An Approach to Injection Therapy

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Objectives

• Be confident in how to safely perform a knee injection or aspiration
• Be confident in how to safely perform a subacromial bursal injection
• Recognize potential complications of intraarticular or periarticular injections or aspirations
Disclosures

• In the past 12 months, we have had no relevant financial relationships with the manufacturer(s) of any commercial product(s) and/or provider(s) of commercial services discussed in this CME activity.

We do not intend to discuss an unapproved/investigative use of a commercial product/device in our presentation.
“The art of good injection therapy is to place the appropriate amount of the appropriate drug at the appropriate time into the exact site of the affected tissue.”
Problems

- Inappropriate drug is used
- Too large a dose is used
- Injections are given too frequently
- Drug is put into the wrong tissue
- Poor injection technique allows for the spread of drugs to adjacent tissues
- Lack of attention to the cause of the lesion
- No regard for the aftercare and rehabilitation
Types of Injections

- *Intra-articular*
- *Peri-articular*
- *Intra-bursal*
- *Intra-muscular*
- Soft tissue – tendon ruptures
Types of Injections

- Anesthetic
- Corticosteroids
- Hyaluronic acid supplements
- Sclerosing agents – attempt to strengthening inadequate ligaments by using an irritant to produce fibroblast hyperplasia
  - Prolotherapy
- Platelet Rich Plasma Preparations (PRP)
- Stem cells, amniotic fluid, others
Evidence

• Injectable steroids have been around for > 50 years
  – Few definitive studies of application in joint and soft tissues
  – Few studies comparing injections to other treatments
  – Most is expert opinion and lacks consensus
    • Diagnosis, lesions to treat, drug choices, drug doses, injection technique, injection intervals and frequency

• Challenge: Apply the best possible evidence-based treatments
Corticosteroids

- Most commonly used are synthetic analogues of cortisol (hydrocortisone) – which is made in the adrenal cortex
  - Effect glucose/protein metabolism
    - Control rate of mRNA synthesis, protein synthesis
  - Suppress polymorph and macrophage migration
  - Suppress immunological response of lymphocytes
- 1950’s – First use for arthritic joints
Steroid types

• Short-acting
  – hydrocortisone
• Intermediate-acting
  – triamcinolone acetonide
  – methylprednisolone
• Long-acting
  – dexamethasone
Side Effects

• Systemic
  – Facial flushing (1-5%), lasts 1-2 days
  – Poor glycemic control – suppression of the hypothalamic-pituitary axis
  – Effect CRP/WSR for 6 months
  – Vagal reaction
  – Anaphylaxis
  – Menstrual irregularities
  – Psychological effects – emotional, insomnia
Side Effects

• Local
  – Bleeding/bruising, Tissue damage (nerve – rare)
  – Post-inj. pain flare (2-10%) - soft tissue >> joint
  – Skin depigmentation/atrophy (knee, foot, hip)
  – Tendon rupture
  – Infection: Cellulitis, joint – rare (1:15,000-75,000)
  – Steroid “chalk”/deposits
  – Steroid Arthropathy – now actually related to “caines”

• <1% risk at superficial site of steroid injection
  – Soft tissue atrophy
  – Local depigmentation
• Usually appears 1-4 months afterward
• Resolves 6-30 months later
• More common depigmentation with darker skin
Reducing Risk

- Use a corticosteroid with more solubility for soft tissue injections
  - Betamethasone sodium phosphate
  - Dexamethasone sodium phosphate

- Less soluble steroids better for intra-articular injection
  - Triamcinolone acetonide or hexacetonide

<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></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dexamethasone sodium phosphate</td>
<td>Rapid</td>
<td>2 - 4</td>
<td>0.8 - 1</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>1.5 - 3</td>
</tr>
</tbody>
</table>
Prevention – remember for soft tissue!

- Use more soluble steroid
- Apply pressure over injection site while withdrawing needle
  - Prevents leakage of steroid along track
Local anesthetics

- Most steroid injections a combination of steroids and anesthetic
- Local anesthetics – reversibly block conduction along nerve fibers
- Diagnostic – confirms diagnosis and correct placement of solution
- Analgesic – temporary effect, makes procedure less unpleasant, break pain cycle
- Dilution – increased volume helps to spread it around, less likely damage to soft tissues.
- Distension – stretching, volume effect
• Lidocaine (xylocaine) – rapid acting, last approximately 30 minutes, most widely used
• Bupivacaine (Marcaine) – slower onset (30 min), lasts 8 hours
• Some provide mixtures of these
• +/- Epinephrine – causes vasoconstriction, used for skin injections, prolongs the effect, reduces bleeding
  – Avoid in joints and soft tissues
Other injection products

