**Objectives for this course**

**KS:** Make everyone comfortable with sticking a needle into a joint
   - Why, What, How
   - Hip & Shoulder

**DR:** Understand Arthrography-MR
   - Hip & Shoulder

**KD:** Understand Arthrography-CT
   - Why, How, for What

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**How “essential” is arthrography?**

“Arthrography”: Opacify a Joint

*Isn’t this an archaic technique?*

NO!

**UW 2009:**

>1100 joint injections

Of the 1700 of you sitting here, how many have been asked to stick a needle into a joint at least once this year?

Raise your hand

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**Arthrography is an old technique**

1906: Pneumoarthrography

Mosby Year Book, 1992, 1995

( Currently out of print)

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**Arthrography common pre-MRI**

Double Contrast Knee Arthrography
   - 1960 – 1990
   - @UW 1990: 800!

**Normal Posterior Horn Medial Meniscus**

Required a lot of varus & valgus stress on the knee

Unpleasant for both patient and radiologist

[Courtesy of Arthur De Smet, MD University of Wisconsin, Madison]

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**Therapeutic Tool**

Inject therapeutic agent into a joint

- **Hyaluronan** (visco-supplementation)
  - FDA approved for OA knee

Typically injected blindly in clinic. May ask for image guidance when can’t feel landmarks in knee.

- **Steroid**: weeks-months pain relief

**Diagnostic Tool**

Inject anesthetic agent into a joint

- Prove pain is coming from within joint
  - e.g. Pt with bad DJD of hip and bad DDD of lumbar spine. Want to prove pain is from hip prior to hip arthroplasty surgery.

**Arthrography: 21st Century**

**Steroids UW MSK**

- **Triamcinolone**
  - Suspension, not solution
  - Granular, stays locally
  - Need to re-suspend prior to use
  - Commonly used for spine injections
    - UW 2009: >1000 ESI, NRB

- **Dexamethasone 10mg/ml**
  - Solution, used superficial structures
  - Less subcutaneous fat atrophy

**Arthrography: 21st Century**

**Anesthetics UW MSK**

Always provide skin anesthesia

- 1% Lidocaine: Bicarbonate (9:1)

- 30g 1/2"
- 27g 1 1/2"

Our surgical colleagues often do not provide skin anesthesia prior to their steroid injections… it really hurts!

**Concern cartilage loss**

Lidocaine Potentiates the Chondrotoxicity of Methylprednisolone


**Anesthetics UW MSK**

Intra-articular: Ropivacaine

- Longer acting than Lidocaine
  - (Bupivacaine is chondrotoxic)
- DON’T mix in Bicarbonate
  - Will precipitate
- Can mix in Lidocaine

**Steroids in joints**

Tend NOT inject steroids into large joints (hip, shoulder, knee)

- Unless specifically requested
- Patients awaiting arthroplasty

Often inject small joints

- Deep (Facets, SI): Triamcinolone
- Superficial (AC): Dexamethasone

**Which injection cocktail for which joint?**
Injection Cocktails

**Therapeutic Tool**
- Inject therapeutic agent into a joint
  - Hyaluronan (visco-supplementation)
  - Steroid: weeks-months pain relief

**Diagnostic Tool**
- Inject anesthetic agent into a joint
  - Prove pain is coming from within joint
  - Aspirate fluid from joint
    - Septic ➔ Culture (Gram Stain, Cell count)
    - Crystals ➔ Polarizing microscopy
  - Prudent to first confirm there IS fluid in joint

Arthrography: 21st Century

- **Sub-deltoid Bursitis (No fluid in joint)**
  - Don’t need to do fluoroscopic-guided aspiration of shoulder capsule...
  - Instead, do ultrasound-guided aspiration of bursal fluid collection.

- **Sub-deltoid Bursitis (No fluid in joint)**
  - Fluid in sub-deltoid bursa
  - T1fs+Gd(IV) pre-aspiration
  - T1fs+Gd(IV) post-aspiration
Arthrography: 21st Century

Therapeutic Tool

Inject therapeutic agent into a joint
- Hyaluronan (visco-supplementation)
- Steroid: weeks-months pain relief

Diagnostic Tool

Inject anesthetic agent into a joint
- Prove pain is coming from within joint

Aspirate fluid from joint
- Septic → Culture (Gram Stain, Cell count)
- Crystals → Polarizing microscopy

Inject contrast prior to MR or CT

Arthrography: Why do we do it

Therapeutic Tool

Inject therapeutic agent into a joint
- Hyaluronan (visco-supplementation)
- Steroid: weeks-months pain relief

Diagnostic Tool

Inject anesthetic agent into a joint
- Prove pain is coming from within joint

Aspirate fluid from joint
- Septic → Culture (Gram Stain, Cell count)
- Crystals → Polarizing microscopy

Inject contrast prior to MR or CT

Arthrography: What we need

IMAGE GUIDANCE

- Can’t be assured of getting a needle into hip/shoulder without imaging
  - With experience, should be able to blindly get a needle into knee
  - Knees commonly injected in clinic
  - Clinics may request image guidance when injecting knees of “larger” pts.
- Young patients: Ultrasound

Ultrasound: Pediatric Hips

Right

Fri 16:25 Outside Clinic

Fri 20:55 UW Peds ER

Diaphysis

Joint Effusion

No Fluid

Capsule

Meta

Sat 03:10 UW Peds OR

Diaphysis

Meta

No Fluid

Joint Effusion

Capsule

Meta

Fri 23:30 UW Peds ER

Post aspiration 2ml pus
Arthrography: What we need

**IMAGE GUIDANCE**

- Can't be assured of getting a needle into hip/shoulder without imaging
  - With experience, should be able to blindly get a needle into knee
  - Knees commonly injected in clinic
  - Clinics may request image guidance when injecting knees of "larger" pts.
- Young patients: Ultrasound
- Most patients: Fluoroscopy
- Preferably C-arm Fluoroscopy

