

Percutaneous periradicular steroid infiltration (PPSI)

1) Introduction

The lumbar portion of the spine causes pain, suffering and disability more frequently than any other part of the body. In the past 20 years, the growing crisis of disability resulting from low back pain has led to the recognition that the problem cannot be solved by better or more frequent surgery. Some minimally invasive interventional procedures are able to relieve pain and to minimize the risk of disability. These procedures offer multiple possibilities of lumbosacral pain control to be associated, according to need, with conventional pain therapies. Nerve root inflammation is responsible for low back pain and sciatica. Percutaneous Periradicular Steroid Infiltration (PPSI) consists of an injection of steroids and anesthetic into the epidural space at the level of the pathological disk.

2) Principle

Percutaneous epidural and nerve root block

Epidural steroids were first used in the treatment of radiculopathy when it was realized that intraarticular steroids were beneficial in the treatment of joint pain. There is no clear single explanation to why a disk rupture causes back pain and / or sciatica. Some disk ruptures remain asymptomatic. The patient's major complaint is pain. But physical pressure on a peripheral nerve alone does not produce pain; it produces paresthesia. When examining this problem further, at the result of routine laminectomy for herniated nucleus pulposus, Macnab instituted the placement of a Fogarty catheter underneath the emerging nerve root of a segment above the laminectomy level. When the patients had regained consciousness, and before they had been given any analgesics, the catheters were distended. It was found that although distention of the catheter underneath an involved, angry, red, inflamed nerve root reproduced the sciatic pain, distention of the catheter underneath the normal nerve root produced paresthesia only. It is likely that there are neuromechanical factors involved in explaining the mechanism of symptom production in a herniated nucleus pulposus. Periradicular injection of long-acting steroids is efficient, probably because it decreases inflammation of the epidural space.

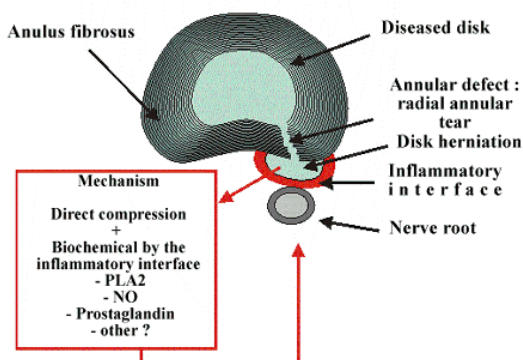


Fig 1: Pathology of disk herniation

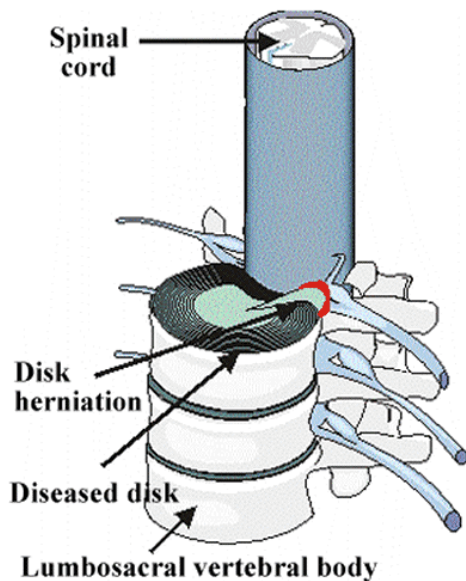


Fig 2: Disk herniation

3) indications

The major indications of percutaneous epidural or periradicular infiltration are:

- Patients with pain localized to the spine (low back or neck pain), radicular symptoms, or pain referred to the hip, thigh, or shoulder. Pain caused by an abnormality affecting nerves within the spinal canal or neural foramen,
- treatment of acute low back pain of discogenic origin (without nerve paralysis) resistant to conventional medical therapy, and
- post-discectomy syndrome.

4) Technique

The procedure is performed on an outpatient basis. The patient is placed prone on the CT table. A CT scan of the affected level allows precise choice of the needle pathway. For these procedures we prefer CT control. However, C-arm fluoroscopy guidance can be used too.

