

CT Arthrogram Injection Guide

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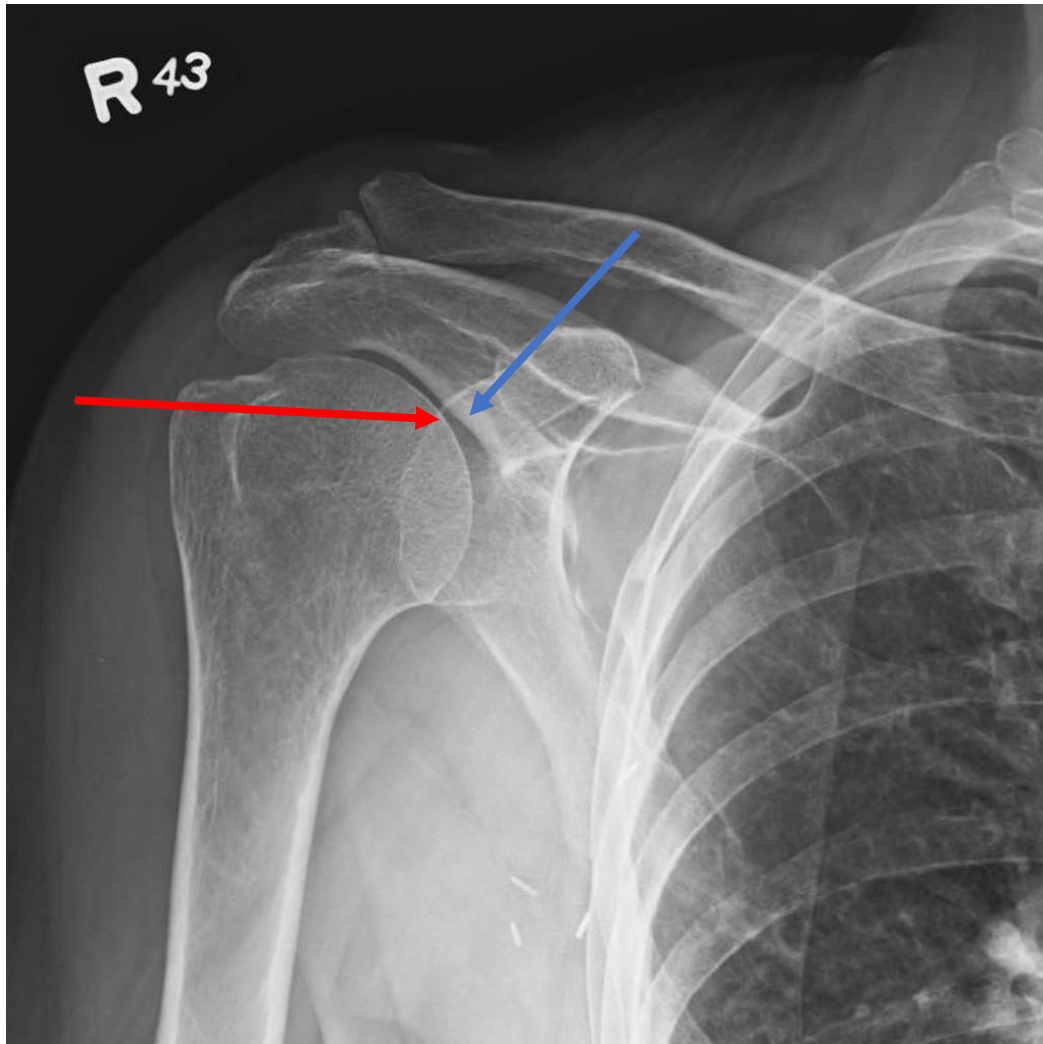
Musculoskeletal Radiologist

Colorado Imaging Associates

Shoulder Arthro

- When trying to pick a spot to mark, you can either go through the subscap muscle or through the rotator interval.
- I prefer rotator interval as the coracoid is less likely to be in the way. Also, you are less likely to infiltrate the subscap.
- I will use the trans-subscap method as a back up if I fail through rotator interval or if there is unusual anatomy.
- 2 needle sticks max on all arthrograms. If you fail twice, it is best to abort the procedure and reschedule the patient.

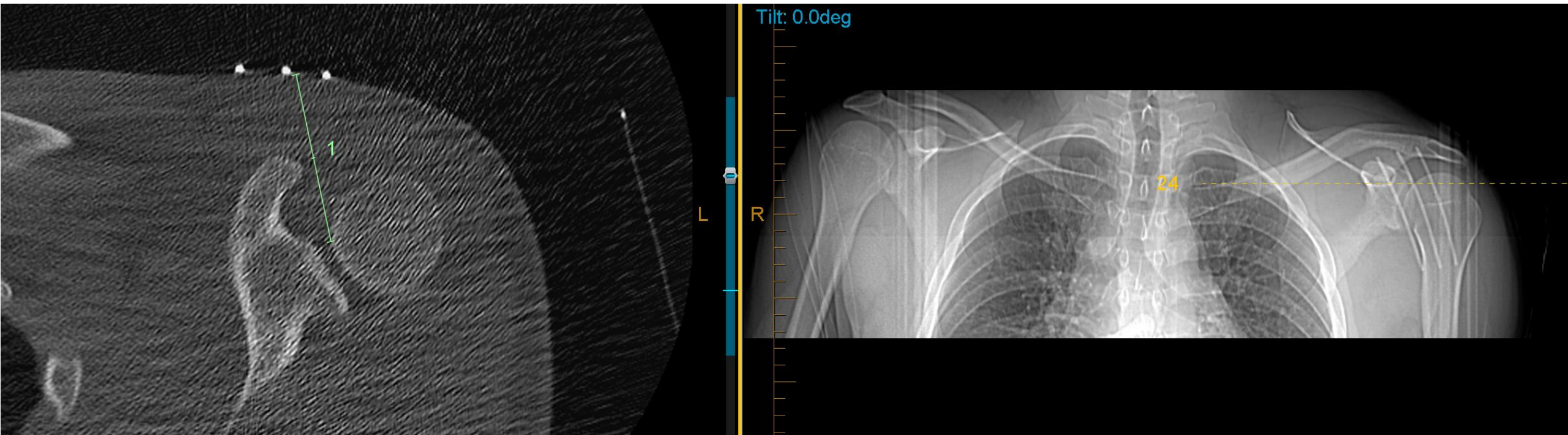
Shoulder Arthro



- Under fluoro, the ideal target (red arrow) is right where the cortical V is formed by the glenoid and humeral head overlap.
- The humeral head is used as a bony back-stop so that I know I'm in joint once I hit it with the needle.
- Not having a bony backstop, and aiming to be intra-articular between the humeral head and glenoid will get you lost.
- The target and stopping point is the round medial margin of the humeral head. 100% in the joint once you hit that target.
- You can slip off the humeral head if you come straight down or from lateral to medial. I typically mark medial (where the blue arrow is) and then angle lateral to hit the articular surface of the humeral at a better angle so the tip of the needle won't slip.

