FMR
Joint Injections
Part 1
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Disclosure
I have no financial or other disclosures that would influence this presentation

Educational Need/Practice Gap
Gap = The number of unnecessary referrals to outside specialists for common joint injections.
Need = To increase continuity and comfort level of common musculoskeletal joint injections in the Primary Care setting.

Objectives
• Discuss indications & contraindications for joint injections
• Review injectate materials, procedures and techniques

Expected Outcome
- Increase the comfort level of primary care physicians in performing common musculoskeletal joint injections

Joint Injections/arthrocentesis
• Indications
  – Crystal induced arthropathies (gout/pseudogout)
  – Spondyloarthropathies (Reiter, psoriatic)
  – Hemarthrosis
  – Septic arthritis
  – Symptomatic relief due to effusion
  – Synovitis
  – Advanced osteoarthritis
  – Inflammatory arthropathies (RA/JRA)
Joint Injections/arthrocentesis

- **Contraindications**
  - **Absolute**
    - Local cellulitis
    - Septic arthritis (injection)
    - Acute fracture
    - Bacteremia
    - Joint prosthesis
    - History of allergy or anaphylaxis to injectate

- **Relative**
  - Minimal relief after two previous injections
  - Underlying coagulopathy
  - Anticoagulation therapy
  - Evidence of surrounding joint osteoporosis
  - Anatomically inaccessible joints
  - Uncontrolled DM (soft tissue injections)

**Contraindications**

- **Relative**
  - Uncontrolled DM – Intra articular
    - No significant change between the mean glucose values and mean fructosamine levels before/after meals after injection for 1 week before and 2 weeks after injection

- **Relative**
  - Uncontrolled DM – soft tissue
    - Elevations in blood glucose levels that last at least 5 days in digital injections were noted
    - Elevations were noted to 145% after 1st morning to 22% at day 5
    - Require closer glucose monitoring and follow up if receiving soft tissue corticosteroid injection

**Contraindications**

- **Relative**
  - Anticoagulation therapy
    - Joint and soft tissue injections appear to be safe in patients receiving warfarin anticoagulation with an INR <3.
    - Showed no clinical hemarthrosis after injection

**Complications**

- Vasovagal response – 10-20%
- Post-injection flare/pain – 2-10%
- Skin atrophy – 1%
- Fat atrophy – 1%
- Facial flushing - <1%
- Hypersensitivity Rxn - <1%
- Steroid arthropathy – 0.8%
- Joint infection - <0.001% to 0.072%
Complications - They Hurt…

- Data analysed for 8446 patients (64% female, mean age 62±14 years) recruited by 240 physicians. Predominant site injected knee (45.5%) and spine (19.1%). Over 80% experienced procedural pain which was most common in the small joints and spine. Severe in 5.3%, moderate in 26.6%, mild in 49.8%, absent in 18.3%.
- Conclusion: Most patients undergoing intra-or peri-articular injections, synovial fluid aspirations and spine injections suffer from procedural pain.

Injectate

- **Steroid**
  - Reduce synovial blood flow, lower the local leukocyte and inflammatory modulator response, and alter local collagen synthesis
  - Reduces pain and inflammation
  - Recommend Depo-Medrol (methylprednisolone) and Kenalog (triamcinolone acetonide) for large joints
  - Recommend Depo-Medrol for smaller joints
  - Due to solubility and length of action

- **Anesthetics**
  - Showed reduced chondrocyte density without cartilage tissue loss 6 months after single injection suggesting bupivacaine toxicity
  - Clinical relevance is unknown and likely subtle

- **Injectate**
  - Dose and time dependent cytotoxic effects of lidocaine on bovine chondrocytes
  - Clinical relevance unknown, but appears local anesthetics as a class, may negatively affect articular cartilage
  - SORT C – The addition of local anesthetics to steroid injections improves pain relief and can be used to differentiate local from referred pain