- For lumbar level: The patient is placed in prone position. The entry point and the pathway are determined by CT.
 - After local anesthesia of the skin, a 22-gauge spinal needle is placed by a posterior approach near the painful nerve root under CT control. In intracanal infiltration, before injection of long acting steroids (cortivazol 3.75 mg) in epidural space, absence of Cerebro Spinal Fluid (CSF) is verified by aspiration. Once the needle is in the epidural space, 1.5 ml air (contained in the connecting tube) is injected to confirm the extradural position of the needle tip. Then 2-3 ml of long acting steroids (cortivazol) solution is injected, mixed with a solution of 1% lidocaine (2 ml). Under precise CT control, dural sac perforation is avoided.
 - However, if the dura is perforated because of an adhesion of the dural sac to ligamentum flavum or because of a mistaken maneuver, the needle must be pulled back slightly, checked by aspiration for CSF, and if there is none, the corticosteroid solution is injected without anesthetic. During injection, the patient may experience a spontaneous recurrence of pain lasting few seconds, brought on by dural stretch. The long acting steroid should never be used in intrathecal injection.
 - For lumbar level in difficult cases: a posterolateral approach (see Fig 6) can be used for very lateral herniations. In some cases a posteromedial diagonal (see Fig 5) approach crossing the midline can be used (we call this approach “diagonal of the fools” in reference to chess game).
- For cervical level: the patient is placed in supine position head slightly turned and hyperextended. The entry point and the pathway are determined by CT. After local anesthesia of the skin, a 22-gauge spinal needle is placed by a lateral approach near the painful nerve root under CT control. The needle is connected to the connecting tube. In cervical level, 2 ml of contrast media is injected to confirm the accurate position of the needle. Then 2-3 ml of long acting steroid (cortivazol) solution is injected. Under precise CT control, and previous contrast injection, vertebral artery injury or intra-arterial injection is avoided.

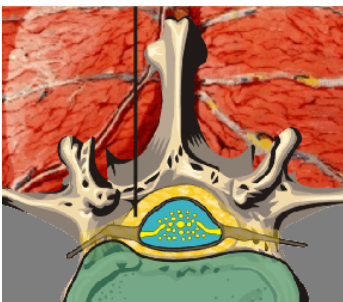


Fig 1: tip of the needle in epidural space.

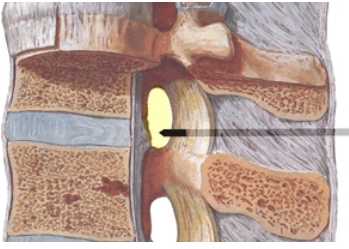


Fig 2: tip of the needle in epidural space.

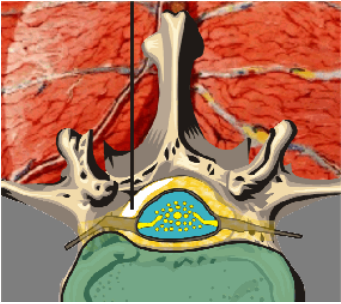


Fig 3: gaseous epidurography.

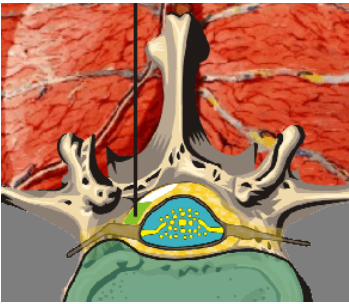


Fig 4: steroid injection.

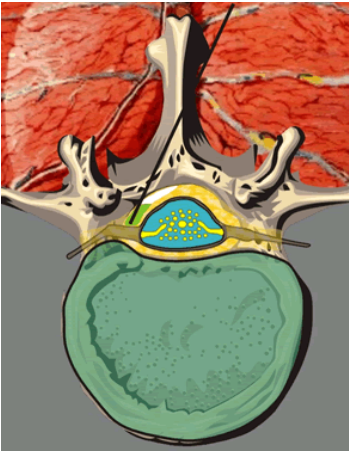


Fig 5: posteromedial diagonal approach crossing the midline (we call this approach “diagonal of the fools” in reference to chess game).

