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# Joint Injection and Aspiration

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# Joint Injection and Aspiration

## *Self-study Program*

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Thank you for purchasing the Joint Injection and Aspiration procedural skills self-study program. Injection and aspiration of joints and various soft tissues are useful skills for family physicians. These techniques can be helpful both therapeutically and diagnostically.

This self-study program reviews basic concepts regarding injection and aspiration, including indications, contraindications, and complications. The basic approach to performing injections in your office will also be reviewed. In addition, demonstrations of specific techniques for commonly used injections will be shown.

## DISCLAIMER

The material presented in this program is being made available by the American Academy of Family Physicians for educational purposes only. This material is not intended to represent the only, nor necessarily best, methods or procedures appropriate for the medical situations discussed, but rather is intended to present an approach, view, statement or opinion of the faculty that may be helpful to others who face similar situations.

Physicians may choose to check specific details such as drug doses and contraindications, etc., in standard sources prior to clinical application. Every effort has been made to assure the accuracy of the data presented in this program.

This program should be used as an educational tool to help learn about the injection and aspiration of joints and soft tissues. In addition to this program, attendance at a formal course related to these skills and supervised clinical experience is highly recommended.

## AUTHOR DISCLOSURE

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Robert Sallis, M.D. – Member, Sports Medicine Review Board,
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The above author has declared that the content of his presentation will not include discussion of unapproved or investigational uses of products or devices.

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# OBJECTIVES

**Upon completion of this program, you should be able to:**

1. Describe indications and contraindications for joint injections and aspiration.
2. Select appropriate equipment/supplies for performing joint injections and aspiration.
3. Illustrate appropriate anatomic landmarks.
4. Demonstrate specific techniques for commonly used injections.

# Injection and Aspiration Basics

# Injection and Aspiration Basics

## Indications for Injection and Aspiration

There are a variety of reasons to aspirate or inject joints or soft tissues in the primary care setting. Common indications for joint or bursa aspiration include:

1. To evaluate red, swollen, or tender joints (or bursa) to rule out infection.
2. To evaluate effusions of unknown origin, looking for blood, crystals, or fat globules (suggests bone fracture).
3. To relieve pain caused by a tense effusion.

Common indications for joint, bursa, or soft tissue injection include:

1. Insertion of therapeutic agents (eg, steroids, lidocaine, hyaluronic acid) to relieve inflammation and pain not responding to conservative treatment.
2. To aid in evaluation and diagnosis by relieving pain (such as differentiating a rotator cuff tear from severe tendinitis).

## Contraindications

Specific contraindications to aspiration or injection include:

1. Cellulitis involving the skin overlying the injection site.
2. Bacteremia or septic effusion (steroids can cause immunosuppression).
3. Coagulopathy (weigh risk of bleeding against benefits from injection or aspiration).
4. Anticoagulant treatment (generally okay if international normalized ratio (INR) is controlled).
5. Joint prosthesis.
6. Acute fracture.
7. Lack of response after 3 to 4 injections.
8. Inaccessible joints.
9. History of allergic reaction to substance being injected.

## Complications from Injection

Any time the skin is punctured with a needle, there is a potential for complications. While most are rare, it is important that patients are informed of these risks prior to consenting to injection or aspiration. Potential complications include:

1. Infection — the rate of associated infection is low if proper sterile technique is used (on the order of 1 infection per 20,000 to 50,000 injections). Staphylococcus aureus is the most common organism that causes infection.
2. Pain locally at the site of injection.
3. Allergic reactions — can occur and are usually related to the anesthetic or preservatives in it.
4. Intravascular injection — may cause a systemic reaction (lidocaine or steroid).
5. Pneumothorax — can occur from rib or trigger point injection in the chest. Advising patients to hold their breath during injection and the use of a short needle can minimize risk.

## Complications from Steroid Injection

Potential complications related to the injection of steroids include:

1. Steroid flare — this is probably the most common complication from steroid injection. It is seen in less than 10% of injections. Steroid flare manifests as increasing pain approximately 6 to 12 hours after injection and can last up to 72 hours. If symptoms last longer than 72 hours, the possibility of infection should be considered. Possible causes include preservatives in the lidocaine or steroid crystals. For these reasons, using a single-dose vial of lidocaine (no preservatives) or bupivacaine (longer-acting anesthetic) are potential strategies to prevent steroid flare. The treatment of steroid flare is conservative, using nonsteroidal anti-inflammatory drugs (NSAIDs) and ice. Patients should be reassured that the injection is no less likely to be effective in spite of steroid flare symptoms.
2. Atrophy or depigmentation of the skin overlying the area injected. This is more likely with injections performed in areas where the skin is thin (< 5mm), such as the elbow epicondyle or Iliotibial band of the knee.
3. Potential for blood sugar to rise in brittle diabetics, or menstrual irregularities in female patients.
4. Worsening a pre-existing joint infection (infection is unlikely if aspirate from the joint is clear).
5. Cartilage or joint deterioration — repeated steroid injections have been reported to accelerate cartilage deterioration and resultant degenerative arthritis (especially in weight-bearing joints). Studies performed on rabbits demonstrated early degenerative changes after multiple injections, but studies on humans have failed to show a similar effect. There is no evidence that steroid injections result in clinically significant joint deterioration.
6. Tendon rupture — this is unlikely to occur if care is taken to avoid injecting directly into a tendon. As a rule, steroid injections around high-load tendons (Achilles or patella) should be avoided.

## Precautions

Specific precautions should be considered before doing a steroid injection:

1. Consider limiting the number of injections in any joint or area (especially weight-bearing) to 3 or fewer per year. If more than 3 injections are needed in 1 year, their effectiveness should be questioned and an alternative therapy considered.
2. Avoid injections in patients who cannot rest the injected joint. A steroid injection is much less likely to be effective if the patient immediately returns to activity without a 1 to 2 week period of rest.
3. Peritendinous injection should be performed as opposed to injecting directly into a tendon. Avoiding intra-tendon injection should decrease the possibility of tendon rupture associated with steroid injection.
4. Avoid trauma to the articular cartilage caused by the needle at the injection site. Articular cartilage has been likened to tree bark, and scratching it with a needle is likely to result in a permanent defect. Paying close attention to anatomic landmarks and depth of injection can minimize this risk.
5. When performing hand or foot injections, dorsal extensor sites are usually preferable. This tends to produce less pain and allows for easier injection.

## Indications for Steroid Injection

Indications for the therapeutic injection of steroids include:

1. Tendinitis or bursitis not responding to conservative treatment measures. With bursitis, the volume of the injection may be important therapeutically. Using larger volumes of saline or lidocaine combined with steroids may have enhanced benefits via rupture of adhesions (especially with subacromial bursitis).
2. Inflammatory conditions such as rheumatoid arthritis and osteoarthritis. Injections can provide symptomatic relief and calm inflammation, especially when systemic treatment is contraindicated (as in patients intolerant to NSAIDs). In rheumatoid arthritis, the treatment of only 1 or 2 bothersome joints with a therapeutic injection, may avoid the need for increased systemic medications and their potential side effects.
3. Crystal arthritis (gout, pseudogout) not responding to conservative measures can be quickly calmed with a steroid injection. Also, seronegative spondyloarthropathy-associated inflammatory arthritis (ankylosing spondylitis, psoriatic arthritis, Reiter's) responds well to steroid injection.
4. Neuritis (carpal tunnel, tarsal tunnel, sciatica). Injections can provide symptomatic (and even permanent) relief and also be helpful diagnostically. Relief of symptoms after injection is confirmatory evidence of neuritis.

