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Basic pain management interventions using fluoroscopy: targets and optimal imaging of lumbar spine

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Interventional pain procedures for management of low back pain (LBP) have significantly evolved over the last decade. A major reason for recent advancements could be attributed to the widespread use of image-guided techniques utilizing fluoroscopy and contrast media. This change improved the delivery of medications to the areas of pathology and potentially contributed to better outcomes and decreased complication rates.

However, many details of the technical aspects of these procedures are still debated and there is room for improvement. The technical approach of these procedures still varies widely among institutions. Some institutions continue to perform these procedures without fluoroscopic guidance. Better outcome studies are needed to establish appropriate techniques for conducting interventional procedures with an aim to establish evidence-supported guidelines.

The main rationale for performing these minimally invasive procedures is their favorable risk/benefit ratio. At the same time, one has to strictly abide to proper technique since complications, although rare, may be very serious such as spinal cord injury.

This manuscript will review the technical aspects of most commonly performed procedures for low back pain with emphasis on image-guided fluoroscopy.

Epidural steroid injections (ESI)

The main purpose of an ESI is to deliver medication as close as possible to the area of pathology, thereby avoiding the effects of systemically administered steroids and unnecessary dilution of medication. Although ESI is the most commonly performed procedure in pain practices, there is a wide variation in technical aspects of this procedure among institutions. Although there are no randomized controlled studies comparing various technical approaches, it seems likely that the outcomes and potential complications may differ from one technical approach to another. One should also bear in mind that different technical approaches may be warranted among various pathological states.

Interlaminar approach for the ESI

Background

Historically, interlaminar approach has been the most common way of performing the ESI. Nonfluoroscopically guided approach can lead to false loss of resistance technique (LOR) in up to 30% of cases, entry at the wrong level, and delivery of medication to the opposite side of pathology.[1] This approach should be performed only when there is no access to fluoroscopy, there is absence of documented severe spinal pathology, and there is no history of prior back surgery.

Fluroscopically guided interlaminar approach can provide more accurate medication delivery to the epidural

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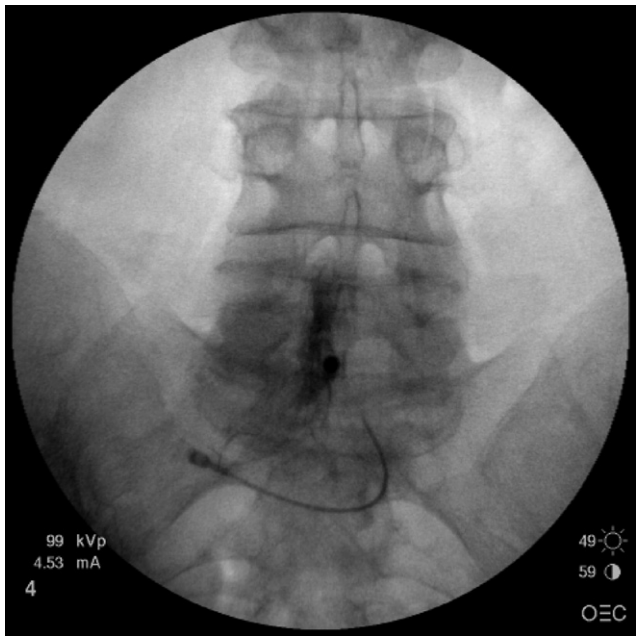

Figure 1 AP fluoroscopic view of the needle position for the L5-S1 intralaminar ESI. Note that the tip of the needle is not more lateral than the lateral projection of spinous process. Note the unilateral contrast spread.

space. Its major drawbacks are poor anterior medication spread and potential for dural puncture. This approach should be avoided in patients with history of prior surgery (even if above/below method is used) and in patients with severe central spinal stenosis. Central spinal stenosis can significantly decrease the depth of the epidural space, and the interlaminar ESI may result more often in dural puncture. At the same time, medication spread can be limited due to significant pathology and scar tissue formation.

Technique

Patient should be placed in prone position with a pillow underneath the abdomen to fascilitate opening of epidural spaces. The back area is prepped and draped in appropriate manner. True anteroposterior view should be obtained (spinous processes are midway in between pedicles). Once the adequate space is identified, skin entry site should be identified in between the laminae. The entry site should not be more lateral than the projection of lateral margins of spinous processes to avoid the placement of needle in the lateral recess of the epidural space.

A 20-gauge Touhy needle should be advanced in coaxial AP view. The lateral view should then be obtained and the needle should be advanced until it resides just a few millimeters posterior to the epidural space. If necessary, the AP view should be repeated to assure that the needle did not migrate laterally. At this point, a drop of saline should be placed in a clear hub of a needle. The LOR should be performed with simultaneous advancement of needle with the other hand. The saline should disappear from the hub (even before the loss of resistance is felt!) when the tip of needle reaches the epidural space. At this point, nonionic contrast media should be administered under fluoroscopic guidance in the lateral view and than the final images and confirmation on laterality of spread should be obtained in the AP view (Figures 1 and 2). The studies among experienced practitioners have shown that the AP view only is not adequate for establishing adequate epidural spread and that the lateral view is needed. However, this applies only to static images and the real-time fluoroscopy may provide better accuracy of contrast media spread even in anteroposterior view. However, we highly recommend the use of lateral view since it eliminates "guesswork" on the depth of the needle when the LOR technique is performed.

A solution of 40 to 80 mg of triamcinolone or depomedrol mixed with 0.5 mL of 1% lidocaine (or 1:1 mix of 1% lidocaine/0.25% bupivacaine) should be injected. Larger volumes may lead to dilution of medication and unnecessary motor blockade if more local anesthetics are used.

Transforaminal approach to the ESI

Background

The transforaminal approach provides better medication delivery to the anterior (ventral) epidural space than interlaminar approach, brings the medication closer to the common areas of pathology (DRG), and is particularly useful in conditions where the anatomy of epidural space is compromised (surgery, scarring, severe pathology). Although several studies support the outcomes of this approach and prefer it to interlaminar, no head-to-head studies were published on comparison of these two techniques. Although a commonly performed and very safe procedure, the transfo-

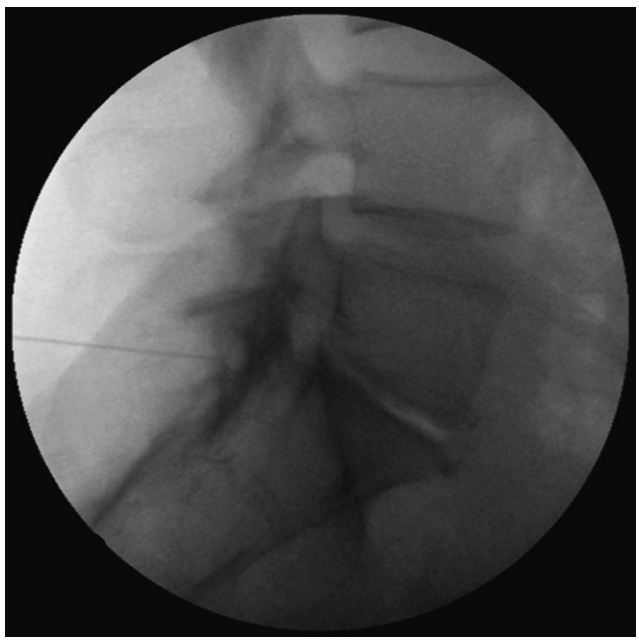

Figure 2 Lateral view of the L5-S1 intralaminar ESI. Note the posterior epidural space contrast media spread.