
(Accepted for publication August 28, 2015.)

The Devil Is in the Details

To the Editor:
In a consensus opinion by the multidisciplinary group regarding the safeguards to prevent neurological complications after epidural steroid injections, Rathmell et al.1 correctly point out that the number of cases with catastrophic neurological injury related to epidural steroid injection is not trivial. Whereas spinal cord and brain infarction secondary to particulate steroid embolization is an important concern, it is to be noted that in a recent analysis of malpractice closed claims, neurological injuries related to direct needle trauma outnumbered the injuries related to spinal cord or brain embolic infarction.2 In this analysis, fluoroscopy was used in 76% of cases in which neurological injury occurred; hence, mere use of fluoroscopy does not guarantee safety.2 In the current consensus, the authors correctly point out that in addition to the anteroposterior view, the lateral or the contralateral oblique (CLO) view may be used to gauge needle depth.

Given that devastating injuries continue to occur despite the use of fluoroscopy, an important safety question is, “does a lateral fluoroscopic view reliably visualize the needle tip and estimate the depth of insertion particularly at the C7-T1 level?” The limitation of the lateral view in providing good needle tip visualization when accessing cervical or cervicothoracic epidural space by the interlaminar approach was highlighted by our study where the needle tip was not visualized or not well visualized in the lateral view in 16 of 24 cases in the low cervical and upper cervicothoracic spine.3 Furthermore, the lateral view did not provide consistent location of the needle tip in the epidural space with respect to bony landmarks.3 These limitations of the lateral view could account for some cases of spinal cord injury despite the use of fluoroscopy. In contrast to this, the CLO view provided crisp visualization of the needle tip and less variability in needle tip location when visualized at an angle of 50 degrees. Based on this, we propose that the preferred use of the CLO view for depth of insertion during interlaminar epidural access has the potential of reducing complications related to direct spinal cord injury. This is likely to be especially true in cases where the needle tip is not well visualized in the lateral view. Correct use of the CLO view as well as the pitfalls of the lateral view should be taught routinely in fellowships and in society educational workshops to promote the safe access to the epidural space.

Competing Interests
The authors declare no competing interests.

Jatinder S. Gill, M.D., Thomas Simopoulos, M.D. Beth Israel Deaconess Medical Center, Boston, Massachusetts (J.S.G.). js.gill@bidmc.harvard.edu

References

(Accepted for publication August 28, 2015.)

Insufficient Clarity of Statement 6 in the Consensus Opinions to Prevent Neurologic Complications after Epidural Steroid Injections

To the Editor:
I read with interest the consensus opinions to prevent neurologic complications after epidural steroid injections in the May 2015 issue.1

The working group deserves the thanks of practitioners of interventional pain medicine. The statements serve to direct
care that has been complicated by statements from the Food and Drug Administration and recent evidence regarding the safety and efficacy of steroid injections.

The statement’s utility lies in the clarity of the recommendations that can be defined as current “standards of care.”

For this reason, statement number 6 should be reconsidered. It reads, “No cervical IL ESI [interlaminar epidural steroid injection] should be undertaken, at any segmental level, without reviewing, before the procedure, prior imaging studies that show there is adequate epidural space for the needle placement at the target level.”

Certainly, no interlaminar cervical epidural steroid injection should be undertaken at a level whose epidural space has been disrupted by surgery, infection, or metastasis.

However, neither clear definition of “adequate epidural space” is given nor is readily available from the literature or reference texts. The supporting references for statement number 6 include the following:

- Hodges et al.² present two case reports of spinal cord injury during a cervical epidural steroid injection placed at C5-C6, 1 cm left of midline while the patients were sedated with propofol.
- Aldrete et al.³ review the imaging of 100 patients and determine the mean depth of the epidural space to be 0.4 cm at C7-T1.
- Hogan⁴ reviews frozen cross-sections of 26 adult cadaveric cervical spines and finds “no posterior epidural space above C7-T1 level.” As well, the investigators find “the ligamenta flava...failed to fuse in about half of the cervical and thoracic levels examined.”
- Goel and Pollan⁵ determined that 2 to 4 cc of contrast injected in 34 patients at C7/T1 reached to C3 bilaterally in 100% of patients. Interestingly, no mention of establishing an adequate epidural space is mentioned before the placement of the needles.

Most importantly, the most recent editions of texts by Benzon and Rathmell, two authors of the statement, do not include clear instruction for “determining that a cervical epidural space is adequate for needle placement at the target level.”

Benzon et al.⁶ include the advice: “It is almost always advisable to have magnetic resonance imaging (MRI) available before performing any cervical epidural injections. Once the safety of potential interlaminar approach is verified, a chlorhexidine alcohol preparation is performed and sterile drapes placed.” (No figures accompany these statements.)

Rathmell and Nelson⁷ state, “Caution should also be taken to avoid interlaminar epidural injection at any level where there is effacement of the epidural space (e.g., complete effacement of the epidural space and cerebrospinal fluid column surrounding the spinal cord within the thecal sac occurs in high-grade spinal stenosis, particularly that due to a large central or paramedian disc herniation).”