## Supplies

Supplies commonly used for injection and aspiration include:

1. Syringes — 3cc, 5cc, 10cc for injection; 3cc to 30cc for aspiration (depending on size of effusion).
2. Needles — 22-g, 25-g, 30-g for injection; 18-g for aspiration.
3. Two 4x4 gauze pads — one soaked with Betadine and the other with alcohol.
4. Hemostat — used to help remove syringe from the needle when aspirating a large joint.
5. Gloves (sterile or nonsterile).

## Injectables

No steroid preparation has been proven superior for use in joint or soft tissue injection *(Table 1).* In general, short-acting steroid preparations should be avoided. They are more water soluble, absorb more rapidly and thought more likely to cause steroid flare or systemic effects. Short-acting agents are also more likely to cause hyperglycemia in diabetic patients. Triamcinolone and prednisone have the highest proportion of anti-inflammatory effect with the lowest proportion of mineralocorticoid effect. Triamcinolone works well for mixture injections because it does not precipitate in lidocaine.

Local anesthetics, such as lidocaine, are commonly combined with a steroid preparation. A longer-acting anesthetic, such as bupivacaine, can be used to prolong the anesthetic effect. Anesthetics with epinephrine should be avoided to prevent vasoconstriction that would inhibit diffusion of the injected material. Many steroids precipitate in the syringe when mixed with lidocaine, but are generally effective despite this. This is less of a problem using single-dose vials of lidocaine and with triamcinolone. As a rule, more lidocaine (not steroid) should be used when a greater volume of injection is desired.

## Injection Procedure

A stepwise approach as follows should be used with every injection:

1. Have the patient lie down if possible (except for shoulder injections) to avoid injury if syncope should occur.
2. Palpate bony landmarks to determine the site for needle insertion.
3. Mark the injection site by indenting the skin with a retracted ballpoint pen or needle cap.
4. Clean the injection site with Betadine. Wipe once with alcohol to remove excess Betadine.
5. Do not touch the injection site once it has been cleaned. Therefore, one can use sterile or nonsterile gloves to protect from blood exposure.
6. A topical vapocoolant spray (Fluoromethane) can be applied to the injection site prior to needle insertion to decrease associated pain.
7. Insert the needle deeply at the designated spot and then inject while slowly pulling the needle back. Often, a fan-like pattern is used to widely distribute the injected material into soft tissues. For most injections, it is not necessary to aspirate prior to injecting (especially if pulling back on the needle while one injects).

## Aspiration Procedure

When aspirating a joint, cyst, or bursa, the above steps for injection should be followed. In addition, the following additional steps may be performed:

1. Consider anesthetizing more difficult-to-aspirate joints (such as the knee or finger) with lidocaine prior to aspiration. A 25-g to 30-g needle can be used to numb the skin and soft tissue above the joint.
2. Use an 18-g needle with a 3cc to 30cc syringe depending on the amount of aspirate anticipated (some large knee effusions may call for several 30cc syringes for complete aspiration).
3. Aspirated fluid should be sent for analysis when indicated *(Tables 2 and 3).* If the aspirate is bloody, hold it up to the light to look for fat globules floating in the blood. These are seen with an associated fracture. *Table 4* identifies the differential diagnosis of arthritis based on synovial fluid white blood cell count.

## Post-injection Instructions:

After completing the injection, the following steps may be helpful:

1. Massage the injected area and move the joint through a full range of motion to help distribute the medication. When the patient gets immediate relief after injection, they can be reassured the medication is in the correct spot and the injection should be effective.
2. Advise the patient to place ice packs over the injected joint for 20 minute intervals every few hours during the next 1 to 2 days after injection. This helps decrease local bleeding, relieves pain, and may lessen the chance of steroid flare.
3. If the injection is near a tendon, avoid sudden ballistic stress on that tendon (such as throwing a ball or swinging a racket) for 2 weeks. Rehabilitation exercises, starting with range-of-motion, should begin gradually as tolerated. This should be followed by a gradual return to activity as tolerated.
4. NSAIDs and ice can be used as needed for pain relief.

## Hyaluronan Injections

These injections are used mainly for osteoarthritis (OA) of the knee in an attempt to delay knee replacement.

1. Two compounds are commonly used (both are expensive):
   - Sodium Hyaluronate (Hyalgan) — given as 5 injections, administered 1 week apart.
   - Hylan G-F 20 (Synvisc) — given as 3 injections, administered 1 week apart.
2. Hyaluronan injections work by decreasing inflammation and may stimulate endogenous hyaluronan synthesis. The concentration of hyaluronan is decreased in patients with OA.
3. These injections may be used in place of or after steroid injections to delay surgical intervention. There is no evidence they can retard the progression of degenerative joint disease, but they can delay the need for knee replacement (as can steroid injections).
4. Possible serious adverse reactions to hyaluronan injections include local inflammatory reactions, septic arthritis, and anaphylaxis.

## Common Sites and Indications for Injection and Aspiration

The following conditions are common indications for cortisone injections in the family medicine setting.

### *Shoulder*

1. Subacromial bursa — rotator cuff (RC) tendinitis, bursitis, impingement syndrome, biceps tendinitis, frozen shoulder.
2. Acromioclavicular (AC) joint — arthritis, osteolysis.
3. Glenohumeral joint — frozen shoulder, glenohumeral joint arthritis.

### *Elbow*

1. Epicondylitis (medial or lateral).
2. Olecranon bursitis.

### *Wrist and Hand*

1. Carpal tunnel syndrome.
2. 1st carpometacarpal (thumb) joint arthritis.
3. deQuervain's tendinitis.
4. Trigger finger.
5. Finger joints (OA or RA).

### *Hip*

1. Trochanteric bursitis.
2. Iliotibial (IT) band tendinitis (near greater trochanter).

### *Knee*

1. Knee joint — osteoarthritis, to aspirate blood.
2. Pes Anserine bursitis.
3. Iliotibial band tendinitis (near lateral femoral condyle).
4. Fat pad.

### *Foot*

1. Plantar fasciitis.
2. Morton's neuroma.
3. Metatarsal-phalangeal joint arthritis or gout.

### Miscellaneous

1. Trigger points — fibromyalgia.
2. Ganglion cysts.

# How to Perform Common Injections and Aspirations

# How To Perform Common Injections

## Shoulder

1. **Subacromial Injection (Figure A-1)**
   *Supplies:* 25-g, 1½ inch needle; 5cc or 10cc syringe; 3cc to 8cc 1% lidocaine and 2cc triamcinolone (20 mg/ml).

   *Approach:* Find the posterior tip of the acromion and insert the needle about 1 cm below that landmark. Completely advance the needle in a perpendicular direction under the acromion, aiming in a slightly cephalad direction. Inject while slowly pulling back on the syringe. If resistance is felt, pull back and re-direct the needle. This approach deposits injection within the subacromial bursa, reaching the RC tendons and the long head of the biceps tendon anteriorly.

