
Cervical Discography:

Indications, technique and image findings

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Objectives

1. Understand the indications for cervical discography
2. Review the technical considerations involved in performing safe, diagnostic and reproducible discography, as well as its complications
3. Identify relevant findings on post-discogram computed tomography

Introduction

- Magnetic resonance (MR) imaging remains the initial imaging modality in the setting of acute and chronic neck pain
- Cervical discography is a spine procedure that entails injecting a small volume of fluid within the disc space in an attempt to elicit the patient's neck pain
- Cervical discogram complements MR in providing valuable pre-operative information regarding the discogenic origin of pain

Background

- In degenerative disc disease, MR reveals areas of increased T2-weighted signal within the annulus, which often represent annular fissures
- MR may not identify reliably distinguish between symptomatic and asymptomatic degenerative disc disease

Background (cont'd)

- A positive pain response is pain that is concordant with an injection at a disc level
- By determining the cervical disc levels that are symptomatic, cervical discogram can effectively guide the surgeon to operate on symptomatic discs while excluding asymptomatic discs
- Cervical discogram is also more sensitive than MRI in detecting internal disc disruption

Indications

- Evaluation of neck pain not explained by MR or computed tomography (CT) findings
- Pre-procedural evaluation for cervical fusion
 - Evaluate the levels above and below a fusion to determine the extent of cervical fusion
 - Determine symptomatic levels in patients with multilevel imaging abnormalities
- Pre-procedural evaluation for cervical fusion
 - Assess an existing cervical fusion in patients with persistent neck pain

Contraindications

- Coagulopathy: INR > 1.5 or plt < 50,000/mm³
- Pregnancy
- Systemic or local infection
- Existing spinal cord compression

Complications

- Major complications occurred in less than 1% in a series of 4400 patients¹
- Bleeding and significant extradural hematoma
- Discitis and prevertebral abscess
- Vascular and neural injury
- Thecal sac puncture and headaches
- Vasovagal reaction
- Allergic reaction to administered medications

¹Seidman SM, Thompson K, Ducker T, 1995.

Equipment

- Sterile gloves, protective gear, drapes and dressings
- C-arm fluoroscopy and lead
- One 26 gauge 3.5-inch spinal needle for each level
- 1-3 ml syringe for each level
- 10-ml syringe with 25 gauge, 1.5-inch needle for local anesthesia
- Non-ionic myelographic contrast 300 mg/ml, such as Omnipaque-300

Equipment (cont'd)

- Cefazolin, Omnipaque-300
- Medallion syringe
- 26 G 3.5 inch needle



Procedure

- Pre-procedural preparation
 - patients should withhold pain medications on day of procedure
- Discitis prevention
 - 1 g cefazolin intravenously (IV) within one hour prior to procedure
 - Addition of 1 mg cefazolin to contrast for each disc injection
- Patient positioning
 - Supine with cushion placed underneath shoulders to slightly hyperextend neck
 - Patient's head is obliqued towards contralateral side

Procedure (cont'd)

1. Prep and drape patient in sterile manner
2. Patient's shoulder is propped on a towel and the patient's head is positioned obliquely to contralateral side
3. 0.6-1.0 mg atropine may be administered to minimize vasovagal response
4. Cervical disc should ideally be approached on side opposite of patient's pain
5. Carotid artery is manually displaced *laterally* to create a safe path for needle in between the trachea and carotid sheath
6. Local anesthetic applied along projected tract
7. 26-G 3.5 inch needle angled 30-40 degrees over fingers that are used to displace carotid
8. Needle tip should be advanced to the center of the disc

Procedure (cont'd)

- A normal disc holds 0.5-1.0 ml fluid
- 3 ml syringe should contain 2.3 ml myelographic contrast and 0.5 ml cefazolin (10 mg/5ml)
- Injection should be discontinued once full capacity is reached, extravasation of contrast external to the disc is identified, or pain is induced
- Disc should not be injected beyond full capacity

