Knee (and other common) injections

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**General aspiration/injection technique**

1. Have an assistant.
2. Explain what you are going to be doing (see “explanation” below).
3. Mark the exact site you will be inserting the needle with back of a betadine stick (Especially if they are “hairy”, make sure to mark firm enough so it is still there when you inject – they don’t appreciate it if you numb it at one site, stick 18 G. needle in another site)
4. Cleanse with 3 betadine sticks (if doing more than one site, I mark and then prep both at same time, using same 3 sticks for both sites)
5. While I’m cleansing site, the assistant places the syringe with lidocaine & 27 G. needle already attached and some 2x2’s (to cleanse betadine from my hands and catch any betadine drips) next to me where I can grab it easily
6. Insert 27 G. needle at site, in direction, and to depth that you will do injection
7. Correct direction if needed-with the 27 G needle alone, they do not feel much discomfort at all
8. Inject 4 cc of 1% lidocaine as you withdraw the needle
9. Insert 18 G needle if doing aspiration first, and aspirate.
10. If injecting only and not aspirating, 22 G needle for larger joints, 25 G for hand & smaller joints.
11. You and assistant note the depth of the needle (distance from hub to skin). The assistant uses a needle holder to clamp the portion of the hub of the needle that has flat sides (so it is less likely to slip- they should not grab the round part), unscrew the aspiration syringe, attach the syringe with the cortisone/marcaine combination, inject- feel for any resistance (if there is more resistance than what the needle itself causes, you are probably not exactly where you want to be).

12. Typically repeat the exam in a few minutes (or just watch them walk out if you injected the knee and ask them how it feels) to confirm you got the injection in the right location and if doing it in part diagnostically, you need to determine what % of the symptoms you have relieved.
13. Look for veins at the site you are injecting and alter the entry site slightly rather than going through a vein

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**Explanation**

Many patients are apprehensive about injections. A few don’t want to know anything, but for most it will help if you explain what you are going to do.

Especially if they ask if it’s going to hurt: “You will feel this some, but almost certainly it’s going to be much better than you think”

Or, for appropriate patient you can joke with: “I won’t feel a thing, and it shouldn’t be bad at all for you”

While holding the betadine stick: “This is the only part you need to look at. I’m going to clean your knee (shoulder, elbow, etc.) with this part, and first make a mark with this plastic end.” (And I demonstrate pressing it on my finger) “So, the first thing you feel will not be a needle, just the plastic.” (If you don’t tell them this, and they are expecting a needle, and you press down hard with the plastic end of the betadine stick, it can scare them and literally make them jump.)

Then, as I’m about to put in the 27 G. needle: “Now you’re going to feel a stick (or poke) and then you’re going to feel some burning.”

Then just before you have pulled the needle back to the point just below the skin: “This is the part that will burn the most because there’s more nerve fibers just under the skin.”

After the numbing is done: “Ok, that should have been the worst. You shouldn’t feel the rest much at all.”

And then: “Ok we’re done.”

And if you did a good job they will say, “That wasn’t bad at all.”
“Issues” related to injections/aspirations

1. Spray or not (ethyl chloride)

This can help them feel the insertion of the needle less, but obviously does not help the deeper pain. Because the initial step of inserting a 27G needle is very well tolerated by most, I rarely use the spray (I don’t think the benefit outweighs the time and effort of the extra step). Exceptions for me would be very anxious patients (in addition to numbing the skin a little, it can provide a placebo effect. The downside is they will probably not let you do any future injections without using it). Another possible exception is for the most sensitive areas- the hand and foot.

2. Numb with 1% lidocaine or not?

The burning as lidocaine is injected can be worse than inserting a 25 or even a 22 G needle. Therefore, if only injecting, it may be well tolerated without using lidocaine.

Also, in general, patients older than 80-85 feel the lidocaine less and less.