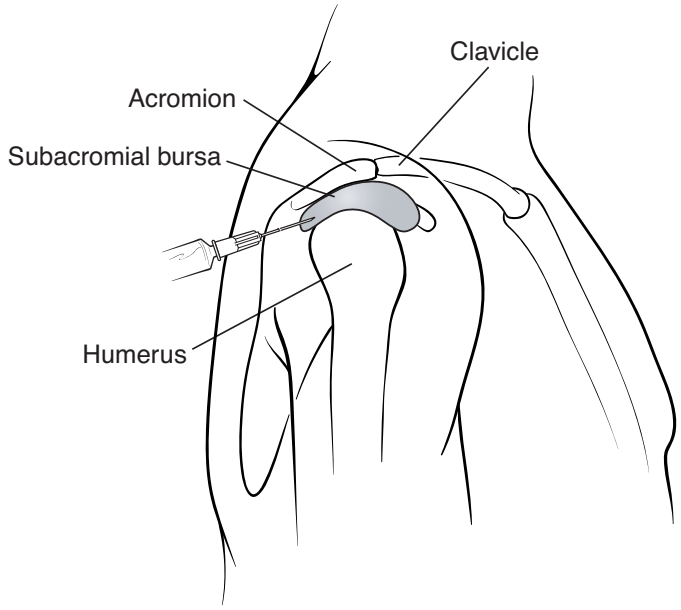


**Figure A-1**

2. **AC Joint Injection (Figure A-2)**
   *Supplies:* 25-g, ½ to 1 inch needle; 3cc syringe; 1cc 1% lidocaine and 1cc triamcinolone (20 mg/ml).

   *Approach:* Insert the needle above the AC joint and perpendicular to the clavicle at the point of maximum pain, aiming slightly medial. You may need to "walk" the needle along the lateral clavicle just beyond the distal clavicular condyle (sometimes distorted by inflammatory changes) and into the joint.

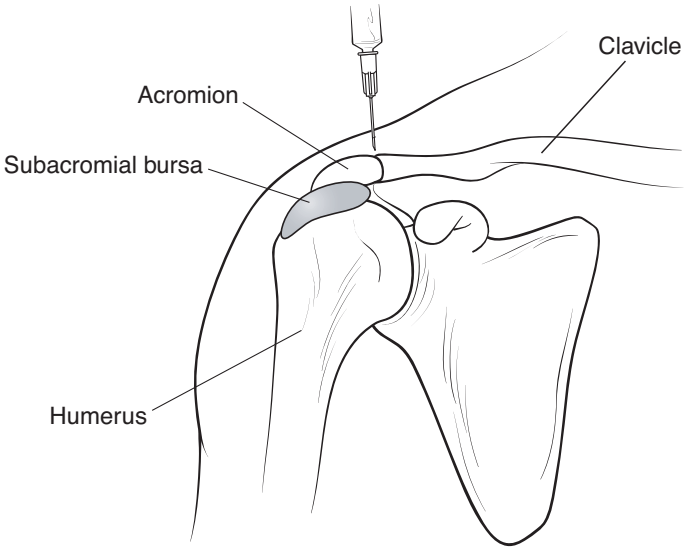


**Figure A-2**

3. **Glenohumeral Joint Injection (Figure A-3)**

   *Supplies:* 25-g, 1½ inch needle; 3cc syringe; 2cc 1% lidocaine and 1cc triamcinolone (20 mg/ml).

   *Approach:* This injection is most often performed using an anterior approach to this joint. With an anterior approach, insert the needle 1 thumb width lateral and 1 thumb width inferior to the coracoid process (where the humeral head curves medially under the pectoralis muscle). Direct the needle perpendicular and slightly lateral to the patient to enter the joint.

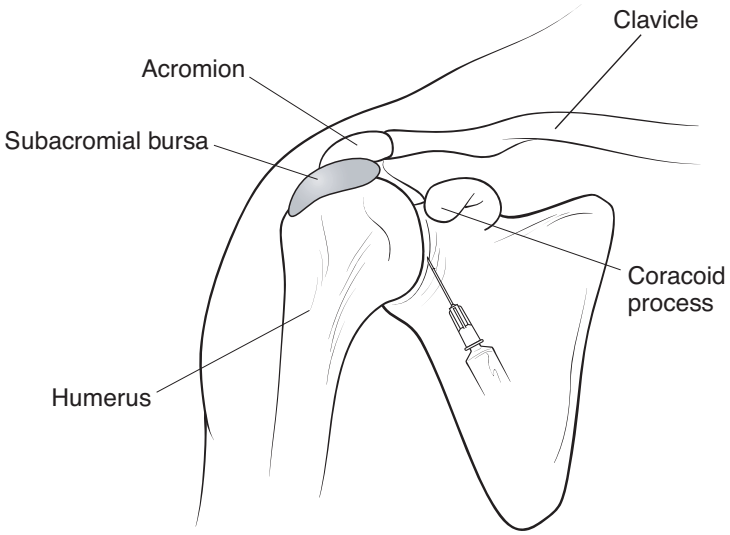


**Figure A-3**

## Elbow

1. **Lateral or Medial Epicondyle Injection (Figure B-1)**

   *Supplies:* 25-g to 30-g, ½ inch needle; 3cc syringe; 1cc 1% lidocaine and 1cc triamcinolone (20 mg/ml).

   *Approach:* Insert the needle tangentially at the epicondyle, about 1 cm from the site of maximum tenderness. Insert the needle deeply into the subcutaneous tissue (to avoid skin depigmentation and atrophy), advancing to the tender area. Slowly inject the contents of the syringe while pulling the needle back and then again advancing in a fan pattern.

   **Note — Because the skin overlying this area is often thin, patients should be warned about the potential for skin depigmentation and dimpling.*

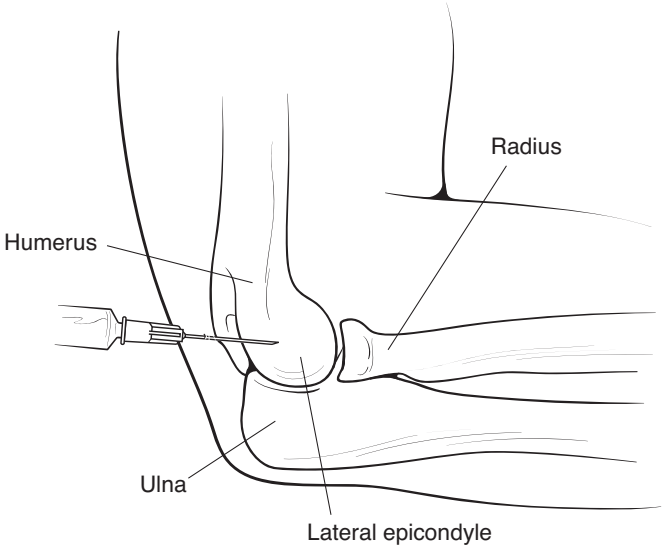


**Figure B-1**

2. **Olecranon Bursa Aspiration (Figure B-2)**

   *Supplies:* 18-g needle; 10cc syringe.