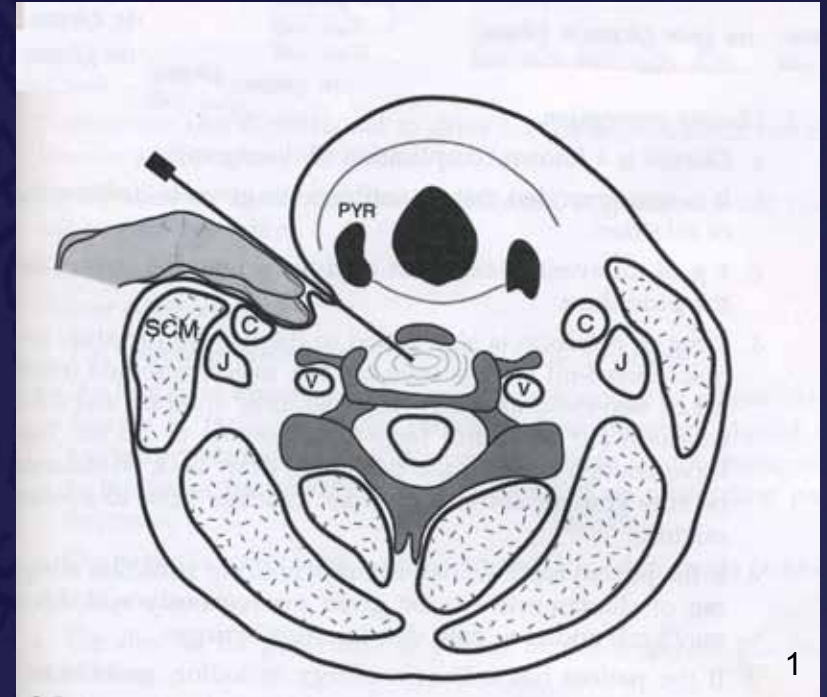
Procedure (cont'd)

- Patient's shoulders are placed on a towel to slightly extend neck
- Patient's head is positioned obliquely to contralateral side



Procedure (cont'd)

- Finger displaces carotid and jugular vein laterally, while advancing needle towards midline over fingers into center of disc
- C – carotid artery
- J – jugular vein
- V – vertebral artery
- SCM – sternocleidomastoid muscle