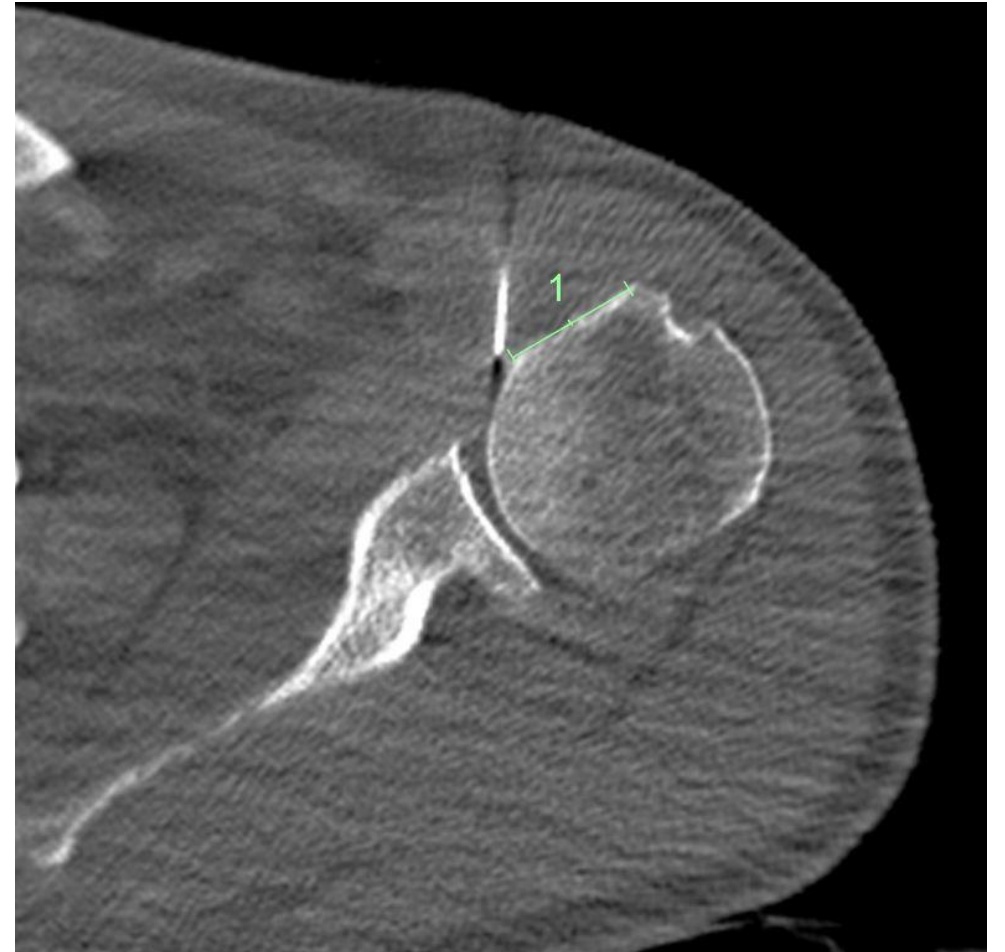
Shoulder Arthro

- This is what the rotator interval looks like on CT, correlating with localizer line on scout image. Note the slight medial to lateral angulation of the ideal needle track (green line).



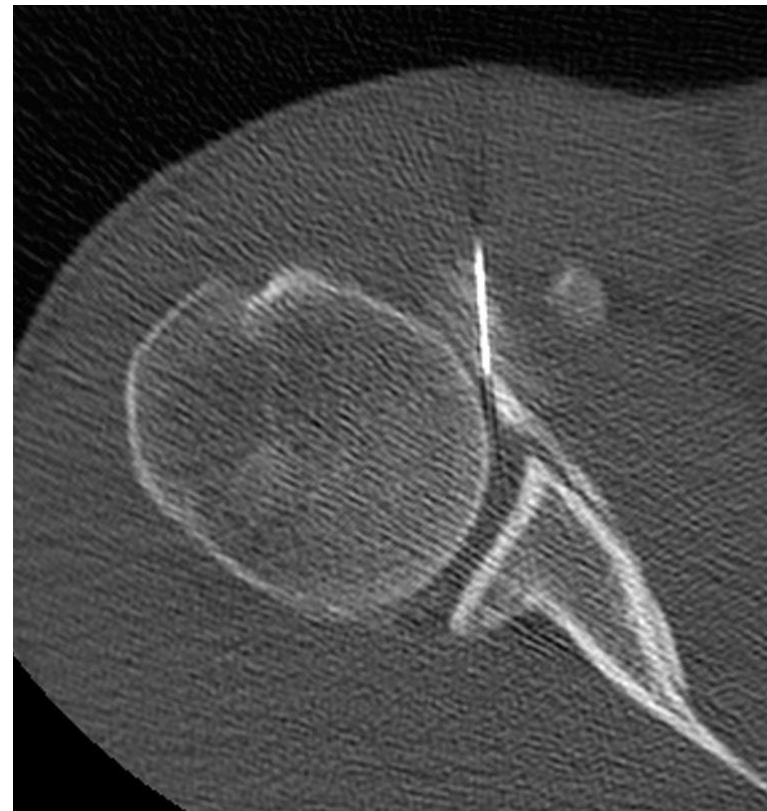
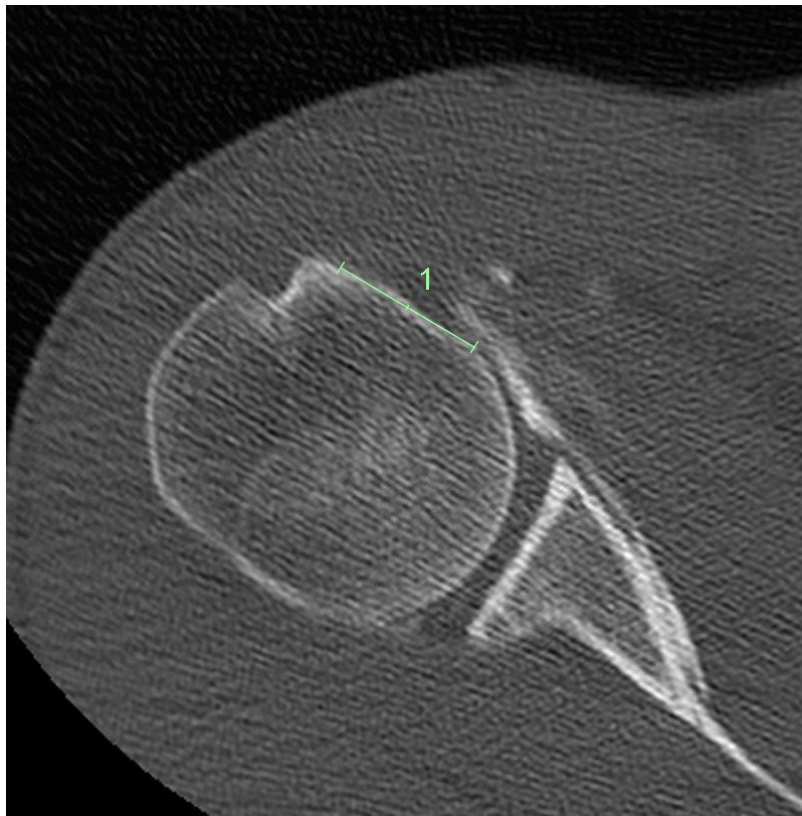
Shoulder Arthro

- Poor technique going subscap and not recognizing the subscap footprint.
- The footprint is marked with the green line.
- Note the lateral to medial angulation of the needle.
- Flat parts of the humeral head are tendon footprints and extra-articular; reposition and do not inject here.



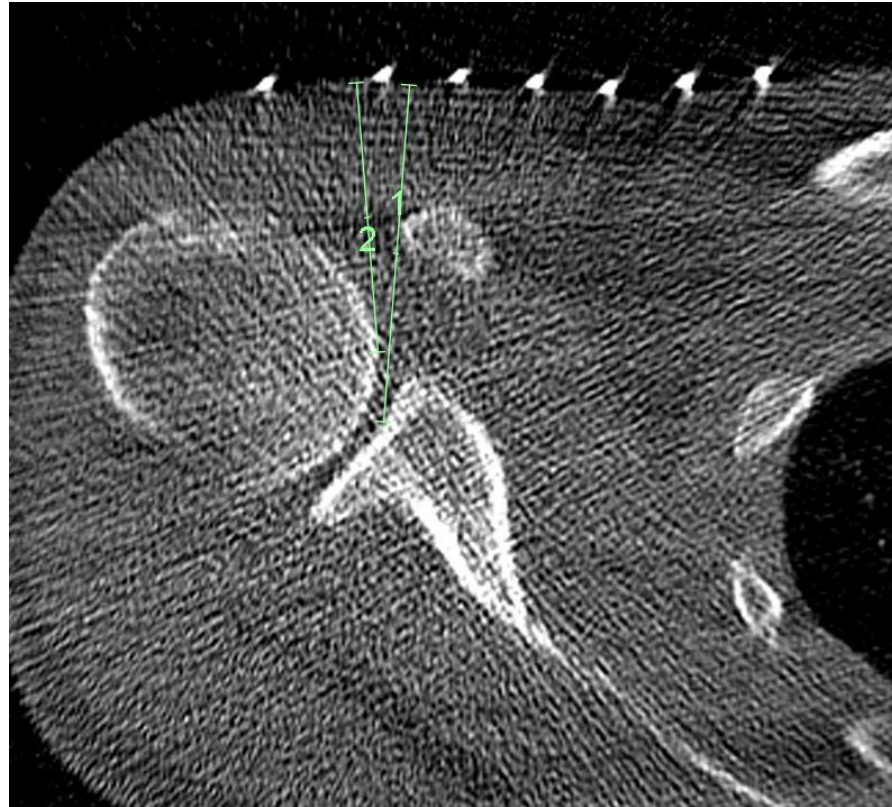
Shoulder Arthro

- Even if the footprint (green line) is avoided, the needle is too close to it and the capsule is too tight in that location resulting in tendon infiltration and mixed injection.