• Viscosupplements – less medication induced SE, (hyaluranons)
  – Thicker products
  – Most approved as medical devices
• PCP – unknown, may depend on preparation
  – Activation of various growth factors
  – Initially used in soft tissue healing, now variable application
Other considerations

• Blood thinners
• Bleeding disorder
• Indwelling hardware
  – Discuss with orthopedic colleagues
• Previous response(s)
“Peppering”/Fenestrations

• Often used for superficial tendon injections
  – Example: Lateral epicondylitis
  – Commonly performed with PRP
  – Caution in large weight tearing, partially torn tendons
Frequency

• Large joints
  – Consensus opinion is q 3-4 months
  – Weigh risks/benefits for your patient
    • Older patient with MMP unable to undergo surgery but needing relief, maybe more often
    • If able, treat underlying cause of issue
      – Overuse
      – Poor biomechanics
      – Work stress
Aseptic Technique

- Sterile, disposable needles
  - Size varies on location
- Single dose ampules when possible
- Change needles after drawing up solutions
- Gloves (sterile vs. non sterile)
- Skin prep (alcohol vs. iodine vs. chloroprep)
- Aspirate joint as advancing needle
- Aspirate a joint effusion first, before injecting
Contraindications to Injection

- Infected joint
- Overlying skin infection
- Allergies to any of meds
- Implanted hardware
**Recommend Maximum dosage/volume for joint injections**

<table>
<thead>
<tr>
<th>Joint</th>
<th>Triamcinolone</th>
<th>Volume</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shoulder</td>
<td>30 mg</td>
<td>10 ml</td>
</tr>
<tr>
<td>Elbow</td>
<td>20 mg</td>
<td>5 ml</td>
</tr>
<tr>
<td>Wrist/thumb</td>
<td>10 mg</td>
<td>2 ml</td>
</tr>
<tr>
<td>Fingers</td>
<td>5 mg</td>
<td>1 ml</td>
</tr>
<tr>
<td>Hip</td>
<td>40 mg</td>
<td>5 ml</td>
</tr>
<tr>
<td>Knee</td>
<td>40 mg</td>
<td>10 ml</td>
</tr>
<tr>
<td>Ankle, foot</td>
<td>20 mg</td>
<td>5 ml</td>
</tr>
<tr>
<td>Toes</td>
<td>10 mg</td>
<td>1 ml</td>
</tr>
</tbody>
</table>
• Prepare Patient
  – Treatment options, procedures, SE
  – Informed consent, time out
  – Positioning

Prepare Equipment
  Meds, gauze, skin prep, etc.

Prepare site
  Mark structures, landmarks, etc.

  Clean, dry
Aspirate Knee

- Swollen, painful, concern for infection, crystals, prior to injection
  - Clean surface
  - Anesthesize with local
  - Insert needle:
    - Rapidly
    - Perpendicular to skin (bevel up)
    - Skin stretched
Knee

• Several ways to inject:
  – Lateral approach, anterolateral approach, medial approach
    • Accuracy of needle placement into the intra-articular space of the knee.
    • Jackson DW¹, Evans NA, Thomas BM.
    • (accuracy 70-90%)
  – Suprapatellar pouch most common for aspiration
Knee

Recommend for knee injection:

- 21 or 25G, 1.5 in needle
- 5 ml syringe
- 1-2 ml (40 mg, triamcinolone)
- 4 ml of 1% lidocaine
- Ethyl chloride for topical anesthesia

For knee aspiration:

- 18 G, 1.5 in needle
- 60 ml syringe (1-2)
Shoulder

- Sub acromial
- AC joint
- Bicepital groove
• Clean site
• Place dressing – usually a band-aid
• Monitor for SE (10-30 min)

• Procedure Note:
  • After risk and benefits were discussed, the patient consented to injection of 2cc kenalog and 2cc marcaine into the left knee via the anterolateral approach. The procedure was done in sterile fashion, with no complications or bleeding. The patient tolerated it well, with large relief of symptoms afterward. The procedure site was bandaged afterward, and aftercare instructions were given.
After care

• Relative rest
• Ice
• Pain medication as needed
• Often accompanied by PT
• Steroid effects – 24-48 hours to 1 week (for triamcinolone)
• Lasts 3 weeks to 3 months
Patient Instructions

- Educate on potential side effects/complications/expectations:
  - Example:
    - Call me if you have any negative side effects from the injection (increased warmth, swelling, redness, or pain). You should have some pain relief today, which will wear off in 4-6 hours. If the injection site is sore later, you may apply ice to it and take acetaminophen or ibuprofen. The steroid should start to take effect in 2-3 days, and longstanding pain relief should occur when that happens.
Questions