   *Approach:* The Olecranon bursa can be aspirated to rule out infection or remove fluid to relieve discomfort. The skin can be anesthetized first with lidocaine and the bursa entered from the side, using a Z-track maneuver (pull skin to side before inserting needle to seal the puncture site after needle is removed). In most cases (when infection is not suspected), it is best to ignore a swollen Olecranon bursa and treat symptomatically, allowing the fluid to reabsorb.

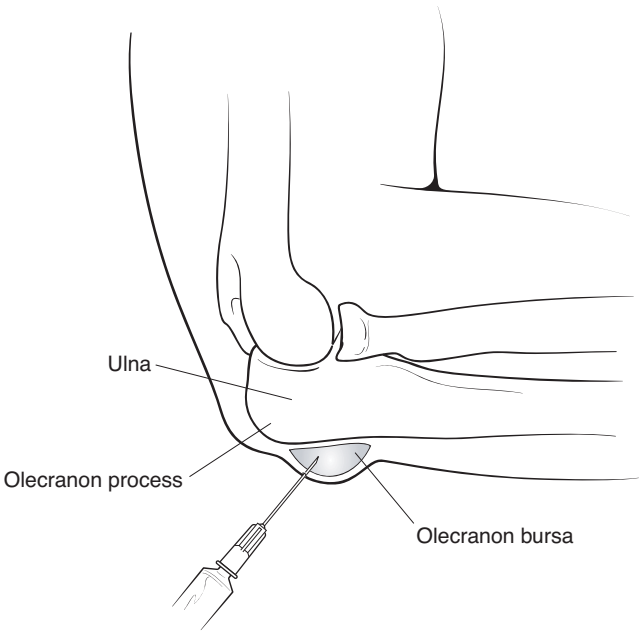


**Figure B-2**

## Wrist and Hand

1. **Carpal Tunnel Injection (Figure C-1)**

   *Supplies:* 25-g, 1 to 1½-inch needle; 3cc syringe; 1cc 1% lidocaine and 1cc triamcinolone (20 mg/ml).

   *Approach:* Insert the needle at a 30º angle to the skin on the volar wrist surface at the proximal wrist crease. You should aim at the proximal inter-phalangeal (PIP) joint of the middle finger, along the ulnar margin of the palmaris longus tendon (flex the middle finger against resistance to see this tendon). The key is to stay ulnar to the tendon, avoiding the radial artery.

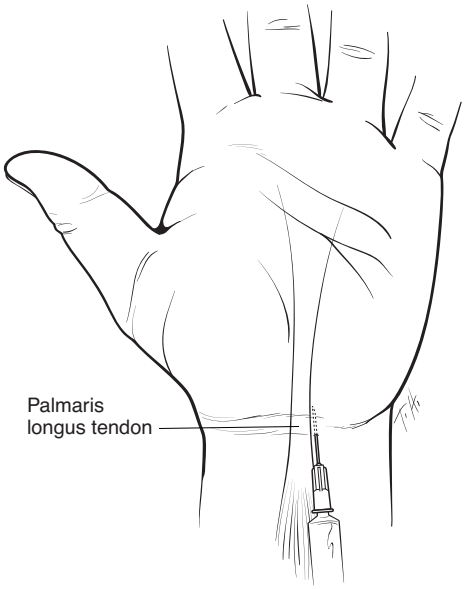


**Figure C-1**

2. **Trigger Finger Injection (Figure C-2)**

   *Supplies:* 25-g, ½ to 1 inch needle; 3cc syringe; 1cc 1% lidocaine and 1cc triamcinolone (20 mg/ml).

   *Approach:* Insert the needle at the metacarpophalangeal joint (MCP) flexor crease distally and advance to the area where "pop" occurs during finger flexion (overlying the metacarpal head). The needle should be inserted with the finger extended and then slightly flexed after insertion (this will release the tendon from the needle tip if accidentally pierced during insertion).

**Figure C-2**

3. **deQuervain's Tendinitis Injection (Figure C-3)**

   *Supplies:* 25-g, 1 to 1½ inch needle; 3cc syringe; 1cc 1% lidocaine and 1cc triamcinolone (20 mg/ml).

   *Approach:* With the wrist in slight ulnar deviation, insert the needle at a tangential angle just distal to the point of maximum tenderness on the tendon. Direct the needle from distal to proximal, attempting to insert the needle just under the tendon sheath and above the tendon. Try to inject between the tendon and its sheath. This injection usually works well even when this potential space is not located.

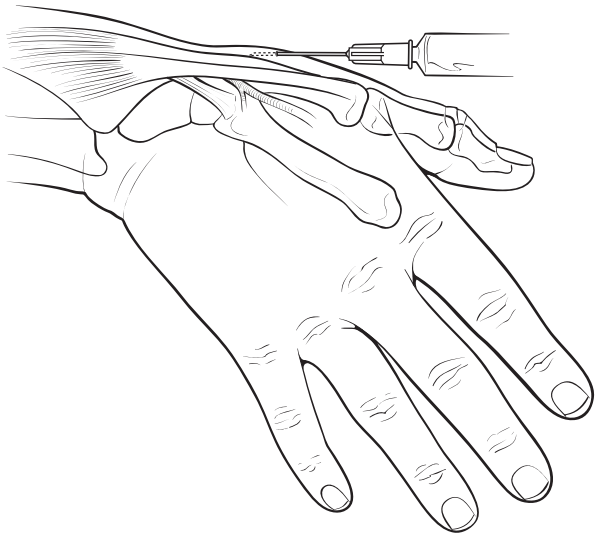

**Figure C-3**

4. **1st Carpal Metacarpal Joint Injection (Figure C-4)**

   *Supplies:* 25-g, ½ to 1-inch needle; 3cc syringe; ½ cc lidocaine and ½ cc triamcinolone (20 mg/ml).

   *Approach:* Locate the proximal end of the 1st metacarpal bone near the apex of the anatomic "snuff box." Passively flexing and extending the thumb while palpating this area can help locate the joint. Aim the needle in a slightly ulnar direction at the joint line to avoid the radial artery (which lies near the base of the "snuff box"). Pulling traction on the thumb can help open the joint space.

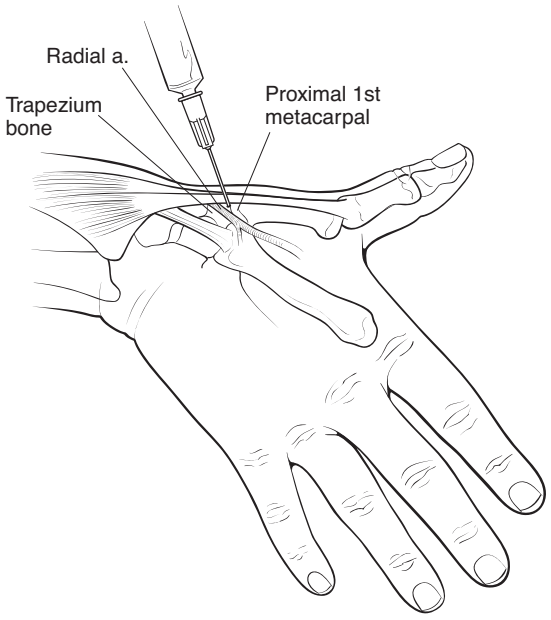


**Figure C-4**

## Hip

1. **Trochanteric Bursa and Iliotibial Band Injection (Figure D-1)**

   *Supplies:* 25-g, 1½ inch needle; 5cc syringe; 3cc 1% lidocaine and 2cc triamcinolone (20 mg/ml).

