US-GUIDED INTRA-ARTICULAR INJECTION TECHNIQUE OF FACETS JOINT

Dott. Luca Di Sante
LBP is a major cause of disability, the exact pathogenesis of acute LBP remains unclear.

The prevalence of Lumbar Disc Herniation (LDH)

Patients with acute LBP 57%

Asymptomatic people 30%
LOW BACK PAIN (LBP): DIFFERENTIAL DIAGNOSIS

LBP CAN BE DUE TO:

✔ Muscle 70%

✔ Facet joints 15-52%

✔ Disc 30-50%

✔ Sacro-iliac joint 13-30%
FACET JOINTS

✔ There is a strong correlation between low back pain and facet joint OA

✔ There is a high prevalence of facet joint OA in men (59.6%) and women (66.7%). Prevalence of FJ OA increases with age and reaches 89.2% in individuals 60–69 years old

ANATOMY
FACET JOINTS

The lumbar zygoapophisial joints are formed by the superior and inferior articular processes of consecutive lumbar vertebra.
The lumbar vertebral column comprises **five vertebra** (L1-L5) and individual discs.

The lumbar body and the posterior arch enclose the **triangular vertebral foramen**.

The lumbar facet joints form the postero-lateral articulations connecting the vertebral arch of one vertebra to the arch of the adjacent vertebra.

The lumbar facet joints are **synovial joints**, consisting of a joint space (1-1.5 ml of fluid), a synovial membrane, hyaline cartilage surfaces, and a fibrous capsule.
MUSCLES

Erector spinae muscle

Dorsal muscle
Erector spinae muscle
MUSCLES

Remove the lamina and spinal processes

Posterior Dura
MUSCLES

Dorsal muscle

Erector spinae muscle
Facet joints are innervated by the medial braches of dorsal ramus sensory nerves.
DUAL INNERVATION:

- Each facet joint receives articular branches from the ipsisegmental **medial branch** and from the medial branch above (**ascending** and **descending branches**).

- The segmental number of the nerves are one segment less than the name of the joint (i.e. the L4-L5 joint is innervated by the L3-L4 medial branches).

**The L1 to L4 segments**, each dorsal branch of root emits a medial branch that innervates the anterior region of the inferior facet and the inferior portion of articulation which one spins around.

**The L5 dorsal branch** emerges dorsally and in the inferior region on top of the sacrum wing. The medial branch comes back around the inferior portion of the lumbar-sacrum articulation that it innervates.
Lumbar facet joint can be responsible of a painful syndrome called “Lumbar facet joint syndrome”. The main symptoms are:

- Acute and intermittent episodes of lumbar pain
- Pain increasing with backward bending
- Pain often radiates down into the buttocks and down the back of the upper leg
- Persisting point tenderness overlying the inflamed facet joints
- No neurological signs
The joint capsule seems to be more likely to generate pain than the synovium or articular cartilage.

- Pain from the upper facet joints tends to extend into the flank, hip, and upper lateral thigh.
- Pain from the lower facet joints is likely to penetrate deeper into the thigh, usually laterally and posteriorly.

In patients with osteophytes, synovial cysts, or facet hypertrophy, the presence of radicular symptoms may also accompany these patterns.
To date, imaging guided facet joint injections are mainly performed under CT or fluoroscopic guidance.
ADVANTAGES:

- Direct visualization of the target of interest
- Real-time needle guidance
- Visualization of the spread of local anaesthetics
- Minimal risk of complications
- Shortening of procedure
- Lack of exposure to ionizing radiation
6 BASIC SONOGRAPHIC VIEWS:

1. Parasagittal transverse process view (white line)
2. Parasagittal articular process view (yellow line)
3. Parasagittal oblique laminar view (white arrows)
4. Midline sagittal spinous process view (black line)
5. Transverse spinous process view (red line)
6. Transverse interlaminar view (green line)
1. PARASAGITTAL TRANSVERSE PROCESS VIEW

Probe is placed approximately 3 to 4 cm lateral to the midline lumbar spinous processes

**ESM**: Erector Spinae Muscle

**P**: Psoas muscle

**T**: Transverse process

**White dots**: cranial portion of transverse processes
1. PARASAGITTAL TRANSVERSE PROCESS VIEW
2. PARASAGITTAL ARTICULAR PROCESS VIEW

- The probe is moved medially in the parasagittal plane.

The peaks represent the intersection between the superior and inferior articular processes of each vertebra.

ESM: Erector Spinae Muscle
AP: Articular Process
2. PARASAGITTAL ARTICULAR PROCESS VIEW
3. PARASAGITTAL OBLIQUE LAMINAR VIEW

- The probe is tilted to angle the beam in a medial direction toward the median sagittal plane.

This view shows the Posterior Bony Structures (spinous processes, laminae, and transverse processes), Facet Joints, and Paraspinal muscles.

