

US-GUIDED INTRA-ARTICULAR INJECTION TECHNIQUE OF FACETS JOINT



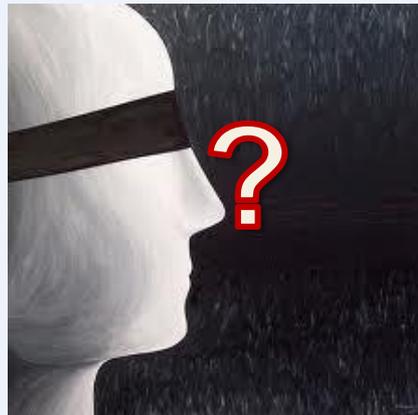
Dott. Luca Di Sante



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

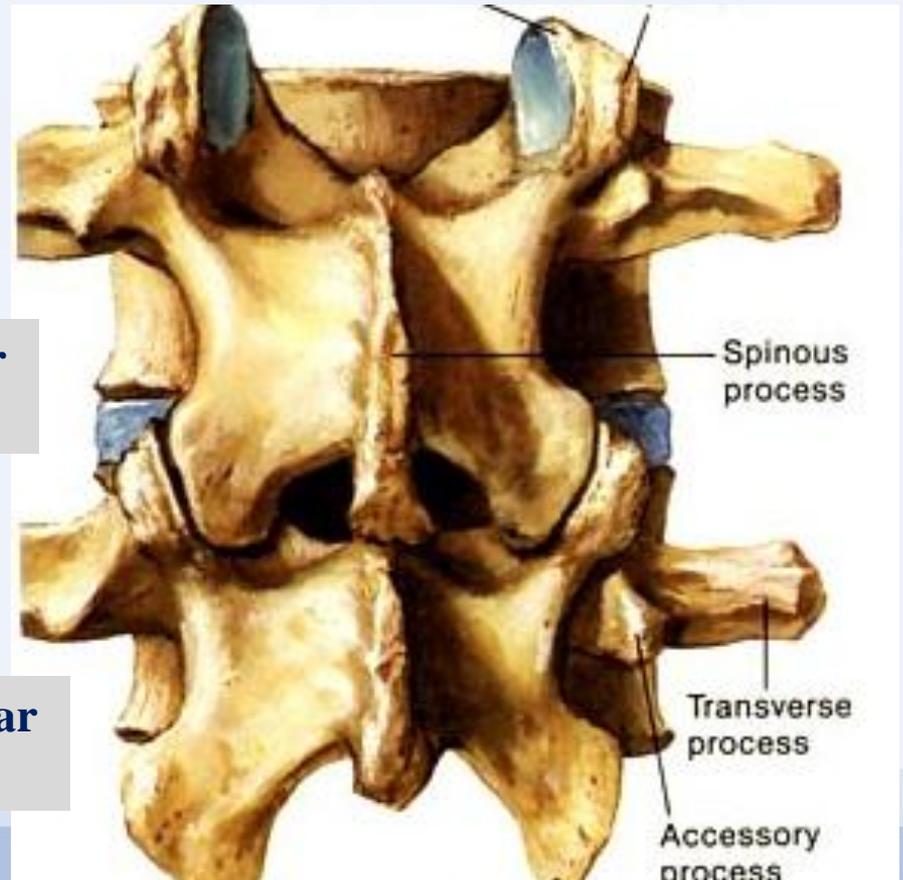
FACET JOINTS

The lumbar zygoapophyseal joints are formed by the superior and inferior articular processes of consecutive lumbar vertebra.

