Joint Injection Workshop

Annual Clinical Day in Family Medicine

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Faculty / Presenter Disclosure

Faculty: Dr. Vikram Dalal

Relationship with Commercial Interests:

NONE
Faculty / Presenter Disclosure

Faculty: Dr. Bryan Lemenchick

Relationship with Commercial Interests:

NONE
Disclosure of Commercial Support

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Potential Conflict(s) of interest: **NONE**
Mitigating Potential Bias

NOT APPLICABLE
Objectives

To Educate Family Physicians on…

• Evidence base for injection therapy
• The drugs used
• The bony landmarks for common joint/bursa/soft tissue injections
• Correct techniques to do joint injections
What Providers Need to Know About Joint Injection and Aspiration

- Relatively simple procedure
- Complications are rare
- Injection/arthrocentesis can provide diagnosis, pain relief, reduce joint damage
  - “Liquid biopsy of joint”
  - Useful information can be provided by relatively inexpensive tests
  - Can help differentiate inflammatory from non-inflammatory arthritis
- Judicious use of anesthetics and steroids may be safer than systemic medications
- Summary: There are often more reasons for doing than not
Indications for Joint Injection /Aspiration

- **Diagnostic:**
  - Acute inflammatory arthritis (24-48hrs) in a patient who has never had these symptoms before
  - Acute effusion in the setting of fever, chills, or presence of infection at another site
  - Acute effusion in the setting of trauma
  - Prior to committing patients to long-term, expensive or toxic therapy

- **Therapeutic:**
  - To facilitate a more tolerable musculoskeletal exam (ie pain control)
  - To suppress inflammation in one or two isolated joints
  - Adjuvant therapy to a few joints resistant to systemic therapy
  - To facilitate a rehabilitative physical therapy program
  - To support a patient with active joint inflammation pending the effects of systemic therapy
  - To remove exudative fluid from a septic joint
  - To relieve pain in a swollen joint
Conditions Likely to be Improved by Joint or Periarticular Injections

- Rheumatoid arthritis
- Seronegative spondyloarthropathies
- Crystal induced arthritis
- Carpal tunnel
- Bursitis
- Tenosynovitis / tendinosis
- Adhesive capsulitis
- Osteoarthritis
### Contraindications to Joint Injection/Aspiration

<table>
<thead>
<tr>
<th>Absolute:</th>
<th>Relative:</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Sepsis / Cellulitis</td>
<td>- Uncontrolled Diabetes</td>
</tr>
<tr>
<td>- Hypersensitivity</td>
<td>- Immunosuppression</td>
</tr>
<tr>
<td>- Fracture</td>
<td>- Bleeding disorder</td>
</tr>
<tr>
<td>- Arthroplasty</td>
<td>- Anticoagulants*</td>
</tr>
<tr>
<td>- Previous severe steroid flare</td>
<td>- &gt; 3 prev. steroid injection in a major wt</td>
</tr>
<tr>
<td>- Reluctant patient</td>
<td>bearing joint within the preceding year</td>
</tr>
<tr>
<td>- Uninformed patient</td>
<td>- Excessive anxiety</td>
</tr>
<tr>
<td>- Injection into critical wt bearing tendons</td>
<td>- Prosthetic Joint</td>
</tr>
</tbody>
</table>

*Therapeutic INR – okay, NOACs variable but okay (Ahmed 2012)
Technique: Equipment
Technique: Preparation

- Discuss with patient option of injection and alternative treatments applicable to condition
- Obtain informed consent
- Check names on consent and expiration dates
- Place in comfortable position
- Define / mark anatomy
Technique: Site Prep

- Skin Preparation
  - Infection is rare
    - Reported incidence unknown, but varies from 1:3,000 to 1:50,000 (Baima, J, 2008)
    - Isopropyl alcohol similar to chlorhexidine in killing skin flora (Cawley et al., 1992)