   *Approach:* This injection is performed with the patient lying on the unaffected side. Direct the needle perpendicular to the skin at the site of maximal tenderness and advance just down to the greater trochanter. Pull back slightly while injecting in a fan-like pattern in the area of tenderness.

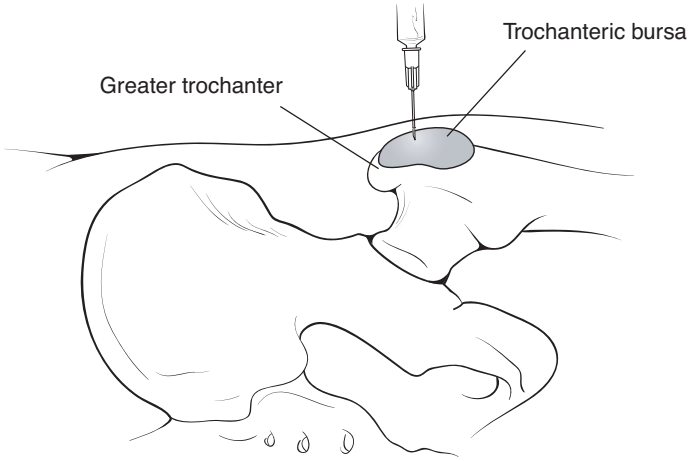


**Figure D-1**

## Knee

1. **Knee Aspiration (Figure E-1)**

   *Supplies:* 18-g, 1½ inch needle; 2 or more 30cc syringes to aspirate; 25-g, 1½ inch needle with 5cc syringe to numb, using 5cc 1% lidocaine. Hemostat to hold needle when changing syringes.

   *Approach:* With the patient supine and the knee extended, insert needle at the intersecting point of a longitudinal line along the medial patella margin and a horizontal line along the superior patella margin (may also use a similar lateral approach). Direct the needle parallel to the floor and just under the patella, allowing entrance into the suprapatellar joint pouch (avoiding injury to articular cartilage). Consider using a 25-g needle to numb with lidocaine first using the same approach, and then follow with an 18-g needle to aspirate.

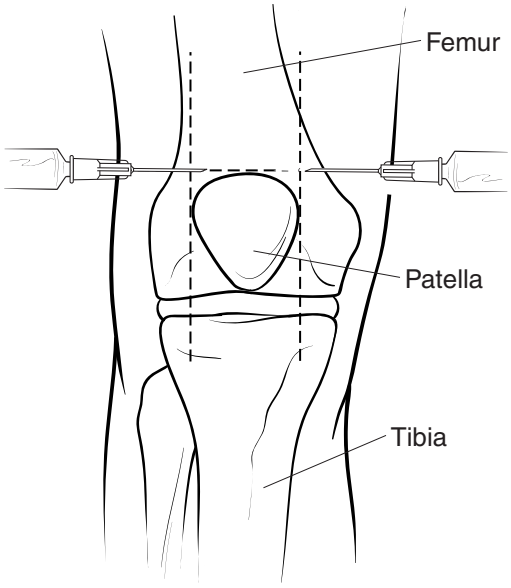


**Figure E-1**

2. **Knee Injection (Figure E-2)**

   *Supplies:* 25-g, 1½ inch needle; 5cc syringe; 3cc 1% lidocaine and 2cc triamcinolone (20 mg/ml).

   *Approach:* With the patient seated and the knee flexed to 90º, insert the needle just medial (or lateral) to the patella tendon (at either the medial or lateral "divot" of the knee joint), advancing toward the intercondylar notch of the tibia. If the needle is inserted medially, aim in a posterolateral direction toward the greater trochanter. If inserted laterally, aim in a posteromedial direction toward the symphysis pubis.

   **Note — aspiration of the knee joint is difficult in this position, as the effusion will be forced into the supra- and infra-patellar pouches with the knee flexed to 90º.*

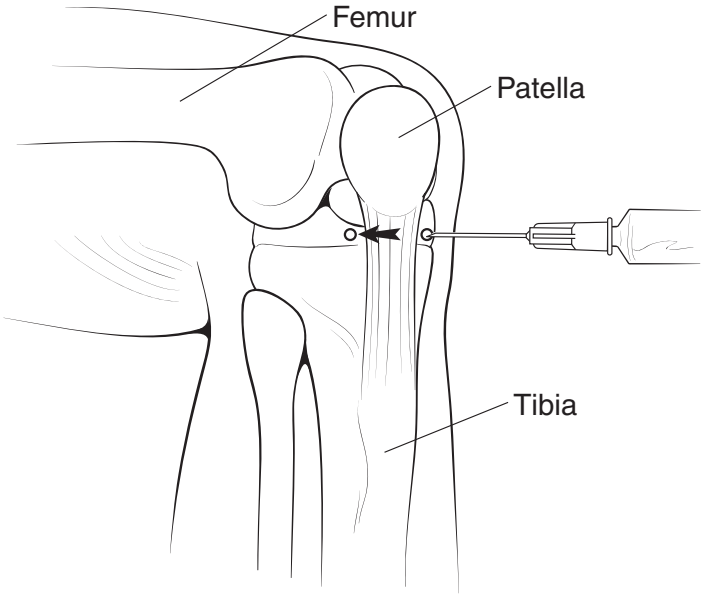


**Figure E-2**

3. **Pes Anserine Bursa Injection (Figure E-3)**

   *Supplies:* 25-g, ½ to 1 inch needle; 3cc syringe; 1cc 1% lidocaine and 1cc triamcinolone (20 mg/ml).

   *Approach:* Insert the needle about 1cm from the tender area, at a tangential angle to the tibia. Advance the needle beyond the area of maximal tenderness and inject while pulling the needle back in a fan-like pattern through this area.

   **Note — Because the skin overlying this area is often thin, patients should be warned about the potential for skin depigmentation and dimpling.*

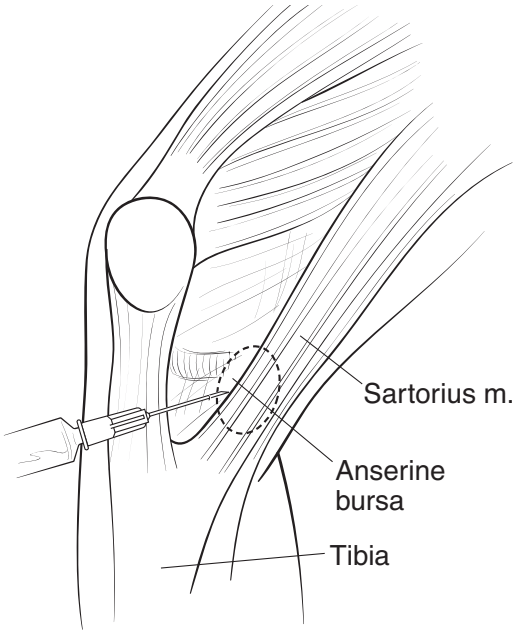


**Figure E-3**

4. **Iliotibial Band Injection (Figure E-4)**

   *Supplies:* 25-g, ½ to 1 inch needle; 3cc syringe; 1cc 1% lidocaine and 1cc triamcinolone (20 mg/ml).