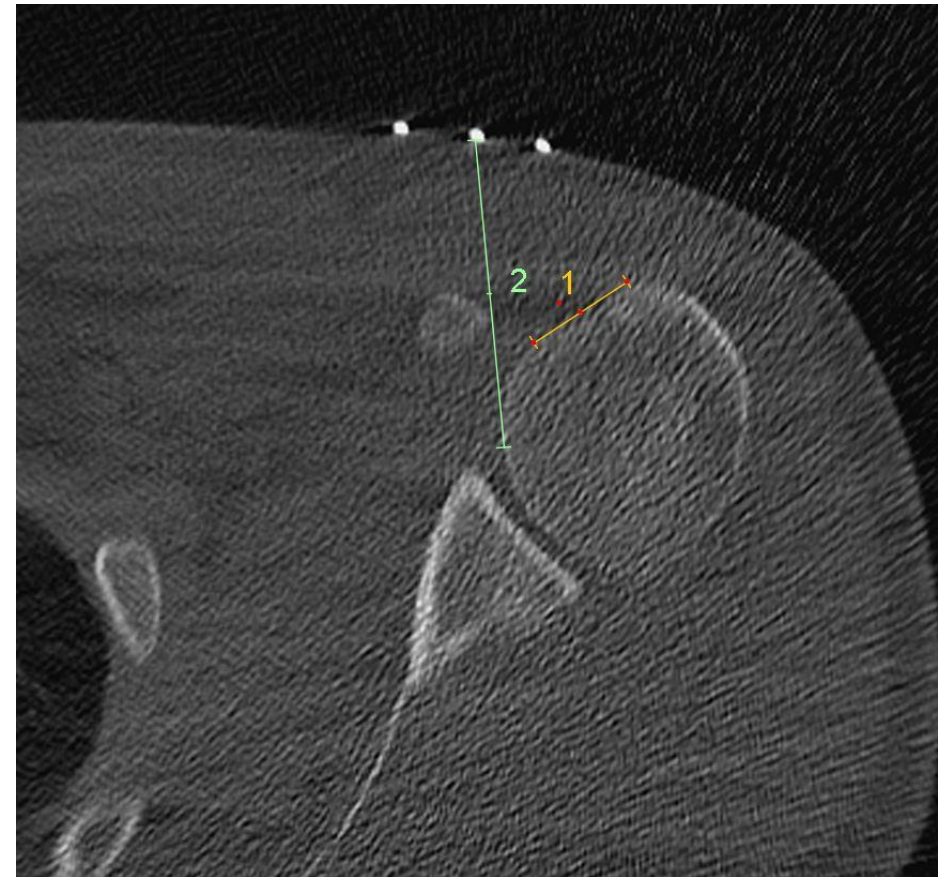
Shoulder Arthro

- Trans-subscap approach only provides you a narrow window between those 2 green lines.



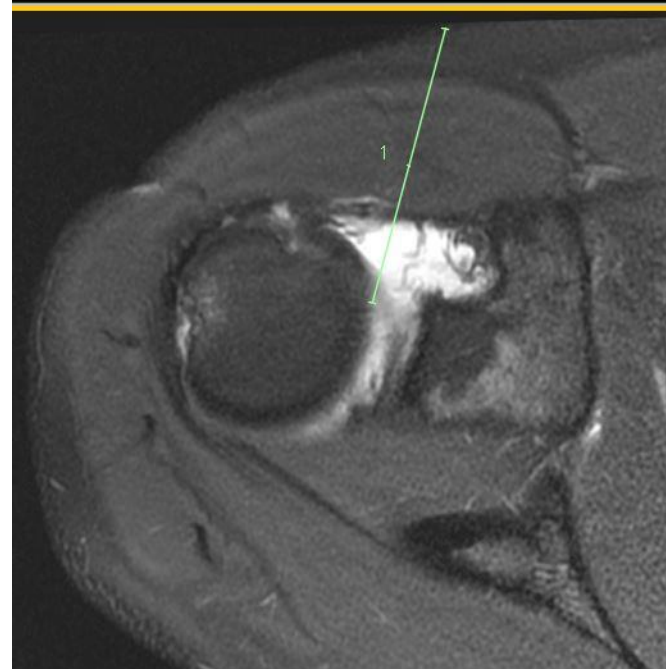
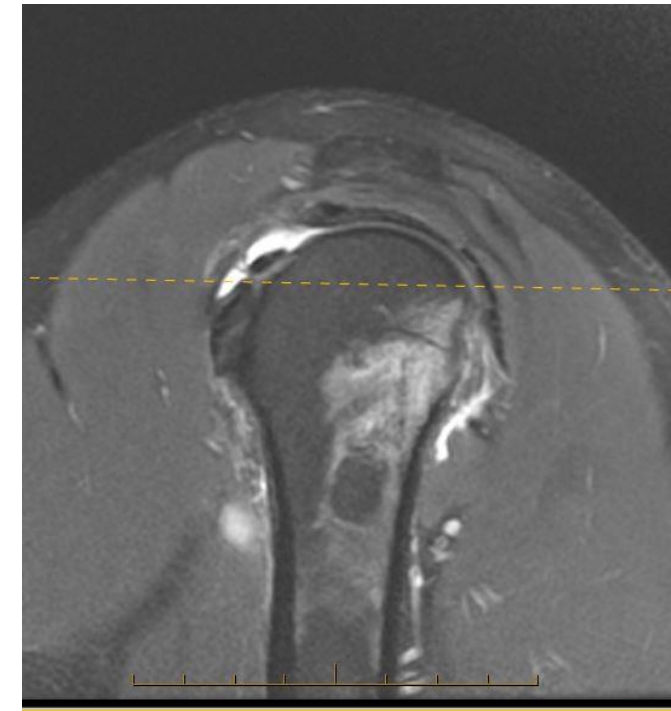
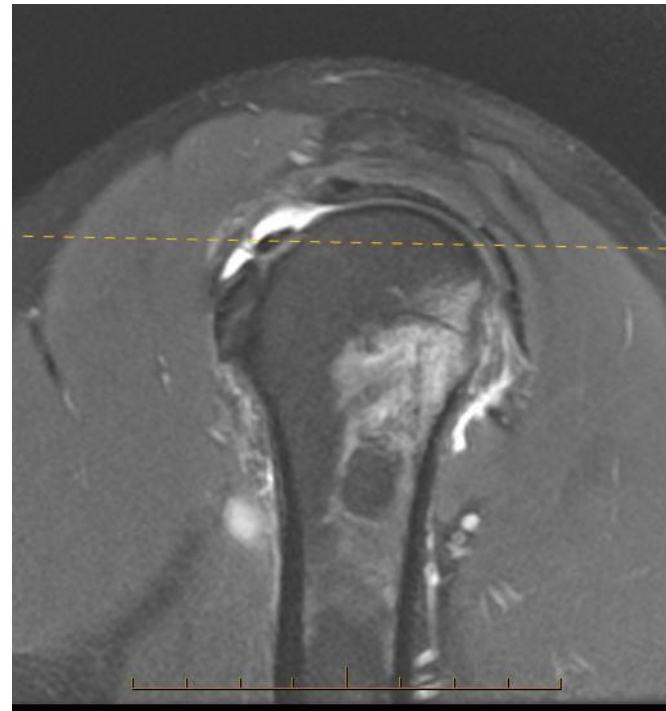
Shoulder Arthro

- Another issue with a trans-subscap approach:
Sometimes the coracoid extends far laterally and your only window is the green line.
- The orange line is the footprint.