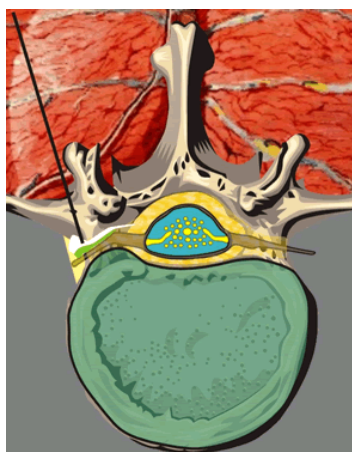


Fig 6: posterolateral approach, used for extraforaminal herniations.

5) complications

Complications of percutaneous nerve block under CT guidance are rare:

- Meningitis with neurologic damage (quadriplegia, multiple cranial nerve palsies, nystagmus...) is described after epidural or intrathecal injection of steroids if strict sterility is not respected. With precise CT monitoring accidental intrathecal injection can be avoided.
- Severe sterility during the intervention is mandatory.
- Epidural haematoma is a rare complication. To avoid this incident, patient under anticoagulant or aspirin are considered as a contraindication for epidural injection.
- There is a risk of calcifications by using triamcinolone hexacetonide as long acting steroid. We do not recommend the use of this steroid.
- For cervical level, vertebral artery injury or intra-arterial injection are described. This can be avoided by precise CT control and previous contrast injection.

6) Results

Uncontrolled studies report success in 33% to 72% of patients. Short-term benefit of the percutaneous nerve root block is quite high with a good pain relief especially in irritative radiculopathy. There is a significantly better response in irritative group than in the compressive group of the patients. Compressive radiculopathy was described as sciatica with sensory, motor, or reflex disturbances. Irritative radiculopathy was described as a sciatica alone. Some authors report no difference in outcome between patients treated

with local anesthetic alone and local anesthetic and steroid. Other reports a significant benefit from epidural steroids for patients with sciatica. A recent publication concluded that epidural steroid injection provided mild to moderate improvement in leg pain and sensory deficits and reduced the need for analgesics for up to 6 weeks.

Combining the results of several controlled studies suggests that at long-term follow-up, no difference may be noted between the steroid-treated groups and the control groups. This can be explained by the favorable long-term prognosis in no surgically treated patients. However, a beneficial effect occurs in patients with radicular pain syndromes at intermediate-term follow-up.

Meningitis with neurologic damage (quadriplegia, multiple cranial nerve palsies, nystagmus...) is described after epidural or intrathecal injection of steroids if strict sterility is not respected. A sterile technique will limit the risk of infection. With precise CT monitoring accidental intrathecal injection can be avoided. We had no complications in our series.

7) Cases

Case 1: Disk herniation and sciatica.



Fig 1: Epidural periradicular injection with a posteromedial diagonal approach crossing the midline.

Case 2: Disk herniation and sciatica.



Fig 2: Epidural periradicular approach, disk herniation.



Fig 3: CT control needle in epidural space.



Fig 4: CT control gaseous epidurography, steroid and lidocaine injection.



Fig 5: CT control, gaseous epidurography after procedure.

Case 3: PPSI at cervical level for disk herniation



Fig 6: Cervical foraminal injection, CT pathway.

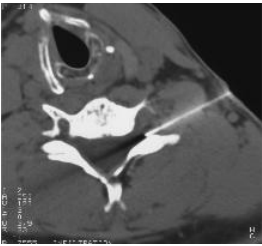


Fig 7: Cervical foraminal injection, CT control. After injection of contrast media, steroids can be injected.

Case 4 : Lumbar level. Disk herniation and sciatica

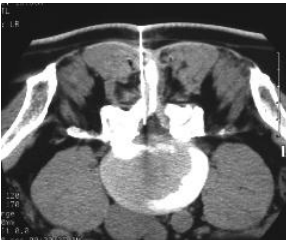


Fig 8: CT control needle in epidural space.



Fig 9: CT control, gaseous epidurography, steroid and lidocaine injection.

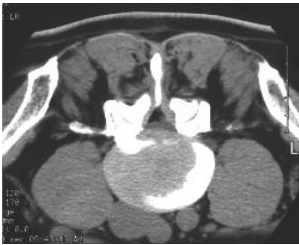


Fig 10: CT control. Gaseous epidurography after procedure.

Case 5 : Cervical level for disk herniation



Fig 11: CT pathway.



Fig 12: CT control. Needle in position.