Joint & Soft Tissue Injection Techniques

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Objectives

Knowledge Objectives
- Students will understand:
  - Indications, contraindications, risks, and benefits of performing injections
  - Techniques for performing injections
  - Medications and supplies that can be used for injections
  - Potential complications of injections
  - Proper procedural documentation

Skill Objectives
- Apply knowledge to specific case scenarios
- Employ proper safety precautions while performing injections

Case
- MG is a 48 yo CF you see at your clinic. She has a history significant for DM, HTN, HLD, OA, and a TIA 2 years ago.
- She developed PAF last year, and she is now on chronic coumadin therapy for this. Her INR has consistently been at target (2-3), last checked 2 weeks ago.
- She presents to you today with left knee pain and swelling after going on a long hike over the weekend with her family.
- The knee has a moderate effusion with secondary limited ROM, no erythema, and some non-specific medial joint line tenderness. She is afebrile.
Case

Would you tap it?
"That’s what she said!"
If so, would you d/c the coumadin first?
How long?
You tap it, you get out clear straw-colored yellow fluid (no hemarthrosis), cultures and fluid analysis reveal normal joint fluid, no crystals.
XRay shows bi-compartmental OA
She still has chronic knee pain with weight bearing that is affecting her ADLs
Would you give her a steroid injection?

Joint and Soft Tissue Injections & Aspirations

One of the most common procedures performed in the outpatient setting
Used in the Dx & Tx of inflammatory and non-inflammatory joint conditions
Used by multiple medical specialties and carry little risk of complications

Indications

Diagnostic
- Pain relief
- Septic, crystal arthropathy, hemarthrosis

Therapeutic
Regional block
Areas to Inject

- Intra-articular (IA)
- Extra-articular (EA)
  - Soft tissue/muscle
  - Tendons (paratenons)
  - Ligaments
  - Nerves (peri-neural)
- Subcutaneous (SQ)
- Subdermal
- Intravenous (IV)
- Intramuscular (IM)
- Intraosseous (IO)
- Scars
- Intraspinal/intrathecal
- Intraosseous

Types of Injections

- Corticosteroid
- Viscosupplementation
- Dextrose (prolotherapy)
- Platelet rich plasma (PRP)
- Trigger point (lido)
- Anesthetizing (lido)
- Biopuncture (nutraceuticals)
- Percutaneous tenotomy (PNT)
- Dry needling
- Hydrodissection
- Saline
- Whole blood
- Autologous/Mesenchymal stem cell
- Neural (curative anesthesia, segm)

Targeting Methods

- Manual palpation
- Ultrasound guided
- Fluoroscopic guided
- CT guided
“-caine” Anesthetics

- Procaine (Novocain)
- Lidocaine (Xylocaine)
- Bupivacaine (Marcaine)
- Ropivacaine (Naropin)
- Cocaine (Blow, Coke, etc)
  - All have potential chondrotoxicity, ropivicaine the least
  - Generally no need to inject combined with epi
    - Especially if injecting area of potential necrosis

Available conduits:
- Patch, gel, cream, ointment, injection, spray

Onset / Duration / Toxicity

Lidocaine (Xylocaine)
- Onset of effect: 1-2 minutes
- Duration of action: 1-2 hours
- Toxicity: limit 4mg/kg
  - 1% has 10mg/mL
  - 2% has 20mg/mL

Bupivacaine (Marcaine)
- Onset of effect: 5-30 minutes
- Duration of action: 8 hours
- Toxicity/Upper limit of dosing:
  - 28mL of 0.5%
  - 60mL of 0.25%

Ropivacaine (Naropin)
- Least chondrotoxic

Upper limit calculation example:
- 70kg (154#) pt use 5.280mg (4mg/kg) = 28mL 1% = 14mL 2%
- Dilute with bacteriostatic saline or sterile water prn
- Prolong injection of bilateral SI joints with 60cc total fluid
  - Per 10cc syringe: 3cc 50% dextrose, 3-4cc 1% lido, 4-3cc saline = 18-24mL 1% lido

Other Anesthetics

- Ice
- Ethyl chloride
- Benzocaine spray
- Instant Ice
- Pain Ease
- Spray & Stretch
  - Fluoromethane
Corticosteroid Solutions

- The duration of the effect is inversely related to the drug’s solubility
- Shorter acting agents tend to have a lower incidence of post-injection flare
- Higher solubility agents (eg: celestone, dexamethasone, methylprednisolone) tend be better for soft tissues (ie: bursa)
- Lower solubility agents (eg: triamcinolone) tend to be better for joint injections

<table>
<thead>
<tr>
<th>Drug</th>
<th>Duration of effect (hrs)</th>
<th>Type of injection</th>
<th>Halflife (hours)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prednisolone</td>
<td>20</td>
<td>IV, IM</td>
<td>20</td>
</tr>
<tr>
<td>Prednisone</td>
<td>8</td>
<td>IV, IM</td>
<td>8</td>
</tr>
<tr>
<td>Hydrocortisone</td>
<td>1</td>
<td>IV, IM</td>
<td>1</td>
</tr>
<tr>
<td>Triamcinolone</td>
<td>6-12</td>
<td>IA, EA</td>
<td>6-12</td>
</tr>
</tbody>
</table>