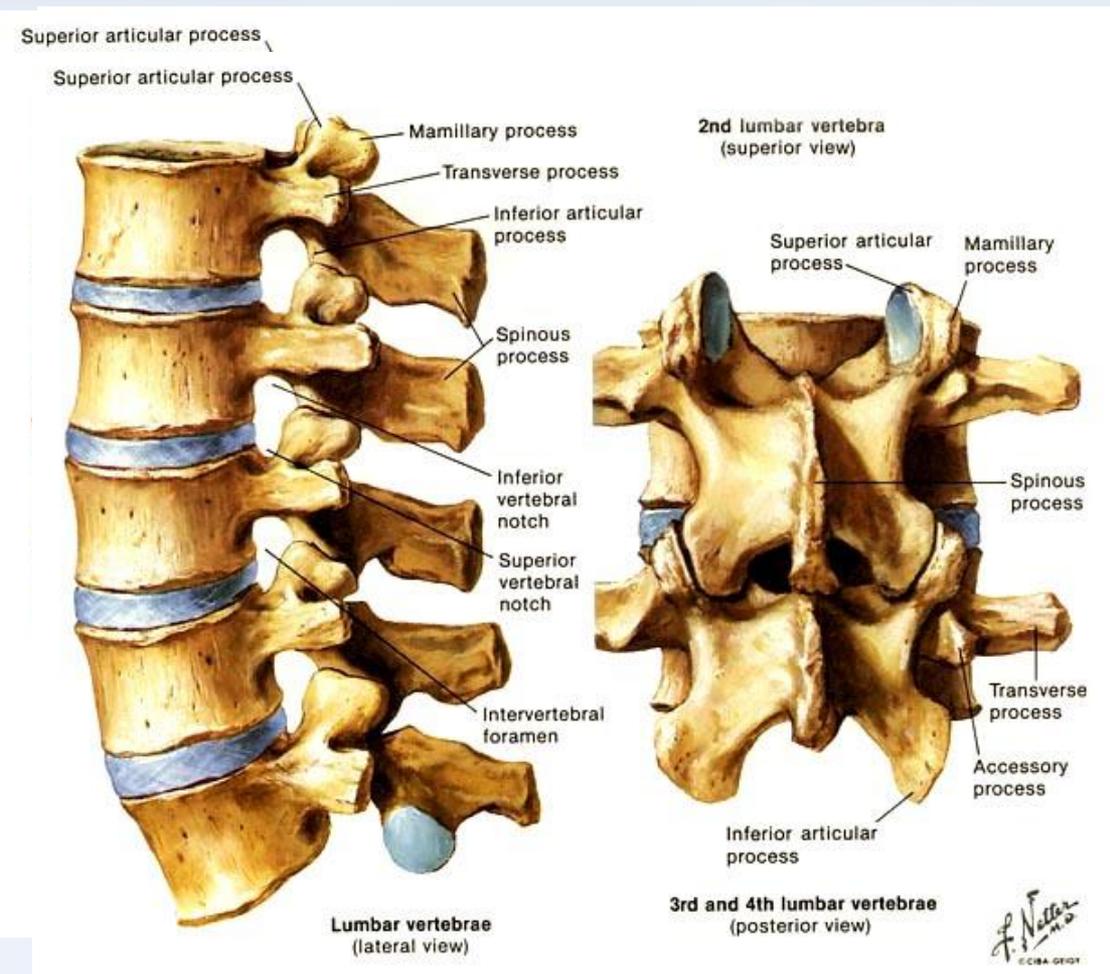


Inferior Articular Process

Superior Articular Process

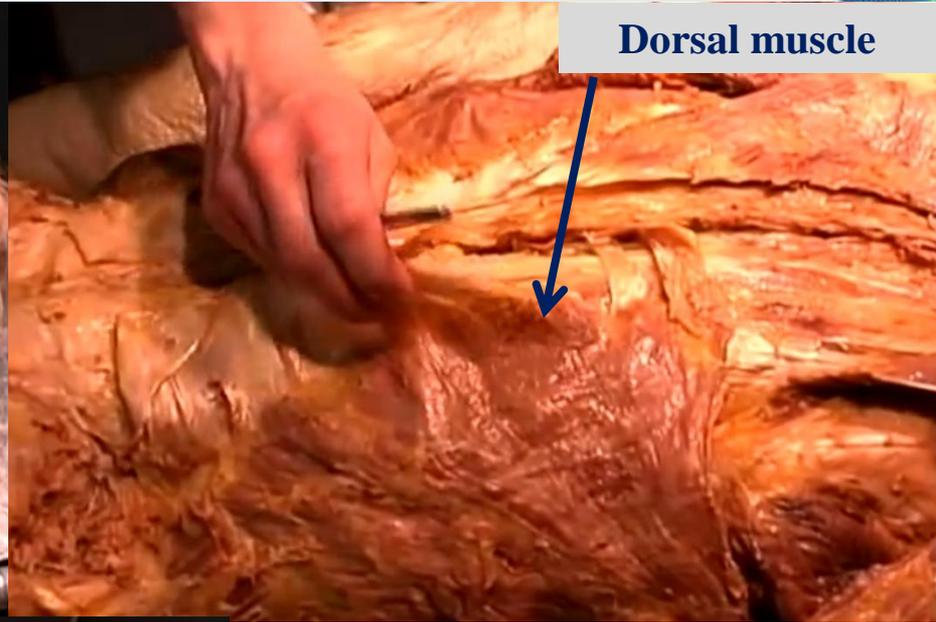


BONY STRUCTURES



- ✓ 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

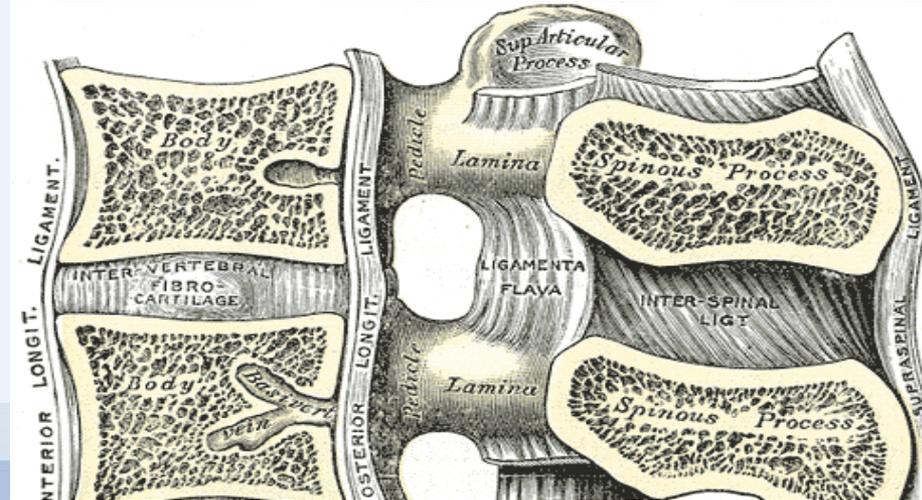
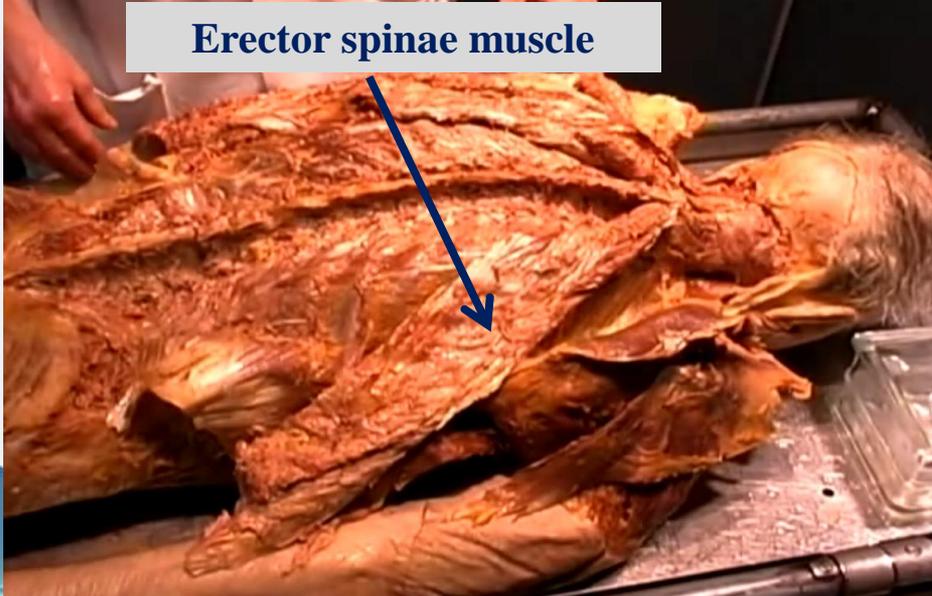


