Image-guided Spine Procedures for Relief of Severe Lower Back Pain:

A Guide to Epidural Steroid Injection, Facet Joint Injection, and Selective Nerve Root Block.

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Outline

I. Introduction
II. Objectives
III. Anatomy
IV. Patient evaluation
V. Procedures
VI. Conclusion

I. Introduction

- Back pain is a major problem in the United States with countless emergency room visits every year.
- The emotional, physical, and healthcare costs are tremendous.
- Image-guided spine procedures can be successful in diagnosing and relieving the source of severe back pain.

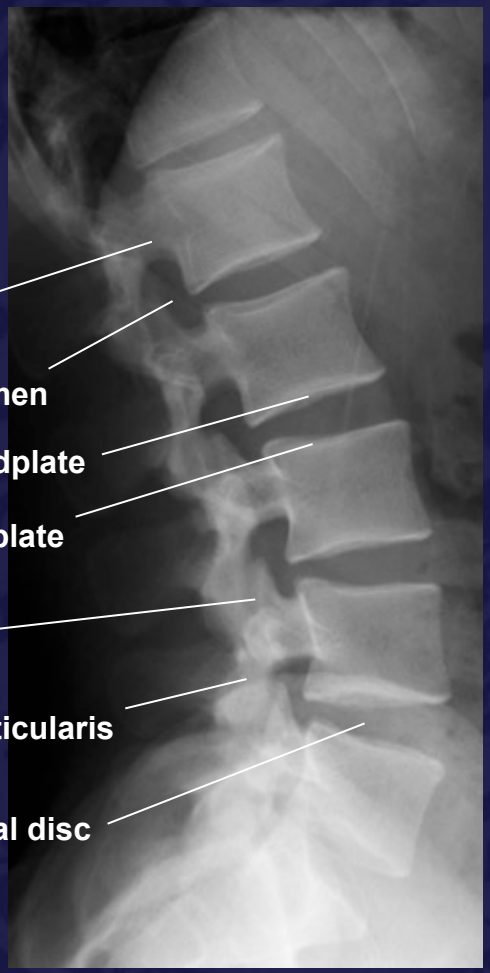
II. Objectives

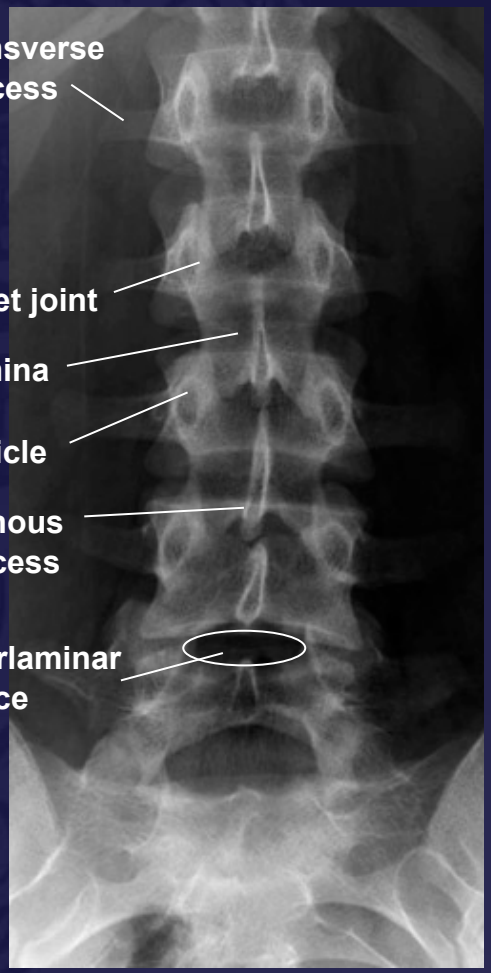
This educational poster will illustrate key learning points of epidural steroid injection, facet joint injection, and lumbar nerve root block.