- Inject using Aseptic Technique

- Confident Approach

- Stretch skin

- Needle insertion depending on site and type of injection
Technique: Aftercare

- Avoid excessive activities for 24-48 hours
- Gradual return
- Apply ice for 10-15 min, 2-3 times/day
- NSAIDS / Acetaminophen for first 12-24 hours (PRN)
- Watch for “steroid flare”
- +/- Follow-up
Steroid Use

Commonly used in ambulatory care settings by family doctors, orthopedic surgeons, and rheumatologists

Conditions warranting injection (Hill JJ (1989); McNabb J (2010))

- Epicondylitis (93%)
- Shoulder Pathologies (91%)
- Greater trochanteric bursitis (91%)
- De Quervain’s tendinopathy (87%)
- Bicipital tendonitis (81%)
- Osteoarthritis (knee) (92%)
Corticosteroid Function

- Corticosteroids have anti-inflammatory and immunosuppressive effect (Pekarek et al, 2011)
  - Alter movement and function of leukocytes
  - Reduce vascular permeability in inflamed areas
  - Reduce prostaglandin synthesis

• Serve to reduce erythema, swelling, heat, and tenderness of inflamed joints

• Also increase the viscosity and hyaluronate concentration in synovial fluid
Steroids - Physiology

- Stabilizes lysosomal membranes of inflammatory cells

- Decreases local vascular permeability

- Alters neutrophil chemotaxis and function

- Passes through cell membranes and binds to nuclear steroid receptors
  - Where they influence RNA transcription and subsequent protein production
Guide to Glucocorticoids for Intra-articular and Soft tissue Injections

<table>
<thead>
<tr>
<th>Solubility/Generic Name</th>
<th>Common Trade Name</th>
<th>Strength (mg/cc)</th>
<th>Relative Potency</th>
<th>Intermediate Joint [A-C Joint] (mg)</th>
<th>Large 'Joint' [S-A Bursa and G-H Joint] (mg)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Most Soluble</strong></td>
<td></td>
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<td></td>
<td></td>
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<tr>
<td>* Betamethasone sodium phosphate</td>
<td>Celestone Phosphate$^f$</td>
<td>3</td>
<td>25</td>
<td>1.5–3</td>
<td>6–12</td>
</tr>
<tr>
<td><strong>Soluble</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>* Dexamethasone sodium phosphate</td>
<td>Decadron$^f$</td>
<td>4</td>
<td>25</td>
<td>2–4</td>
<td>7.5–15</td>
</tr>
<tr>
<td>Prednisone sodium phosphate</td>
<td>Hydeltrasol</td>
<td>20</td>
<td>4</td>
<td>12.5–25</td>
<td>50–100</td>
</tr>
<tr>
<td><strong>Slightly Soluble</strong></td>
<td></td>
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<td></td>
<td></td>
<td></td>
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<tr>
<td>* Methylprednisolone acetate</td>
<td>Depo-Medrol</td>
<td>20/40/80</td>
<td>5</td>
<td>10–20</td>
<td>40–80</td>
</tr>
<tr>
<td>Triamcinolone diacetate</td>
<td>Aristospan Forte$^f$</td>
<td>25/40</td>
<td>5</td>
<td>10–20</td>
<td>40–80</td>
</tr>
<tr>
<td>Prednisolone tebutate</td>
<td>Hydeltra-TBA</td>
<td>20</td>
<td>4</td>
<td>12.5–25</td>
<td>40–80</td>
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<tr>
<td><strong>Relatively insoluble</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>* Triamcinolone acetonide</td>
<td>Kenalog$^f$</td>
<td>10/40</td>
<td>5</td>
<td>10–20</td>
<td>40–80</td>
</tr>
<tr>
<td>* Triamcinolone hexacetone</td>
<td>Aristospan$^f$</td>
<td>20</td>
<td>25</td>
<td>10–20</td>
<td>40–80</td>
</tr>
<tr>
<td>Hydrocortisone acetate</td>
<td>Hydrocortone</td>
<td>25</td>
<td>1</td>
<td>25–50$^d$</td>
<td>100–200$^l$</td>
</tr>
<tr>
<td>Dexamethasone acetate</td>
<td>Decadron-LA$^f$</td>
<td>8</td>
<td>25</td>
<td>2–4</td>
<td>7.5–15</td>
</tr>
<tr>
<td><strong>Combination</strong></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>* Betamethasone sodium phosphate-Betamethasone acetate</td>
<td>Celestone Soluspan$^f$</td>
<td>6</td>
<td>25</td>
<td>1.5–3</td>
<td>6–12</td>
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The Drugs