Erector spinae muscle

MUSCLES

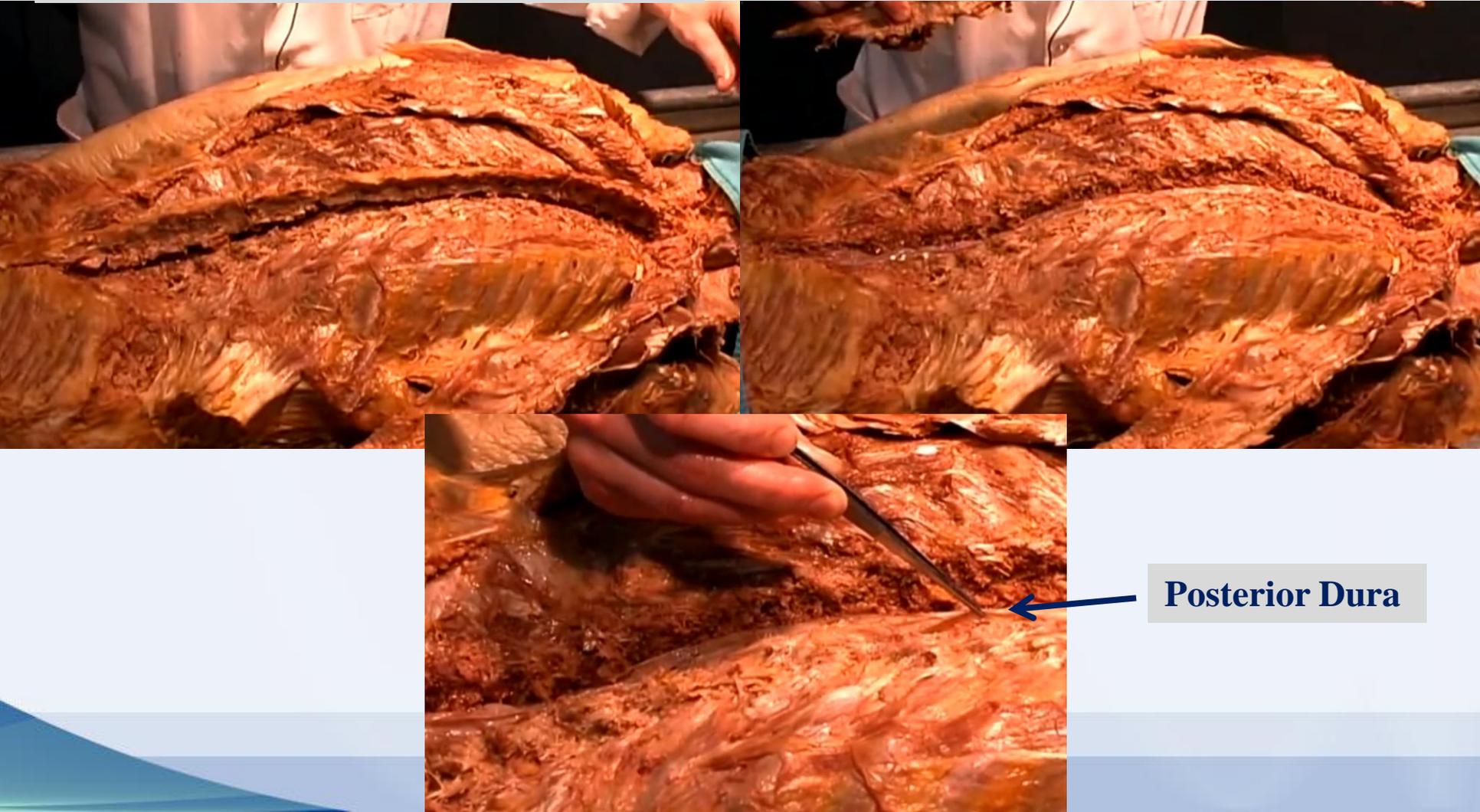


Erector spinae muscle



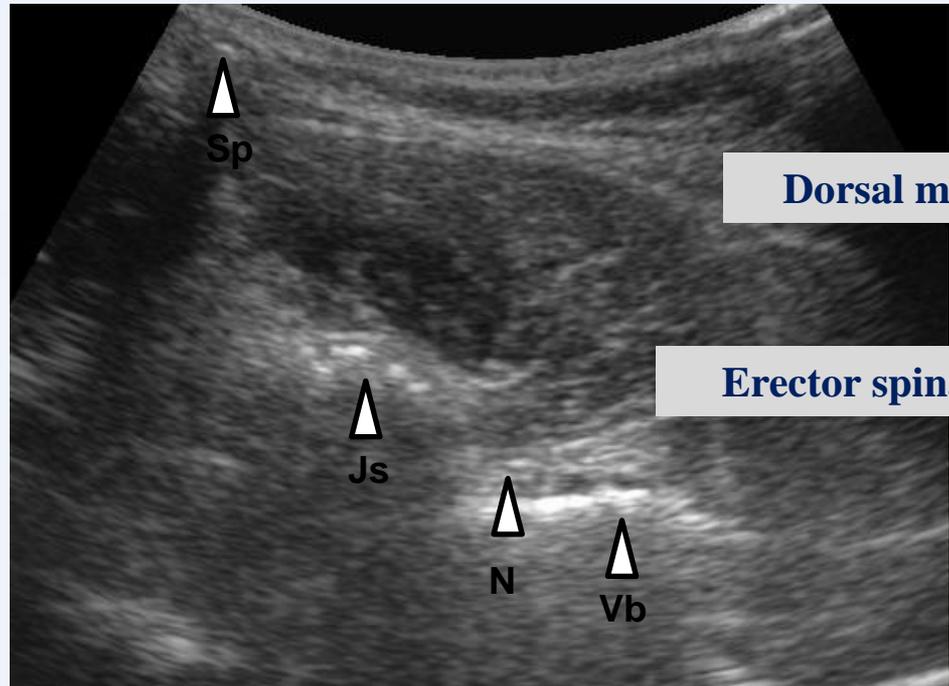
MUSCLES

Remove the lamina and spinal processes



Posterior Dura

MUSCLES



▲
Sp

Dorsal muscle

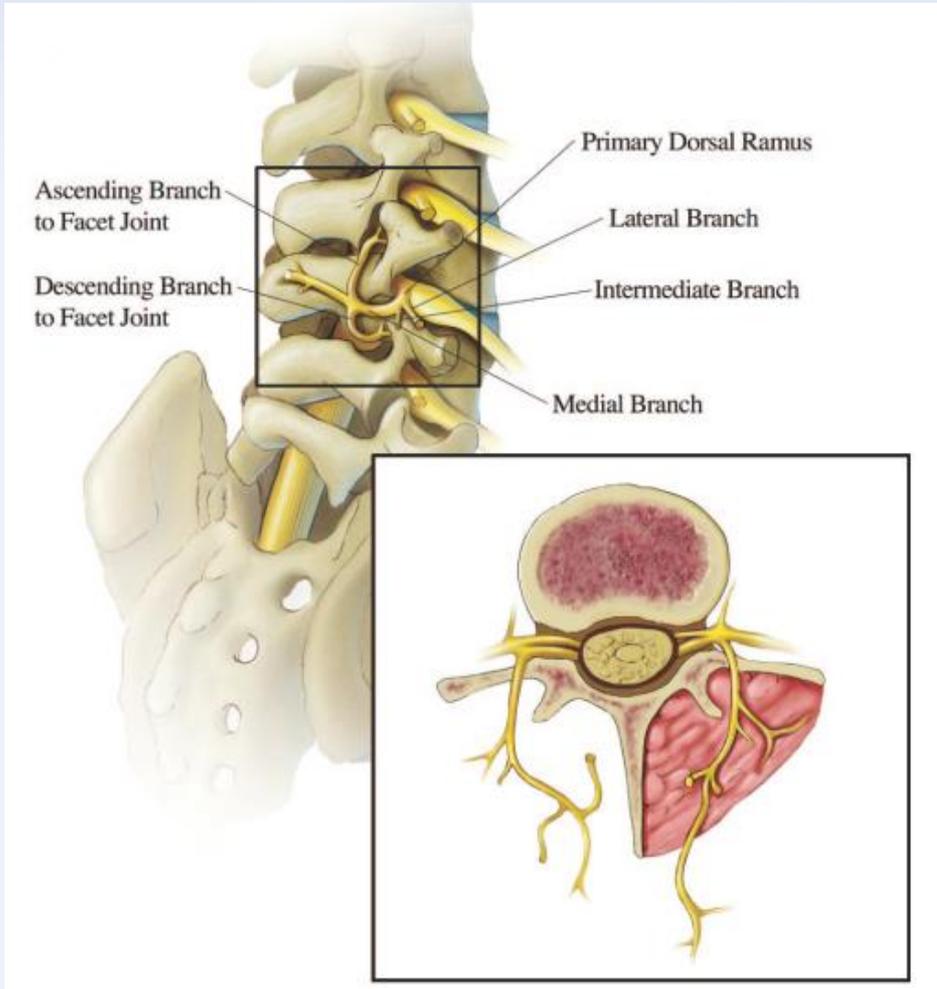
▲
Js

Erector spinae muscle

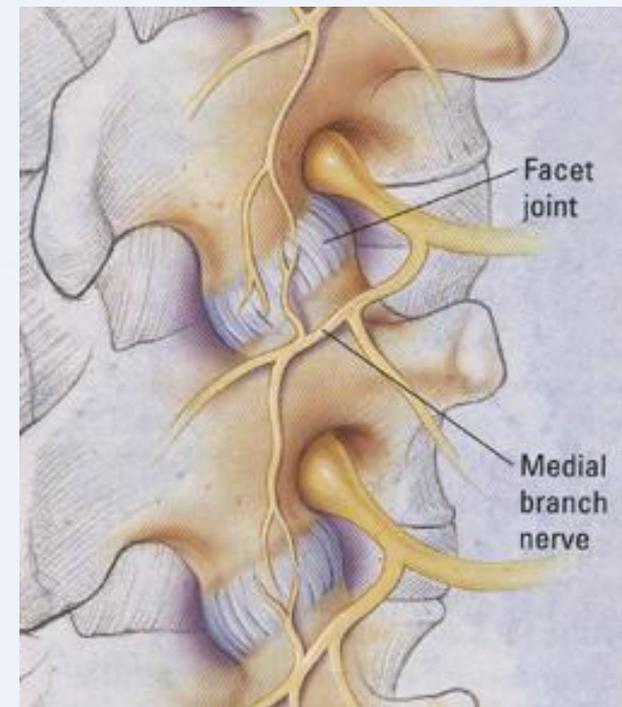
▲
N

▲
Vb

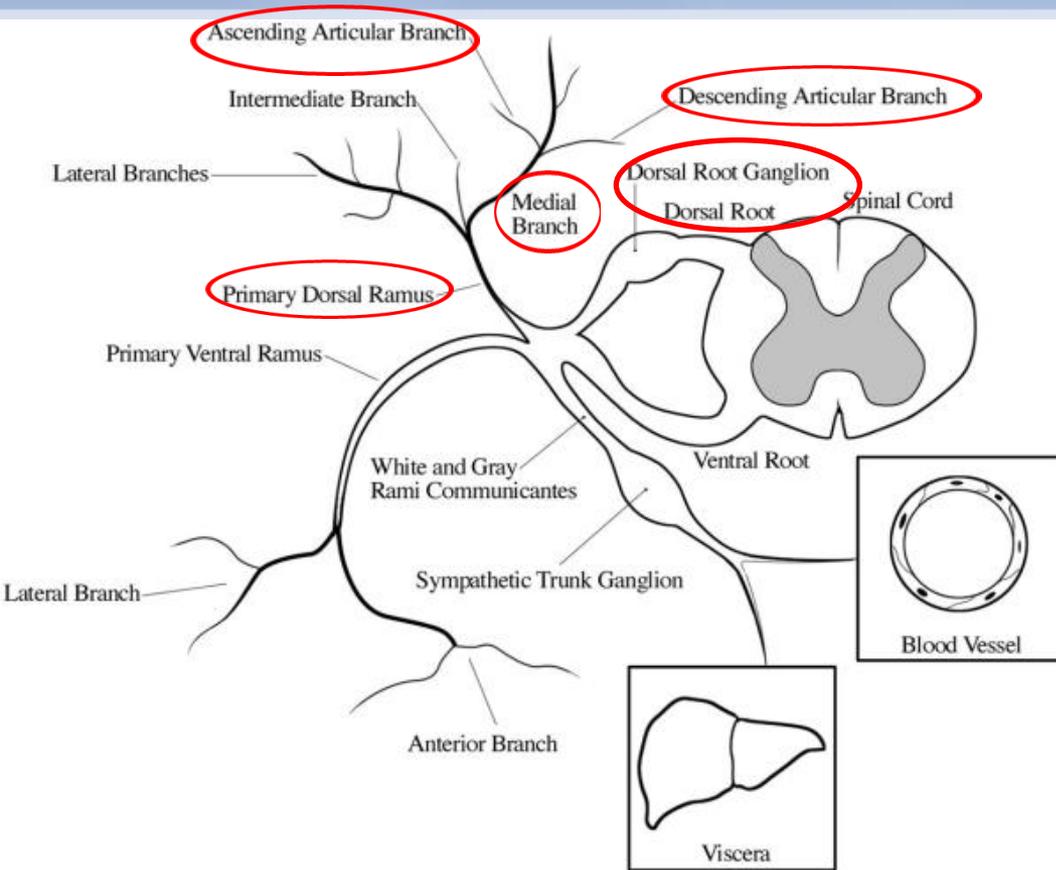
INNERVATION



Facet joints are innervated by the **medial branches of dorsal ramus sensory nerves**



INNERVATION



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 innerves 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.