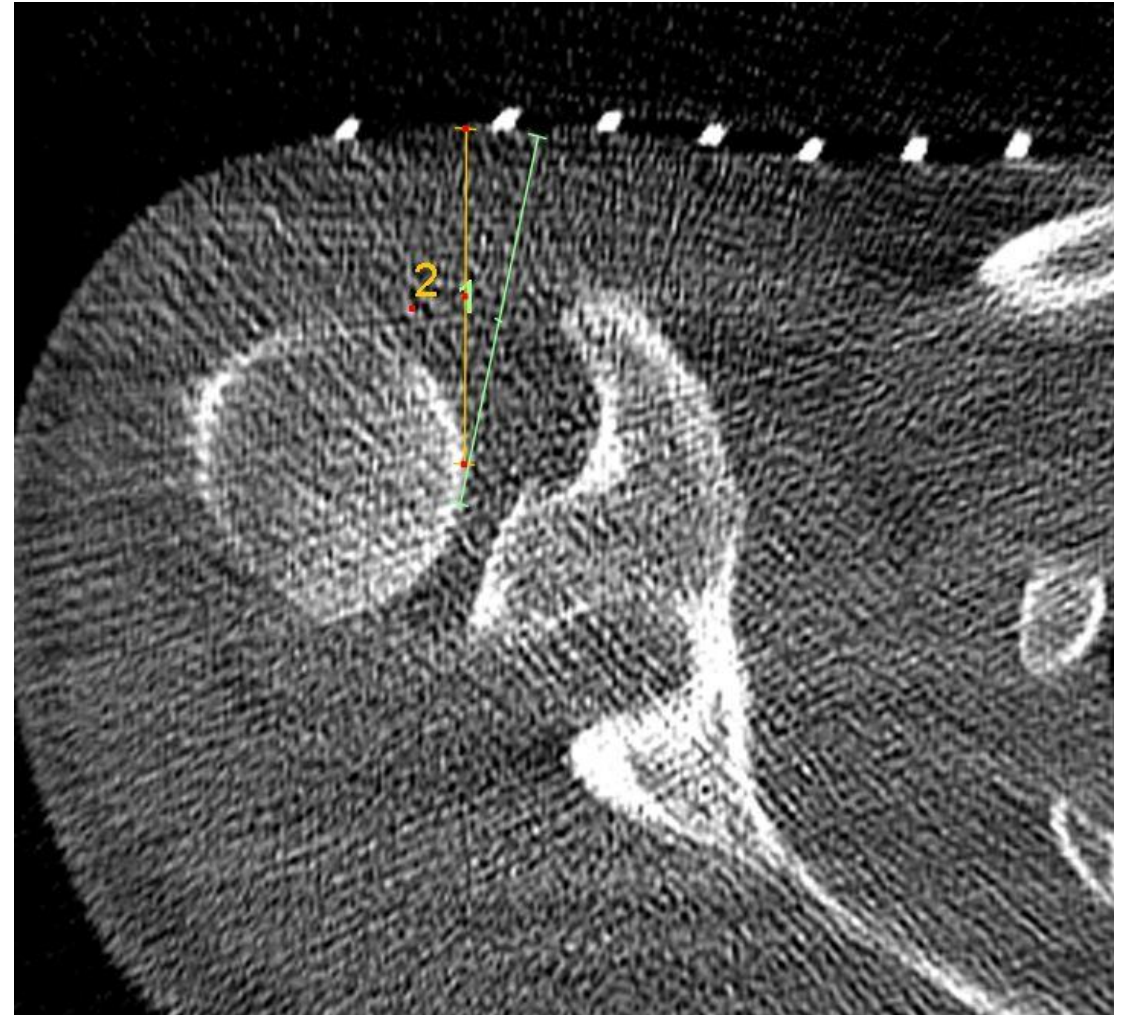
Shoulder Arthro

- Rotator Interval for the win!!!
- Much wider landing zone through the rotator interval and no tight capsule to fight against.



Shoulder Arthro

- This is what it looks like on CT.
- The orange line is if you go straight down.
- A good angle is marked by the green line.
- You could even have a more extreme medial to lateral angle to make sure you don't slip off your bony backstop.

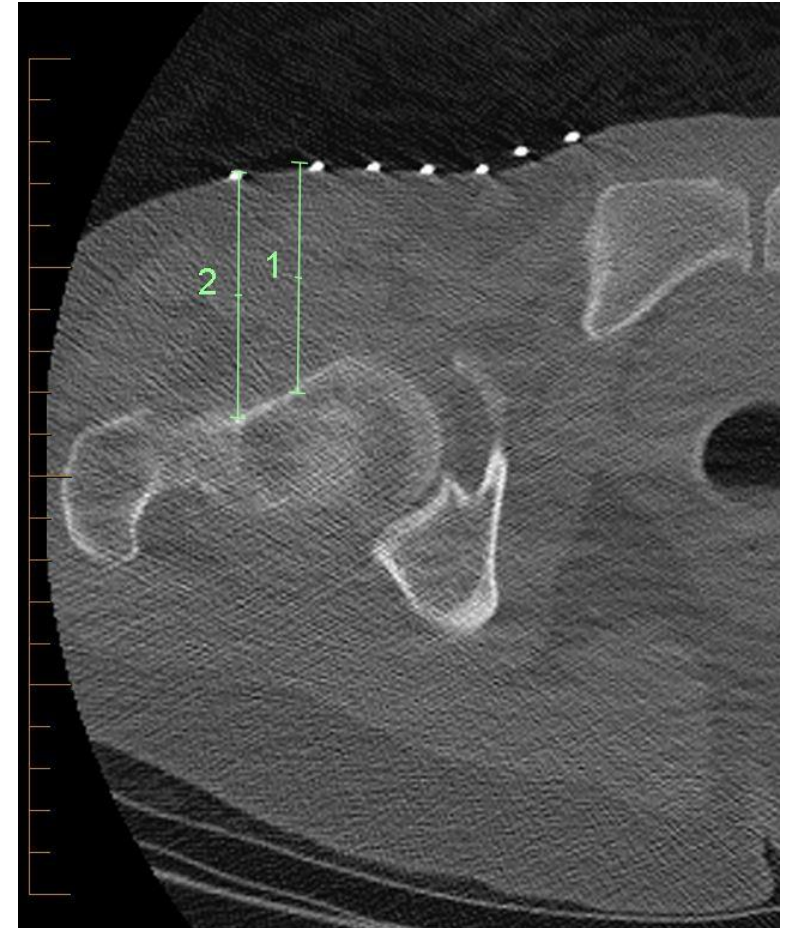


Shoulder Arthro

- 12cc total will fill a shoulder joint. Risk of iatrogenic capsular rupture beyond that.
- Total Shoulder Arthroplasty – use the same technique. Hit the medial round part of the prosthetic humeral head. I put in 15cc to distend the pseudocapsule in a TSA.

