ABSTRACT

Introduction: Interventions in pain management hold an important aspect in diagnosing as well as treating patients in today’s practices. Knowing proper procedural technique is an important aspect for a pain practitioner to avoid complications. Each individual patient is not the same, thus producing a challenge for any pain intervention. In this article, we discuss the standard procedure of cervical epidural, contralateral interlaminar approach with its complications and troubleshooting.

Keywords: Cervical epidural steroid, Interventions, pain management.


INTRODUCTION

Cervical epidural steroid injections have been used since long time for the treatment of cervical radicular pain syndromes. In 1933, Dogliotti\(^1\) introduced the loss-of-resistance technique into clinical practice describing a sudden loss of resistance to injection when the needle bevel was passed from the ligamentum flavum into the epidural space and was the first to describe the technique of cervical epidural block. Goebert et al\(^2\) in 1961 clinically reported using cervical epidural steroids. In 1985, Pawl et al\(^3\) found 51 to 100% relief of symptoms in 40% of patients with cervical epidural steroid injections. Since then, there has been numerous publications citing the role of cervical interlaminar epidural steroids in the management of cervical spinal pain.\(^4,5\)

Cervical radicular pain is a term applied to describe pain resulting from the stimulation of, or a disorder of, a cervical nerve root.\(^6\) Most common causes of cervical radiculopathy are disk protrusion and cervical spondylisis. Other rare causes\(^7\) include facet joint pathology, vertebral body pathology, meningeal pathology, pathology secondary to the involvement of blood vessels, nerve sheath, and nerve. There have been several proposed mechanisms of action of epidural steroids including anti-inflammatory, direct neuromembrane stabilization effects, and modulation of peripheral nociceptor input.\(^8\) They have been shown to be able to block nociceptor C-fiber conduction and also inhibit prostaglandin synthesis. Local anesthetics provide short- to long-term symptomatic relief by suppression of nociceptive discharge and block sensitization.

ANATOMY

The cervical vertebrae are the smallest moveable vertebrae and are characterized by a foramen in each transverse process.\(^9\) A typical cervical vertebra has a small, relatively broad vertebral body; the pedicles project posterolaterally and the longer laminae posteromedially, enclosing a large, roughly triangular vertebral foramen; the vertebral canal accommodates the cervical enlargement of the spinal cord. The atlas (C1), the first cervical vertebra, supports the head and is unique in that it fails to incorporate a centrum; instead the centrum’s expected position is occupied by the dens, a cranial protuberance from the axis. The axis (C2), the second cervical vertebra, acts as an axle for rotation of the atlas and head around the strong dens (odontoid process) that projects cranially from the superior surface of the body. The seventh cervical vertebra, the vertebral prominence, has a long spinous process, i.e., visible at the lower end of the nuchal furrow. The neuraxial compartment consists of all structures within the osseous and ligamentous boundaries of the spinal canal. The cervical epidural space is a potential space that extends superiorly from foramen magnum to upper part of T1 inferiorly. Epidural space is bounded anteriorly by posterior longitudinal ligament with vertebral body and intervertebral disk anterior to it, laterally by intervertebral foramen and posteriorly by facet joint, lamina, and spinous process with ligamentum flavum between lamina. Ligamentum flavum is less well developed in cervical region and is very thin in midline and sometimes absent. So while using loss of resistance technique, it should be done very meticulously. The epidural veins are primarily localized in the anterior lateral portion of the epidural space.\(^10\) The vertebral artery ascends through the cervical transverse foramina of C1 to C6, which is located anterolaterally.\(^11\)

FLUOROANATOMY

In the anteroposterior (AP) view, identify T1 by identifying the first longest transverse process. Locate spinous process,
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Ribs, pedicle, lamina, interlaminar space in AP view (Fig. 1). In oblique view (Fig. 2), locate contralateral lamina, spinous process, vertebral body, and epidural space.

Indications
- Acute disk herniation with radiculopathy
- Complex regional pain syndrome of the upper extremity
- Acute and postherpetic neuralgia in the cervical and upper extremity region
- Cervical diskogenic pain
- Cervical spinal canal stenosis
- Failed back surgery syndrome

Contraindications
Absolute contraindications include
- Local or systemic infection
- Coagulopathy or patient on anticoagulants without adequate recommended drug-free period
- Lack of consent
Relative contraindications include
- Pregnancy
- Not able to lie prone
- Noncooperative patient
- Severe cognitive dysfunction
- Allergy to drugs used for procedure
- Unstable vital parameters
- Pleural bleb near procedure site
- Severe emphysematous lung
- Previous surgery
- Anatomical variation

Drug Dose and Volume
The volume of injectate varies from 1.5 to 15 mL of injectate. Botwin and Guirgis\textsuperscript{12} have described utilizing 10 to 15 mL in the cervical spine without a noticeable increase in complications. A combination of local anesthetic and steroid is usually utilized. A common injectate is 3 to 5 mL of 0.5 or 1% lidocaine without preservative or epi-nephrine and 1.0 to 2.0 mL of corticosteroid. Commonly used corticosteroids are 6 to 12 mg betamethasone acetate, triamcinolone acetate, or 40 to 80 mg methylprednisolone acetate.

Technique
- Place the patient in prone position\textsuperscript{12,13}
- Keep pillow of appropriate size under chest to flex the neck.
- Attach standard basic monitoring as recommended by the American Society of Anesthesiologists.

Procedural Steps
- Take AP image with spinous process exactly in midline.
- Identify C7–T1 interspinous space.
- The skin is anesthetized with 1% lidocaine without preservative or epinephrine.
- The needle is advanced to target the upper edge of the inferior lamina at the target interspace (Fig. 1).
- The needle is subsequently then walked off superiorly (Figs 2 to 4). Subsequently, with C-arm in contralateral oblique view so as to view the contralateral laminae as teardrops and utilizing loss of resistance technique, epidural space is identified (Figs 5 to 7).
- Following negative aspiration and no dripback of fluid, nonionic contrast is then injected to confirm epidural placement (Figs 8 and 9).
- Following this, the injectate can be slowly injected.
- The patient is observed for at least 10 minutes for hypotension inside the procedure room and once hemodynamic stability is assured, patient can be shifted to postprocedure room.
Complications for Cervical Interlaminar Epidural Injections\textsuperscript{12}:

- Infections
- Epidural abscess
- Meningitis neurologic
- Intrinsic spinal cord damage
- Upper limb weakness
- Nerve root injury

Fig. 3: Needle advanced further over T1 lamina

Fig. 4: Needle reaching towards C7-T1 lamina interspace

Fig. 5: Contralateral oblique view showing needle tip into ligamentum flavum

Fig. 6: Needle tip in ligamentum flavum

Fig. 7: Loss of resistance technique utilized to reach epidural space

Fig. 8: Dye into epidural space
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• Quadriplegia
• Pneumothorax
• Recurrent laryngeal injury
• Dural puncture
• Epidural hematoma
• Subdural hematoma

REFERENCES