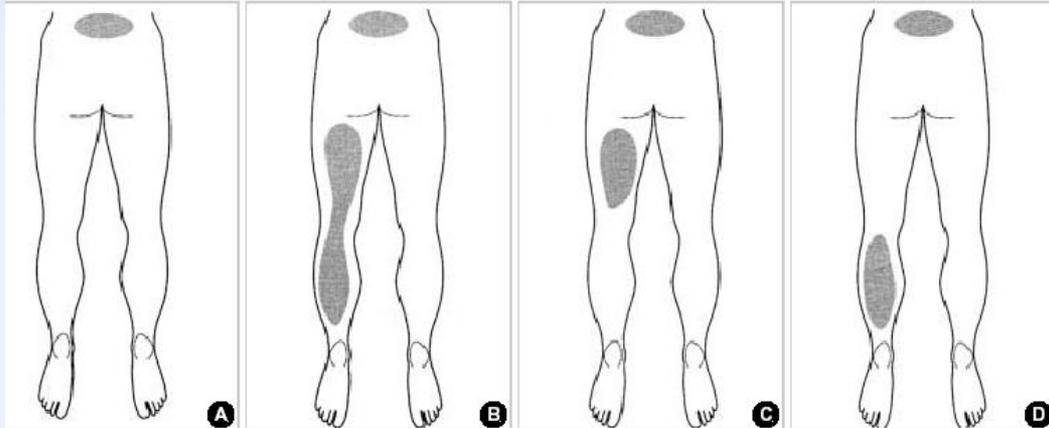
FACET JOINT SYNDROME

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



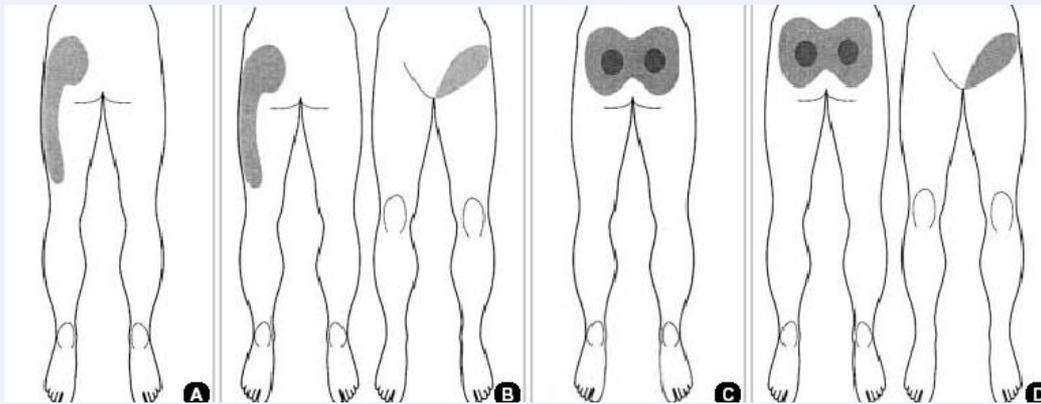
PAIN REFERRAL PATTERNS



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**

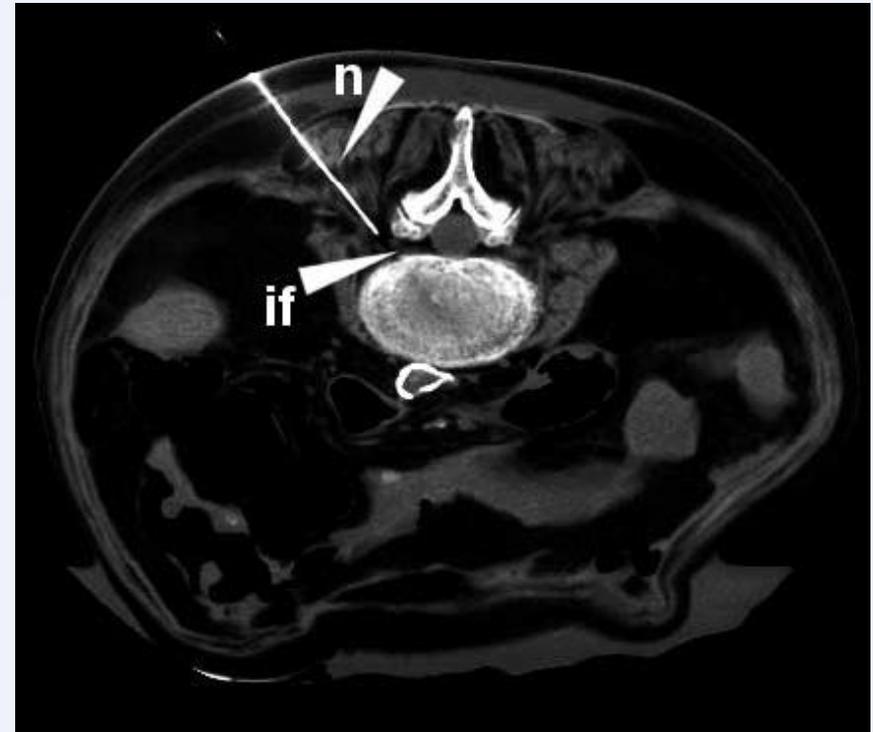


In patients with osteophytes, synovial cysts, or facet hypertrophy, the presence of radicular symptoms may also accompany these patterns

GUIDED PROCEDURE

FLUOROSCOPY

CT-GUIDED



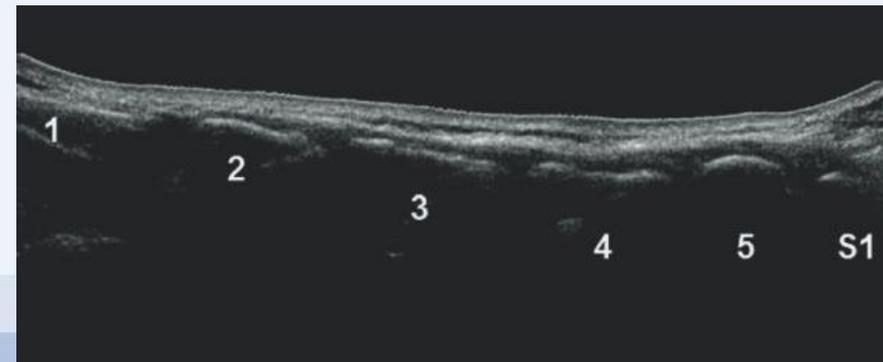
To date, imaging guided facet joint injections are mainly performed under **CT** or **fluoroscopic guidance**

Ultrasound-guided injections in the lumbar spine

Alexander Loizides¹, Siegfried Peer¹, Michaela Plaikner¹, Verena Spiss¹, Klaus Galiano², Jochen Obernauer², Hannes Gruber¹

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

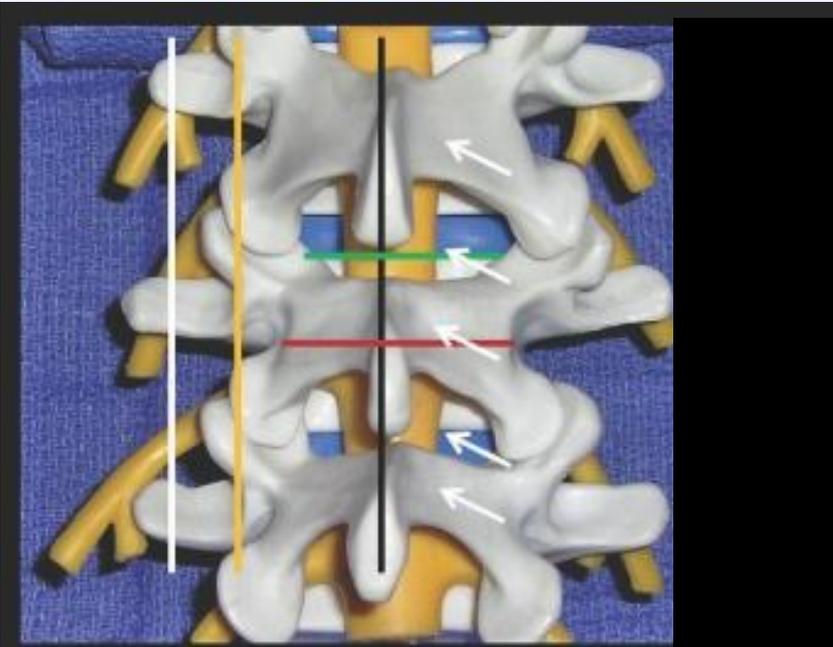


Sonographically Guided Lumbar Spine Procedures

David A. Provenzano, MD, Samer Narouze, MD, PhD

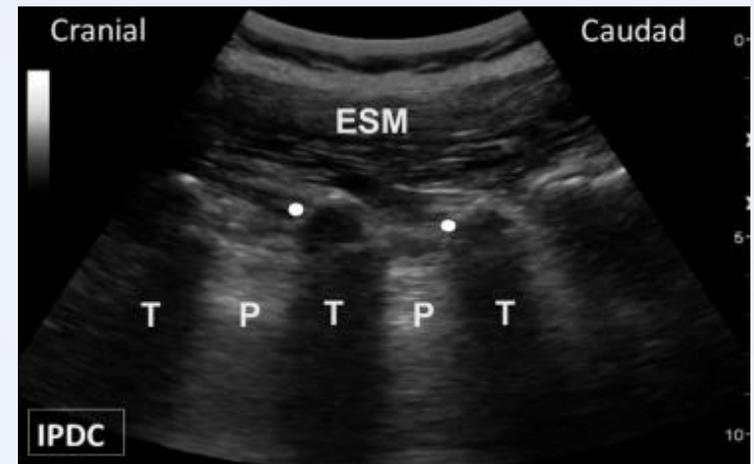
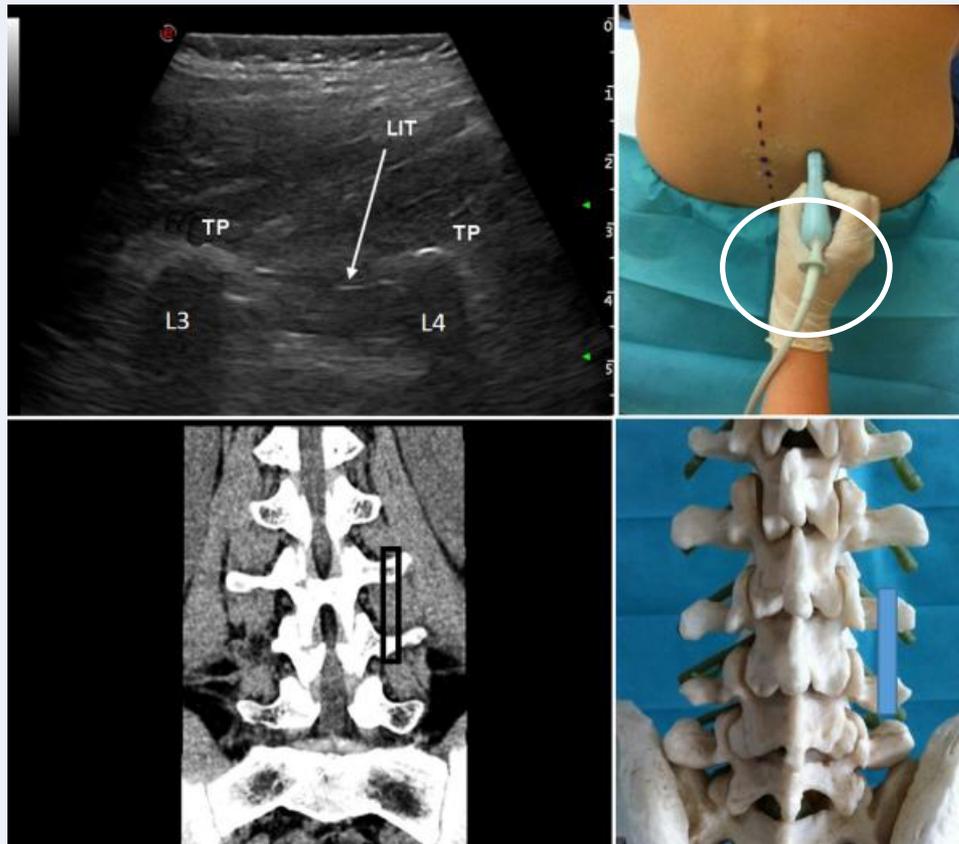
6 BASIC SONOGRAPHIC VIEWS :