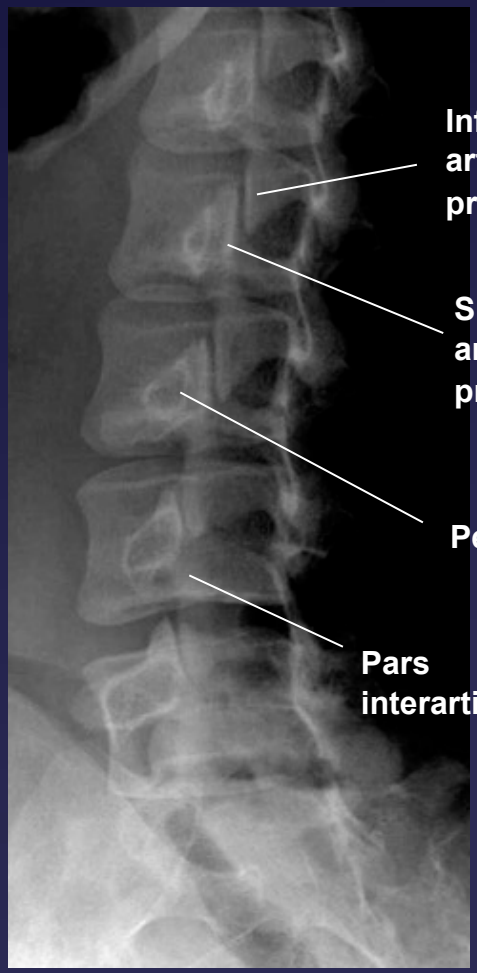
- Basic relevant anatomy
- Indications
- General procedure principles
- Possible complications