However, inserting a 27 G needle, which I use for injecting the lidocaine, is surprisingly minimally painful for most. It can act as a guide to get the correct orientation for doing the injection. If you hit bone when you should be in a space you can withdraw the needle and adjust it up or down, depending on whether you think you are high or low, and this is very well tolerated (better than it would be with a 22 G needle). Therefore the reasons I use it:

1. Improves accuracy of the injection
2. Especially in the knee, I like aspirating first to confirm that I’m in the joint and not within or against synovium (this is especially important if injecting Synvisc), and I use an 18 G needle for aspirating. With this needle, it is definitely less painful if I inject lidocaine first.
3. Once I’m satisfied I have the needle at the right location, I begin to withdraw the needle slowly and inject the lidocaine very gradually as I pull the needle out. I also explain what I’m doing and what they can expect to feel (see explanation above). And as a result of these things, the lidocaine is typically very well tolerated.
4. In rare case that the fluid is cloudy, I have a sample to send for labs to rule out crystal dz, other inflammatory process, or infection. (I do not send normal appearing joint fluid. I always dictate the appearance of the fluid)
5. Patients like seeing the fluid that was in their knee- added "placebo" effect

3. Needle size

- 27 gauge for numbing medium and large joints
- 27 or 30 for fingers and toes
- 18 to aspirate

22 if injecting without aspirating (this is big enough to feel resistance besides the needle itself if against something you should not); 25 if injecting fingers or toes
4. Syringe size

Unless you think there is more than 60 cc to aspirate, use just a 20 cc syringe for aspirating. A 60 cc produces a stronger suction which can pull synovium over the needle and make aspiration difficult. If you use a 20 cc syringe and it turns out there is more than 20, your assistant can steady the needle while you disconnect the syringe and exchange it for another one.

5. Sterile gloves, or gloves at all?

From the patient’s standpoint, sterile gloves do not decrease the risk of infection anymore than without them as long as you don’t touch the aspiration site with anything other than the sterile needle once the site is prepped. It is a major hassle and time consuming to put on sterile gloves, to handle the syringes and needles steriley. It probably decreases the risk of you being stuck by a needle, but decreases my “feel” for when the needle penetrates the joint capsule. From a practical standpoint, (which doesn’t necessarily make it right), with more than 10,000 injections over 28 years, I have not stuck myself nor have I had a patient get infected.

6. Frequency

- Arthritic knees, shoulders, AC joints, and ankles (where the next step is a total joint or excision (in the case of AC joints) or fusion (in the case of the ankle), injections can be done every 3 months indefinitely.

- Medial or lateral epicondylitis- I would only repeat it once, and that if they had more than 6 months relief the first time.

- Shoulder bursitis/impingement syndrome- Maximum 2 or 3 times, separated by at least 6 months.

- Rotator cuff tears- if they are planning surgery, I would rarely inject them prior to surgery since it can make the torn cuff tissue more friable and difficult to repair

7. What if they are on Coumadin?

I would do any of the injections listed below if they are on Coumadin (as long as they are not supra-therapeutic). Whether they are on Coumadin or not, I avoid injecting through veins.

8. Diabetics

Especially with knee cortisone injections, patients' blood sugars may be thrown off temporally. Advise patients to check their blood sugars.
9. Instructions after the injection

For shoulders (AC joints and impingement syndrome), and medial or lateral epicondylitis, emphasize to the patient they should take it easy for at least days and preferably a week after the injection. They should NOT do things that would have hurt it before the injection during that time, and then EASE back into routine activities. If they were taking anti-inflammatories, they should continue them for 1 week after they have no pain.

10. Risks

1. Subcutaneous atrophy- The subQ tissue can atrophy, be relatively translucent, and cause a “dimple”, all of which are permanent. Highest risk areas are those sites where the subcutaneous tissue is the least: elbow (medial or lateral epicondylitis), Pes anserine bursa at the knee, deQuervain’s.

2. Tendon rupture- I will NOT inject the patellar tendon or Achilles tendon.

3. Articular cartilage damage, avascular necrosis- small risk in joints, especially if they are already bone-on-bone
11. Laboratory tests

If infection is a possibility, or if you suspect inflammatory or crystal induced arthritis (gout or psuedogout), you should use a culture tube for gram stain and C&S. I change the needle I aspirated with before injecting the fluid into the culture tube to decrease contamination from skin flora.

Send fluid in a purple top tube for WBC and differential, and crystal analysis.

