Learning Objectives for Joint Injection Workshop

At the completion of this workshop attendees will be able to:
1. Describe the anatomic landmarks associated with arthrocentesis of the shoulder and knee joints.
2. Understand the indications and contraindications to arthrocentesis of the shoulder and knee joints.
3. Know the common approaches to arthrocentesis of the shoulder and knee joints.
4. Perform arthrocentesis of the shoulder and knee joint on simulation trainers.

Background Information

1. Arthrocentesis is a clinically rewarding and relatively simple office procedure.
2. Arthrocentesis is generally performed to pull something out and/or to put something into a joint.
3. Knowledge of soft tissue and bony landmarks provides a reliable method for identification of needle insertion sites.
4. The emerging role of musculoskeletal ultrasound in office-based practice additionally offers new opportunities to improve diagnostic and therapeutic techniques.
Joint Aspiration/Injection in General

Indications for Arthrocentesis

**Diagnostic:**
- To establish the diagnosis of a joint effusion of uncertain etiology
- For any suspicion of infectious arthritis
- Evaluation of suspected inflammatory/non-inflammatory arthritis

**Therapeutic:**
- Removal of large joint effusion for symptomatic relief of pain
- To reduce pain and inflammation by injecting lidocaine, with or without corticosteroids

**Steroids:**
- Indications for intra-articular steroid injection may include localized joint pain that persists for several weeks despite NSAID therapy or when the risks of oral NSAIDs outweigh those of intra-articular steroids.
- FYI: There is no good evidence to indicate that steroid injections decrease the long-term adverse effects of chronic degenerative disorders.

Contraindications to Arthrocentesis

**Absolute:**
1. Overlying skin infection or lesions
2. Coagulopathy or use of anticoagulant medications
3. Bacteremia
4. Prosthetic Joint

**Relative:**
1. Lack of response to 2-3 prior injections
2. ≥ 3 previous injections in a weight-bearing joint in the preceding 12 months
3. Pregnancy or uncontrolled diabetes mellitus
Equipment for Arthrocentesis

• Prep Equipment:
  • Skin cleansing agent (chlorhex, iodine, ETOH)
  • Single-dose vial of 1% lidocaine
  • 27 gauge, ½-inch needle, for skin anesthesia
  • Gloves (sterile vs exam)
  • Sterile drapes (optional)

• Procedure Equipment:
  • Injection only:
    • 22 gauge, 2 ½” needle with 3-5mL syringe
  • Aspiration with Injection:
    • 18-22 gauge, 2 ½” needle with 20-60mL syringe
    • Hemostats (to help swap syringes)

• Post-Procedure Equipment:
  • Bandage and Elastic wrap
  • Specimen tubes or caps for syringe

Medications for Arthrocentesis

General Guidelines

• Bursa and Tendon sheaths Injections
  • 1cc Lidocaine
  • 1cc Triamcinolone (40mg/mL)

• Joint Injections:
  • 1-2cc Lidocaine
  • 1-2cc Bupivacaine
  • 1cc Triamcinolone (40mg/mL)

Pre-Procedure Patient Preparation

• Preparation
  • PAR-Q
  • Obtain consent
  • Identify landmarks
  • Mark needle entry site
  • Betadine/Sterile draping
  • Anesthetize with lidocaine

Figure 1. Equipment. Adapted from Arthrocentesis: Knee, by Procedures Consult 2007, retrieved from https://www.clinicalkey.com/#!/content/medical_procedure/19-s2.0-mp_EM-058. Copyright 2018 by Elsevier, Inc.

Figure 2. Medications. Adapted from Flicker Photo Library, retrieved from https://www.flickr.com/photos/itsnitram/9728443566. Taken 2013.
Synovial Fluid Analysis

“The proof is in the pudding”

- Cell count with differential
  - Color
    - Increasing amounts of plasma and nucleated cells contribute to the yellow color.
  - Clarity
    - The clarity of the fluid reflects the leukocyte count.
  - Viscosity
    - Normal fluid will produce a long “string-like” extension as it falls.
    - Release of proteolytic enzymes into inflamed synovial fluid typically causes a decrease in viscosity.
  - White Blood Cells per mm3
    - Normal synovial fluid is nearly acellular. Inflammatory and infectious synovial fluids are characterized by increasing numbers of leukocytes
    - Polymorphonuclear Leukocytes (PMNs)
      - PMNs represent a small proportion of the nucleated cells present. Inflammatory and septic fluids have increasing proportions of PMNs present Normal: < 25%
    - +/- glucose and protein
      - Current literature suggests that synovial protein and glucose are highly inaccurate markers of inflammation.

