 20 (31%) direct trauma to the spinal cord or nerve.)⁵ [4]

One may use CS technique alone to recognize entry into epidural space. In such a case, with the needle close to the epidural space on lateral or contralateral oblique fluoroscopy, one controls needle depth location with incremental injections of a contrast and fluoroscopy. Needle advancement should be slow, no more than 1–2 mm at a time. One follows CS and is able to see qualitative change from soft tissue spread to

epidural spread. In case of any doubt, continuous (live) fluoroscopy may be utilized, with the physician monitoring dye spread while injecting a contrast. Low dose or pulsed mode is used with live fluoroscopy to decrease X-ray exposure. Continuous fluoroscopy would clearly differentiate the CS above (soft tissue) or beyond (epidural space) the spinolaminar line.

It is easier, however, to combine both techniques: LOR and CS. Utilizing both techniques has the benefit of decreasing the chance of not recognizing epidural space with possible tragic consequences. It also increases the success rate of a procedure as it improves localization of epidural space with an injection.

One may argue that the right name for the above described technique would be Contrast Flow technique. When there is a doubt where the medicine goes we often utilize contrast flow under live fluoroscopy. However, spread is a better term for the technique. With cervical epidural injection one should identify the entrance into the epidural space. Injection of the contrast will show the distribution, with dye spreading in soft tissue, or in an epidural space. Flow goes with something that is changing, for example, with the blood stream in the case of intravascular injection, or with spinal fluids in case of subarachnoid injection. And spread goes with something that stays, does not change, like soft tissue or an epidural space.

More and more interventional procedures are done with fluoroscopic or ultrasound guidance. CS technique may be taught in residency or fellowship programs with fluoroscopically performed procedures. It is not a substitute for LOR technique, but rather an addition to it that may provide some benefits to Pain Practitioners by improving both the safety and quality of spinal injections.

YAKOV PERPER, MD
Private Practice, New York

Notes

1. Dogliotti's principle is a principle in epidural anaesthesia first described by Professor Achille Mario Dogliotti in 1933. It is a method for the identification of the epidural space. Wikipedia, the free encyclopedia.
2. Atlas of Spine Injection. Donald L. Renfrew, M.D. 2004 Elsevier Inc., Tables 2–9 and 2–10, pages 46 and 48.

Perper

3. Cervical and high thoracic ligamentum flavum frequently fails to fuse in the midline.
4. There are different opinions on the thickness of cervical epidural space: Midline epidural fat is minimal at C6–7 and there is none at C5–6 and above. Avoiding Catastrophic Complications from Epidural Steroid Injection. The distances from ligamentum flavum to dural sac, representing the depth of the epidural space, averaged 3 mm at C6–C7 level. Skin to cervical epidural space distances as read from magnetic resonance imaging films: consideration of the “hump pad.” Numbers provided for cervical epidural space width is the author’s estimate based on multiple clinical observations.
5. Injury and Liability associated with cervical procedures for chronic pain.

References

- 1 Lirk P, Kolbitsch C, Putz G, et al. Cervical and high thoracic ligamentum flavum frequently fails to fuse in the midline. *Anesthesiology* 2003;99(6):1387–90.
- 2 S. Abram, Q. Hogan. *APSF Newsletter* spring-summer, 2011.
- 3 Aldrete JA, Mushin AU, Zapata JC, Ghaly R. Skin to cervical epidural space distances as read from magnetic resonance imaging films: consideration of the “hump pad.” *J. Clin Anesth* 1998;10(4):309–13.
- 4 Rathmell JP, Michna E, Fitzgibbon DR, et al. Injury and liability associated with cervical procedures for chronic pain. *Anesthesiology* 2011;114(4):918–26.