Injections/Procedures
Common Injections to Review

- Knee
- Shoulder
- Trochanteric Bursa
- Lateral Epicondyle
- Carpal Tunnel
- CMC
deQuervain’s

Knee Injection/Aspiration

- Indications
  - Aspiration
    - Unexplained effusion
    - Possible septic arthritis
    - Relief of pain from effusion
  - Injection
    - Corticosteroid injection for advanced OA
    - Inflammatory arthritides (gout/pseudogout)
    - Viscosupplementation

Knee Injections

- Evidence for Usage
  - OARSI recommendations for the management of hip and knee osteoarthritis, Part II: OARSI evidence-based, expert consensus guidelines
  - Osteoarthritis Research Society International
  - “16. Intra-articular (IA) injections with corticosteroids can be used in the treatment of hip or knee OA, and should be considered particularly when patients have moderate to severe pain not responding satisfactorily to oral analgesics/anti-inflammatory agents.”
  - “17. Injections of IA hyaluronate may be useful in patients with knee or hip OA. They are characterized by delayed onset, but prolonged duration, of symptomatic benefit when compared to IA injections of corticosteroids.”
  - Raynauld et al. Safety and Efficacy of Long-Term Intraarticular Steroid Injections in Osteoarthritis of the Knee A Randomized, Double-Blind, Placebo-Controlled Trial. ARTHRITIS & RHEUMATISM. Vol. 48, No. 2, February 2003, pp 370–377

Knee Injections

- Evidence for Usage (Are CSIs beneficial for OA?)
  - Meta-analysis of randomized placebo controlled trials in which the efficacy of intra-articular corticosteroids for osteoarthritis of the knee, of any duration was selection criterion (10 trials met criteria)
  - pooled relative risk for improvement in symptoms of osteoarthritis of the knee at 16-24 weeks after intra-articular corticosteroid injections was 2.09 (95% confidence interval 1.2 to 3.7) and the number needed to treat was 4.4
  - pooled relative risk for improvement up to two weeks after injections was 1.66 (1.37 to 2.0). The numbers needed to treat to get one improvement in the statistically significant studies was 1.3 to 3.5 patients
  - Need prednisone equivalency of 50mg to see improvement at 16-24 weeks (Depo-Medrol 40mg or Kenalog 40 mg)
  - (yes they are, this study shows up to 6 months of relief)
Knee Injections

• Approaches
  – Medial retropatellar
  – Lateral retropatellar
  – Anterior (either medial/lateral)

Knee Injection

• Medial Retropatellar
• Lateral Retropatellar Approach
• Anterior Approach

Knee Injection

• In the absence of a knee effusion, reproducible needle placement into the intra-articular space presents a challenge to clinicians.
• 240 consecutive injections, by one orthopaedic surgeon using same needle through 3 different approaches. Accuracy confirmed with fluoro imaging.
• 57/80 injections, Anterolateral approach = 71% accuracy
• 60/80 injections, Anteromedial approach = 75% accuracy
• 74/80 injections, Lateral midpatellar = 93% accuracy
• Conclusion: With lack of effusion, a lateral midpatellar injection was most accurate.

Knee Injection

• Accuracy of different approaches
  – Anterior medial – 70%
  – Anterior lateral – 83%
  – Lateral infrapatellar – 84%
• No statistically significant difference in accuracy of any approach
• Imaging (US/MR arthrography/fluoroscopy) increases overall accuracy from 79% to 99%
Knee Injection

- **SORT Recommendation**
  - Intra-articular steroid injections reduce pain and swelling in osteoarthritis of the knee – **SORT A**

- **Steroid**
  - Depo-Medrol – 20-80mg
  - Kenalog – 40mg

- **Anesthetic**
  - 1% Lidocaine – 5 mL
  - 21 gauge, 1.5” needle


Knee Aspiration with Injection

- Lateral Infrapatellar approach
- Lidocaine for local anesthesia (25-27g, 1 ¼ in needle), may inject intraarticular
- 18 g needle insertion with large (>60ml) syringe
- Aspirate (send for culture/crystals?)
- Leave needle in place, disconnect large syringe, place syringe filled with injectate.