**Joint fluid analysis**
- synovial fluid should be cultured if there is any suggestion of infection.
- **normal synovial fluid:**
  - contains < 60 to 180 cells per ml, most of which should be mononuclear;
  - fluid is considered to be "noninflammatory" if it contains < 2000 cells / ml, but most samples of synovial fluids from pts w/ DJD contain < 500 cells per ml;
- **differential dx:**
  - bacterial arthritis:
    - usually causes most intense synovial fluid leukocytosis, w/ 50,000 to 200,000 cells / ml and usually over 90 % PMN's;
    - synovial-fluid leukocyte count is rarely < 20,000 cells per ml;
    - lower leukocyte counts are more common early in course of bacterial arthritis and in pts w/ disseminated GC infection;
  - gout, pseudogout, acute rheumatic fever, Reiter's disease, and RA can cause a markedly inflammatory synovial effusion;
  - finding of > 90 % PMN's despite relatively low total leukocyte count should prompt concern about infection or crystal-induced disease;

- **Greater > 2000 leukocytes/ml:**
  - considered to be affected by an inflammatory process.
  - as the leukocyte count increases, so does suspicion of infection.
  -
    - Traumatic < 5,000 (w/ RBC's)
    - Toxic Synovitis 5,000- 15,000 and less than < 25 % polymorphs
    - Acute Rheumatic F. 10,000- 15,000 and 50 % polymorphs
    - JRA 15,000- 80,000 and 75 % polymorphs

- **Greater > 50,000 leukocytes/ml:**
  - although other dz's, including trauma, may produce WBC cells in joint fluid, levels > 50,000/mm³ are usually due to infectious arthritis.
  - Disease
    - JRA 15,000- 80,000 and 75 % polymorphs
    - Septic Arthritis 80,000-200,000 and > 75 % polymorphs (usually >90%)
    - Pseudogout

- **Greater > 100,000 leukocytes/ml:**
  - conventional wisdom is that effusions containing > 100,000 leukocytes per cubic ml are septic, but this is more a guideline than a rule.
Specific joints:

**Knee aspiration and/or injection**

Position- supine, with heels completely on table, not hanging over the end of the table (so that the knees are fully extended)

Landmarks- An aspiration can be done from the superior lateral or medial aspect of the knee; 1-1.5 cm posterior to the superior aspect of the patella.

Advantage of superomedial- if the knee cap is tilted at all, it is tilted laterally, making the medial space bigger, the lateral space smaller. If at the superior pole of the patella and the knee is extended, the tilt of the patella does not matter much.

Advantage of superolaterally- you don’t have to be reaching over the patient’s other knee. *(I do it most frequently from superolaterally)*

Direct the needle horizontal or angled slightly posteriorly. You should be able to feel the needle (even a 27G needle) go through the capsule.

An injection can be done from either of the above 2 sites or also from the anterolateral or anteromedial parapatellar tendon site. Have the patient flex their knee 90°, and have foot flat on exam table to stabilize it. There is a ridge on the lateral tibia just below the joint line. Rest your thumb on that ridge and that distance above that ridge, just lateral to the tendon, is the entry site. This will be just slightly below the level of the inferior pole of the patella. Direct the needle 30°-40° toward the middle of the knee (toward the notch). This site is easier in massively obese patients, but it is difficult to aspirate much from this site. This site is also easier if they have a major flexion contracture i.e. they can’t come close to extending their knee fully.

Amount- 40 mg triamcinalone in 1 cc, 9 cc .5% Marcaine.

Special considerations- Even when you are in the joint for sure, it can be difficult to aspirate fluid presumably because the needle is within the fat pad or synovial tissue. But, if you redirect the needle and/or slowly withdraw the needle while aspirating, you will usually find the spot that you can aspirate. Using your free hand to ‘milk’ the suprapatellar region can help to aspirate more fluid. If you suspect infection send the fluid for a WBC and differential, gram stain (purple top), cultures, and crystal analysis (red top)

If the patient does not relax and instead tenses their quads, the patella is pulled down into the trochlear groove making it much more difficult to get into the joint. Acknowledge to them that it is hard to relax with a needle in their knee, but they need to -and feel their quads/knee cap to ensure that they do relax.
Knee Bursal Aspiration or Injection

This is much easier than an intraarticular aspiration. If it is a very large bursa, it can be easier to use a Kling or Kerlex to wrap around the proximal, distal and sides of the bursa to concentrate the fluid more. The most important thing, if it is an infected bursa, is to NOT go through the infected bursa into a joint that was not previously infected.
Shoulder

a) Subacromial

Position- Sitting, with arm resting on lap (not with hand palm down on table and pushing up- want weight of arm hanging down to make space greater)