- **L**: lamina
- **S**: sacrum
- **LF/DP**: ligament flavum and posterior dura
- **VB/PLL**: vertebral body/posterior longitudinal ligament

(J Ultrasound Med 2013; 32:1109–1116)
3. PARASAGITTAL OBLIQUE LAMINAR VIEW

![Ultrasound Image]

J Ultrasound Med 2013; 32:1109–1116
4. MIDLINE SAGITTAL SPINOUS PROCESS VIEW

- The probe is moved toward the anatomic midline

The spinous processes, the interspinous ligament and the thoraco-lumbar fascia are visible

**Landmarks:** L5 and S1 spinous processes
4. MIDLINE SAGITTAL SPINOUS PROCESS VIEW
5. TRANSVERSE SPINOUS PROCESS VIEW

- The probe is rotated 90° into transverse orientation

- **L**: lamina
- **S**: spinous process
5. TRANSVERSE SPINOUS PROCESS VIEW
One radiologist, experienced in musculoskeletal sonography, performed sonographically guided posterior approaches to the spinal nerves in the lumbar spine on 5 prepared cadavers.

Sonographic examinations were performed using a broadband curved array transducer working at 2 to 5 MHz and a broadband linear array working at 4 to 7 MHz.
6. TRANSVERSE INTERLAMINAR VIEW

- The probe is moved in either the cephalad or caudal direction.

**AP**: articular pillar
**LF/PD**: ligamentum flavum/posterior dura
**S**: shadow of the spinous process
**SC**: spinal canal
**V**: vertebral body
FACET JOINT INTERVENTIONS

✓ Intra-articular facet joint injections
✓ Medial branch blocks
✓ Neurotomy (radiofrequency or neurolysis)

INJECTION TECHNIQUE

- Materials:
  - curved 9-4 MHz transducer
  - sterile drapes
  - 20-22 Gauge, 90 mm needle

1. Patient in a prone position

2. Sagittal midline view and identification of the respective lumbar segment. Then, adjacent structures are delineated.

3. The probe is rotated on the transverse plane, centered on the spinous process. Then it is moved laterally to the respective facet joint.

4. The needle is inserted 3-4 cm laterally from the midline and lateral to the transducer in in-plane technique

5. After the needle tip reaches the respective facet joint (intra-articular bone contact), the injection is performed
INJECTION TECHNIQUE

TRANSVERSE VIEW

- Green: superior and inferior articular processes
- Red: joint space
- Yellow dots: needle
In 1 cadaver, the most lateral aspect of the roof of the intervertebral foramen was defined as a reference point. Its position was computed as a distance from the tip of the spinal process (A), the midline (B), and the intervertebral disk (C). Subsequently, axial transverse CT scans were made to verify these distances.
On 1 embalmed cadaver a spinal needle (20 gauge, 90 mm) was advanced under sonographic guidance to the spinal nerves for each lumbar spinal level. The needle was inserted perpendicular to the skin, 3 to 4 cm lateral to the spinous process and exactly in line with the transducer and the echo plane.
Conclusions:
Sonographic guidance is a useful adjunct to increase the safety and efficacy of peri-radicular injections in the lumbar spine

“All 10 needle tips were placed within the dorsal third of the intervertebral foramen in the periradicular area”
LUMBOSACRAL SPINE SONOANATOMY
An adult-size lumbosacral spine model was placed into a microwave-safe rectangular container of approximately 4 L in volume.

4 L of hot tap water (120-F) is then mixed with 350 g of gelatin.

The mixture is thoroughly stirred using an electric mixer until all gelatin is completely dissolved.
Metamucil has been added to gelatin ultrasound phantoms to simulate the sonographic appearance of soft tissue.

The dissolved gelatin is then poured over the spine model in the plastic container so that the model is completely immersed.

The model is refrigerated overnight to allow the gelatin to harden.
A Low-Cost Ultrasound Phantom of the Lumbosacral Spine

Geoff A. Bellingham, MD, FRCPC* and Philip W.H. Peng, MBBS, FRCPC†
This teaching tool can provide trainees with an opportunity to familiarize themselves with sonoanatomy of the lumbosacral spine in addition to practicing probe handling techniques and needle placement.

A distinct advantage of this gelatin phantom compared to other commercially available phantoms is the transparency of the mold. This allows trainees to have direct visual access to the section of the spine the ultrasound probe is scanning.
Spinal cord infarct probably due to the embolization of the cord as a result of intra-arterial injection of particulate steroids.

Betamethasone, methylprednisolone, and triamcinalone have particles, or form aggregates, that are larger than red blood cells.
Generalized infection following facet joint injection -A case report-

Sae Young Kim, Sung Ho Han, Min Woo Jung, and Ji Hee Hong

Department of Anesthesiology and Pain Medicine, Keimyung University School of Medicine, Daegu, Korea

Facet joints have been shown to be a source of chronic low back pain, and it is generally accepted in clinical practice that diagnostic and therapeutic facet joint injections are the most reliable technique for the treatment of facet joint pain, which is considered to be an easy and safe procedure. Serious complications and side effects are uncommon after facet joint injection. However, infectious complications including septic arthritis, epidural abscess, meningitis and endocarditis have been reported following facet joint injections. We report here the first case of death following lumbar facet joint injection due to generalized infection. (Korean J Anesthesiol 2010; 58: 401-404)
THANK YOU