Percutaneous Periradicular Infiltration (PPRI)

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 available 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 inflammations are responsible for low back pain and sciatica. Percutaneous Periradicular Infiltration (PPRI) consists of an injection of steroids and anesthetic into the epidural space at the level of the pathological disk.

2) Principle

There is no clear, single explanation as 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. In examining this problem further, at the conclusion 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.

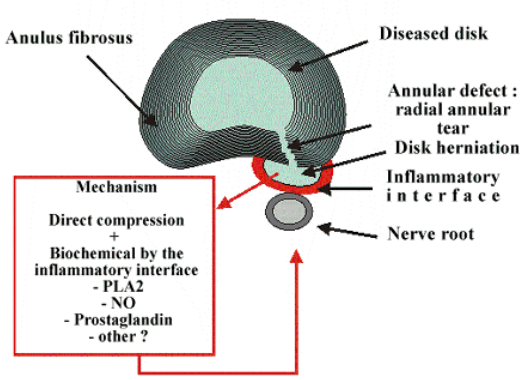


Fig 1: Pathology of disk herniation

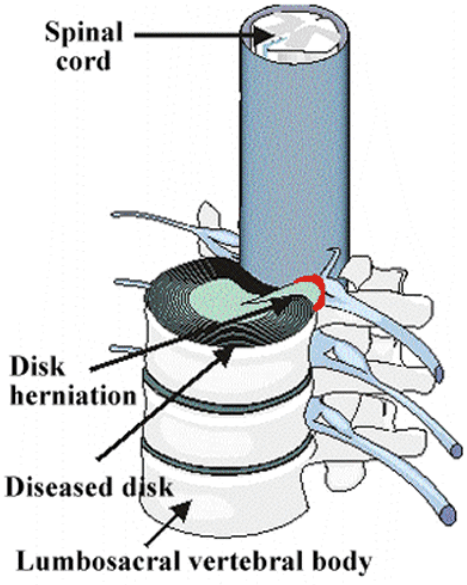


Fig 2: Disk herniation

3) Indications

The major indications of PRI are :

- Treatment of acute low back pain of discogenic origin (without nerve paralysis) resistant to conventional medical therapy
- 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 this procedure we use only CT control.

- 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 intracanalar 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 is injected to confirm the extradural position of the needle tip. Then 2-3 ml of long acting steroids (cortivazol) solution is injected, pure or mixed with a solution of 0.5% 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.

- For cervical level : the patient is placed in supine position head slightly turned and in hyperextension. 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. Then 2-3 ml of long acting steroid (cortivazol) solution is injected. Under precise CT control, vertebral artery injury or intra-arterial injection is avoided.

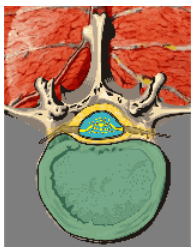


Fig 3: disk herniation

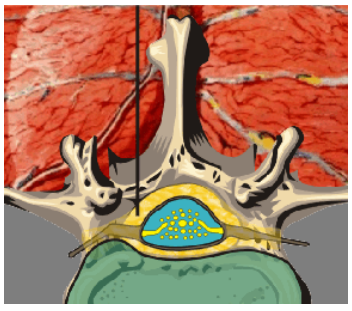


Fig 4: needle in epidural space

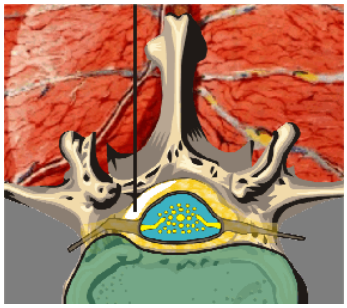


Fig 5: gaseous epidurography

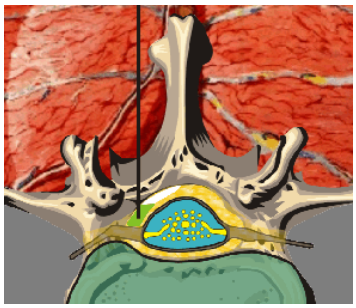


Fig 6: steroid injection

5) Complications

Complications of PPSI under CT guidance are rare :

- Meningitis with neurologic damage (quadriplegia, multiple cranial nerve palsies, nystagmus…) are 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.
- 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-aterial injection are described. This can be avoided by precise CT control.

6) Results

Over a period of 6 years, 186 periradicular injections were performed under CT-guidance. Short-term benefit of the PPRI is quite high with a good pain relief in 78% of extraforaminal herniations and 65% of the other localizations. The long-term result (persistence of relief for at least 6 months) was satisfactory only in PPRI of extraforaminal herniations : 68% good results two years after the infiltrations (average of 3 injections). Meningitis with neurologic damage (quadriplegia, multiple cranial nerve palsies, nystagmus…) are 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.

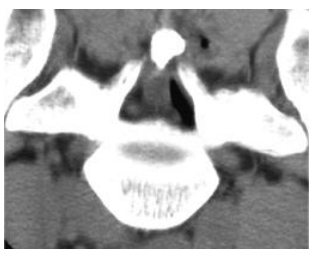
7) Cases

Case 1 : PPSI at lumbar level for disk herniation and leg pain

PPSI : disk herniation

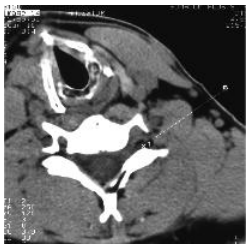
PPSI : CT control needle in in epidural space

PPSI : CT control gaseous epidurography, steroid injection

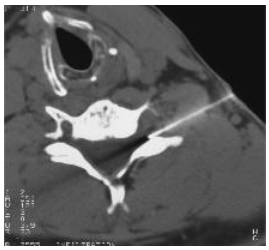


PPSI : control gaseous epidurography after procedure

Case 2 : PPSI at cervical level for disk herniation

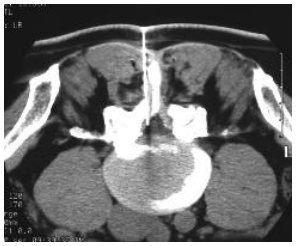


PPSI : CT pathway



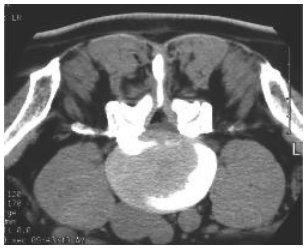
PPSI : CT control

Case 3 : PSI at lumbar level for disk herniation and leg pain



PPSI : disk herniation CT control needle in epidural space

PPSI : CT control gaseous epidurography, steroid injectino



PPSI : control gaseous epidurography after procedure

Case 4 : PPSI at cervical level for disk herniation

PPSI : CT pathway

PPSI : CT control