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

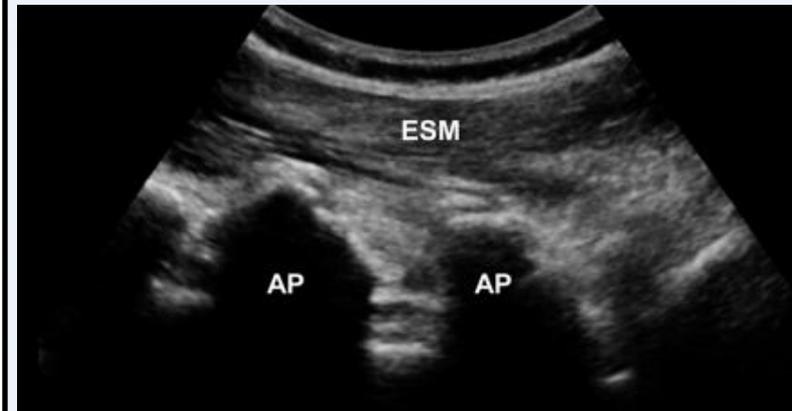


2. PARASAGITTAL ARTICULAR PROCESS VIEW

➤ 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

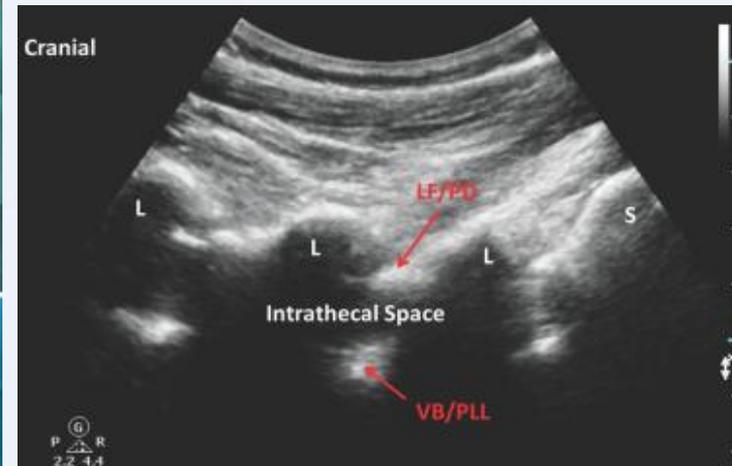


3. PARASAGITTAL OBLIQUE LAMINAR VIEW

➤ 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

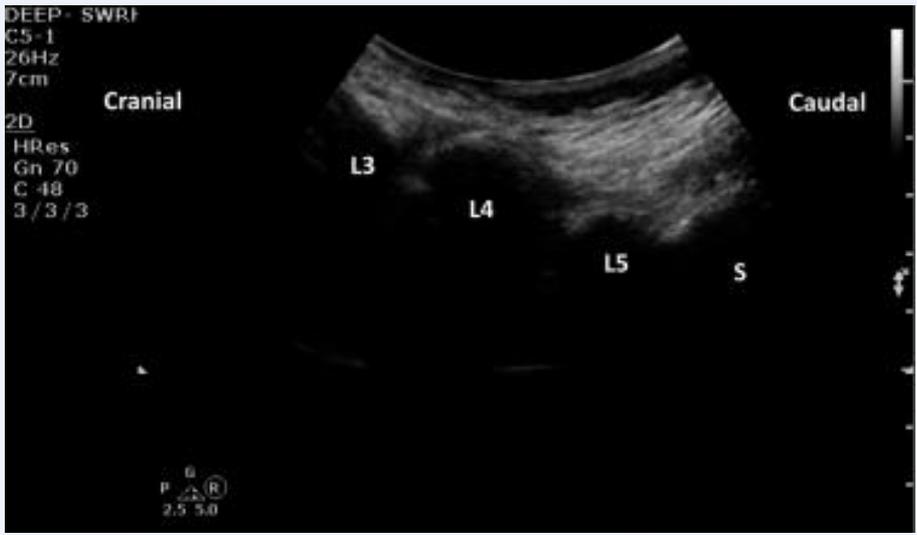
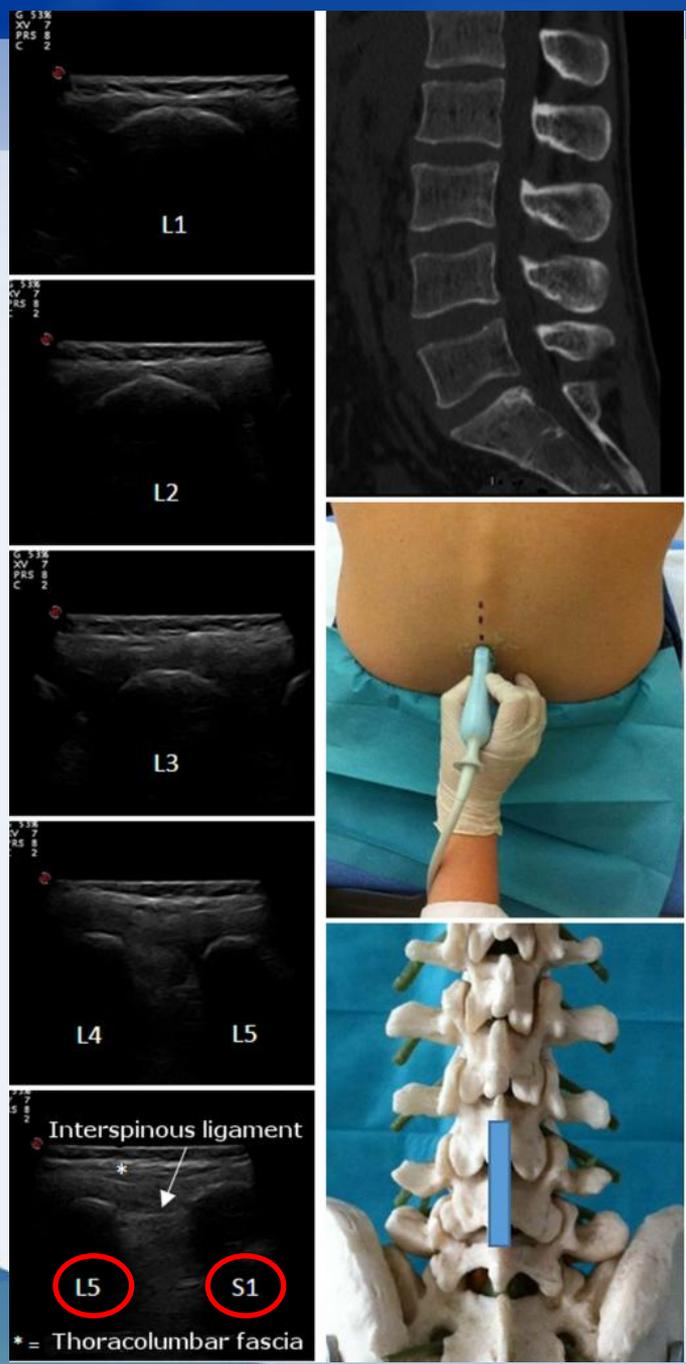
3. PARASAGITTAL OBLIQUE LAMINAR VIEW



4. MIDLINE SAGITTAL SPINOUS PROCESS VIEW

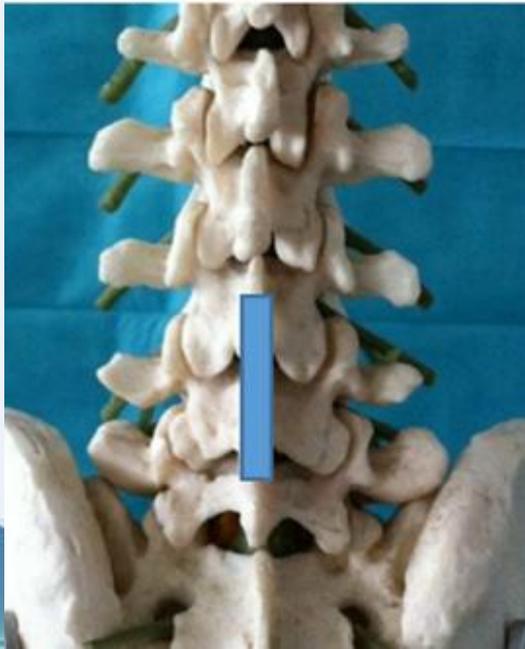
➤ The probe is moved toward the anatomic midline

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



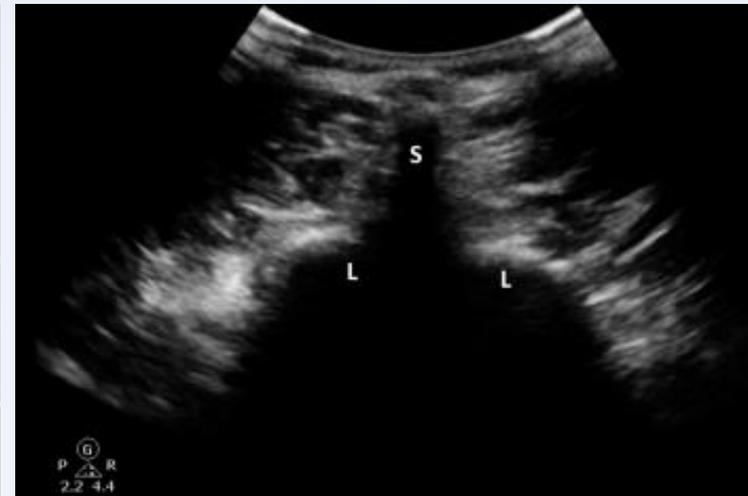
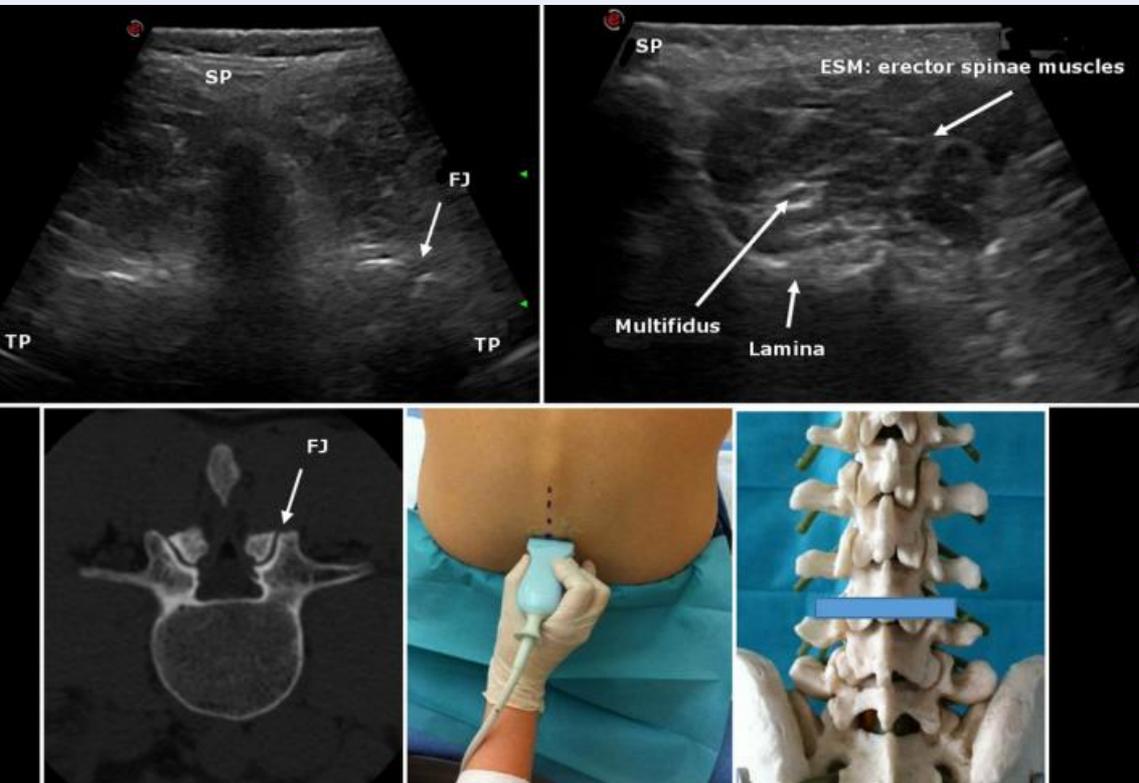
Landmarks: L5 and S1 spinous processes