¹Diagram borrowed from Williams AL and Murtagh FR, 2002

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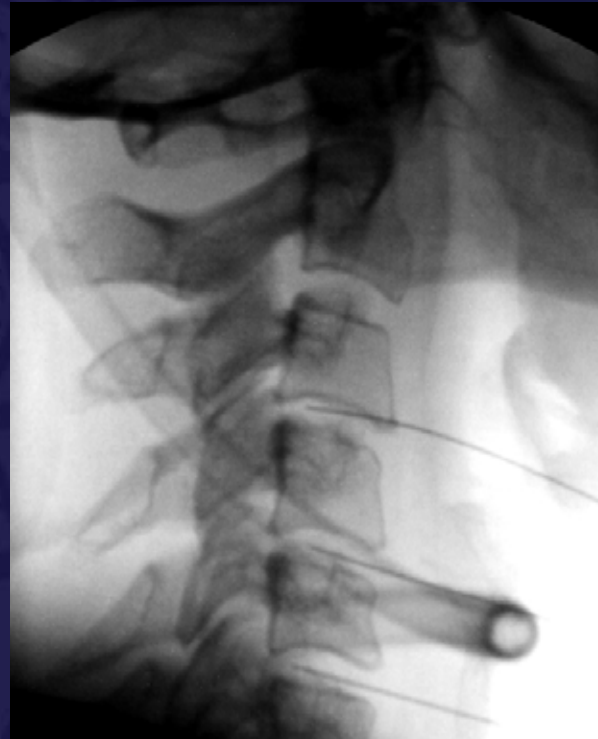
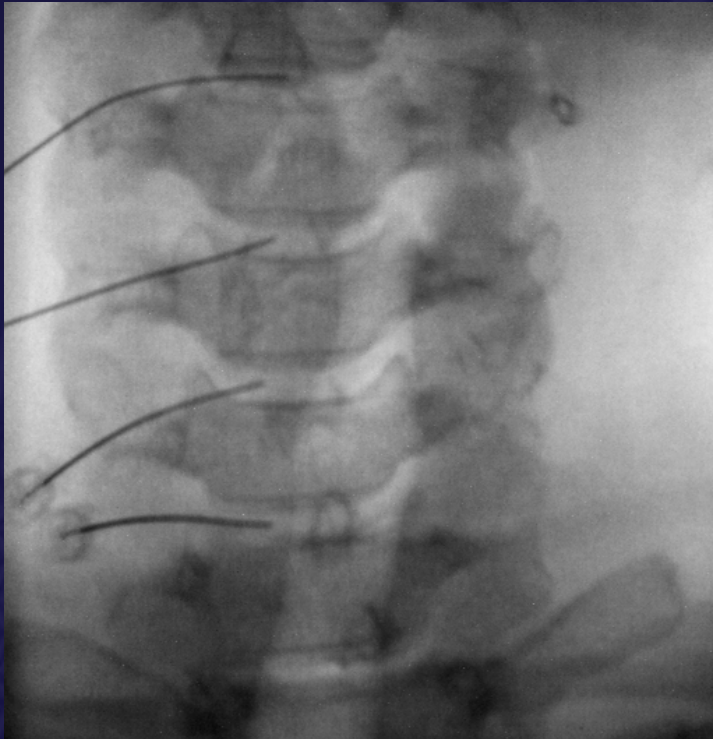
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Procedure (cont'd)

- Fingers displace carotid sheath and jugular vein laterally while positioning needle towards midline over fingers



Procedure (cont'd)



- AP and lateral fluoroscopic images from a normal discogram
- Needles are all placed into position before injection of any contrast

Post-procedure imaging

- Post-discography CT with coronal and sagittal reconstructions is preferred
- Leakage of contrast into the epidural space posterior to the disc or to the periphery of the disc implies an annular tear
- An annular tear permits intradiscal fluid to come into contact with nerve tissue, often eliciting pain

Annular tears

- Intervertebral disc composed of nucleus pulposus centrally and annulus fibrosus peripherally
- Degenerative process of annular tears not well understood, but are likely associated with age related degeneration of annulus fibrosus
- Degeneration begins with disc dessication leading to compromise of structural integrity of annulus

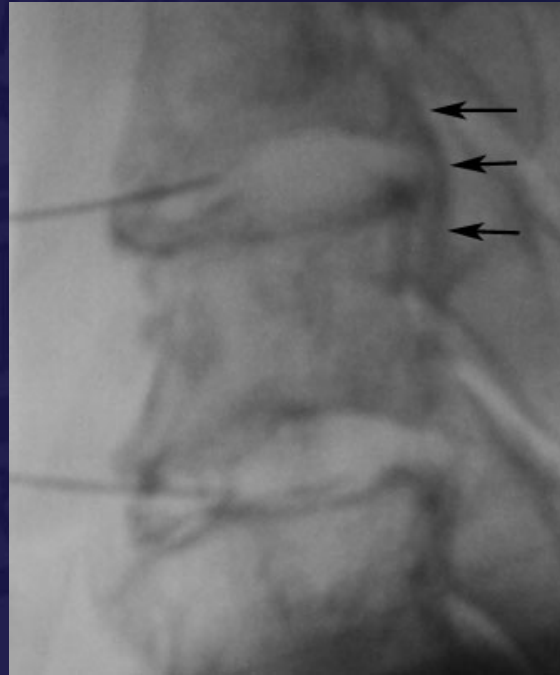
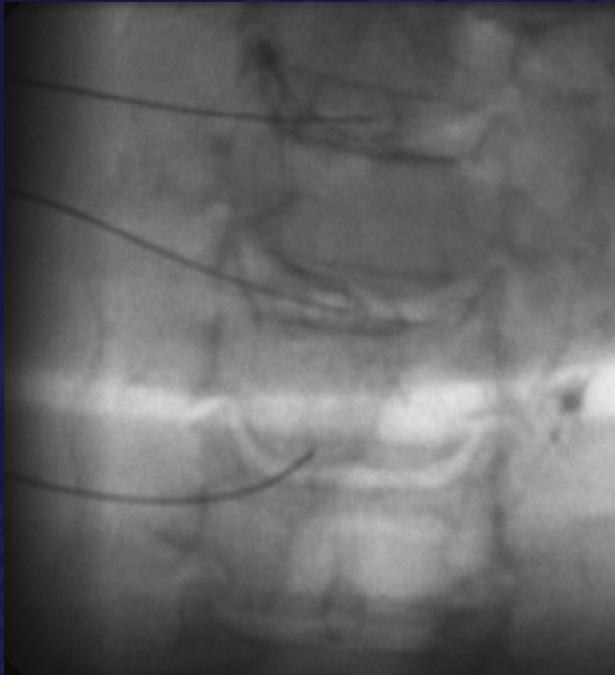
Annular tears (cont'd)