   *Approach:* Insert the needle at a tangential angle, about 1cm away from the area of tenderness over the lateral femoral condyle. Inject the tender area slowly while pulling back on the needle in a fan-like pattern.

   **Note — Because the skin overlying this area is often thin, patients should be warned about the potential for skin depigmentation and dimpling.*

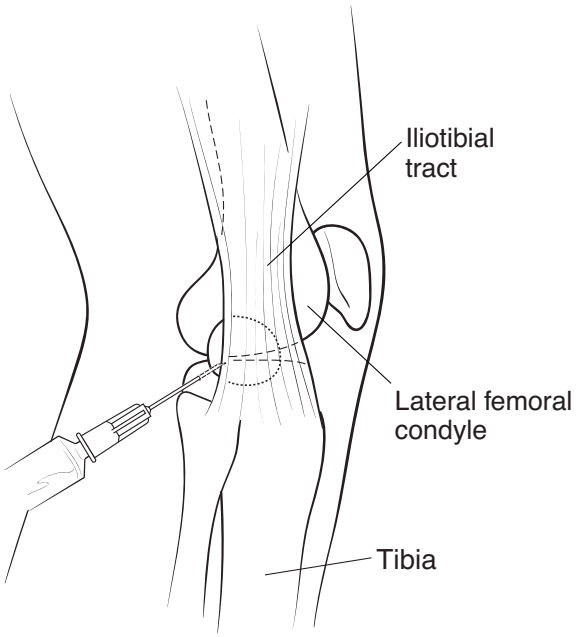


**Figure E-4**

## Foot

1. **Plantar Fascia (heel spur) Injection (Figure F-1)**

   *Supplies:* 25-g, 1½ inch needle; 3cc syringe; 2cc 1% lidocaine and 1cc triamcinolone (20 mg/ml).

   *Approach:* Palpate the area of maximal pain on the plantar surface of the foot. Insert the needle from the medial side at the intersection of a line drawn parallel to the bottom of the foot 1 finger width above the sole (superior to the thickened skin) and a perpendicular line drawn from the point of maximal tenderness. Direct the needle tip into the painful area and inject in a fan pattern. Superficial injection may cause atrophy of the heel fat pad, so inject deeply near the fascial attachment to the calcaneus.

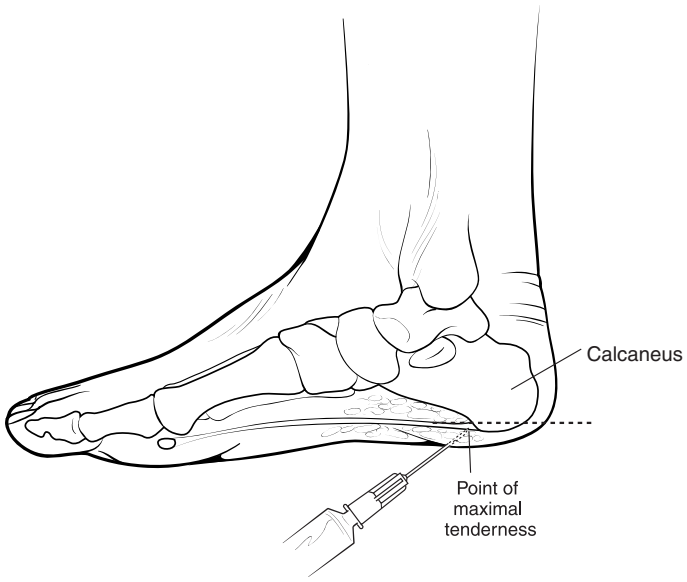


**Figure F-1**

2. **Morton's Neuroma Injection (Figure F-2)**

   *Supplies:* 25-g, 1 to 1½ inch needle; 3cc syringe; 1cc 1% lidocaine and 1cc triamcinolone (20 mg/ml).

   *Approach:* Insert the needle on the dorsal side of the foot in the area of maximal tenderness between the metatarsal heads. Inject the tender area using a narrow fan pattern.

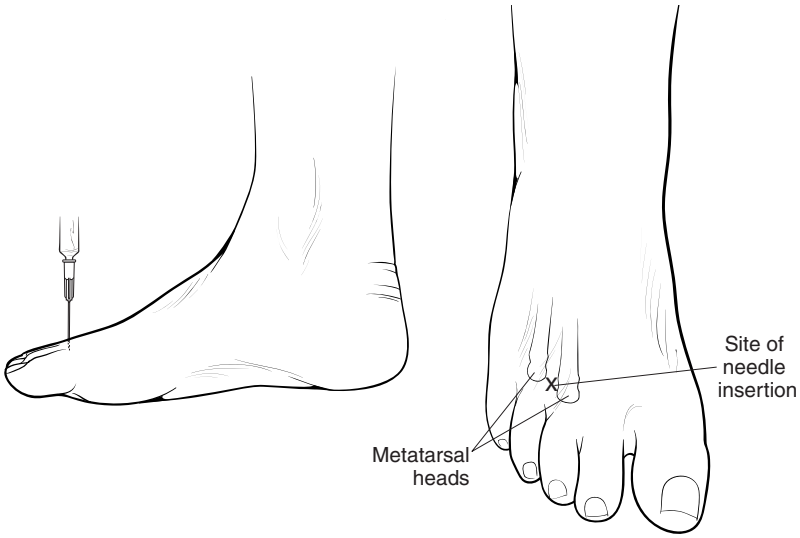


**Figure F-2**

## Miscellaneous Problems

1. **Ganglion Cyst Aspiration (Figure G-1)**

   *Supplies:* 18-g, 1½ inch needle; 5cc syringe to aspirate; 30-g, ½ inch needle with 3cc syringe to numb using 1cc 1% lidocaine.

   *Approach:* First, numb the skin overlying the cyst, inserting the needle in a tangential fashion. Next, insert an 18-g needle into the cyst at the point of maximal fluctuance. The cysts contain a thick jelly-like material that is often difficult to aspirate. Avoid aspirating on the volar wrist, especially at the radial side, since these ganglia are often wrapped around the radial artery.

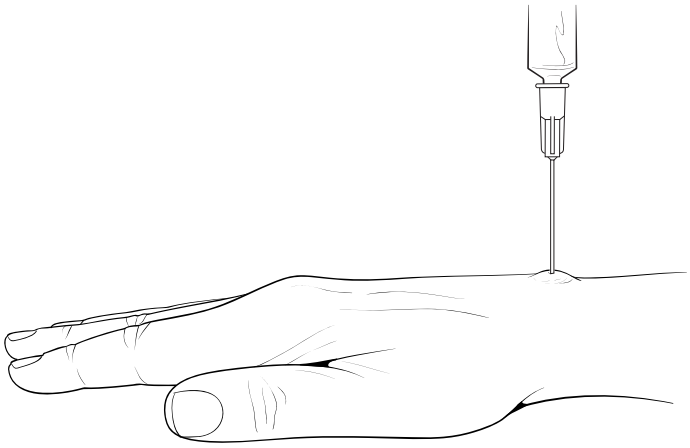

**Figure G-1**

2. **Finger or Toe Joint Injection (Figure G-2)**

   *Supplies:* 25 to 30-g, ½ inch needle; 3cc syringe; ½cc 1% lidocaine and ½cc triamcinolone (20 mg/ml).