Questions?

- Any questions regarding knee injections/aspirations?

Shoulder Injections

- **Indications**
  - Osteoarthritis
  - Adhesive capsulitis
  - Rheumatoid arthritis
  - Subacromial bursitis/RTC tendinopathy
Shoulder Injections

• SORT B recommendations for Chronic Shoulder Pain
  – Most patients with chronic shoulder pain improve with nonoperative treatment.
  – Worse outcomes are associated with severe pain, prolonged symptoms, or gradual onset.
  – There is little evidence for or against the use of medication for chronic shoulder pain.
  – Physical therapy can provide improved short-term recovery and long-term function for rotator cuff disorders.
  – Although subacromial corticosteroid injections for rotator cuff disorders are very common in clinical practice, there is little evidence to support or refute its use.
  – Glenohumeral joint injection has been shown to hasten the resolution of symptoms in patients with adhesive capsulitis, but most patients resolve without intervention, and interventions have not been shown to improve long-term outcomes.

Shoulder Injections

• Approaches
  – Anterior
  – Posterolateral
  – Superior

Shoulder Injections

• Posterior Approach
• Anterior Approach

Accuracy of Different Approaches
– Anterior - 45%
– Posterior – 85%
– Statistically higher accuracy rate with posterior approach.
– Imaging increase the accuracy rate overall from 79% to 95% (really 85-95%).

Shoulder Injections

• “Imaging increase the accuracy rate overall from 79% to 95%”

Shoulder Injections

• SORT Recommendations
  – Subacromial corticosteroid injection provides short-term pain relief that is greater than placebo and at least equal to nonsteroidal anti-inflammatory drug therapy – SORT B
Shoulder Injections

- **Steroid**
  - Depo-Medrol – 20-40mg
  - Kenalog – 40mg
- **Anesthetic**
  - 1% Lidocaine – 5 mL
  - 21 gauge, 1.5” needle


Shoulder Injections

- Any questions related to shoulder injections?

Trochanteric Bursa Injections

- **DIAGNOSIS** is confirmed by palpation of tenderness, and sometimes swelling, in the region of the bursa

**INDICATIONS**

- Trochanteric bursitis, the primary indication for therapeutic injection at this site
  - Usually is associated with chronic pressure or trauma to the area
  - Leg-length abnormalities, obesity, rheumatoid arthritis, and olecranon bursitis are associated factors in many patients
- IT Band Friction Syndrome
  - Typically seen in runners

**TIMING AND OTHER CONSIDERATIONS**

- Early corticosteroid injection – preferred treatment
  - has been shown to be effective with satisfactory duration of effect

Trochanteric Bursa Injections

- **Syringe:** 5-10 mL
- **Needle:** 22-25 g, 1.5 inch (longer if obese)
- **Anesthetic:** 3-5 mL of 1% Lidocaine, or 0.25%-0.5% bupivacaine
- **Steroid:** 1 mL of betamethasone or methylprednisone (40mg/mL)

**TECHNIQUE**

- See Table 1 for a list of pharmaceuticals and equipment
- **Position of Patient**
  - The patient should be in the lateral recumbent position with the affected side up.
  - For the patient’s comfort and stabilization, the hip is flexed 30 to 50 degrees and the knee is flexed 60 to 90 degrees.

**Position of Patient**

- **Palpation of Landmarks**
  - The greater trochanter is identified by palpating the femur from the mid-shaft proximally until the area of bony protrusion is reached.
  - The injection site is the point of maximal tenderness or swelling.

**Approach and Needle Entry**

- Area most tender or swollen to palpation in the region of the greater trochanter.
- A 22- or 25-gauge, 1 1/2–inch needle is inserted perpendicular to the skin.
- In very obese patients, a longer needle may be required.
- The needle should be inserted directly down to bone and then withdrawn two to three millimeters before injecting.