- Annular tears begin as fissures or small circumferential tears in the outer annulus
- Tears progress to involve the outer and inner annulus
- Radial tear extends through all layers of the annulus fibrosus

Annular tear on MR and post-discogram CT

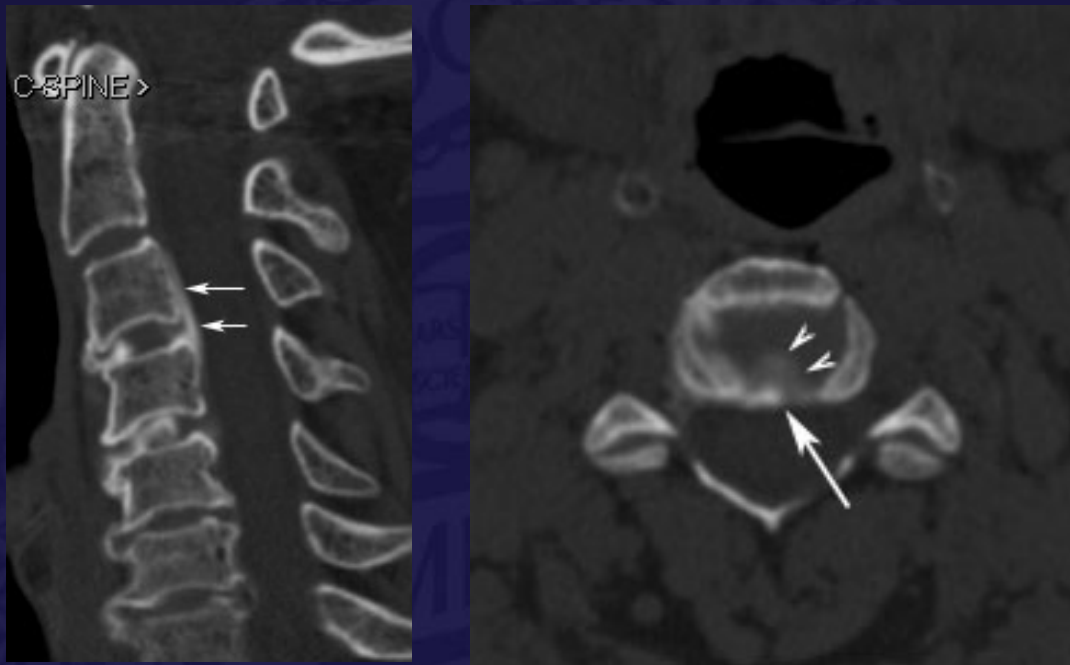
- Tears manifest as a narrow waist in the posterior disc on sagittal plane and as bands of high T2-weighted signal in the annulus
- Tears may also enhance on post-contrast images
- Post-discography CT demonstrates leakage of contrast from disc into epidural space