   *Approach:* Flex the joint slightly to open up the joint space. Insert the needle on dorsal side (avoid volar) either medial or lateral to the extensor tendon. These small joints are often difficult to enter and painful.

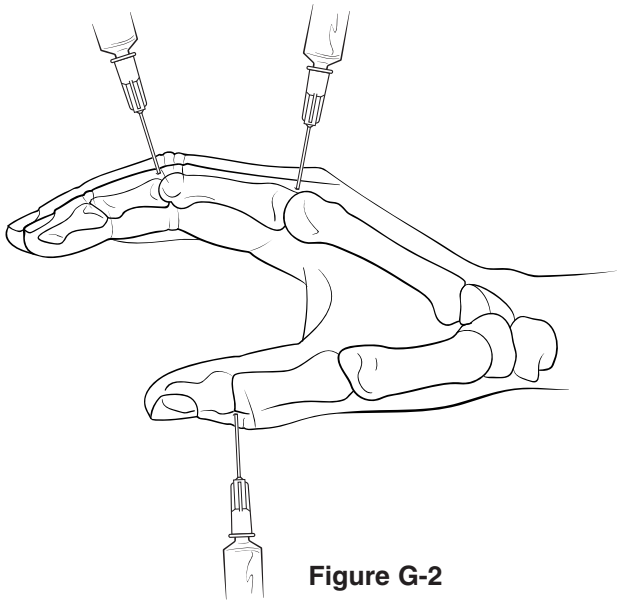

**Figure G-2**

3. **Trigger Point Injection**

   *Supplies:* 30-g, ½ inch needle; 3cc syringe; 1% lidocaine.

   *Approach:* Insert needle at the point of maximal tenderness and inject ½ cc of lidocaine in a narrow fan pattern. When injecting on chest wall, have patient exhale prior to needle insertion to avoid pneumothorax.

**Table 1**

### Relative Potency of Steriod Preparations

| Corticosteroid | Relative Potency | Equivalent Dose (mg) |
|---|---|---|
| *Short-acting* | | |
| Cortisone | 0.8 | 25 |
| Hydrocortisone | 1 | 20 |
| *Intermediate-acting* | | |
| Prednisone | 3.5 | 5 |
| Triamcinolone | 5 | 4 |
| Methylprednisolone | 5 | 4 |
| *Long-acting* | | |
| Dexamethasone | 25 | 0.6 |
| Betamethasone | 25 | 0.6 |

**Table 2**

### Synovial Fluid Analysis

1. Physical characteristics: color, clarity, viscosity
2. Microscopic appearance: white blood cell count and differential, crystals (polarized light)
3. Microbiology: Gram stain, bacterial culture, fungal culture (if indicated), mycobacterial culture (if indicated)
4. Glucose levels (need simultaneous serum levels)

**Table 3**

### Characteristics of Normal and Pathologic Synovial Fluid

| Characteristic | Normal | Pathologic |
|---|---|---|
| Appearance | Pale yellow, clear | Yellowish green to gray<br>Cloudy to opaque |
| Viscosity | Viscous | Decreased viscosity<br>or watery |
| Clot formation | No clotting | Clots on standing |
| White blood cell count | Less than 600 per mm3 (0.6x109per L) | More than 2,000 per mm3 (2.0x109per L) |
| Differential | Polys <25% (0.25) | Polys >65% (0.65) |
| Cultural | Sterile | Positive or negative |
| Glucose | Same as blood | Different from blood,<br>>30 mg per dL |

**Table 4**

### Synovial Fluid White Blood Cell Count and Diagnosis of Arthritis

| Non-inflammatory<br>200-2,000 per $mm^3$ | Inflammatory<br>2,000-50,000 per $mm^3$ | Septic<br>50,000-300,000 per $mm^3$ |
|---|---|---|
| Degenerative joint disease | Rheumatoid arthritis | Bacterial infections |
| Trauma (*) | Psoriatic arthritis | |
| Osteochondritis dissecans | Ankylosing spondylitis | |
| Rheumatic fever | Acute rheumatic fever | |
| Chronic gout | Acute gout | |
| Chronic pseudogout | Acute pseudogout | |
| Polymyositis | Polymyositis | |
| Scleredema | Scleroderma | |
| SLE | SLE | |
| Neuropathic arthropathy (*) | Reiter's syndrome | |
| Erythema nodosum | Arthritis of chronic inflammatory bowel disease | |
| Pigmented villonodular synovitis (*) | Fungal infections | |
| | Viral infections | |
| Hypertrophic Osteoarthropathy | Bacterial infections (partially treated) | |

*(*) May be hemorrhagic*

# References


1. Cardone DA, Tallia AF. Joint and soft tissue injection. *Am Fam Physician.* 2002;66:283-90.
2. Cardone DA, Tallia AF. Diagnostic and therapeutic injection of the elbow region. *Am Fam Physician.* 2002;66:2097-100.
3. Cardone DA, Tallia AF. Diagnostic and therapeutic injection of the hip and knee. *Am Fam Physician*. 2003;67:2147-52.
4. Pfenninger JL. Joint and soft tissue aspiration and injection. In: Pfenninger JL, Fowler GC, eds. Procedures for primary care physicians. 2d ed. St. Louis, Mo.: Mosby, 1994:1036-54.
5. Pfenninger JL, ed. The clinics Atlas of Office Procedures: Joint Injection Techniques, Vol 5(4), Dec 2002, WB Saunders, Philadelphia, PA.
6. Rifat SF, Moeller JL. Basics of joint injection: general techniques and tips for safe, effective use. *Postgrad Med.* 2001;109:157-66.
7. Rifat SF, Moeller JL. Site-specific techniques of joint injection: useful additions to your treatment repertoire. *Postgrad Med.* 2001;109:123-36.
8. Tallia AF, Cardone DA. Diagnostic and therapeutic injection of the shoulder region. *Am Fam Physician.* 2003;67:1271-8.
9. Tallia AF, Cardone DA. Diagnostic and therapeutic injection of the wrist and hand region. *Am Fam Physician.* 2003;67:745-50.
10. Tallia AF, Cardone DA. Diagnostic and therapeutic injection of the ankle and foot. *Am Fam Physician.* 2003;68:1356-62.