- Crystal analysis
  - Useful in the diagnosis or exclusion of gout and pseudogout from other forms of inflammatory arthritis.
  - The presence of crystals in the synovial fluid does not exclude septic arthritis

- Gram Stain
  - Can provide immediate information pertaining to diagnosis and treatment
  - May be the only evidence of fastidious organisms that don’t grow in culture
  - The sensitivity of Gram stain varies from 29-50%; thus, a negative Gram stain does not rule out an infection

- Culture
  - Usually provides the definitive diagnosis of infectious arthritis, except in such cases as disseminated gonococcal arthritis.
Complications of Arthrocentesis

- Arthrocentesis is relatively safe and complications are uncommon.
- Iatrogenic infection (occurs < 0.01% of cases)
- Iatrogenic hemorrhage (thought to be safe in patients with therapeutic anticoagulation)
- Pain during the procedure
- Reaccumulation of the joint fluid

Clinical Pearls for Arthrocentesis

- Pearls pertaining to injection/aspiration:
  - Aspirate prior to injection to ensure you are not in a blood vessel.
  - If it feels difficult to inject, withdraw slightly and try again. This will prevent ligament/tendon rupture.

- Pearls pertaining to infectious arthritis:
  - Joint effusions tend to cause a more circumferential pain and swelling than periarticular causes such as cellulitis, bursitis, tendinitis
  - Joint effusions tend to restrict both active and passive range of motion whereas periarticular causes restrict active ROM more than passive ROM

Knee Aspiration/Injection
Knee Joint Arthrocentesis

- The knee joint is the largest synovial cavity in the body and extends from the proximal tibia to the suprapatellar region.

- Approach can be:
  - Suprapatellar
  - Generally preferred location if large effusion present
  - Medial or Lateral
  - Generally the preferred approach
  - Performed by inserting needle at the superior third of the patella
  - Anterior
  - Generally avoided due to the proximity of intra-articular cartilage and ligaments, but may be useful in patients with advanced osteoarthrosis.

Suprapatellar Approach to Knee Joint:

1. Position the knee in a slightly flexed
2. Identify joint line and the patella
   - Suprapatellar
     - Insert the needle 1 cm lateral and 1 cm superior to the superior lateral aspect of the patella.
   - Lateral
     - Insert the needle at the superior third of the patella and direct the needle toward the middle of the knee
   - Anterior
     - Insert the needle 1 cm above tibial plateau and 1 cm lateral to the patellar ligament directing toward the middle of the knee
3. Direct the needle toward the intercondylar notch
4. If you contact bone, withdraw slightly and redirect
5. Aspirate as you insert the needle until you get return of synovial fluid

Shoulder Aspiration/Injection
Conditions associated with Shoulder Arthrocentesis

- Glenohumeral Joint:
  - Osteoarthritis or Rheumatoid arthritis
- Subacromial Bursa:
  - Impingement syndrome/bursitis
  - Rotator cuff tendonitis (supraspinatus)
- Bicipital Tendon
  - Bicipital tendonitis

Anterior approach to Glenohumeral Joint:

1. Insert the needle 1cm inferior and lateral to coracoid process but medial to the head of the humerus.
2. Direct needle posteriorly and slightly superior toward the AC joint to a depth of about 1 ½ - 2 inches.

- FYI:
  - Aspiration prior to injection is advised due to risk of hitting the thoracoacromial artery.
  - The axillary artery and the brachial plexus are located a little lower near the axilla.

Posterior approach to Glenohumeral Joint:

1. Insert needle 1-2 cm inferior and medial from posterolateral corner of acromion process
2. Direct needle anteriorly/medially toward coracoid process to a depth of 1 ½ - 2 inches.

- FYI:
  - Generally considers safer approach but more difficult due to musculature obscuring landmarks.
Lateral approach to Subacromial Bursa:

1. Insert needle 2cm inferior to the posterior 1/3 of the lateral border of the acromion process.
2. Advance needle medially/anteriorly and slightly superior to a depth of 1 ½ - 2 inches.

• FYI:
  • Avoid inserting needle at the midpoint because it is the narrowest area due to the convexity of the humeral head.

Bicipital Tendon Approaches

• Approach to Bicipital Tendon:
  • Needle entry between the greater and lesser tubercles approximately 2cm below the anterior corner of the acromion.

References

Video Links

Arthrocentesis Videos

- Knee Suprapatellar Approach for effusions:
  - https://www.youtube.com/watch?v=Jx8HmJJOGas
- Knee Lateral Approach:
- Knee Anterior Approach:
- Shoulder Anterior Approach:
  - https://www.youtube.com/watch?v=52dLCcmM2wVw
- Shoulder Posterior Approach:
  - https://www.youtube.com/watch?v=O9uOECX9loI
- Shoulder Lateral Approach for Subacromial Bursa:
  - https://www.youtube.com/watch?v=W2zalsFmok