- 40 patients underwent trochanteric bursa injections. Initial needle placement done blindly, with all subsequent attempts done using fluoro guidance.
- At first attempt, 78% of the time the GT was contracted, but only 45% had a contrast influx to the bursa (bursagram).
- Attendings obtained a bursagram on the first attempt 53% of the time vs 46% for fellows, and 36% for residents (P=0.64) (non-significant).
- **Conclusion:** Radiological confirmation of bursal spread is necessary to ensure that the injectate reaches the area of pathology during trochanteric bursa injections.

**Any questions regarding trochanteric bursa injections?**
Lateral Epicondyle Injections

• Indications
  – Chronic pain and disability not relieved by more conservative means
  – Severe acute pain with functional impairment that calls for a more rapid intervention.

• Systematic, evidence-based review concluded that corticosteroid injections appear to be relatively safe and seem to have a short-term effect (two to six weeks).
• A more recent, multicenter, randomized controlled trial concluded that corticosteroid injections are effective in providing early symptom relief.

• Therapeutic injection for epicondylitis should be performed only after a trial of other therapeutic modalities such as use of NSAIDs and avoiding aggravating activities.
• To date, there is no conclusive evidence to show that orthotic devices are effective in treating lateral epicondylitis.
• Immobilization of the elbow should be avoided.

• Pragmatic randomised controlled trial of local corticosteroid injection and naproxen for treatment of lateral epicondylitis of elbow in primary care. BJM Volume 319, 9 October 1999.
  - At 4 weeks, 92% in injection group were completely better or improved compared with 57% in the naproxen group.
  - At 12 months, no difference in outcome of injection vs naproxen group.

• Syringe: 5 mL
• Needle: 25 gauge, 1 inch
• Anesthetic:
  – 2 to 3 mL of 1% lidocaine or 0.25-0.5% bupivacaine
• Steroid:
  – 1 mL betamethasone or 1 mL of methylprednisolone (40mg)

Lateral Epicondyle Injections
Lateral Epicondyle Injections

- **TECHNIQUE**
  - Patient placed in the supine position
  - Affected arm should rest at the side with the elbow flexed to 45 degrees and the wrist pronated
  - The most tender point of the epicondyle is identified by gentle palpation
  - The needle is inserted at 90 degrees down to the level of the bone and then pulled back 1 to 2 mm

Carpal Tunnel Injections

- **DIAGNOSIS**
  - Diagnosis of carpal tunnel syndrome is clinical
  - Electrodiagnostic studies (NCV/EMG) may assist in confirming the diagnosis, but they have significant false-positive and negative results
  - Weakness of thumb abduction is a specific and reliable sign

- **FINDING**

<table>
<thead>
<tr>
<th>Finding</th>
<th>Sensitivity</th>
<th>Specificity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flick sign</td>
<td>93</td>
<td>96</td>
</tr>
<tr>
<td>Hypalgesia</td>
<td>39</td>
<td>88</td>
</tr>
<tr>
<td>Square wrist sign</td>
<td>53</td>
<td>80</td>
</tr>
<tr>
<td>Classic or probable pattern on hand</td>
<td>64</td>
<td>73</td>
</tr>
<tr>
<td>Abduction weakness</td>
<td>65</td>
<td>65</td>
</tr>
<tr>
<td>Thenar atrophy</td>
<td>16</td>
<td>90</td>
</tr>
<tr>
<td>Tinel sign</td>
<td>36</td>
<td>75</td>
</tr>
<tr>
<td>Phalen maneuver</td>
<td>57</td>
<td>58</td>
</tr>
<tr>
<td>Nighttime or morning symptom</td>
<td>70</td>
<td>43</td>
</tr>
</tbody>
</table>
Carpal Tunnel Injections

INDICATIONS

- The major indication for carpal tunnel injection is the syndrome of median nerve compression
  - may result from osteoarthritis, rheumatoid arthritis, diabetes mellitus, hypothyroidism, repetitive use injury or other traumatic injuries to the area, and pregnancy


Carpal Tunnel Injections

- O’Gradaigh, D., Merry, P. Corticosteroid injection for the treatment of carpal tunnel syndrome; Ann Rheum Dis 2000;59:918-919

- RCT to compare low and high dose and short and long acting corticosteroids in the treatment of CTS

- Result: 25mg hydrocortisone (low dose steroid) is as effective as higher doses or long acting triamcinolone at 6 week and 6 months f/u.