C-Arm Fluoroscopy

Positioning Patient

Shoulder:
- External Rotation
- Sandbag

Hip:
- Internal Rotation
- Sandbag

Arthrography: What we need

**TARGET SITE**

➔ Keys to Arthrography

Target is NOT the joint
- Don’t necessarily need to position needle between 2 articular surfaces

Target is the CAPSULE
- Just need to have the needle touch a bone within the capsule

Joint Capsule: Hip
Joint Capsule: Hip

TARGET SITE: Head-Neck Junction

Capsule widest: Head-Neck Junction

Joint Capsule: Shoulder

TARGET SITE: RC Interval

Arthrography: What we need

Non-sterile tray
- Metal pointer & marker
  - To localize & mark target
- Metal R/L
  - To prove which side

Arthrography: What we need

IMAGE GUIDANCE

TARGET SITE

NON-STERILE TRAY

STERILE TRAY

Sterile Tray

If tray is set up before patient enters it is important to COVER TRAY to prevent patient contaminating it!

Sterile Tray: Prep & Drapes

Clean & sterilize skin
Sticky drape with hole
4 x 4" sponges

Additional sterile drapes/towels
Sterile covers for image intensifier and controls

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**Sterile Tray: Syringes**

Local anesthetic (1% Lido:Bicarb 9:1)
- 10ml syringe w/skin needle
- Contrast (iohexol 300 mgI/ml)
- 5ml syringe w/connecting tube

**Cocktail**
- 10ml syringe w/18g drawing up ↑ needle

**Arthrography: How we do it**

Local anesthesia

- "You will feel a bee sting"
- "This will burn for a few seconds, and then will be numb"

2 needles
- Skin: 30g ½” needle
- Deeper: 1½” needle

**Local Anesthesia**

Skin: 30g ½” needle
- DON'T raise a wheal

Advance needle vertically

Shoulder: RC Int
- Can reach bone with 1½” needle
- Use 22g
  - Anesthesia only
  - Advance needle through capsule, touching bone

**Local Anesthesia**

Skin: 30g ½” needle
Deeper: 1½” needle

Advance needle vertically

Hip:
- Can't reach bone with 1½” needle
- Use 27g
  - Anesthesia only
  - Use 22g 3½” spinal needle to reach bone

**Sterile Tray: Needles**

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**Keys to Arthrography**

ADVANCE NEEDLE SLOWLY
Don’t just jab it in there...

1. Use 2 hands:
   - One hand on needle hub
   - One hand on patient’s skin
   - Allow needle to pass between your thumb & index finger tips so you can feel the needle being advanced
   - Advance just a few mm at a time
   - Check fluoro, readjust position

**Example: Hip Arthrogram**

Contrast flowing away from needle

**Keys to Arthrography**

ADVANCE UNTIL HIT BONE
Don’t stop at the capsule
WATCH FIRST DROP OF CONTRAST
- Should flow away from needle tip
- If contrast stays by needle tip, needle is NOT in a space! (Extravasation)
Recognizing Extravasation: Hip

- Needle repositioned
- Contrast stays by needle

Contrast flowing away from needle

Recognizing Extravasation: Shoulder

- Not contrast flowing into capsule
- Contrast NOT filling capsule
- Contrast NOT filling joint

Mixed Injection (½ in, ½ out)

Shoulder Arthrogram pre MRI
Sterile Tray: Syringes
Arthrogram MR/CT
Local anesthetic (1% Lido:Bicarb 9:1)

- 10ml syringe with skin needle
  - Deep sub-Q needle
  - 3½" (hip)

- 20ml syringe
  - 25-50% Iodine (5-10ml Iohexol 300mg/ml)
  - 50% anesthetic (5ml 1% Lido, 5ml Ropi)
  - 0.1ml Gd

Extra needle

Two Tips...
MR Arthrogram

- Make sure Gd gets into cocktail!
  - 0.1ml Gd in 1ml (tuberculin) syringe

- Make sure Gd doesn’t get trapped
  - but actually enters solution

Two Tips...

MR Arthrogram

- Avoid Air Bubbles!
  - Air in joint causes susceptibility artifact
  - Get air out of arthrogram needle hub
  - Extra needle on connecting tube

Metal Hip: Injecting

- Can’t see metal needle thru metal prosthesis
  - Capsule is thick and fibrotic (like wood)

- Skin
  - Sub-Q Fat
  - Synovial capsule
  - Don’t stop when touch wood, go until touch metal
  - Capsule constricted around head-neck junction

- Target: Head-Neck Junction

Metal Hip: Aspirating

Loose acetabular component r/o infection pre replacement
Requested aspiration

- When aspirating suspected pus, use: 18g Needle and 20ml Syringe

Metal Hip: Aspirating

Loose acetabular component r/o infection pre replacement
Requested aspiration

- When aspirating suspected pus, use: 18g Needle and 20ml Syringe
Metal Hip: Aspirating

Test needle location by injecting contrast:
- Flowing into synovial capsule

Reposition needle
Asp =/ 20ml

When aspirating suspected pus, use:
✓ 18g Needle
✓ 20ml Syringe

Question 1
Which of the following is safe to inject into a large joint:
- a) Triamcinolone
- b) Dexamethasone
- c) Bupivacaine
- d) Ropivacaine
- e) Bicarbonate

Question 2
When aspirating an infected joint, what gauge needle should be used:
- a) 14
- b) 18
- c) 22
- d) 26
- e) 30

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