A review of several other available reference texts on MRI of the spine yields no clear direction for the visualization or measurement of the cervical epidural space.⁸⁻¹⁰

The International Spine Intervention Society Practice Guidelines (2013) mention this concern when presenting a case that resulted in a complication from direct cord injury by the needle. However, a specific process for evaluating imaging is not included, other than the statement, “preprocedural MRI was not taken into account.”¹¹

Perhaps, the authors of the statement mean that at least a 1-mm white epidural space is clear on MRI T1 axial and sagittal cuts at the level of needle entry. If so, must the MRI be less than a year old? Frequently, sagittal cuts do not include the exact laterality of the planned track of the needle. Frequently, practitioners have access to a written report by the radiologist, but not the images themselves. Frequently, the MRI has been read, and the presence of the epidural space not been commented upon. How should computed tomography images be evaluated for patients who cannot undergo MRI? Should new images be required if symptoms have changed in severity or distribution since previous imaging? Are practitioners of interventional pain required to interpret a millimeter-thick absence or presence of an epidural space on MRI or is this the appropriate responsibility of the radiologist?

Please clarify this recommendation, and offer a clear process for establishing adequate epidural space at the level of the injection, as this clarity would match the mandate that no such procedure should be attempted without certainty. Such clarification would include the type and timing of imaging and the exact measurements that, if not obtained, would render the injection contraindicated.

If such a clarification is not forthcoming, statement number 6 should be regarded as an important suggestion—not a mandate and not a standard of care.

Competing Interests
The author declares no competing interests.

David R. Vaughn, M.D., Private Practice, Anesthesia Services of Lynchburg, Lynchburg, Virginia. robinsonvaughn@gmail.com

References

Anesthesiology 2016; 124:239–48

Correspondence
In Reply:

We thank Drs. Knezevic et al., Gill et al., and Vaughn for their letters in response to our Special Article on safeguards to prevent neurologic complications after epidural steroid injections.1 It is important for clinicians to understand that the work that ultimately led to publication of the safeguards manuscript spanned over years, and despite the Knezevic et al.’s conjectures to the contrary, our work had no relationship to the Food and Drug Administration Drug Safety Communication issued in April 20144 regarding epidural steroid injections. Knezevic et al. were in agreement with many of the safeguards our consensus group recommended, but they questioned our recommendation for the initial use of the nonparticulate steroid dexamethasone for all transforaminal epidural steroid injections (TFESI). The issue of the nonparticulate versus particulate steroids for lumbar TFESI generated significant discussion among experts who worked together on the safeguards manuscript. Knezevic et al.’s objections stem from the belief that particulate steroids are more efficacious than nonparticulate steroids when administered via the transforaminal route and they refer to a recent systematic review3 and cite two additional studies4,5 to support this notion. These articles provide weak and conflicting evidence for the superiority of nonparticulate steroids. Just two studies from the review by MacVicar et al.3 used dexamethasone. Only one of those studies compared particulate with nonparticulate steroid; 116 patients were randomized to receive TFESI with either triamcinolone or dexamethasone, and the investigators found that triamcinolone resulted in significantly greater pain relief, yet no significant changes in the McGill Pain Questionnaire and Oswestry Disability Index scores.6 The study by Kim et al.4 mentioned by Knezevic’s group compared translaminar (not transforaminal) epidural injection of dexamethasone versus triamcinolone and noted no significant difference in the reduction in pain scores between the two groups and a nonsignificant trend toward shorter duration of action of dexamethasone. The multicenter, double-blind randomized trial of Kennedy et al.5 demonstrated no difference between dexamethasone and triamcinolone in terms of pain relief and rate of surgery. As emphasized by Knezevic et al., Kennedy et al. also reported that the percentage of patients requiring a third injection was 17% with dexamethasone compared with 3% in the triamcinolone group. This is in stark contrast to the findings of El-Yahchouchi et al.,7 who noted that the percent of patients requiring repeat injection within 6 months were not different between different steroid preparations: 10% for triamcinolone, 6% for betamethasone, and 4% for dexamethasone. We did indeed consider these studies and others when comparing particulate and nonparticulate steroid. Knowing that catastrophic neural injuries can and do occur after administration of particulate steroids via the transforaminal route at both cervical and lumbar levels, the group came to the consensus that initial use of nonparticulate steroid for lumbar TFESI represents the safest approach to avoiding these injuries. Clearly, additional studies are needed to confirm the efficacy, duration of effect, and optimal dose of the nonparticulate dexamethasone.

Knezevic et al. tell us that they were vexed by the safeguard groups’ “…inability to consider evidence that clearly indicates the published efficacy of parasagittal interlaminar epidural steroid injection…,” and for that we do apologize. Their assertion on the equal efficacy of the parasagittal interlaminar approach to TFESI is correct based on their own published studies and those of others cited in their letter. Yet, there are other studies that demonstrated better efficacy of TFESI over the interlaminar approach4-11 or equal efficacy between the two approaches.12 Our group did not discuss alternative approaches to TFESI because our primary task was to improve the safety of epidural steroid injections and reserve comment on the relative efficacy of one technique over another.

Knezevic et al. also objected to the safeguard group’s statement regarding the use of digital subtraction imaging, stating that digital subtraction cannot differentiate between intraarterial or IV injections. Intraarterial injections are uncommon, perhaps even rare, during the conduct of TFESI, so we are uncertain that intraarterial and IV injections cannot be differentiated because studies comparing the rate of detection of these two events are not available. Indeed, in one recent study of the use of digital subtraction, all of the intravascular injections were via IV.13 Nonetheless, to avoid intravascular injection, one must first detect intravascular needle placement, whether it be IV or intraarterial. Several studies have demonstrated that digital subtraction is significantly more sensitive in detecting intravascular injection when compared with aspiration followed by injection of radiographic contrast

References


(accepted for publication August 28, 2015.)