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

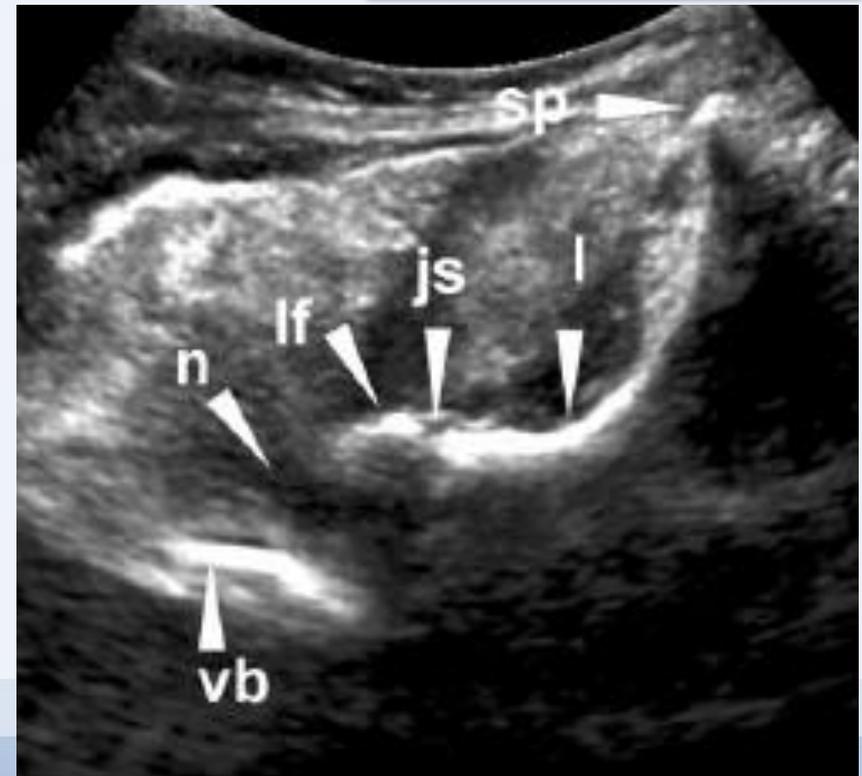


Real-time Sonographic Imaging for Periradicular Injections in the Lumbar Spine

A Sonographic Anatomic Study of a New Technique

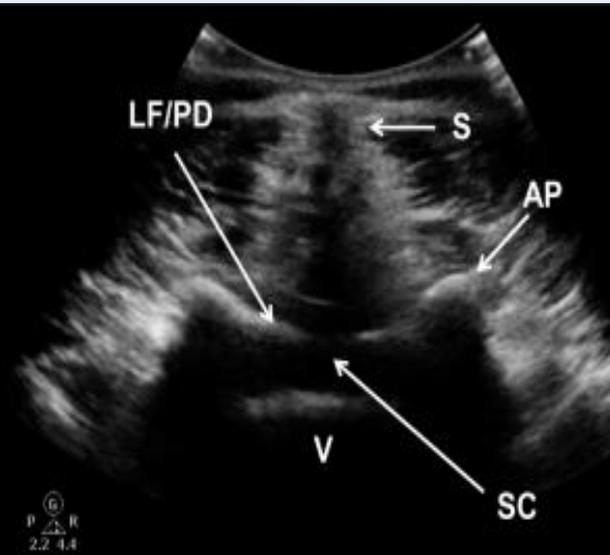
js: joint space
l: lamina
lf: lateral facet
n: spinal nerve
sp: spinous process
vb: vertebral body

- 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 caudad 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)

Diagnostic
and
therapeutic

Boswell MV, et al. Therapeutic facet joint interventions in chronic spinal pain: A systematic review of effectiveness and complications. Pain Physician 2005; 8:101-114.

Boswell MV, et al. A systematic review of therapeutic facet joint interventions in chronic spinal pain. Pain Physician 2007; 10:229-253

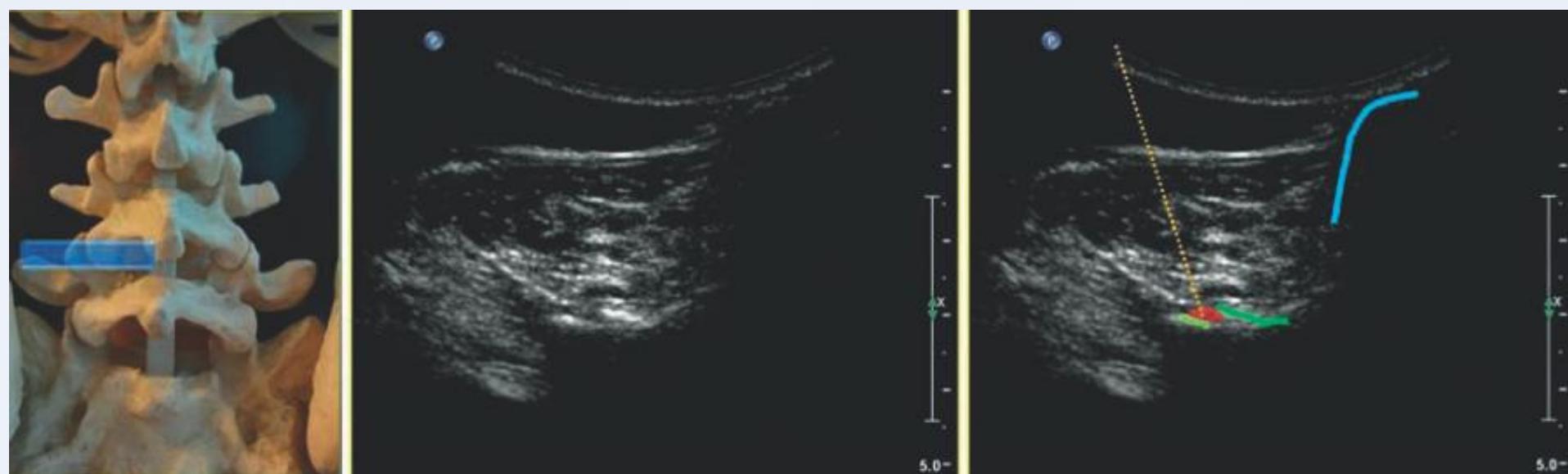
Geurts JW, et al. Efficacy of radiofrequency procedures for the treatment of spinal pain: A systematic review of randomized clinical trials. Reg Anesth Pain Med 2001; 26:394-400

Falco FJE, et al. Systematic review of diagnostic utility and therapeutic effectiveness of cervical facet joint interventions. Pain Physician 2009; 12:323-344.

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

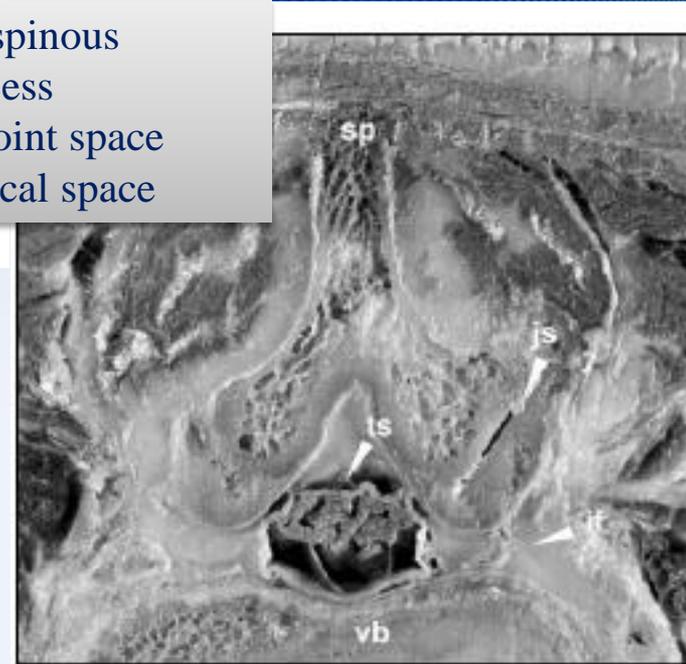
- Green: superior and inferior articular processes
- Red: joint space
- Yellow dots: needle