Table 2 – Injectable corticosteroids

<table>
<thead>
<tr>
<th>Solubility/ Generic name</th>
<th>Effect onset</th>
<th>Large joint dose (mg)</th>
<th>Small joint dose (mg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Somewhat insoluble</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Triamcinolone acetonide</td>
<td>Variable</td>
<td>5 - 40</td>
<td>2.5 - 5</td>
</tr>
<tr>
<td>Triamcinolone hexacetonide</td>
<td>Variable</td>
<td>10 - 40</td>
<td>2 - 6</td>
</tr>
<tr>
<td>Slightly soluble</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Methylprednisolone acetate</td>
<td>Very slow</td>
<td>20 - 80</td>
<td>4 - 10</td>
</tr>
<tr>
<td>Triamcinolone diacetate</td>
<td>Variable</td>
<td>20 - 40</td>
<td>2 - 5</td>
</tr>
<tr>
<td>Soluble (not preferred for joints)</td>
<td>Rapid</td>
<td>2 - 4</td>
<td>0.8 - 1</td>
</tr>
<tr>
<td>Dexamethasone sodium phosphate</td>
<td>Rapid</td>
<td>6 - 12</td>
<td>1.3 - 3</td>
</tr>
<tr>
<td>Combination</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Betamethasone sodium phosphate and betamethasone acetate</td>
<td>Rapid</td>
<td>6 - 12</td>
<td>1.3 - 3</td>
</tr>
</tbody>
</table>

Contraindications

- Cellulitis or broken skin over the intended entry site
- Anticoagulant therapy that is not well controlled
- Severe primary coagulopathy
- Allergy to injectable substance
- Acute closed fx
  - Could convert to open fx
- Suspected bacteremia
  - Unless the joint is suspected as the source of the bacteremia
- Joint prostheses
  - Avoid IA injections, but can do EA with caution
- Pregnancy
  - Relative contraindication
Complications of Injections
- Infection
  - including septic arthritis
- Hemarthrosis
- Skin atrophy
- Chondrotoxicity
- Nerve damage
- Aggravation of pain
- Aggravation of symptoms
- Intraarterial injection
- Intraspinal injection
- Spinal HA
- Migraine HA
- Pneumothorax
- Neurological damage
- Allergic reaction
  - Dextrose can be from corn allergy
- Lidocaine toxicity
- Medicolegal
- Respiratory depression
  - From nerve or lung injury
- Flare-up of gout
  - With prolotherapy

Complications of Corticosteroids
- Tendon rupture
- Facial flushing
- Post-injection flare
- Skin atrophy
- Fat atrophy
- Skin hypopigmentation
- Corticosteroid arthropathy
- Osteonecrosis
- Cartilage degeneration
- Other systemic complications of corticosteroid use
  - including hyperglycemia, wt gain, menstrual irregularities, and adrenal & pituitary inhibition

Precautions
- For CS injections:
  - Limit number of injections
    - ≥ 3 months apart
  - Don’t inject directly into tendon
- Avoid if unable to rest joint
- Avoid trauma to articular cartilage
- Dorsal approach better than ventral for hand & foot
Supplies

- **Preparation:**
  - Skin marker / eyeliner (optional)
  - Sterile drapes (optional)

- **Position:**
  - Buttress, towels, pillows

- **Procedure:**
  - Gloves (sterile or non-sterile)
  - Insulin syringe and needle
    - for anesthetic wheal
    - 1-20 cc syringe
    - 1,3,5,6,10,20,50,60cc sizes
    - 16-18 gauge, 1-1.5” needle
    - For drawing up meds
    - 22-25 gauge, 1.5-3.5” needle

- **Post-Procedure:**
  - 1 or 2% lidocaine
  - Medication being injected
  - Alcohol swabs
  - 70% isopropyl EtOH
  - Iodine or Chloraprep (chlorhexidine) swabs
  - Sterile 4x4” gauze pads
  - Sterile hemostat (curved or straight)
  - Ethyl chloride spray (optional)

Procedure & Technique

5 P’s of Injections

1. Preparation
   - Consent patient
   - Get supplies set up
   - Clean outside of med vial with EtOH swab
   - Ensure proper medication is drawn-up, labeled
   - Ensure that solution mixes, doesn’t precipitate
   - Clear air out of syringe and needle

2. Patient position
   - Mark area(s)

3. Practitioner position

4. Procedure
   - Apply anesthetic
   - Enter the skin bevel up
   - The bevel will control the direction of the needle
   - The syringe and needle should be an extension of your palpatory abilities
   - Feel for layers of dermis, fascia, joint capsule, ligament, tendon, etc.
   - “Treat tissue gently”
   - Aspirate prior to injection

5. Post-Procedure
   - Clean & dress area
   - Sharps & biohazard disposal
   - Provide aftercare instructions
   - What to expect, si/sx of infxn, etc