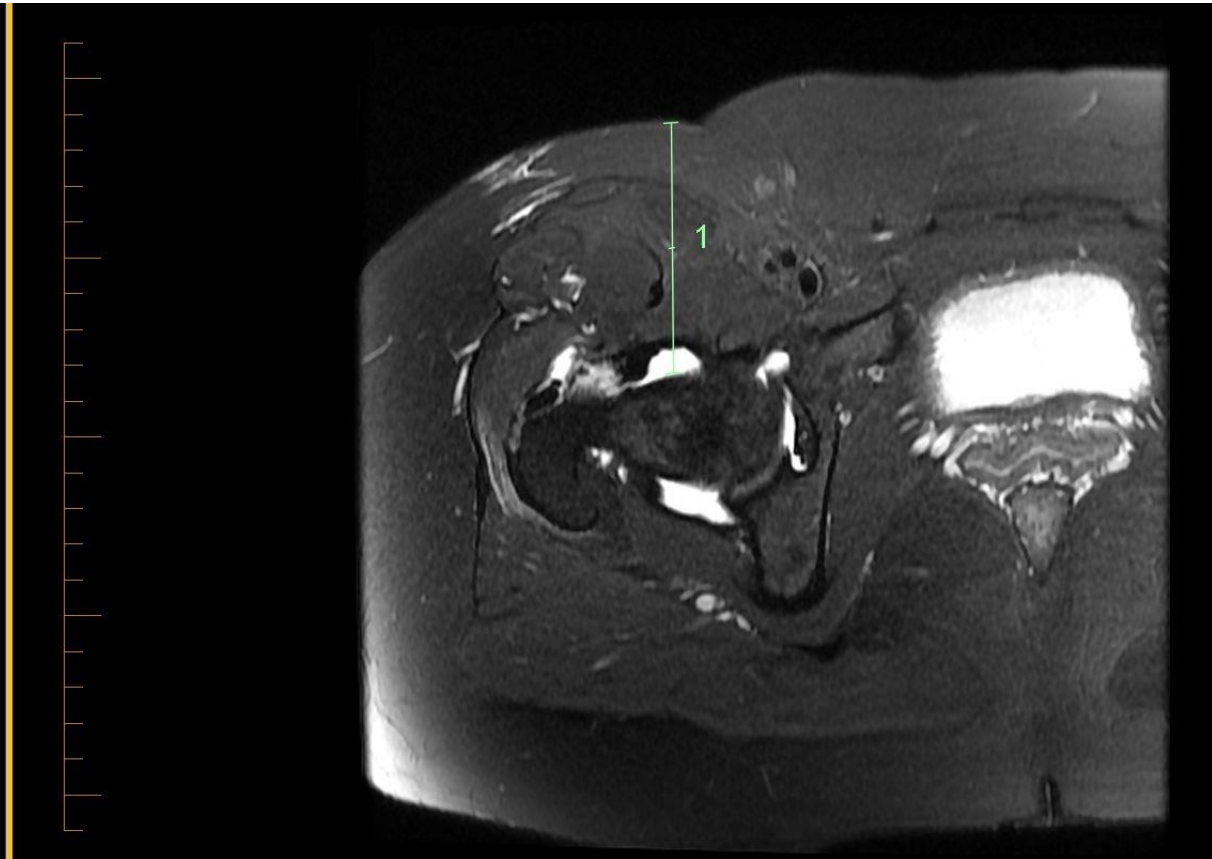
Hip Arthro

- Aim mid femoral neck. The capsule is not as tight in this location as it is around the anterior femoral head.
- You can angle it if you want to slide just under capsule or go straight in and risk a mild mixed injection (intra and extra-capsular contrast). Nbd.
- Your ideal landing zone is between the green lines. But you can hit the lateral third of the femoral head too if you want. I do sometimes.
- Use the femoral neck as your bony backstop, once you hit that, you are in the joint.



Hip Arthro

- Too lateral of an approach (left image).
- The ideal track is the green line (right image).



Hip Arthro

- Medial approach. It works most of the time, but again you are fighting the joint capsule in this location.
- If there is a large Cam deformity, it is even harder to inject if you use the humeral head as the target.

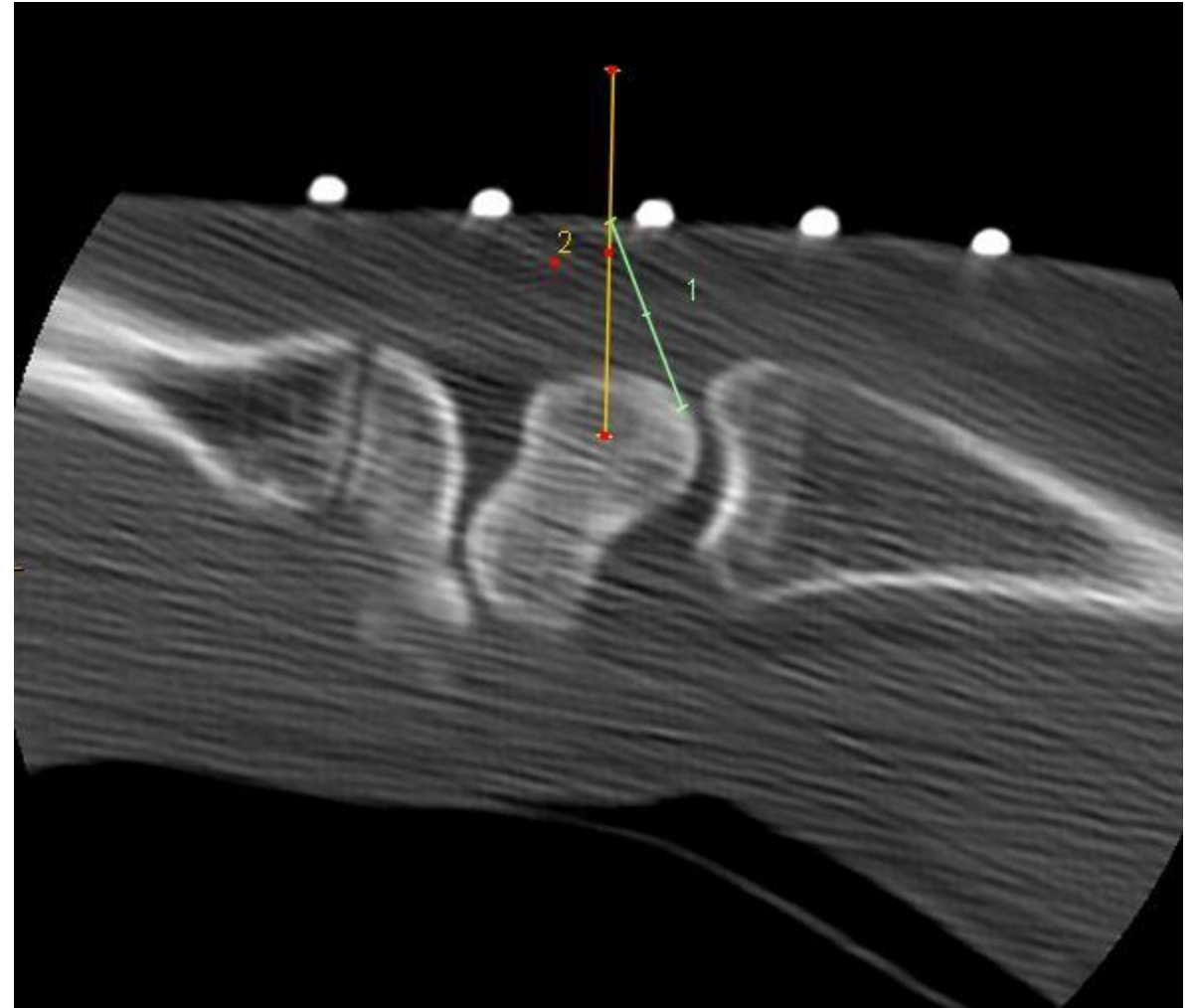


Hip Arthro

- I typically inject 15cc total into the hip. The hip joint capsule will not rupture like the shoulder does and takes a lot to distend it.

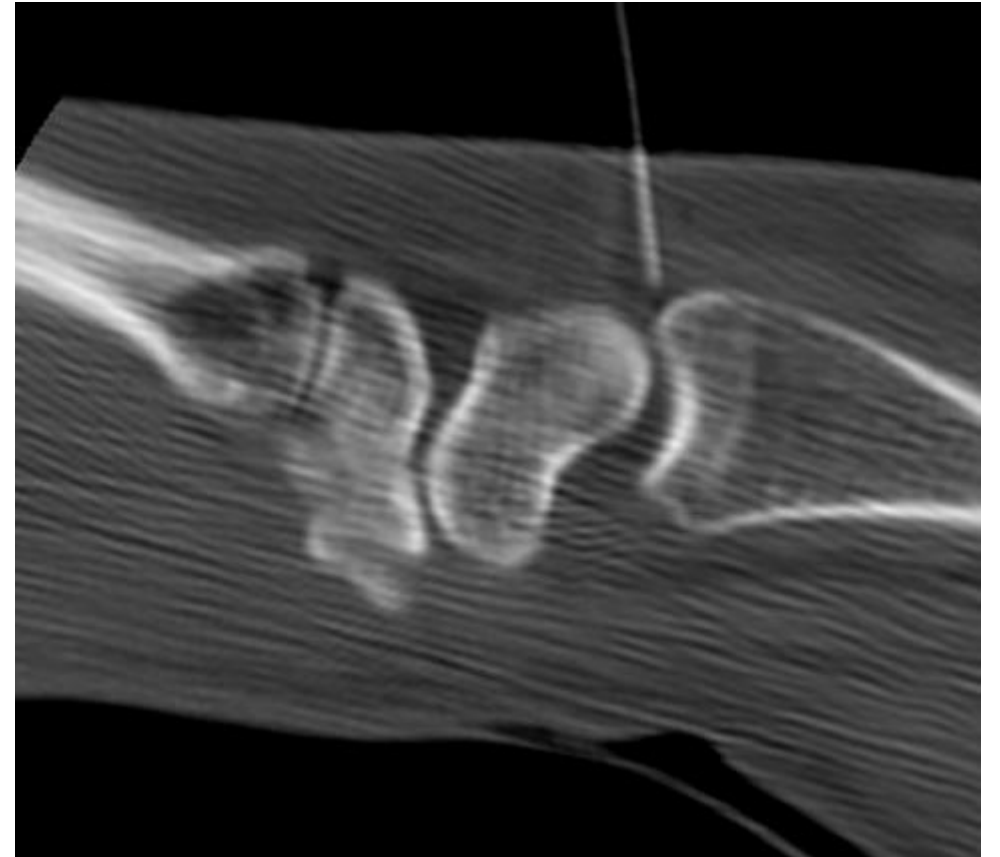
Wrist Arthro

- I mark the mid scaphoid (orange line) and then angle back to slip into the joint (green line).
- If the needle hits the scaphoid anywhere between the orange and green lines, you are technically in the joint.
- It is easy to adjust the needle though and walk the tip down into the radioscapoid joint.