Real-time Sonographic Imaging for Periradicular Injections in the Lumbar Spine

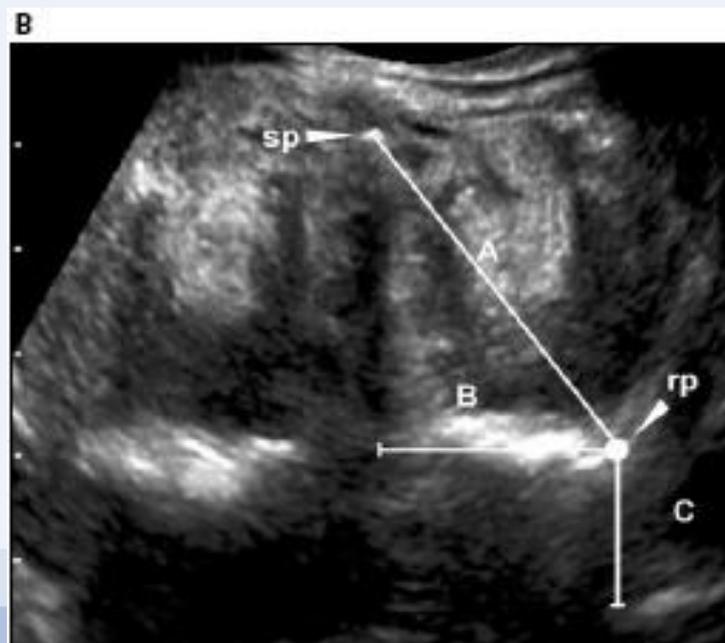
A Sonographic Anatomic Study of a New Technique

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 spinous process (A), the midline (B), and the intervertebral disk (C). Subsequently, axial transverse CT scans were made to verify these distances

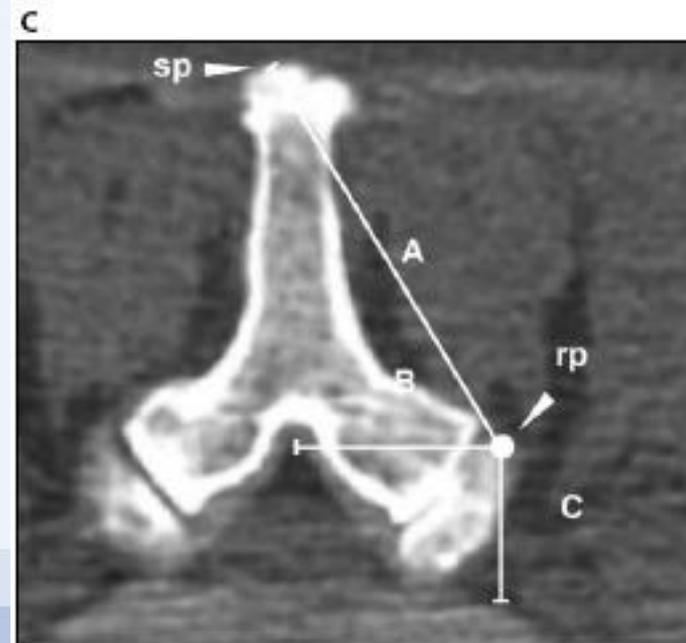
sp: spinous process
js: joint space
ts: tecal space



sp: spinous process
rp: reference point
A: sp-rp distance

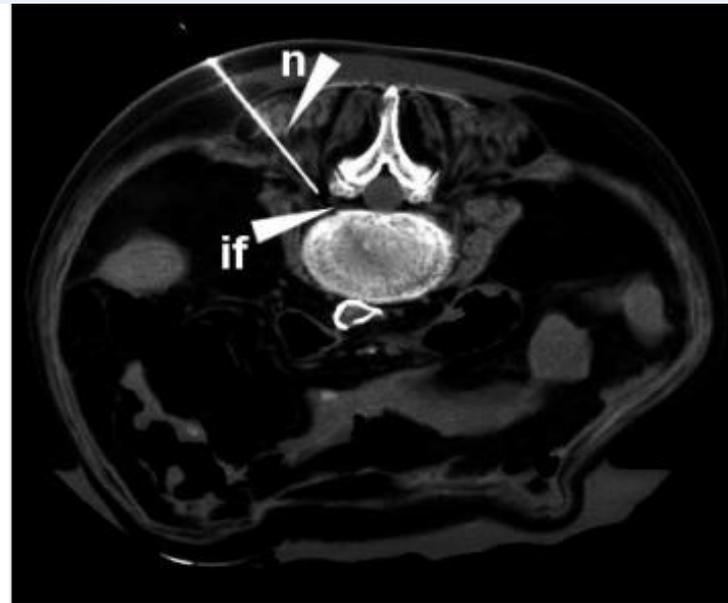
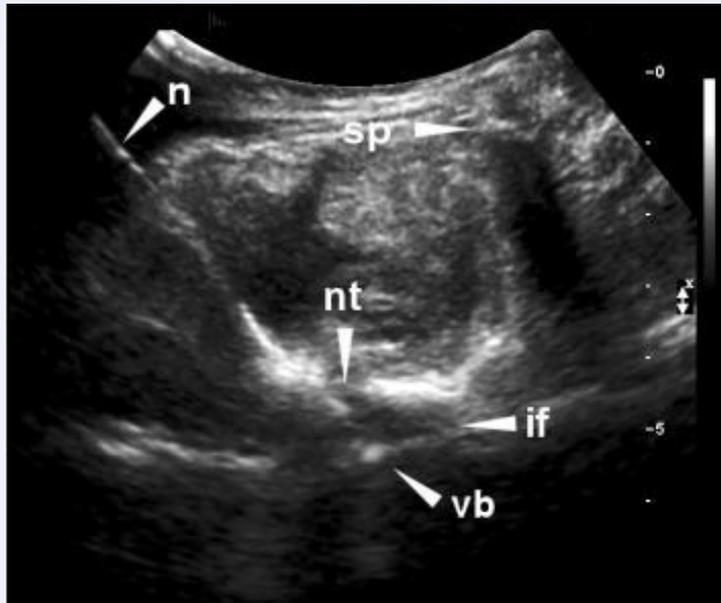


Transverse scan (L4-L5)



Real-time Sonographic Imaging for Periradicular Injections in the Lumbar Spine

A Sonographic Anatomic Study of a New Technique



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.

Real-time Sonographic Imaging for Periradicular Injections in the Lumbar Spine

A Sonographic Anatomic Study of a New Technique

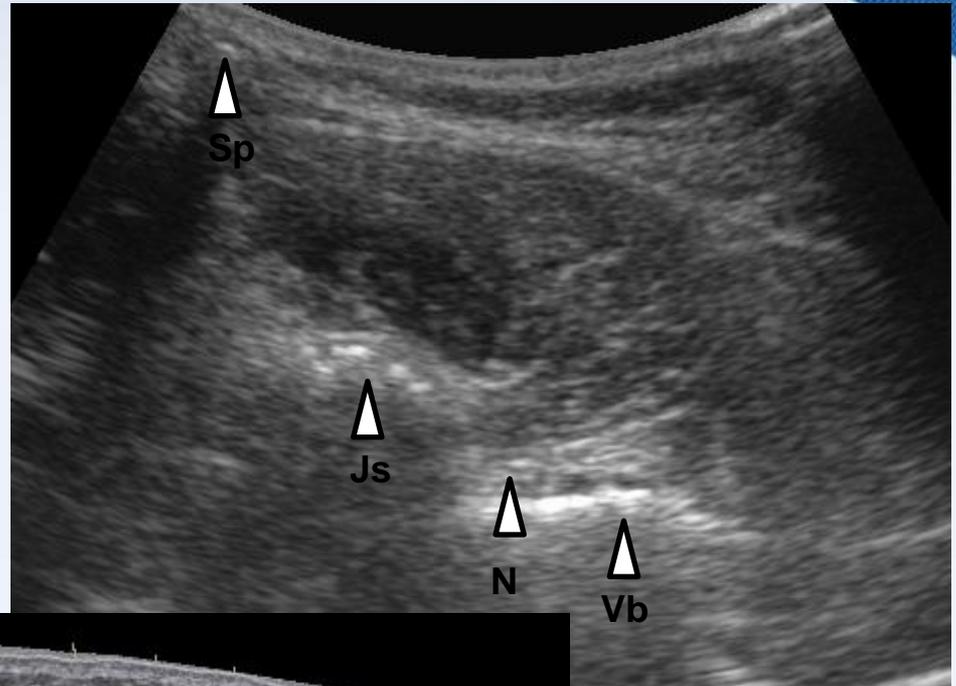
Klaus Galiano, MD, Alois Albert Obwegeser, MD, MSc, Gerd Bodner, MD, Martin Freund, MD, Herbert Maurer, MD, Florian Stefan Kamelger, MD, Reinhold Schatzer, PhD, Franz Ploner, MD