III. Anatomy – Lumbar Spine

Plain film

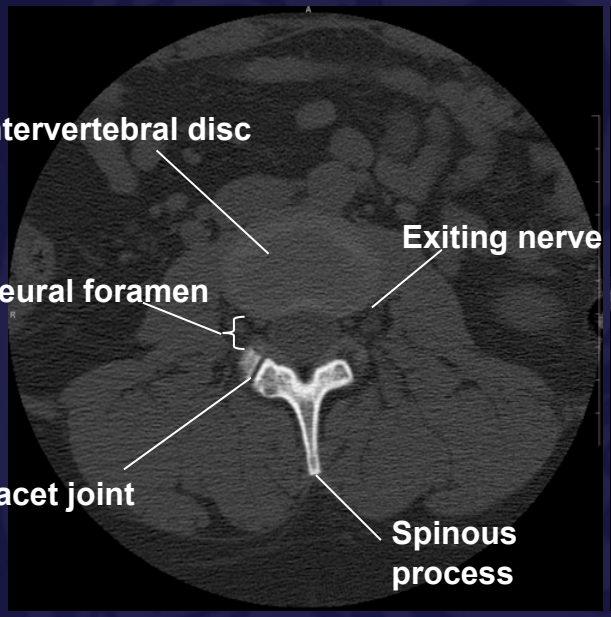


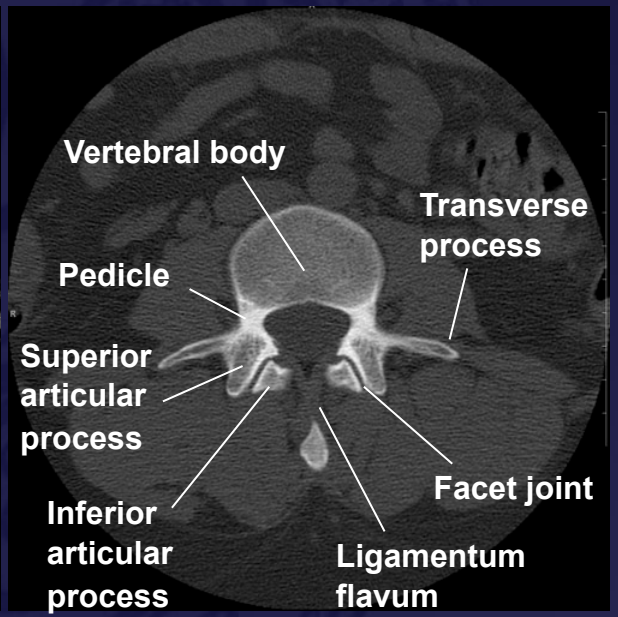


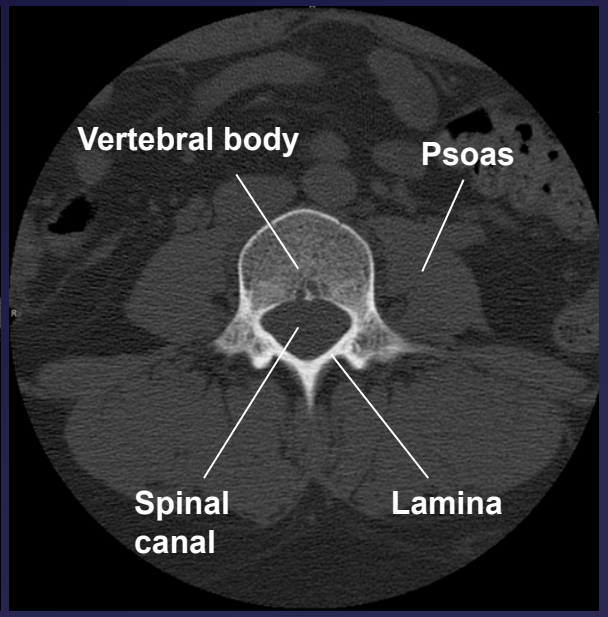


III. Anatomy – Lumbar Spine

CT







III. Anatomy – Lumbar Spine

MRI

Spinous process

Supraspinous ligament

Interspinous ligament

Anterior longitudinal ligament

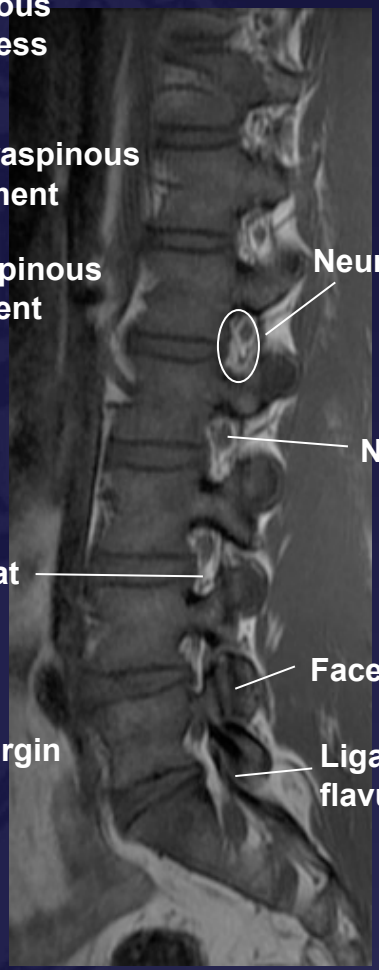
Intervertebral disc

Vertebral body

Epidural fat

Dorsal Dural margin

T1



Neural foramen

Nerve root

Facet joint

Ligamentum flavum

T1

Superior endplate

Inferior endplate

Conus medullaris

Nucleus pulposus

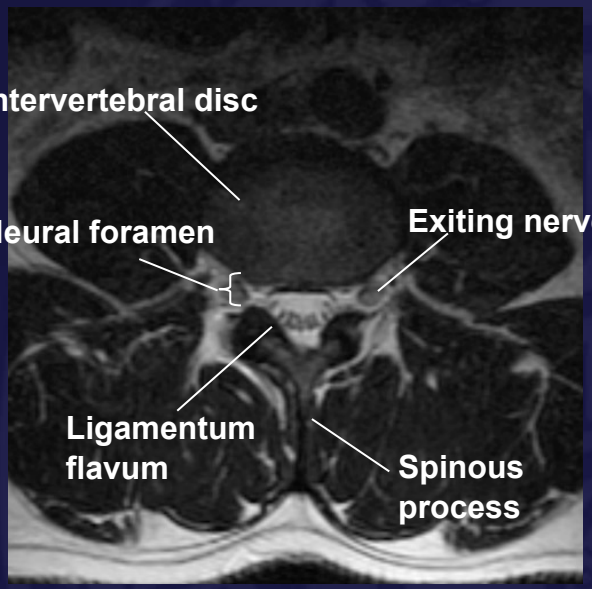
Annulus fibrosus

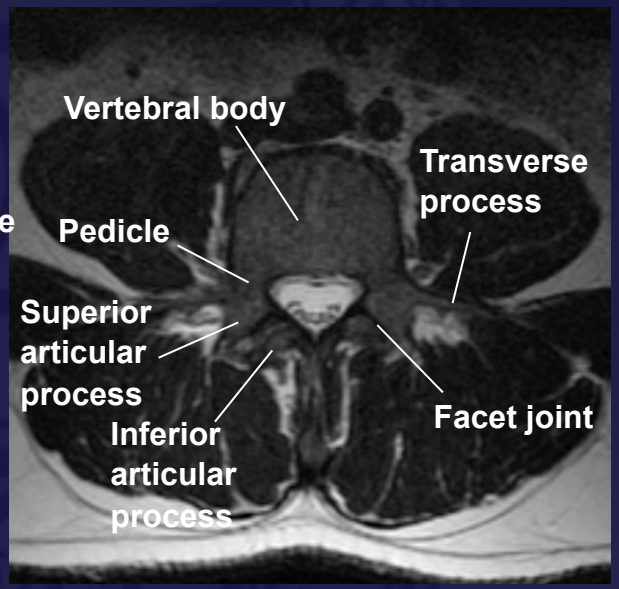
CSF

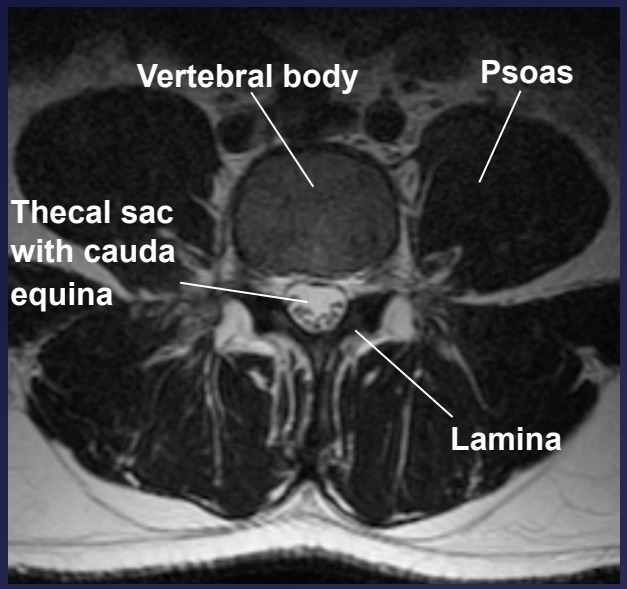
T2

III. Anatomy – Lumbar Spine

MRI







T2

IV. Patient evaluation

All patients are evaluated by the neuroradiologist prior to procedure.

- History including duration and nature of pain
- Physical exam
- Review imaging studies, findings must correlate with pain
- Explain risks, benefits, and possible complications
- Informed consent

V. Procedures

1. Epidural injections
2. Facet joint injections
3. Lumbar nerve root block

1. Epidural injections

Indications and Rationale

- Commonly performed for symptoms of
  - Herniated disc
  - Spinal stenosis
  - Refractory back pain of uncertain etiology
- Decrease inflammation and swelling of nerve root
- Relieve pain and break pain cycle
- Allow patients to return to their usual activities
- May help delay or avoid more invasive surgical procedures

1. Epidural injections

Contraindications

- Coagulopathy. Patient should discontinue anticoagulative medication (coumadin). Check INR, PT, PTT.
- Allergy to contrast. Procedure can be modified and performed without contrast.
- Contraindication to steroids use (ulcers, active infection)

