*Pain Physician*. 2004;7:287-290, ISSN 1533-3159

**Letters to the Editor**

# Evaluation of Fluoroscopic Caudal Epidural Steroid Injections

To the Editor:

Two articles, one by Botwin (1) and the other by Manchikanti (2), in the January 2004 edition of Pain Physician helped confirm that patterns of epidural injections exist, depending on the site of injection among other variables. Botwin concluded that ventral spread, considered the target site, only occurs 36% of the time with interlaminar injections, and bilateral spread only 16% of the time. Manchikanti demonstrated that caudal injections may reach lumbar levels but do not always fill the suspected pain generator target. I would like to add some observations.

We pain physicians typically rely on injected corticosteroid to produce the benefits of epidural injections. Corticosteroids are not highly diffusible ionic agents such as the local anesthetics that often spread far beyond the injections site. Rather, we inject particulate sustained-release corticosteroids which may remain close to the site of injection.

My own unpublished cadaver study done for a local surgical club highlights this graphically, and was presented at the ASIPP annual meeting in September 2002. I injected a scoliotic cadaver spine with pigmented suspensions by the interlaminar and transforaminal routes, then cautiously dissected away the lamina. Transforaminal injection (A) of 3cc of pigment demonstrated limited spread in the lateral dimension, but more spread ventrally. Interlaminar injections [(B) L4-5 8cc, (C) L5-S1 4cc] were confined unilaterally, ipsilateral to the side of fluoroscopically guided needle entry, and more dorsally (Figure 1 and 2) without pigment ventral to the thecal sac. These findings regarding particulate material injected by the interlaminar route agree with Botwin's common pattern of dorsal, unilateral epidural spread.

A very clear plica mediana dorsalis existed in the specimen shown in the

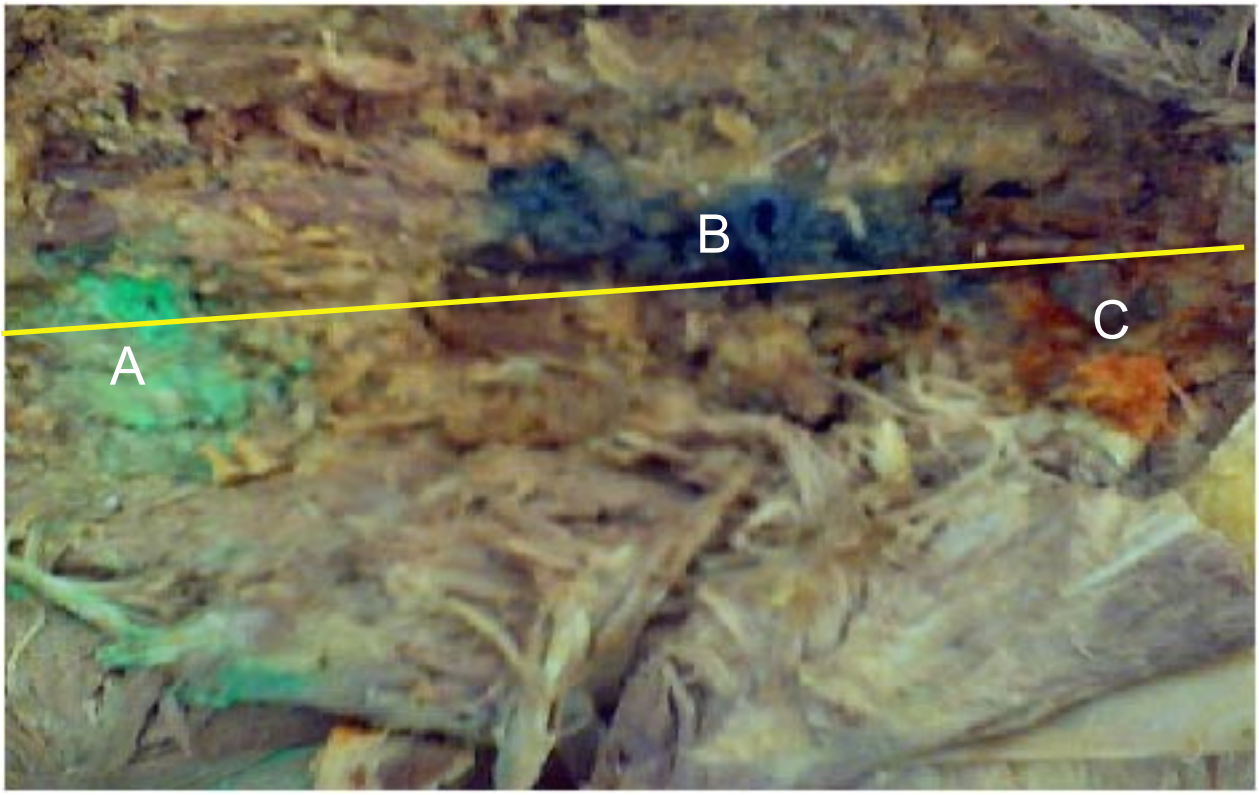


Fig 1. *Left is cephalad. A: left L2-3 transforaminal 3cc injection. B: L4-5 interlaminar 8cc injection. C: Left L5-S1 interlaminar 4cc injection. The line depicts the midline of the posterior spinal epidural canal. Note that the transforaminal injections remain to the left of midline, whereas the interlaminar injection is confined to the right half of the epidural space.*