Landmarks- Any location that results in the needle being in the bursa works- can be anterior, lateral, posterolateral. I prefer posterolateral- patient doesn’t need to see needle(s). Palpate the posterolateral aspect of acromium, plus observe the area of the deltoid that has a slight indentation. Entry site is 1 to 1.5 cm inferior to edge of acromium, angle up 30 to 40°

Amount- 40 mg/ml triamcinalone with 4 cc .5% marcaine

Special Considerations- Advise patient that for most, the cortisone “kicks in” before the marcaine wears off, but for some it may be more painful starting 6-8 hours later, and this may last a day or so. If that happens, they can take NSAID’s and ice it. Even when that happens the cortisone eventually “kicks in” and can be beneficial. The injection can recreate the pain they have been complaining about as you do the shoulder injection.

b) AC joint

Position- sitting

Landmarks- palpate AC joint, identify anterior and posterior aspects of the joint, mark the center. The joint is not vertical but angled some laterally, therefore the needle should be angled approximately 30° from the vertical

Amount- 20 mg triamcinalone (½ ml) plus 1 ml 0.5% marcaine

Special Considerations- very small joint, difficult to get into, a lot of pressure when you inject
Elbow

a) **Lateral Epicondyle (for lateral epicondylitis/tennis elbow)**

Position- patient lying supine, with elbow flexed 90° and resting on abdomen

Landmarks- point of maximal tenderness will be center of the injection, but inject in an area of 1-2 cm in diameter around that.

Amount- 40 mg triamcinalone plus 2 cc of .5% marcaine.

Special Consideration- warn of risk of subcutaneous atrophy

b) **Medial Epicondyle**

Position- patient lying on affected side with elbow flexed.

Landmarks/amount- same as for lateral epicondylitis. Be careful not to inject posterior to the epicondyle (the ulnar nerve is there.)

Special consideration- warn of possible short term numbness in the ulnar nerve distribution.

Hand/Wrist

a) **DeQuervain’s tenosynovitis**

Position- lying supine

Landmarks- The goal is to inject the space between the sheath and the tendon, centered where the tendons run through the sheath. Mark the tendon distal and proximal to the sheath so you have the correct alignment. Insert the needle from distal to proximal, beginning at the base of the thumb metacarpal, at a 45° angle to the skin, bevel up, advance until it feels like you’ve reached the tendon. Try to inject- if there is resistance, you’re in the tendon. Retract just slightly, should be in the sheath. Then if in correct position, should have less resistance, should see fullness/swelling of sheath proximal along sheath.

Amount- 20 to 40 mg triamcinalone, 2 cc 0.5% marcaine

Special considerations- Risk of subcutaneous atrophy, continue to wear splint (assuming they have been already) for one more week.
b) **Carpal Tunnel**

Indications- carpal tunnel during pregnancy

Position- patient lying supine with hand at side

Landmarks- insert 22 or 25 G needle 1 cm proximal to wrist flexion crease, in line with ring finger metacarpal. (Just to the ulnar side of the Palmaris longus- the nerve is just underneath it). Have needle angled 30-45° to the surface of the skin. You should be able to feel the needle go through the transverse carpal ligament. If at any time inserting the needle the patient reports paresthesias, redirect the needle. Once through the ligament, inject the cortisone/lidocaine.

Amount- 20 to 40 mg triamcinalone, 2 ml .5% lidocaine.

Special considerations- Advise patients they may have numbness in the distribution of the median nerve. (In fact, it is good to check the patient 5 to 10 minutes after the injection. If they have tingling in the median nerve distribution, you know you got the injection the right place.)

c) **Thumb carpometacarpal joint**

Position- lying supine

Landmarks- palpate the joint dorsally, just radial to ECRB tendon

Amount- 20 mg (.5 ml) triamcinalone, 1 ml .5% marcaine

Special considerations- pull on the end of the thumb (distract it) as you do the injection to increase the space slightly.

**Trigger finger injection**

d) **Trigger Finger**

Position- lying supine with hand at side. If they can’t supinate enough to lay hand flat on table, have them lay on their side.