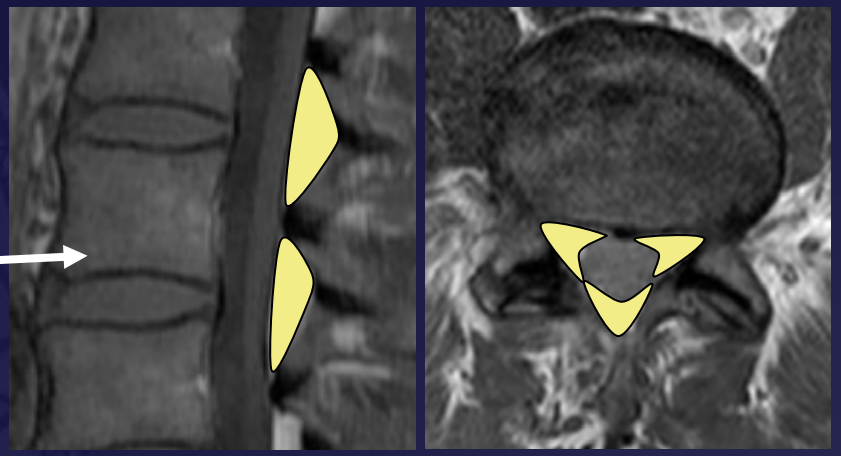
Preparation

- Prone position on fluoroscopy suite table
- Sterile preparation of lower back and drapes
- 1% buffered lidocaine for skin local anesthesia
- 22-gauge Tuohy needle with Medallion syringe and tubing
- Syringes for local anesthetic, contrast, and steroid
- Mixture of 2-3 cc of 0.5% Marcaine and 80 mg of Kenalog
- Conscious sedation not necessary. IV midazolam and fentanyl can be given if required

1. Epidural injections

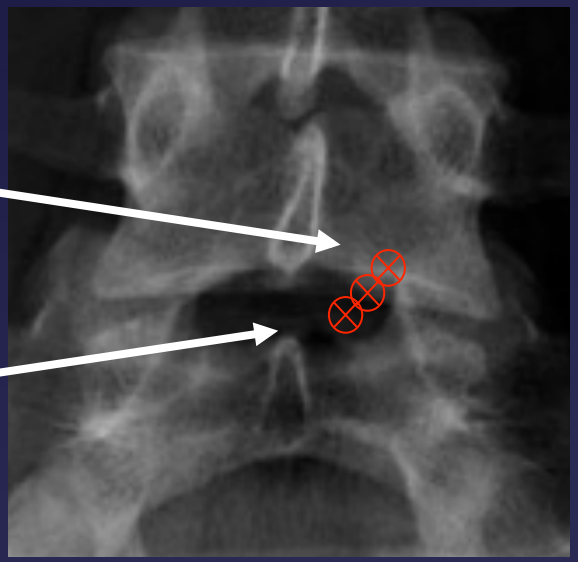
Anatomy

- Epidural space bordered by dural sac, ligamentum flavum, and vertebral bodies



Procedure

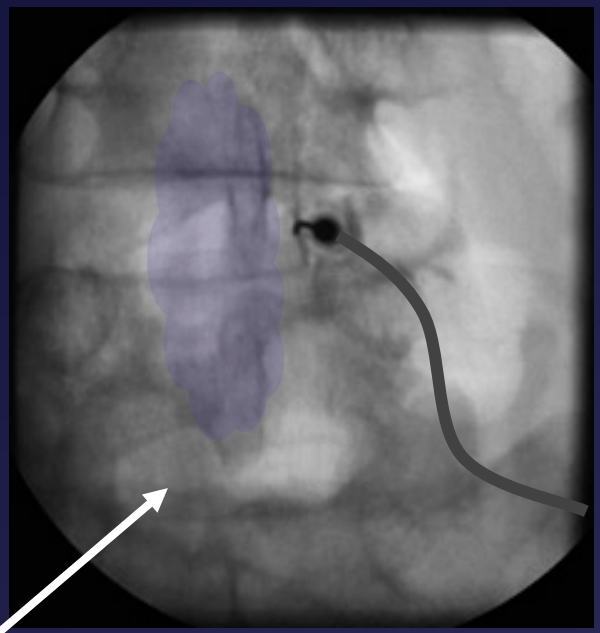
- Needle is advanced to the appropriate level lamina under fluoroscopy, just touching the periosteum adjacent to interlaminar space
- Needle is withdrawn a few millimeters and “walked” carefully past the lamina medially



1. Epidural injections

Procedure (continued)

- Stylet removed and connected to Medallion syringe containing air
- Needle is slowly advanced while tapping syringe plunger until loss of resistance
- Needle is connected to contrast (Omnipaque 180) via tubing and slowly injected
- Contrast rapidly advances confirming placement in epidural space
- Spot image is obtained
- Mixture of Marcaine and Kenalog is injected into epidural space



1. Epidural injections

Complications

- Bleeding
- Infection
- Placement of needle into subarachnoid space
- Injury to vessel or nerve
- Contrast reaction
- Vasovagal reaction
- Non-response to therapy