Case 1



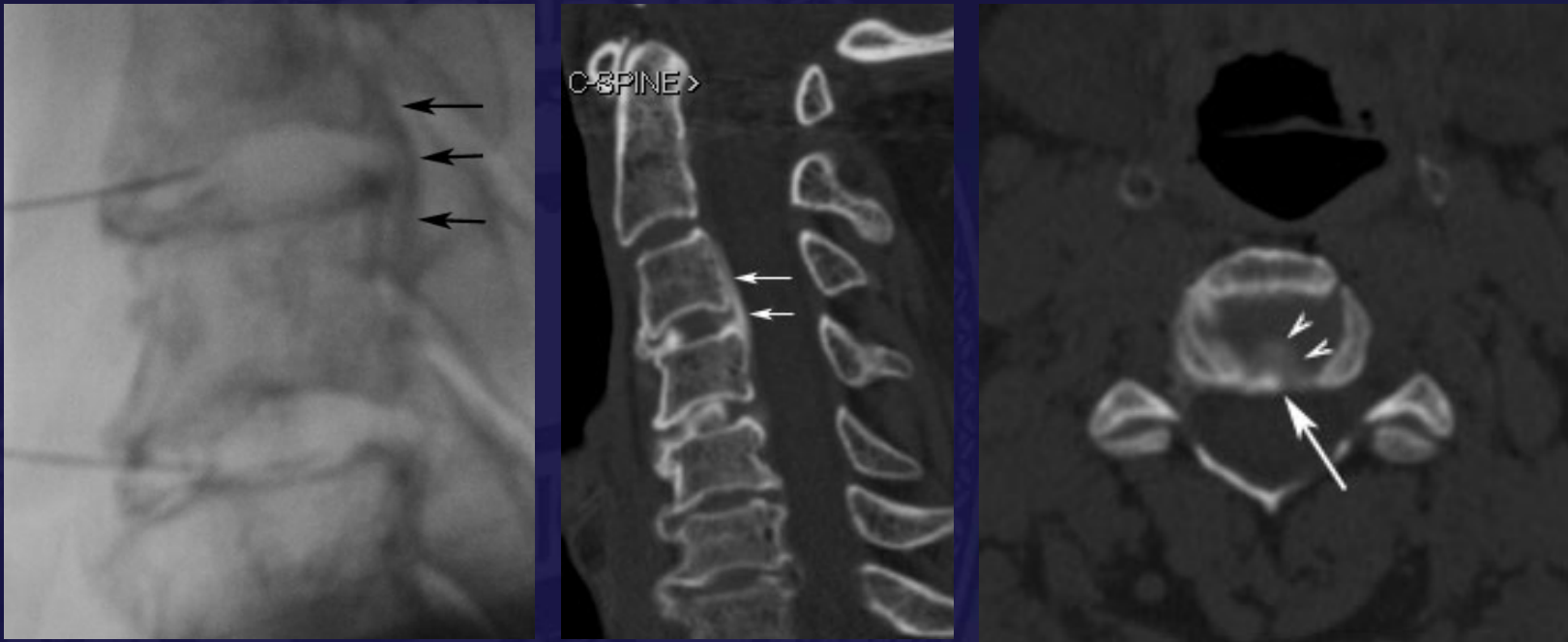
- 55 year old female who reported pain at the C3-4 level during injection
- AP and lateral fluoroscopic views during cervical discogram demonstrates leakage of contrast from C3-4 intradiscal space into epidural space (*arrows*)

Case 1



- Sagittal reconstruction and axial image from a post-discogram CT again demonstrating posterior extravasation of contrast (*arrows*) from C3-4 disc into epidural space through an annular tear. Intradiscal contrast extends to epidural space (*small arrowheads*)

Case 1



- Comparison of fluoroscopy and post-discogram CT
- The patient ultimately decided to not undergo surgery