Carpal Tunnel Injections

- Injection of the carpal tunnel is considered only after trial of
  - NSAIDs
  - splinting
  - avoidance of precipitating activities


Pharmaceuticals and Equipment

<table>
<thead>
<tr>
<th>Preparation</th>
<th>Dose</th>
<th>Needle size</th>
<th>Absolute volume</th>
<th>Relative volume</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corticosteroids</td>
<td>20 mg</td>
<td>1 mL</td>
<td>0.3 mL at 5% Medication in 0.5% Lidocaine</td>
<td>1:1000 in 0.5% Lidocaine</td>
</tr>
<tr>
<td>Triamcinolone</td>
<td>5 mg</td>
<td>1 mL</td>
<td>0.25 mL at 40 mg/mL</td>
<td>1:1000 in 0.5% Lidocaine</td>
</tr>
<tr>
<td>Kenalog</td>
<td>10 mg</td>
<td>1 mL</td>
<td>0.3 mL at 10 mg/mL</td>
<td>1:1000 in 0.5% Lidocaine</td>
</tr>
<tr>
<td>Kenalog</td>
<td>10 mg</td>
<td>1 mL</td>
<td>0.3 mL at 10 mg/mL</td>
<td>1:1000 in 0.5% Lidocaine</td>
</tr>
<tr>
<td>Methylprednisolone</td>
<td>30 mg</td>
<td>1 mL</td>
<td>0.3 mL at 30 mg/mL</td>
<td>1:1000 in 0.5% Lidocaine</td>
</tr>
</tbody>
</table>

Steroid injections are believed to reduce perineural inflammation or soft tissue swelling, and may stabilize the neural membrane, thus limiting the ephaptic transmission (“cross talk”) in ischaemic nerve fibres which causes symptoms.
Carpal Tunnel Injections

- Syringe: 5mL
- Needle: 25 g, 1.5 inch
- Anesthetic: 2-3 mL of 1% lidocaine or 0.25% or 0.5% bupivacaine

**APPROACH AND NEEDLE ENTRY**
- Just ulnar to the palmaris longus tendon and at the proximal wrist crease.
- For those few patients without a palmaris longus tendon, the needle is inserted just ulnar to the midline of the wrist.
- Needle is inserted at a 20-degree angle and directed toward the ring finger.
- If the needle meets obstruction or if the patient experiences paresthesias, the needle should be withdrawn and redirected in a more ulnar fashion.

As with any injection, aspirate to ensure that the needle has not been placed in a blood vessel.

Inject slowly, but with consistent pressure.


Any questions regarding carpal tunnel injections?

CMC Injections

- **INDICATIONS AND DIAGNOSIS**
  - Pain associated with arthritis or overuse is the most common indication for injection of this joint.
  - Diagnosis is determined by limitation of motion and palpation of crepitus and tenderness over the joint.
  - Diagnosis may be confirmed by radiographs.


- **Syringe**: 3 mL
- **Needle**: 25 gauge, 1 inch
- **Anesthetic**:
  - 0.5 mL of 1% lidocaine or 0.25-0.5% bupivacaine
  - **Steroid**:
  - 1 mL of methylprednisolone (40mg)

CMC Injections

• TECHNIQUE
  – Palpate the joint space between the trapezium and the first metacarpal


CMC Injections

• APPROACH AND NEEDLE ENTRY
  – Just proximal to the first metacarpal on the extensor surface
    – avoid the radial artery and the extensor pollicis tendons
    – To avoid the radial artery, the needle should enter toward the dorsal (ulnar) side of the extensor pollicis brevis tendon
  – The needle, a 25 gauge, should fall into the joint space
  – Traction can be applied to the thumb to further open the joint space.