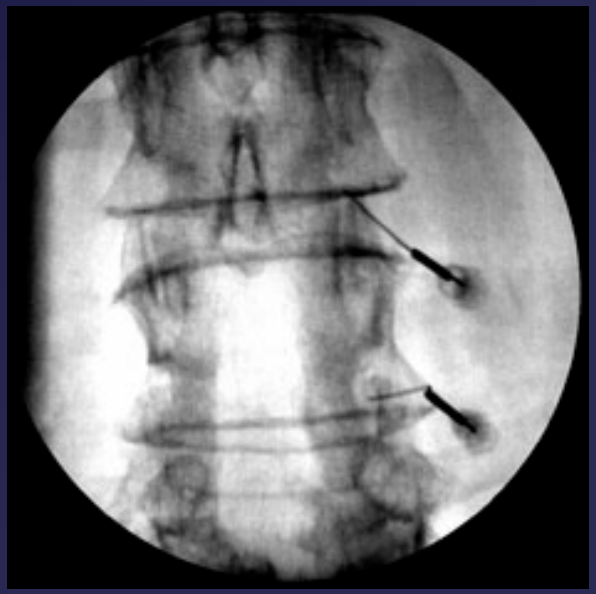
Post Procedure

- Monitoring of vital signs
- Home care instructions for potential complications, ie. Infection
- Initial pain reduction from local anesthetic
- Steroid effects may gradually take effect after 1-2 day delay
- May require repeat series of injections for optimal effect

2. Facet injections

Indications and Rationale

- Commonly performed for spinal facet syndrome, inflammation of facet joints
- Symptoms are variable and diagnosis can be a challenge
- Pain can be overlying affected joints, or may be referred
- Innervation of facet joints by medial branch of dorsal rami of spinal nerves
- Facet injections can be both diagnostic and therapeutic



2. Facet injections

Contraindications

- Coagulopathy. Patient should discontinue anticoagulative medication (coumadin). Check INR, PT, PTT.
- Allergy to contrast. Procedure can be modified and performed without contrast.
- Contraindication to steroids use (ulcers, active infection)

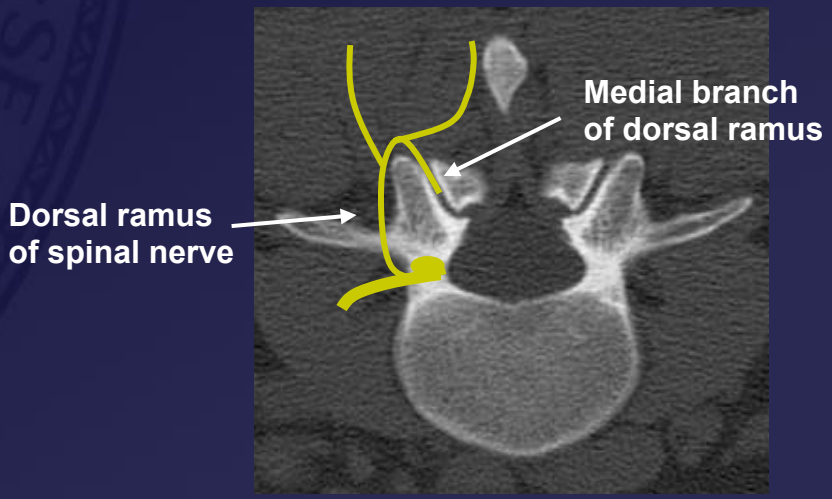
Preparation

- Prone position on fluoroscopy suite or CT table
- Sterile preparation of lower back and drapes
- 1% buffered lidocaine for skin local anesthesia
- 25 gauge (or 22 gauge) 3.5 to 5 inch needle (longer if obese)
- Syringes for local anesthetic, contrast, and steroid
- Mixture of 2-3 cc of 0.5% Marcaine and 80 mg of Kenalog
- Conscious sedation not necessary. IV midazolam and fentanyl can be given if required