Wrist Arthro

- Poor technique, marked too proximal.
- You can't go straight down as the dorsal lip of the radius will get in the way.
- This should be marked more distal and angled more.



Wrist Arthro

- 3cc max into the radiocarpal compartment/wrist joint. You will rupture the joint otherwise. 2 cc is typically plenty and is what I do most of the time.
- I only do a skin wheal, no deep numbing. Many people don't even do a skin wheal and just go right in.
- This is the only joint I use tubing for.
- I draw up 8cc of the gad/saline/omni mixture into a 10cc syringe, hook up tubing, then flush the tubing into the trash with the mixture until the syringe mark is at 5cc. Then once the needle is in, I'll hook up the tubing and inject until the syringe mark shows 2 – 3 cc remaining.
- The 10cc syringe allows greater feel for when the joint is distended and when to stop injecting, often after 2cc's.

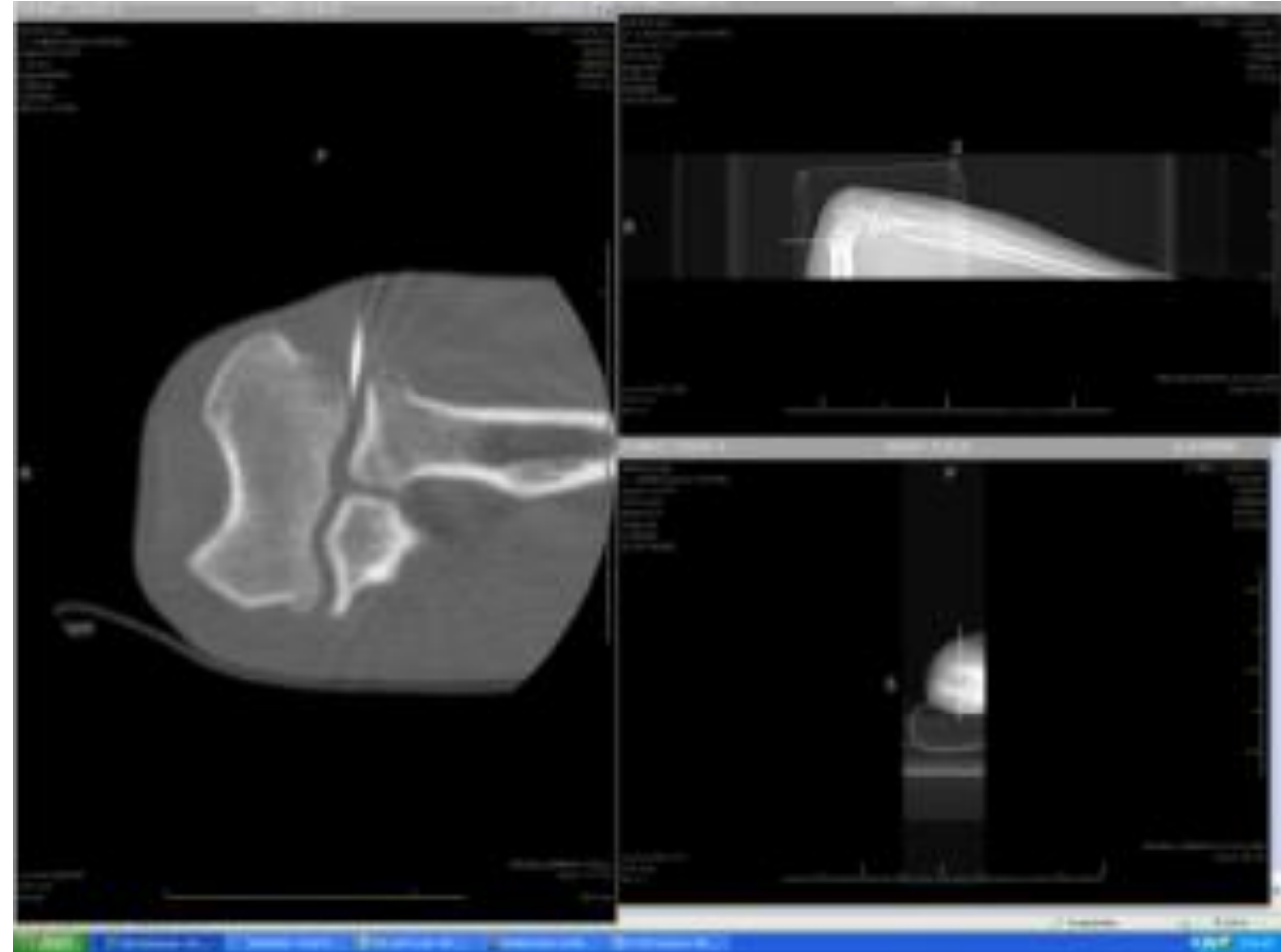
Elbow Arthro

- Patient is in superman position with the elbow flexed at 90 degrees over/distal to their head.
 - Wrist is supinated so that a thumbs up will be pointing to the ceiling.
 - The view should look like you're shooting a lateral elbow x-ray.
 - The pic on the left is how the elbow will lay on the CT table, but the patient will not be seated, they'll be going in head first in superman position.