CMC Injections

• Any questions regarding CMC injections?

de Quervain’s Injections

• ANATOMY
  • This disorder, a stenosing tenosynovitis, involves the abductor pollicis longus and extensor pollicis brevis tendons.


de Quervain’s Injections

• INDICATIONS AND DIAGNOSIS
  – de Quervain’s disease usually occurs with repetitive use of the thumb.
  – Thickening is noted, and tenderness is elicited just distal to the radial styloid process over the site of the involved tendon sheath.
  – The Finkelstein test is performed by having the patient make a fist with the thumb inside while simultaneously ulnar deviating the hand. Pain over the affected area is elicited in de Quervain’s disease.
de Quervain’s Injections

TIMING AND OTHER CONSIDERATIONS
- Immobilization and the use of NSAIDs should be tried before injection therapy is performed.


INJECTION TECHNIQUE
- Pharmaceuticals and equipment are described in Table 1.
- With the thumb abducted and extended, palpate the course of the tendons distal to the radial styloid process.


APPROACH AND NEEDLE ENTRY
- The needle is placed into the first extensor compartment, directed proximally toward the radial styloid process and sliding in parallel to the abductor and extensor tendons.
- Do not inject directly into a tendon.
de Quervain’s tenosynovitis

- Any questions regarding de Quervain’s injections?

Viscosupplementation

  - AMSSM Scientific Statement Concerning Viscosupplementation
  - Trojian, Thomas H. MD; Concoff, Andrew L. MD; Joy, Susan M. MD; Hatzenbuehler, John R. MD; Saulsberry, Whitney J. PharmD; Coleman, Craig I. PharmD

Viscosupplementation/Knee Injections

- Evidence for Usage
  - OARSI recommendations for the management of hip and knee osteoarthritis, Part II: OARSI evidence-based, expert consensus guidelines
  - Osteoarthritis Research Society International
  - “16. Intra-articular (IA) injections with corticosteroids can be used in the treatment of hip or knee OA, and should be considered particularly when patients have moderate to severe pain not responding satisfactorily to oral analgesic/anti-inflammatory agents and in patients with symptomatic knee OA and effusions or other physical signs of local inflammation. SOR: 76% (95% CI 0.48-0.97)”
  - “17. Injections of IA hyaluronate may be useful in patients with knee or hip OA. They are characterized by delayed onset, but prolonged duration, of symptomatic benefit when compared to IA injections of corticosteroids. SOR: 64% (95% CI 0.34-0.89)”

Viscosupplementation

- Abstract
  - Objective: Osteoarthritis (OA) is a disabling disease that produces severe morbidity and loss of physical activity. Our position statement on treatment of knee OA with viscosupplementation injection (hyaluronic acid [HA]) versus steroid (intra-articular corticosteroid [IAS]) and placebo [intra-articular placebo (IAP)] is based on the evaluation of treatment effect by examining the number of subjects within a treatment arm that met the Outcome Measures in Rheumatoid Arthritis Clinical Trials–Osteoarthritis Research Society International (OMERACT-OARSI) criteria, which is different and more relevant than methods used in other reviews which examined if the average change across the treatment groups was clinically different.
  - Data Sources: We performed a systematic literature search for all relevant articles from 1960 to August 2014 in the MEDLINE, EMBASE, and Cochrane CENTRAL. We performed a network meta-analysis (NMA) of the relevant literature to determine if there is a benefit from HA as compared with IAS and IAP.
  - Main Results: Eleven articles met the inclusion criteria from the search strategy. On NMA, viscosupplementation was more likely to result in benefit than IAS and IAP (P < 0.05 for both).
  - Conclusions: The American Medical Society for Sports Medicine recommends the use of HA for the appropriate patients with knee OA.

Questions

- Any questions before we proceed to cases/questions?