Case 2

- 48 year old male with chronic neck pain since a fall several years ago, not relieved by conservative management

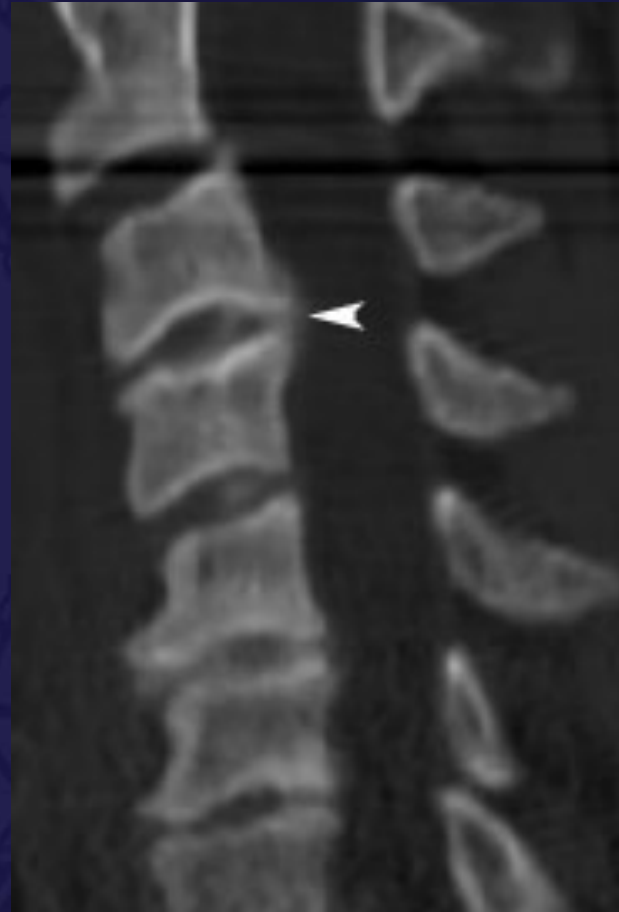
Case 2

- Sagittal T1-weighted image (*left*) from a cervical MR demonstrates herniated disk at C3-4 and C5-6 through annular tears, shown as a thin waist of tissue (*arrows*)



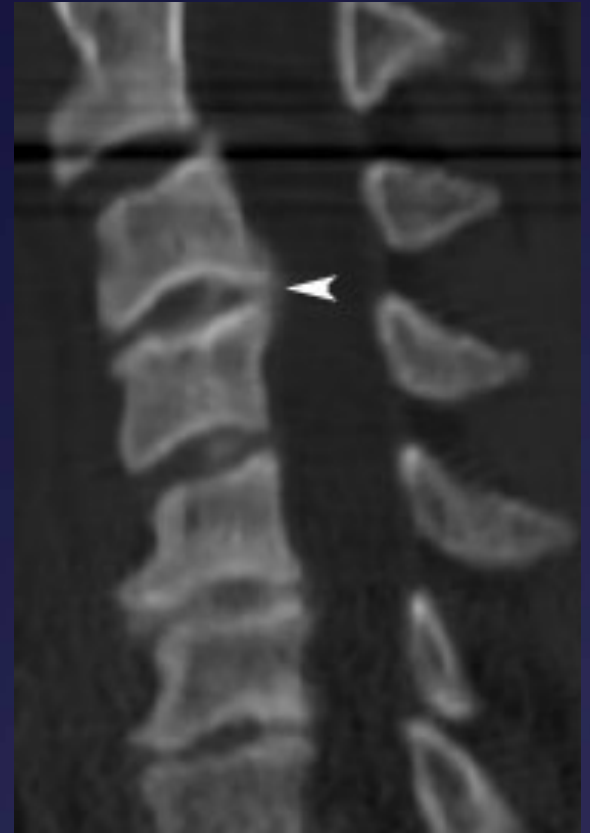
Case 2

- Cervical discography revealed pain at the C3-4 level upon injection
- Sagittal reconstruction (right) from a post discogram CT reveals extravasation (arrowhead) of contrast at C3-4