Cardinal Rules of Injections

- **ALWAYS** Know your anatomy
- **NEVER** Inject against resistance
- **ALWAYS** Aspirate
- **NEVER** Forget to discuss adverse effects/complications
ABCs of Prolotherapy

Anatomy

Bone contact

Compression

“A joint is only as strong as its weakest ligament.” - George Hackett, MD

Safety

Always state out loud, “needle down” when placing needle down
Capping the needles
Disposing the needles
Watch out for needle “flicks” with longer more flexible needles
Always practice universal precautions

Documentation

Informed consent prior
- Overview risks/benefits
- Allows patient to make decision whether to proceed
Procedure note:
- Ultrasound-guided injection of the right shoulder was performed today to treat the diagnosis of right subacromial bursitis. The patient was consented. A formal timeout was conducted identifying the correct area, side, and medication. The area was cleaned and prepped in sterile fashion. The area was anesthetized topically with ethyl chloride and a wheal of 1% lidocaine prior to the injection. Using a 22 gauge 2 inch needle 1 mL of dexamethasone 4mg/mL and 4mL of 1% lidocaine were injected in to the right subacromial bursa via the lateral approach under US guidance with image capture of the procedure obtained. The area was cleaned and bandaged after completion of the procedure. There was no fluid aspirated. There was no reportable blood loss or complications with this procedure. The patient reported decreased pain, increased range of motion, and good patient tolerance. Procedural aftercare instructions were provided to the patient.”
Billing & Coding
- 20610 – $190
  - Aspiration/Injection of large joint (hip, shoulder, knee)
- 20605 – $143
  - Aspiration/Injection of medium joint (AC, wrist, elbow, ankle)
- 20600 – $132
  - Aspiration/Injection of small joint (fingers, toes)
- 20550 – $139
  - Injection single tendon sheath, ligament, or aponeurosis (Plantar fascia)
- 76942 – $488
  - Ultrasound guided injection
- 20551 – $142
  - Single tendon origin/insertion
- 20526 – $183
  - Injection, therapeutic, of carpal tunnel
- 20552 – $130
  - Trigger point, 1 or 2 muscles
- 20553 – $147
  - Trigger point, 3 or more muscles
- 20612 – $142
  - Aspiration/injection of ganglion cyst

Knee Injection
- Knee Joint:
  - Procedure: inject from lateral, inferomedial, or inferolateral, insert ~1-1.5 inch depth
  - Needle size and dosage: 1cc CS and 2-4cc lido; 22-25G 1.5-2” needle

Shoulder Injection
- Subacromial Space:
  - Procedure: inject from posterior edge of acromion, needle bevel-up, in slightly cephalad angulation, pointed to the AC joint, insert ~1-1.5 inch depth
  - Needle size and dosage: 1cc CS and 4-10cc lido; 25G 1.5-2” needle
- Glenohumeral Joint:
  - Procedure: inject from posterior edge of acromion, needle bevel-up, in slightly cephalad angulation, pointed to the coracoid process, insert ~1-1.5 inch depth
  - Needle size and dosage: 1cc CS and 4-10cc lido; 25G 1.5-2” needle
Back to our case
- MG is a 48 yo CF you see at your clinic. She has a history significant for DM, HTN, HLD, OA, TIA, and PAF on chronic OAC.
- She presents to you today with left knee pain and swelling after going on a long hike over the weekend with her family.
- Would you tap it?
- Would you inject it?
- Would our derm enthusiasts put topical steroids on it and hope the effusion goes away?

Key Points
- Use the 5 P’s
  1. Preparation
  2. Patient position
  3. Physician position
  4. Procedure
  5. Post-Procedure
- Practice the Cardinal Rules
- Safety first

Conclusion
- Injections are one of the most common procedures performed in the outpatient setting
- There are a variety of neuromusculoskeletal and soft tissue conditions that can be treated using injections, and various ways to target these areas
- These are satisfying procedures for both patient and physician
- These are safe & effective procedures…when done appropriately
Workshop Supplies

1) Gloves (one large, medium, and small box)
2) Syringes - seven 1cc insulin syringes (usually they have a 30 gauge needle on them), seven 3cc syringes, two 10cc syringes and one 20cc syringe
3) Needles: ten 18 gauge 1.5", ten 22 gauge 3.5", ten 25 gauge 1.5", ten 25 gauge 2", and ten 27 gauge 1.5"
4) Gauze - 4 boxes (contains 10) 4"x4" gauze sponges
5) Bandaids - 1 box standard size
6) Coban - one 2" roll
7) Meds: two 10cc vials of 1% lidocaine, one vial of 10cc Kenalog, one vial of 50% dextrose (usually comes in a 50cc vial)
8) Hemostat - one straight and one curved one
9) Ethyl chloride spray
10) Skin cleaning materials: 1 box of alcohol wipes, 10 povidone iodine swabs, 10 Chloraprep (Chlorhexidine) swabs
11) A skin marking pen (surgical pen) and/or eye liner pencil
12) A sharps container (if one not available in the room we're in)
13) Two sterile drapes