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

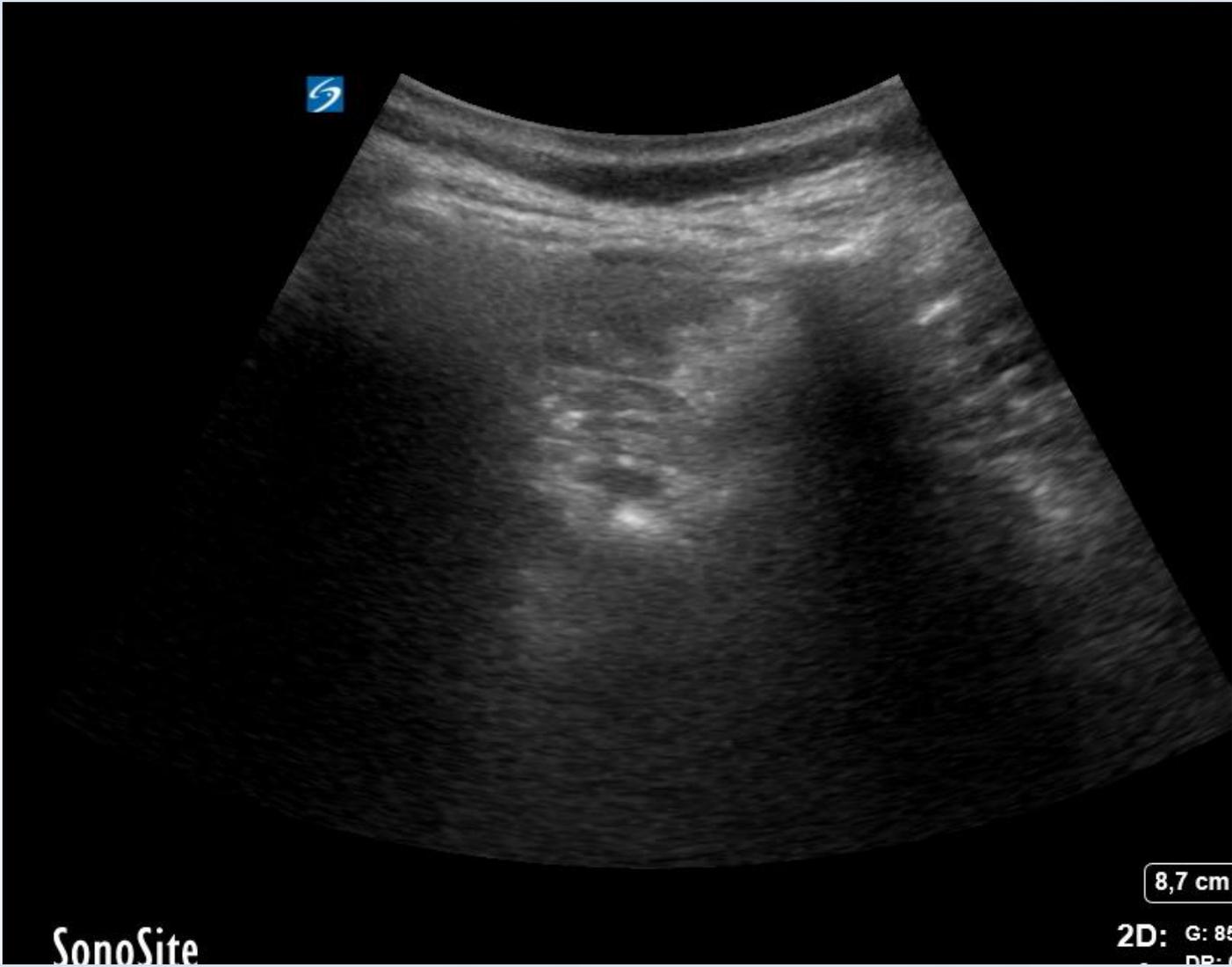






INJECTION





SonoSite

8,7 cm

2D: G: 85
DR: 0

A Low-Cost Ultrasound Phantom of the Lumbosacral Spine

Geoff A. Bellingham, MD, FRCPC and Philip W.H. Peng, MBBS, FRCPC†*



- 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

A Low-Cost Ultrasound Phantom of the Lumbosacral Spine

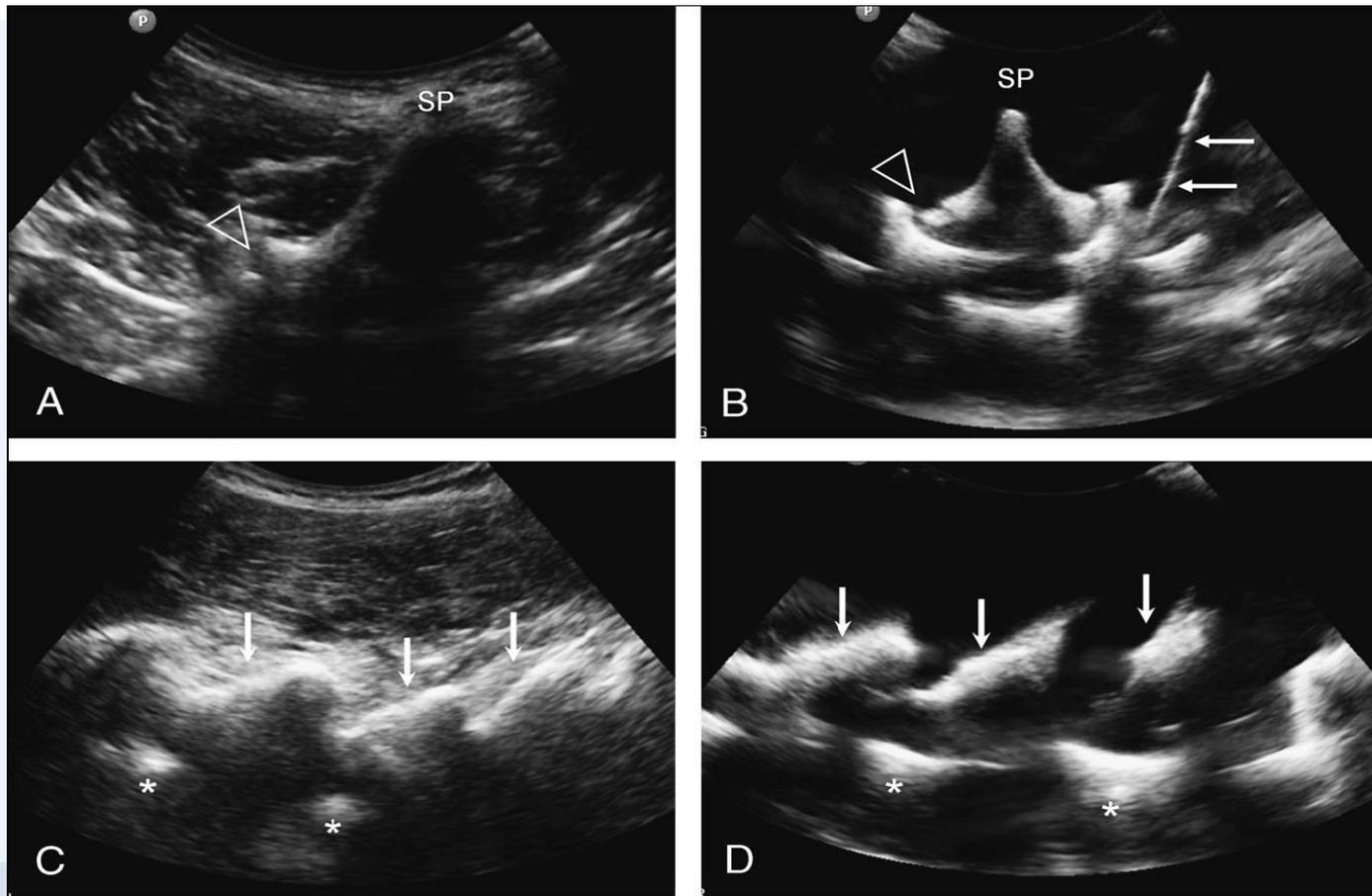
Geoff A. Bellingham, MD, FRCPC and Philip W.H. Peng, MBBS, FRCPC†*



- 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

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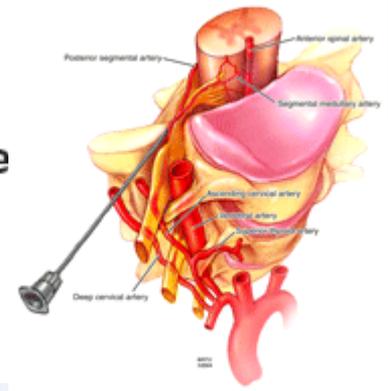
- ✓ This teaching tool can provide trainees with an opportunity to familiarize themselves with sonoanatomy of the lumbosacral spine in addition to practicing probe handling techniques and needle placement
- ✓ A distinct advantage of this gelatin phantom compared to other commercially available phantoms 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.

COMPLICATIONS

Case Report

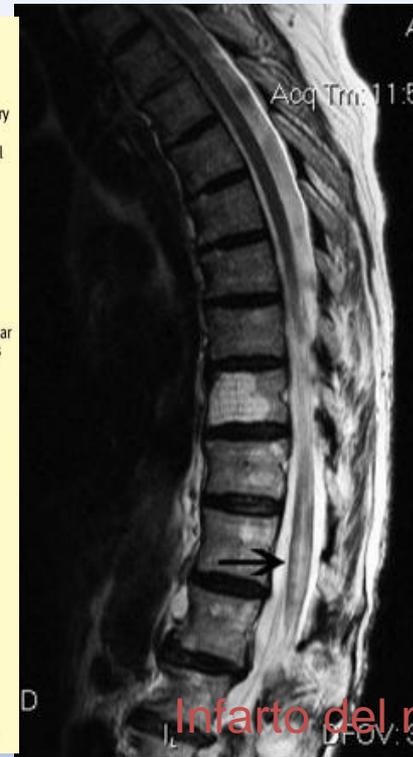
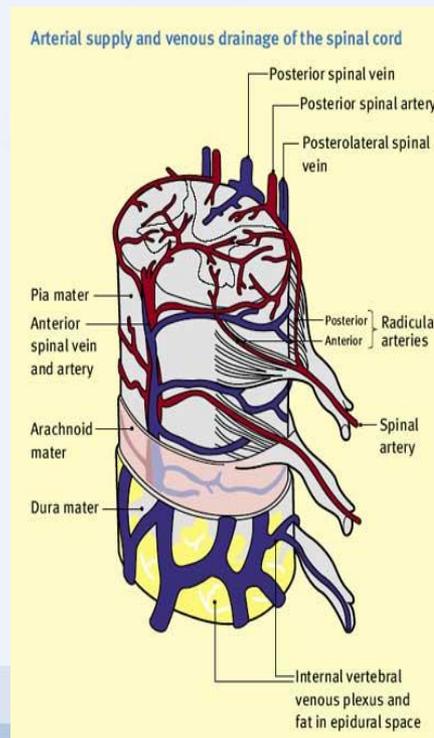
Paraplegia Following Image-Guided Transforaminal Lumbar Spine Epidural Steroid Injection: Two Case Reports

David J. Kennedy, MD,* Paul Dreyfuss, MD,† Charles N. Aprill, MD, APMC,‡ and Nikolai Bogduk, MD, PhD, DSc§



✓ **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



Infarto del midollo spinale

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