• Few studies have assessed the comparative efficacy of different corticosteroid injections for various articular and peri-articular disorders

• Physician’s choice of specific corticosteroid for injection is linked to the region where the physician was trained, as opposed to specific evidence based practice (Wittich et al., 2009)

• What we know:
  • Triamcinolone hexacetonide had faster pain relief than methylprednisolone for knee RA at day 7 and knee OA at 3 weeks; both had similar long term efficacy (Garg et al., 2014)
  • Triamcinolone acetate and methylprednisolone seem to have similar efficacy for knee and shoulder injections (Garg et al., 2014)
Local Anesthetics

Typically a local anesthetic agent is combined with steroid agents

1. **Analgesia:**
   - Decrease nerve conduction through the blockade of sodium channels, which disrupts axonal nerve conduction

2. **Diagnostic:**
   - pain relief confirms pathology and correct administration

3. **Volume Distribution / Dilutional:**
   - dilutes the steroid (reduced chance skin atrophy)
   - increases the distribution of the agent to the treated area

Lidocaine:
- Rapid onset (minutes)
- Short duration (60-90 min)

Bupivicaine
- Slower onset (30 min)
- Longer duration 96-8 hours

Buffering:
- Sodium bicarbonate
What Patients (and Providers) Need to Know About Joint Injection and Aspiration

- Relief will typically last weeks or longer
- No ligamentous or tendon structure should be injected directly
- Activity modification following injections of steroid is uncertain
- Maximal number of injections and the required period between injections have not been determined (Nichols, A (2005); Pfenninger, JL (2010))
What Patients (and Providers) Need to Know about Joint Injections

• In a meta-analysis summarizing 25+ studies, a 5.5% complication rate noted
  - Most common side effects included skin atrophy (2.4%), depigmentation (0.8%), localized erythema and warmth (0.7%), and facial flushing (0.6%)
  - Post-injection pain was noted in up to 9% of patients
  - Prolonged and repeated usage may increase the risk of complications and systemic side effects (hence at times limited to 3 injections within 12 months)
  - Post injection flare (2-5%)

• Infection 18/250,000 injections (0.072%)

• In diabetic patients, hyperglycemia has been shown to persists up to 5 days after single soft tissue injection

*Dietzel, D (2004); Nepple J (2009); Wang AA (2006); Pfenninger JL (2010)*
Typical Injection/Aspiration Procedure

- Determine the medical diagnosis and consider relevant differential diagnosis
- Discuss the proposed procedure and alternatives with the patient
- Obtain written informed consent from the patient
- Collect and prepare the required materials
- Correctly position the patient for the procedure
- Identify and mark the anatomic landmarks and injection site with ink
  - Do not allow the patient to move the affected area from the time that the marks are placed until after the procedure is completed
- Press firmly on the skin with the retracted tip of a ballpoint pen to further identify the injection site
- Prepare the site for injection by cleansing with a topical antimicrobial agent (providine-iodine and/or alcohol swab)
  - If using providine, allow to dry for full antibacterial effect
- Provide local anesthesia as indicated***
Typical Injection/Aspiration Procedure