Landmarks- The triggering occurs at the A1 pulley, which is just distal to the distal palmar crease of the little and ring fingers, the proximal palmar crease of the index, between the distal and proximal creases of the long, and the MCP crease of the thumb. Mark the site of the injection, plus the course of the tendon proximal and distal to this so you have the correct alignment. Numb the skin with a 27 G or 30 G needle, either from direct volar or from dorsal (less painful). Then use a 25G needle directed from distal to proximal at the A1 pulley site, with the needle angled about 30 to 45° to the skin. Go
down to the tendon, try injecting. There should be resistance if you are in the tendon. Keep some injection pressure on, and then slowly withdraw the needle. You should reach the point where the fluid injects easily and you can see the tendon sheath fill proximally.

Amount- 20 mg triamcinolone, 1 ml 0.5% marcaine

Special Considerations- Most successful for the thumb (can be of benefit even if present for several months). In other digits, best chance of helping if symptoms present less than 3 weeks.

e) Finger Block

Position- Patient lying supine or sitting
Landmarks- Can be done from dorsal or volar
Dorsal aspect:
Insert needle from dorsal radial aspect of digit at level of webspace, directed at volar midline aspect of digit. Inject as you draw needle out. The, inject along dorsum of finger superficial to extensor tendon, deep to skin. Lastly, insert along ulnar aspect of digit directed at volar midline. Inject as you withdraw.

Volar aspect- At the distal palmar crease, first inject in the midline, then radially, and finally ulnarily.

Amount- Use a total of 5-10 ml 1% lidocaine or .5% marcaine or combination

Special considerations- do NOT use any epinephrine

Hip Joint

The main indication for a hip joint injection is diagnostic, i.e. differentiating hip pathology from sciatica or another cause; or to evaluate for infection. Unlike the knee, cortisone injections into the hip joint do not predictably give relief for very long. This is a difficult joint to predictably get into without fluoroscopic guidance. Therefore we would rarely attempt this in clinic but would have the physiatrist or radiologist do this using fluoroscopy.

Trochanteric Bursa

Position- lying on opposite side with affected hip up

Landmarks- Point of maximal tenderness is center of injection. Advance needle down to bone, withdraw it about 1/16” then inject over a 2-3 cm diameter area

Amount- 40 mg/ml triamcinolone with 5 cc .5% marcaine

Special Considerations- The majority of times a spinal needle is necessary to reach the trochanter. Be careful not to go posterior to the trochanter where the sciatic nerve is.
Ankle Injection

Position- supine

Landmarks- At the level of the joint just medial to the anterior tibial tendon. You can localize the ankle joint by having them plantar and dorsi flex the ankle. Direct the needle in at an angle of about 30° from the midline.

Amount- 40 mg triamcinalone, 4 cc .5% marcaine
**Plantar Fasciitis Injection**

Position- supine with posterior aspect of heel on table with toes pointing to the ceiling.

Landmarks- Palpate the calcaneus where it begins to curve upward (this is also usually where they are maximally painful). From the medial aspect, about 2 cm from the plantar surface of the foot. Direct the needle parallel to the plantar aspect of the foot aiming directly laterally. It should be just at or superior to the plantar fascia. Advance the needle (1 1/2") to its hilt, then begin injecting. Withdraw the needle 2 cm as you finish the injection. Do not inject any corticosteroid into the medial subcutaneous fat or the fat pad that is superficial to the plantar fascia.

Special considerations- This is one of the more painful injections. Warn the patient ahead of time. Also advise them to take it easy the rest of the day. It may take a few weeks for the full benefit.

**Toe Block**

Position- supine

Landmarks- Using a 25 or 27G needle, start dorsally at either side of the toe at the level of the MTP joint. Direct the needle plantarly, angling it slightly to the midline of the digit. Advance the needle until it begins to tent the plantar skin. Begin to inject as you withdraw the needle. The sensory nerves travel along the plantar side of the metatarsal, so the needle will be at this level when you’ve withdrawn it about 1 cm. Continue to inject as you withdraw the needle dorsally. Inject across the dorsum of the toe, then along the other side of the MTP joint.

Amount- 10 ml 1% lidocaine, 0.5 % marcaine, or a combination of both.
Mark:
1. Subacromial
2. AC joint
3. deQuervain’s
4. Carpal Tunnel
5. Thumb basal joint
6. Ring trigger finger
7. Thumb trigger finger
8. Dorsal long finger block
9. Knee: Superolateral, superomedial, and anterolateral parapatellar tendon
10. Ankle
11. Plantar fascia
12 Big toe block