2. Facet injections

Anatomy

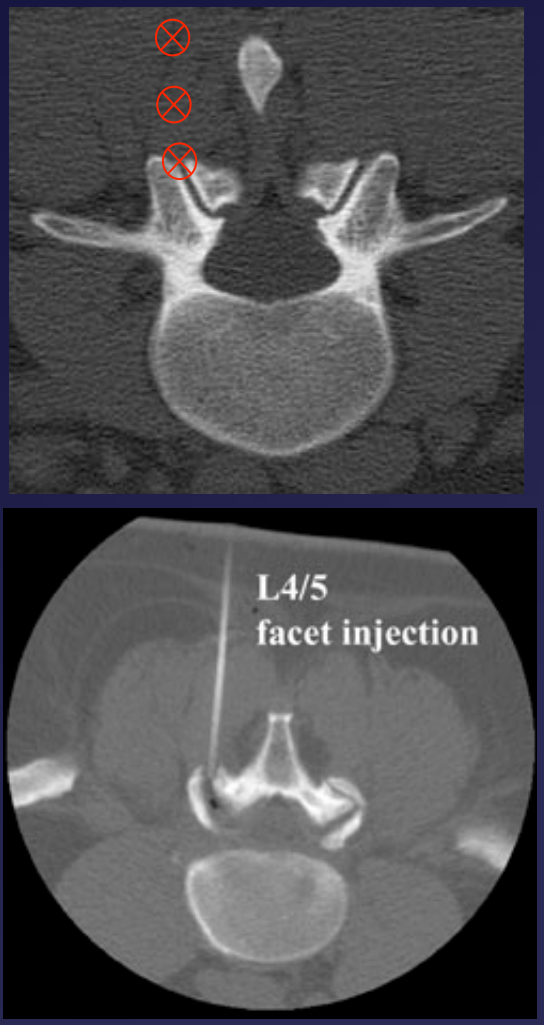
- Facet joints are synovial joints with joint capsule, articular cartilage and synovium
- Osseous components include the superior articulating process from the caudal spinal segment and inferior articulating process from the rostral spinal segment
- Innervation from medial branch of the dorsal ramus of spinal nerve from the corresponding level and variably from a level above and below



2. Facet injections

Procedure

- Needle insertion at appropriate level with small incremental advances under fluoroscopy or CT guidance
- Confirm placement of needle in joint with contrast
- Spot image is obtained
- Mixture of Marcaine and Kenalog is injected into facet joint space
- Where equipment is available, pulsed radiofrequency ablation can be performed on medial branch of dorsal ramus



2. Facet injections

Complications

- Bleeding
- Infection
- Injury to vessel or nerve
- Contrast reaction
- Vasovagal reaction
- Non-response to therapy

Post Procedure

- Monitoring of vital signs
- Home care instructions for potential complications, ie. Infection
- Initial pain reduction from local anesthetic
- Steroid effects may gradually take effect after 1-2 day delay
- May require repeat series of injections for optimal effect

3. Lumbar nerve root block

Indications and Rationale

- For diagnosis of radicular pain when etiology is uncertain
- For therapeutic block of spinal nerve causing radicular pain following successful diagnosis

3. Lumbar nerve root block

Contraindications

- Coagulopathy. Patient should discontinue anticoagulative medication (coumadin). Check INR, PT, PTT.
- Allergy to contrast. Procedure can be modified and performed without contrast.
- Contraindication to steroids use (ulcers, active infection)

Preparation

- Prone position on fluoroscopy suite or CT table
- Sterile preparation of lower back and drapes
- 1% buffered lidocaine for skin local anesthesia
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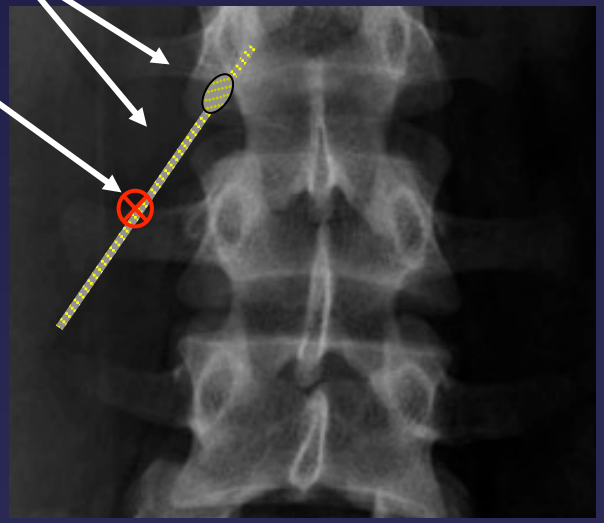
3. Lumbar nerve root block

Anatomy

- Nerve root exit the neural foramen in the lumbar region inferior to adjacent pedicle
- Ganglion is located in the lateral aspect of neural foramen
- Postganglionic portion of lumbar exiting nerve root tracks anteroinferiorly under the mid transverse process the level below