• Using the no-touch technique, introduce the needle at the injection site and advance into the treatment area
• Aspirate fluid (optional) using a 18 or 20-g needle and send it for laboratory examination if indicated
• If injecting corticosteroid immediately following aspiration, do not remove the needle from the joint or bursa; In this case, grasp the needle hub firmly (with hemostat clamp if necessary), twist off the original syringe, and then immediately attach the second syringe that contains the corticosteroid
• Always aspirate before injection to avoid intravascular administration
• Inject corticosteroid solution into the treatment area
  - If not aspirating then use 25-g needle
  - Do not inject the medication against resistance
• Withdraw the needle
• Apply direct pressure over the injection site with a gauze pad
• Apply an adhesive dressing
• Provide the patient with specific post-injection instructions
Shoulder Complex

- A complicated anatomical and biomechanical joint
- Actually multiple joints
- Static and dynamic stabilizers
- Bursitis, tendinosis, adhesive capsulitis, impingement syndrome, calcific tendinopathy
Shoulder Complex

Anatomy: No major arteries or nerves in the technique

Examples:
GH Joint (Ground Floor):
- 1-2 cc (40-80mg) depomedrol + 3-4cc xylocaine

Subacromial bursa (First Floor):
- 1cc (40mg) depomedrol + 2cc xylocaine

AC Joint (Attic):
- 1cc (40mg) depomedrol + 1cc xylocaine
Shoulder – Glenohumeral joint – *The Ground Floor*
Shoulder – Subacromial Bursa (1st Floor)
Shoulder - The AC joint (The Attic)
Knee Injections

- OA, RA, Gout, Synovitis, Meniscal Tear, Effusion, Pain

- Anatomy: Large Joint / No major arteries or nerves

- Can improve patient’s symptoms for up to 3 weeks with NNT of 3 or 4 (Roskos, 2005)

- Approaches:
  - Anterior
  - Medial Retropatellar
  - Lateral Retropatellar
  - Suprapatellar (done for suprapatellar effusions)

Example:
- 1cc (40mg) Depomedrol + 4 cc lidocaine
Knee – Lateral Retropatellar

- Keep knee straight

- Palpate the upper and lower pole of the patella

- Lateral access point: within the lateral retropatellar space in line with the junction of the upper and middle thirds of the patella

- Apply pressure on the patella medially and with knee extended advance the needle medially and a bit inferiorly while holding the needle horizontally
Knee – Medial Retropatellar

- Keep knee straight / extended

- Palpate the upper and lower pole of the patella

- Medial access point: At medial parapatellar groove underneath the patella, in line with the half-way point between the superior and inferior poles of the patella

- Apply pressure on the patella laterally and with knee extended (to open the patella medially) advance the needle laterally while holding the needle horizontally
Knee - Anterior or Infrapatellar Approach (Lateral side)

- Flex at 30 or 90 degrees

- Locate the patellar tendon, move about 1cm laterally (or medially); locate tibial plateau and move 1cm superiorly and palpate slight depression

- Mark the site

- Direct needle perpendicular to knee towards the center of the knee
Knee - Superolateral Approach

- Palpate superolateral and lateral edges of patella with patient supine and leg straight
- Mark the lines (red)
- Aspirate for effusion (compression of the opposite side of the joint may aid in arthrocentesis)
- Can use same needle if using aspiration and injection (steroid or viscosupplementation)
Positioning:
- Sitting or supine

- Knee flexed at 90° with leg either hanging or bent with heel resting against the stretcher

- Plantar flexion of the ankle against minimal ankle dorsiflexion by the patient helps define the anatomy

Indications:

Diagnostic:
- Evaluation of arthritis (monoarticular or septic)
- Evaluation of joint effusion
- Evaluation of crystal arthropathy
- Identification of intra articular fracture

Therapeutic:
- Relief of pain by aspirating effusions or blood
- Injection of medications (corticosteroids, antibiotics, anesthetics)
- Drainage of septic effusion
References

References

• Nichols, AW. Complications associated With the Use of Corticosteroids in the Treatment of Athletic Injuries. Clin J Sport Med (2005); 15:E370
• Pfenninger JL. Procedures for Primary Care Physicians. St. Louis: Mosby, 2010