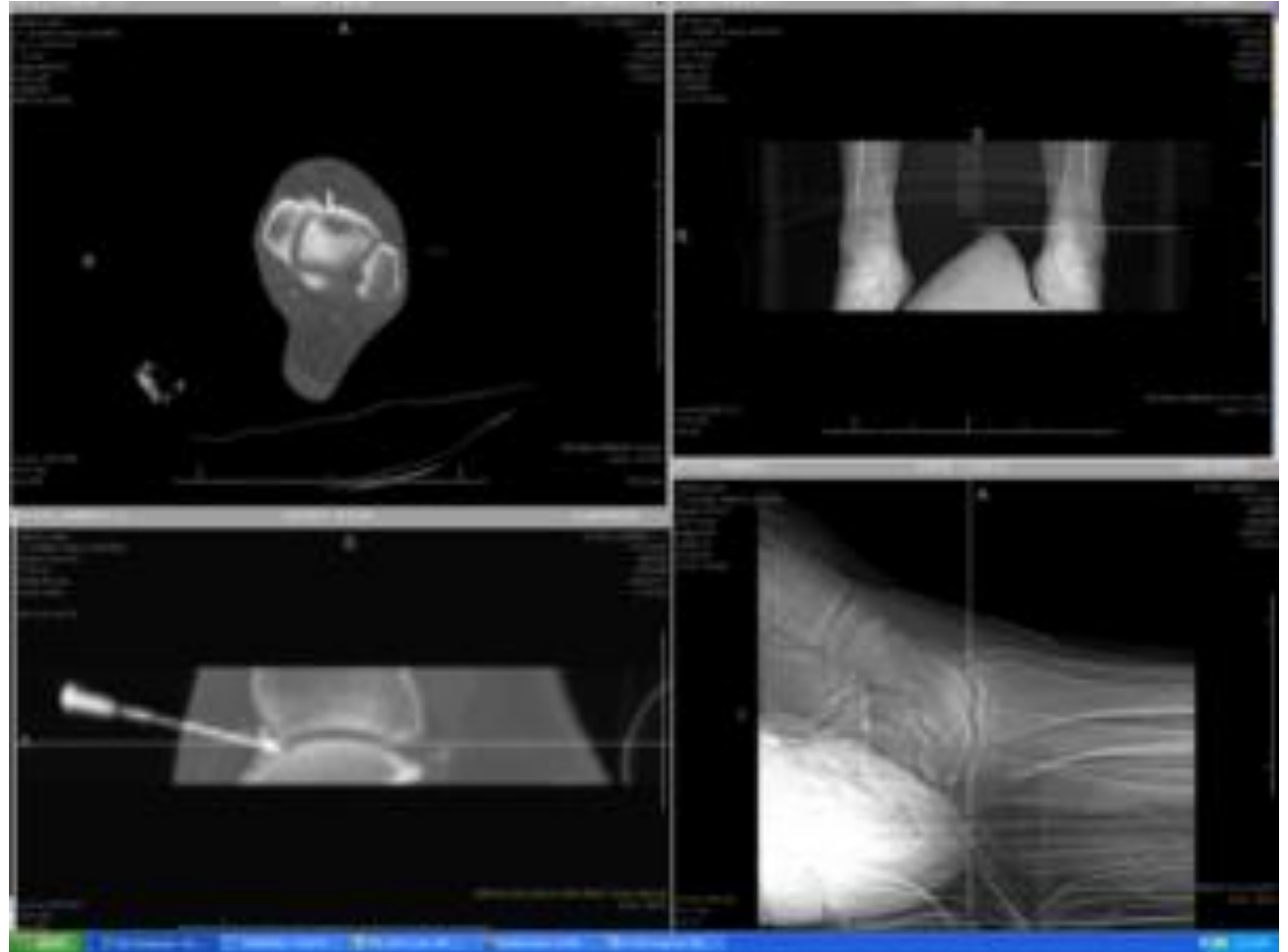
Elbow Arthro

- Your target is the radiocapitellar joint. Come straight down from the lateral aspect of the elbow.
- Shove the needle directly into the joint. The joint is your target (see pic). You will not shear off cartilage by aiming directly into the joint.
- Inject 5cc's max into the elbow joint. 3-4cc's is what I do.



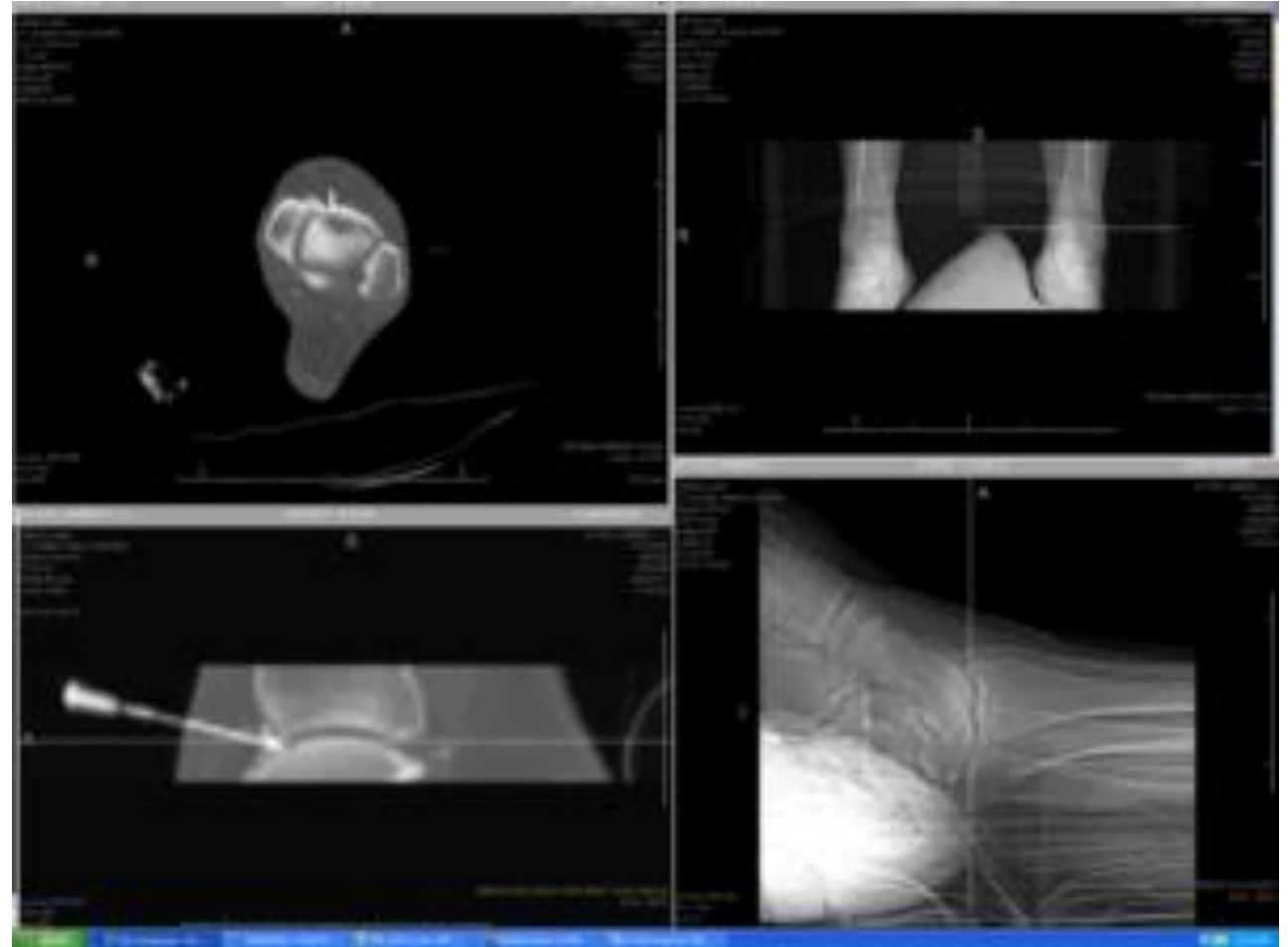
Ankle Arthro

- Position the patient feet first/Supine, toes pointed at ceiling, feet taped, knees strapped to decrease motion.
- Mark just lateral to the Anterior Tibialis tendon. This is pretty much center of the anterior ankle joint.
 - The ATA is a large tendon. You can feel yours if you dorsiflex your foot.