# Joint Injection and Aspiration

## Video Learning Package

## Self Assessment Questions

1. Contraindications to aspiration or injection include?
   a. Joint prosthesis
   b. Cellulitis
   c. Bacteremia
   d. All of the above

2. Infection related to injection is usually due to which bacteria?
   a. Staph aureus
   b. Staph epidermidis
   c. Group B strep
   d. Group A strep

3. The most common complication from steroid injection is?
   a. Tendon rupture
   b. Diabetes flare
   c. Steroid flare
   d. Menstrual irregularities

4. Precautions which may help prevent steroid flare include?
   a. Using a single dose vial of Lidocaine
   b. Using Bupivacaine
   c. Using NSAID's prior to injection
   d. A and B

5. Short acting steroids are preferred for joint injections?
   a. True
   b. False

6. When a greater volume of injection is desired
   a. Increase the amount of steroid only
   b. Increase the amount of Lidocaine and steroid in equal parts
   c. Increase the amount of Lidocaine only
   d. Give two injections

7. The correct order for preparation of the injection site is?
   a. Mark injection site, palpate bony landmark, wipe once with alcohol, clean with betadine
   b. Clean area with betadine, wipe once with alcohol, palpate bony landmark, mark injection site
   c. Palpate bony landmarks, mark injection site, clean with betadine, wipe once with alcohol
   d. Palpate bony land marks, clean with betadine, wipe once with alcohol, mark injection site

8. When examining aspirate from a joint, the presence of fat globules suggest?
   a. Infection
   b. Gout
   c. Arthritis
   d. Fracture

9. After an injection, the patient should do all of the following except?
   a. Apply ice packs
   b. Take NSAID's as needed
   c. Massage the injected area
   d. Avoid moving the shoulder

10. All of the following are true regarding Hyaluronan injections except?
    a. They are used primarily for osteoarthritis
    b. They are used in place of steroid injections
    c. They are inexpensive
    d. They can delay the need for knee replacement

11. The posterior tip of the acromion is an appropriate landmark for which injection?
    a. A.C. joint injection
    b. Subacromial injection
    c. Glenohumeral joint injection
    d. Biceps tendon injection

12. The key to avoiding the radial artery during carpal tunnel injection is to?
    a. Stay ulnar to the palmaris longus tendon
    b. Inject distal to the radial artery
    c. Inject on the dorsal wrist surface
    d. Inject at the distal wrist crease

13. Subcutaneous steroid deposition may increase the risk of?
    a. Skin depigmentation
    b. Fat atrophy
    c. Bleeding
    d. Both a and b

14. Approximately what percentage of patients will experience a temporary increase in pain for 24 to 48 hours after corticosteroid injection?
    a. 75%
    b. 50%
    c. 25%
    d. <10%

15. The proper approach to epicondyle injections is to insert the needle?
    a. About 1 cm from the site of maximum tenderness
    b. Directly into bone at the epicondyle
    c. Into the tendon attached to the epicondyle
    d. Above the ulnar nerve

16. The appropriate approach to A.C. joint injections should be?
    a. Anterior to the clavicle
    b. Posterior to the clavicle
    c. Above the A.C. joint and perpendicular to the clavicle
    d. 1 cm from the site of maximum tenderness

17. Olecranon Bursa Aspiration:
    a. May be indicated to rule out infection.
    b. Should be performed using Z-track maneuver
    c. Is best avoided if infection is not suspected
    d. All the above

18. The best approach to Trigger Finger Injection is?
    a. At the MCP flexor crease
    b. At the PIP flexor crease distally
    c. At the DIP flexor crease
    d. At the Palmer crease

19. Locating the 1$^{st}$ Carpal Metacarpal Joint for injection is best done by?
    a. Locating the proximal end of the 1$^{st}$ metacarpal near the “snuff box”
    b. Passively flexing and extending the thumb while palpating
    c. Pulling on the thumb to open the joint space
    d. All of the above

20. Which surface on the heel should be entered when injecting the plantar fascia?
    a. Lateral
    b. Plantar
    c. Medial
    d. Posterior

21. Which approach should be used when injecting toe or finger joints?
    a. Ventral
    b. Dorsal
    c. Palmer
    d. Anterior

22. When injecting the chest wall, you can have the patient do this to reduce the risk of pneumothorax?
    a. Inhale and hold breath
    b. Exhale and hold breath
    c. Breathe rapidly in and out
    d. Stand

23. Which structure in the knee should not be injected with cortisone?
    a. Prepatella bursa
    b. The joint space
    c. Patella tendon
    d. Pes anserine bursa

24. Aspirating ganglion cysts in this area of the wrist should be avoided?
    a. Dorsal - ulnar
    b. Dorsal - radial
    c. Volar – radial
    d. All of the above

25. What gauge needle should be used to aspirate a ganglion cyst?
    a. 30
    b. 25
    c. 20
    d. 18

26. Intermediate acting steroid preparations include all except?
    a. Triamcinolone
    b. Prednisone
    c. Methylprednisolone
    d. Dexamethasone

27. Synovial fluid with a WBC count > 50,000 per mm3 is indicative of which of the follJoint Injection and Aspirationowing?
    a. SLE
    b. Acute gout
    c. Rheumatoid arthritis
    d. Bacterial infection

28. Superficial injection of a heel spur can result in what serious complication?
    a. Achilles tendon rupture
    b. Heel fat pad necrosis
    c. Ganglion cyst formation
    d. Ankle instability

29. The normal appearance of aspirated synovial fluid is?
    a. Tan and cloudy
    b. Green and thick
    c. Red and watery
    d. Pale yellow and clear

30. Essential studies on aspirated synovial fluid include:
    a. Gram stain
    b. Antinuclear antibodies (ANA)
    c. Lactate Dehydrogenase (LDH)
    d. All of the above

# Joint Injection and Aspiration
# Self-study Program

## *Evaluation*

Name: _____ AAFP ID#: _____

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We hope this program has provided information that will be useful to you in your practice. Your evaluation will help us plan future programs. May we have your comments?

1. What was your overall opinion of the CD-ROM program?
   ❑ Excellent ❑ Good ❑ Satisfactory ❑ Poor

2. Did the material presented meet the stated objectives? ❑ yes ❑ no

3. What changes will you make in your practice as a result of studying this CD-ROM?

_____

_____

4. What did you like most and/or least about this program?

_____

_____

5. What other CD-ROM programs would you be interested in purchasing?

_____

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6. Do you have suggestions as to how this learning CD-ROM package might be improved?

_____

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7. Would you recommend this package to a colleague? ❑ yes ❑ no

8. Please evaluate the CD-ROM by checking the most appropriate response.

| | | | | |
|---|---|---|---|---|
| a. Value of the topic | ❑ Excellent | ❑ Good | ❑ Fair | ❑ Poor |
| b. Relevance to your practice | ❑ Excellent | ❑ Good | ❑ Fair | ❑ Poor |
| c. Organization of program | ❑ Excellent | ❑ Good | ❑ Fair | ❑ Poor |
| d. Program length | ❑ Excellent | ❑ Good | ❑ Fair | ❑ Poor |
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# Joint Injection and Aspiration Self-study Program

## *Answers*

| | | | |
|---|---|---|---|
| 1. d | 9. d | 17. d | 25. d |
| 2. a | 10. c | 18. a | 26. d |
| 3. c | 11. b | 19. d | 27. d |
| 4. d | 12. a | 20. c | 28. b |
| 5. b | 13. d | 21. b | 29. d |
| 6. c | 14. d | 22. b | 30. a |
| 7. c | 15. a | 23. c | |
| 8. d | 16. c | 24. c | |