Procedure (Lumbar Postganglionic)

- Superior aspect of mid transverse process is targeted inferior to level of desired nerve root
- Needle insertion with small incremental advances under fluoroscopy or CT guidance



3. Lumbar nerve root block

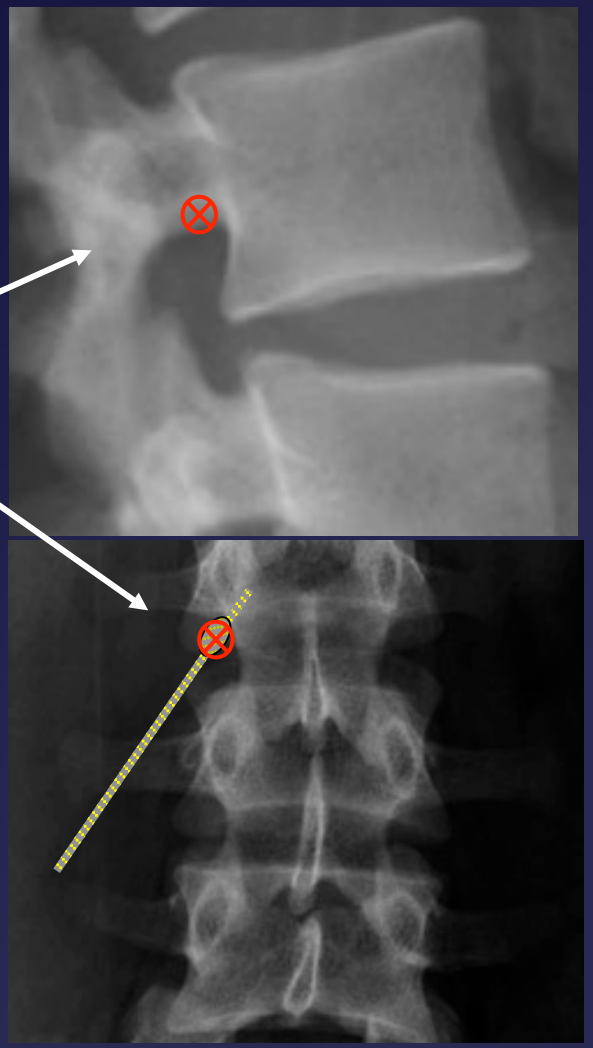
Procedure (continued)

- Paresthesia felt by patient when needle is at the target nerve
- Confirm placement of needle by nerve root with contrast
- Spot image is obtained
- For diagnostic block, 2-3 cc of 1% lidocaine is injected
- For therapeutic block, mixture of Marcaine and Kenalog is injected

3. Lumbar nerve root block

Procedure (Lumbar Periganglionic)

- For periganglionic block (transforaminal epidural injection), neural foramen is targeted
- Needle insertion with small incremental advances under fluoroscopy or CT guidance
- Needle is directed to the neural foramen at the rostral pedicle
- Confirm placement of needle by nerve root with contrast, frequently contrast will extend into epidural space
- Spot image is obtained
- For diagnostic block, 2-3 cc of 1% lidocaine is given
- For therapeutic block, mixture of Marcaine and Kenalog is injected



3. Lumbar nerve root block

Complications

- Bleeding
- Infection
- Injury to vessel or nerve
- Contrast reaction
- Vasovagal reaction
- Non-response to therapy

Post Procedure

- Monitoring of vital signs
- Home care instructions for potential complications, ie. Infection
- Initial pain reduction from local anesthetic
- Steroid effects may gradually take effect after 1-2 day delay

VI. Conclusion

- Back pain is a major problem requiring countless emergency room visits
- Significant physical, emotional, and healthcare costs
- Image-guided spine procedures can diagnose and relieve severe back pain
- Image-guided spine procedures can help delay or avoid more invasive surgical procedures
- Many patients have improvement in quality of life

References

Brown D. Atlas of Regional Anesthesia. 2nd Ed. Saunders 1999.

Williams A and Murtagh FR. Handbook of Diagnostic and Therapeutic Spine Procedures. Mosby 2002.

Amirsys StatDX website. http://my.statdx.com

Acknowledgements

Some of the images were adapted from the University of Rochester Neuroradiology website. http://www.urmc.rochester.edu/radiology/

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