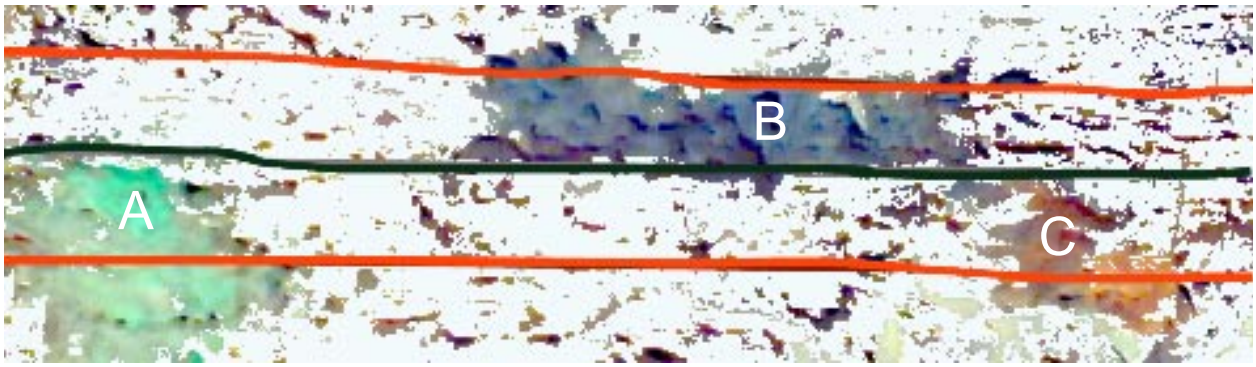


Fig 2. *Digitally manipulated photo enhances clarity of the above pigment distributions. A: left L2-3 transforaminal 3cc injection. B: L4-5 interlaminar 8cc injection. C: Left L5-S1 interlaminar 4cc injection.*

photographs, which may explain the unilateral restriction of flow with either route of injection. This structure is of variable expression but present in most people's lumbar region (3-9). Other more subtle connective tissues exist laterally in the epidural space at the foraminal level that may help explain the poor ventral spread of interlaminar injections. In patients, as opposed to cadaveric studies, the probability that ventral tissues will be more inflamed than dorsal tissues may also limit ventral spread of injectate.

It should be noted that fluids follow the path of least resistance. If an area of pathology has indurated tissue, injectates are likely to avoid the inflamed site and seek normal tissue that offers little resistance. One solution to this problem is to inject directly into the inflamed site. This is largely the theory that supports the Racz adhesiolysis procedure or any variation of the directed catheter technique. It helps support the use of cervical, thoracic, lumbar and caudal epidural catheters over simple needle techniques, at least in theory. The studies of Botwin and Manchikanti further support the development of target-specific fluoroscopically guided injection therapies. Now we need outcome data to bring the evidence to a strong level.

While my own clinical experience seems to support this theory, a controlled study must be conducted to determine its validity.

## References

1. Botwin KP, Natalicchio J, Hanna A. Fluoroscopic Guided Lumbar Interlaminar Epidural Injections: A Prospective Evaluation of Epidurography Contrast Patterns and Anatomical Review of the Epidural Space. *Pain Physician* 2004;7: 77-80
2. Manchikanti L, et al Evaluation of Fluoroscopically Guided Caudal Epidural Injections. *Pain Physician* 2004;7:81-92
3. Savolaine ER et al. Anatomy of the lumbar epidural space: new insights using CT-epidurography. *Anesthesiology* 1988;68: 217-220
4. Luyendijk W The plica mediana dorsalis of the dura mater and its relation to lumbar peridurography (canalography). *Neuroradiology* 1976 16;11:147-149
5. Tomczak R Epidurography: Comparison with CT, spiral CT and MR epidurography. *Rofo Fortschr Geb Rongenstr Neuen Bildgeb Verfahr* 1996 ;165:123-129 [in German]
6. Seeling W et al Unilateral epidural anesthesia. *Reg Anaeth* 1990;13:23-8 [in German]
7. Tomczak W et al. CT epidurography: A comparison of conventional and CT epidurography with contrast edium injected through a thoracic peridural catheter. *Anaethetist* 1995;44:24-36 [in German]
8. Morisot P. Is the posterior epidural space partitioned? *Ann Fr Anest Reanim* 1992;11: 72-81
9. Gallart L et al. Clinical and radiologic evidence of the epidural plica mediana dorsalis. *Anesth Analg* 1990;71:698-701

**Joseph Jasper, MD**
Medical Director
Advanced Pain Medicine Physicians
1628 South Mildred Street, Suite #105
Tacoma, WA 98465
Email: apmedicine@qwest.net