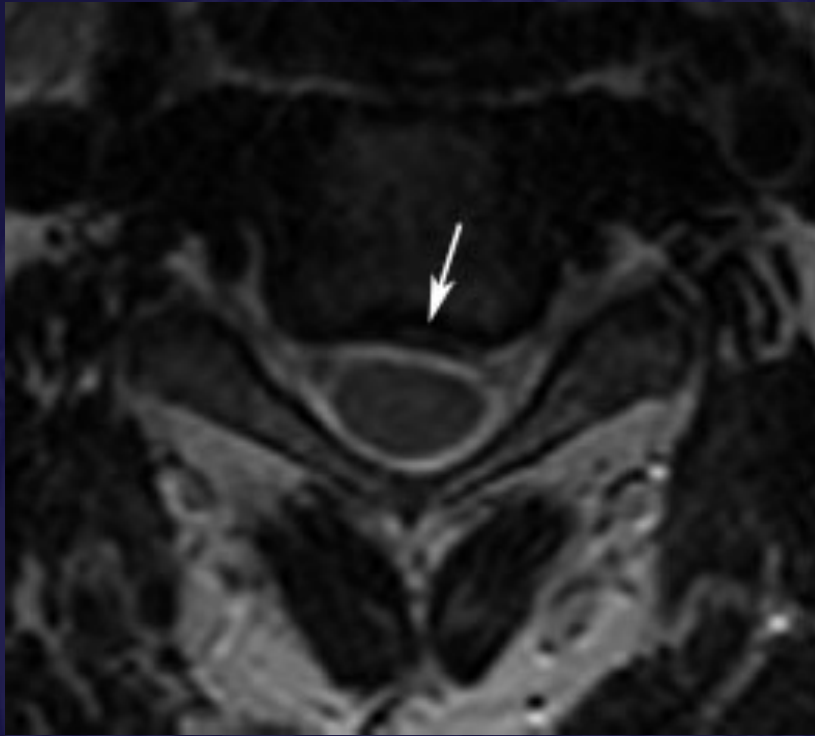


Case 2

- Patient is planning to undergo C3-4 discectomy and fusion, but not at the C5-6 level



Case 3



Pre-procedural axial T2-weighted image demonstrates a small posterior annular tear (*arrow*) at the C3-4 level

- This 47 year old male did not report pain upon injection at the C3-4 level
- The patient was managed conservatively

5 year experience at URMIC

- 34 cervical discograms were performed over a 5 year period
 - 13 patients had negative discograms
 - 15 patients reported pain on one level
 - 6 patients reported pain on 2 or more levels
- 1 of the 34 patients had a major complication – discitis – which was ultimately managed surgically

5 year experience at URMCC (cont'd)

- 5 patients underwent cervical fusion, of which 3 / 5 were performed at the level of pain on discography
 - all reported improvement in pain scores after surgery
- 2 of the 5 patients underwent surgery despite a negative discogram
 - one continues to have persistent chronic neck pain
 - the second was recently operated on

Conclusion

- MR has dramatically improved sensitivity in detecting multilevel degenerative changes
- MR does not always distinguish between symptomatic and asymptomatic degenerative disc disease
- Cervical discography may help identify disc pathology that are clinically apparent and guide therapeutic intervention to specific spinal segments, while excluding asymptomatic levels

Summary

- Safe cervical discogram requires knowledge of spinal anatomy and pathology, familiarity with proper technique, and accurate interpretation of images
- Contrast is injected into the disc until full capacity is reached, extravasation of contrast external to the disc is identified, or pain is induced

Summary (cont'd)

- Major complications are less than 1% and include significant extradural hematoma, discitis, prevertebral abscess, and vascular and neural injury such as myelopathy
- Posterior annular tears manifest as extravasation of contrast into epidural space on post-discogram CT

Reference

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