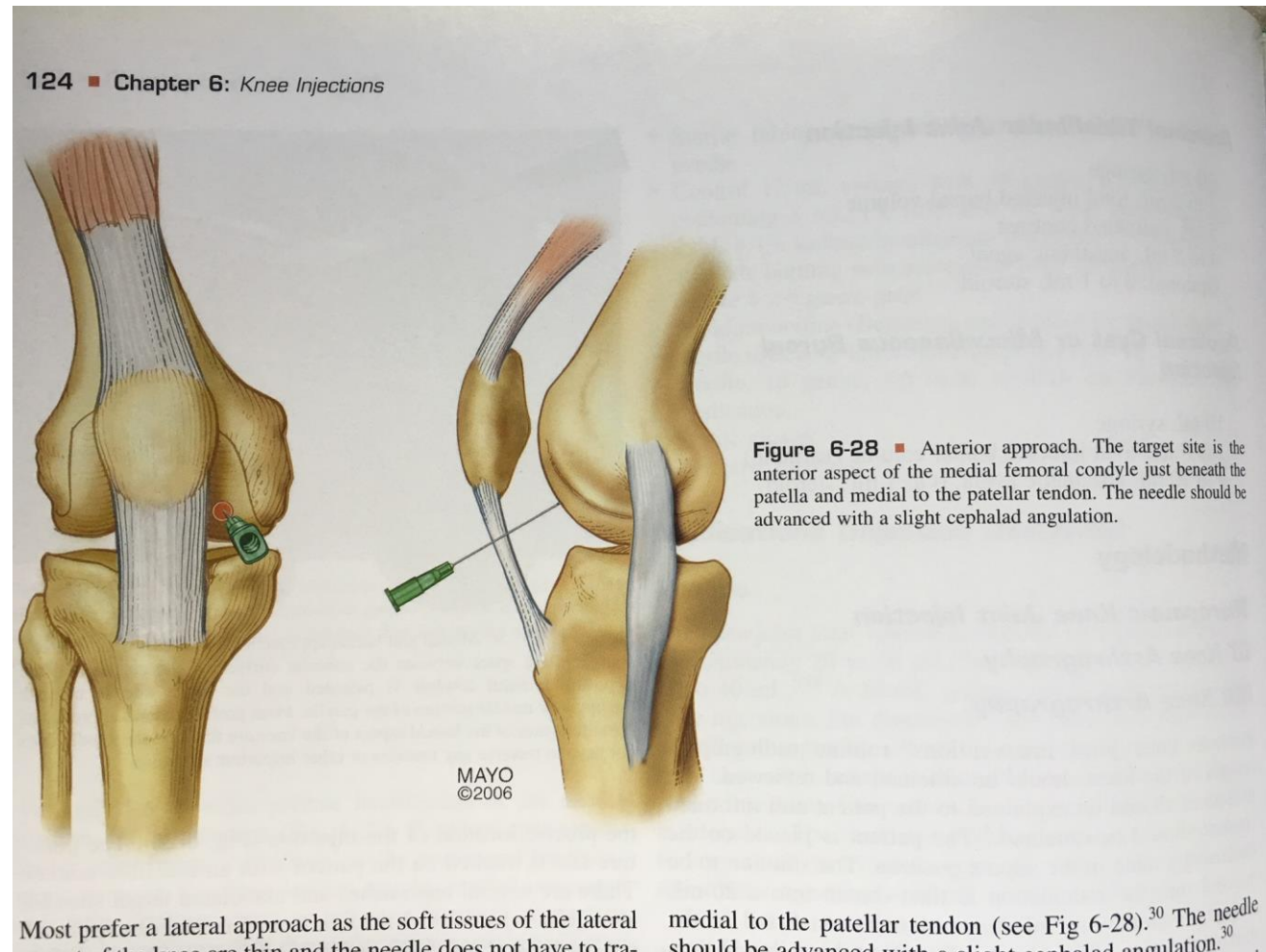
Ankle Arthro

- Target is the anterior ankle joint.
- Shove the needle directly into the joint. The joint is your target (see bottom left pic). You will not shear off cartilage by aiming directly into the joint.
- Inject 5cc's max into the ankle joint. 3-4cc's is what I do.



Knee Arthro

- Position the patient supine with the knee flexed at 45 degrees and the foot flat on the table. The other leg can be straight.
- Feel the patellar tendon and mark just medial to it like in the picture.
- Lidocaine the skin and along the track like the pic to the left.
- Angle slightly up and go until you hit the face of the medial femoral condyle. You will eventually hit bone even if you're angled a bit too high or low. Really doesn't matter. You'll never make out through the back of the knee without hitting something and then you know you're in!
- You may have to withdraw the needle by half a millimeter for you to get the loss of resistance.
- Inject the Gad/omni solution into the knee – 40cc's total. Don't skimp on the total volume. Knee's can hold a lot of fluid.
- I don't get any pre or post imaging. You can if you want.



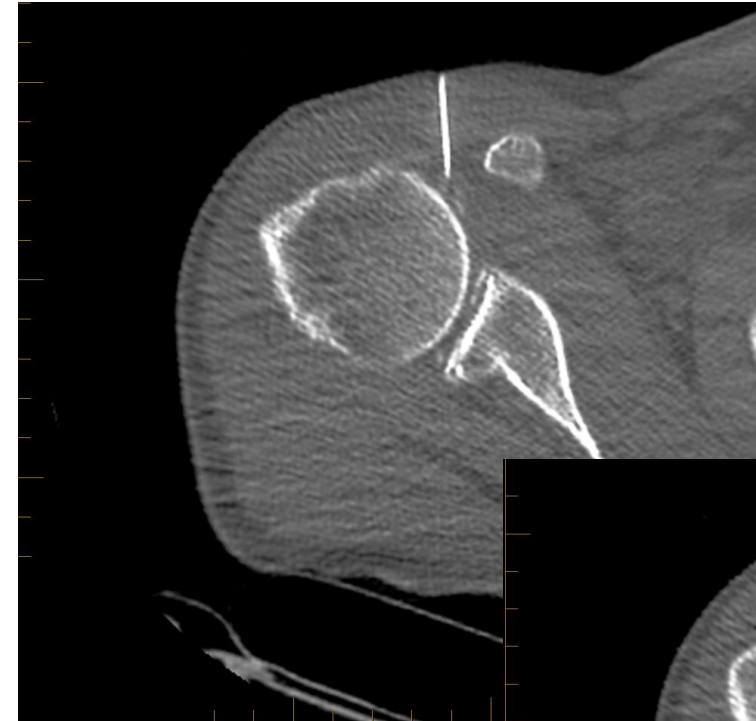
Step by step guide for Shoulders and Hips

- When you walk into the tech area, the tech will already have the scout CT done, asking which axial slice you want to select to mark.
 - Use page up and page down to find the best axial approach.
 - Say “that one” to the tech when you’ve found your guy.
 - Use the ruler tool to measure how far lateral or medial from the marker you want your entry site.
- Walk into the room, say hi, chit chat, and mark the patient with the sharpie.
 - There will be a small ruler in the room. For the example on the left, you’ll mark 5mm lateral to the marker. The tech will have the CT laser on so you know which axial level you are at. Remove the linear radio-opaque marker when done.
- Your tray will already be uncovered and everything should already be drawn up. You may have to ask for tubing or an extra syringe if you need it. The only thing you may need to do is get some of the tiny air bubbles out of syringe.
 - For shoulders and hips, your tray will have a 20cc syringe of the Gad/omni/saline mixture + a 10cc syringe of lido. The techs sometimes also give you a 10cc syringe of just omni. But they will have labels so you can tell the two 10cc syringes apart.
- Clean off the skin with the ChloroPrep stick.
- Put on the sterile blue drape.
- Skin wheal to numb. Then deeper numbing along expected track with the short needles in the tray. You won’t get all the way down to the joint.



Step by step guide for Shoulders and Hips

- Insert the spinal needle. You can either go all in until you hit your bony backstop and then check the spot or you can insert half way and check.
- Walk back out to tech area. For the check, they will take 5 slices and you can see if you need to adjust up vs down or medial vs lateral. You can always ask for more slices if you don't see the needle tip.
- Walk back into the room and adjust the needle. Repeat above steps until you want to check again.
- When you've hit your bony backstop, inject a bit of lido to see if you can get that loss of resistance. You may need to hold down on the syringe while pulling back a half millimeter to get that feeling. If you get that loss of resistance and are confident you're in, then fill the joint with your 12-15cc's of Gad/omni mixture from the 20cc syringe.
- If you're unsure, just inject 1-2cc's of the Gad/omni solution from the 20cc's syringe and take a look.
- For the example on the left, the rad inserted the spinal needle until he hit the bony backstop, got loss of resistance with 1-2cc's of lido (maybe, hopefully, idk I didn't do this one), injected 2cc's of the Gad/omni solution and then did his first check.
- Once you get pictures that look like the example on the left and you have confirmed you're in by visualizing that 1-2cc's of intra-articular contrast, you can inject the remainder of the Gad/omni solution up to 12cc's in the shoulder.



Final Tips

- Always use wet to wet connections when switching syringes.
- Always re-insert the spinal needle stylet before walking out of the room for your checks unless you are using tubing.
- You will never shear off cartilage by doing an arthrogram. I've bent the needle inside the joint a few times so I know I was pushing hard. And the arthrograms are all normal. So when all else fails, just aim for the joint.
- If you hit the coracoid, it's painful. You should be able to recognize it because you're not very deep. The extra-articular periosteum is innervated and can be painful.
- The techs may ask you if you want post-injection imaging. Never get post-injection imaging unless it is a wrist arthrogram. Waste of radiation otherwise. I mean you're not going to redo the procedure after telling the patient you're done and throwing all your tray materials away. If you missed, you missed and we'll just reschedule the patient or usually the exam is diagnostic anyways.
- Call me or any of the MSK rads with any questions or if it's your first one and you just want a little pep talk/how-to over the phone. Happy to do it and look at your CT injection images to give you more pointers after the procedure is done. Ideally we'd train all of you on every joint, but there's no way to work out scheduling for the rare elbow or knee or ankle arthrograms.

End

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