



Fluoroscopy Protocols

Arthrograms- Major Joints 1.5T

Fluoro Time Target Limit-1.0

Use an anatomical side marker on all images

Scheduling and Prep:

*There is no prep for this exam.

Knee MRI arthrogram:

* If NO previous Knee surgery, but referred by an orthopedic surgeon:
Perform arthrogram as ordered.

*If NO Knee surgery and ordered by a Dr. that IS NOT an orthopedic Surgeon: Contact Dr. Rodriguez about changing MRI Knee arthrogram to a plain Knee MRI.

*CT Knee arthrogram-OK surgery or not

**If performing multiple joints at relatively the same time; replace the diluting Lidocaine with Xylocaine with Epinephrine. This will keep the contrast mixture within the joint for a longer period of time so that the CT or MRI will have optimal joint distention / contrast retention.

**Do not use the Xylocaine with Epinephrine to anesthetize the skin and Tissues. Use the usual Lidocaine.

*Patient must be informed and sign the consent form prior to the procedure
And prior to any sedation, if receiving sedation

*Patient must fill out a contrast questionnaire.

*If the patient has a known contrast allergy, or allergy to any items to be used during the arthrogram, they must be referred to a Paramedic for premedication.

*Patient must fill out an MRI metal screening form- for MRI arthrograms

*Fill out the Procedure Time-out Documentation form completely

*If the scout image demonstrates a large amount of metal, confirm with an MSK Radiologist if exam would be better under CT

*****If the patient has had a joint replacement, or a lot of metal in the joint, they must have a CT. of the affected joint prior to the arthrogram with CT**

Room Prep: *Remove tower drapes *Prepare sterile arthrogram tray
*Position an anatomical side marker on the image intensifier surface

Supplies: *Arthrogram Tray *Sterile gloves *Gadavist or equivalent – (MRI's only)
(**No Gadavist on hips**) *Sodium Chloride bottle *Omnipaque 300 or 240
*.25% Bupivacaine (Hips only)
*Lidocaine *Sodium Bicarbonate (optional)
*Sandbag for immobilization ***LT or RT anatomical marker**

Formulas

MRI Formula: **Shoulders, Elbows, Wrists, and Ankles**

*Draw up in a 5cc syringe: 2cc sodium bicarbonate (optional) + 3cc Lidocaine- for anesthetizing the skin and underlying tissues. Or 5cc- Lidocaine

*Draw up in a 1cc syringe: **0.3cc** Gadavist or equivalent, and inject it Into a 30cc bottle of Sodium Chloride – (saline) – mix well

***0.2** if 20cc bottle of Sodium Chloride- (saline)- mix well
0.1 for every 10cc of Sodium Chloride

*Draw up in a 20cc syringe: 10cc of the above Gad/saline solution, add 5cc Omnipaque 300 or 240 and add 5cc lidocaine = 20cc of mixture- Mix well

****Per Dr. Rodriguez: Do not use the same needle/medic-pin to draw up the Gadavist and the lidocaine. This prevents the GAD from being injected into the subcutaneous fat during the process of anesthetizing the skin.**

MRI Formula: **Hips Only**

*Draw up in a 5cc syringe: 2cc sodium bicarbonate (optional) + 3cc 1% lidocaine- for anesthetizing the skin and underlying tissues.
Or 5cc Lidocaine

***DO NOT USE ANY GADAVIST FOR MRI HIP ARTHROGRAMS-
as of 5-20-2021**

*Draw up in a 20cc syringe: 10cc of saline + 5cc Omnipaque 300 or 240 + 5cc Bupivacaine or Marcaine= 20cc of mixture

CT Formula: **Shoulders, Elbows, Wrists, and Ankles**

*5cc syringe: 2cc sodium bicarbonate (optional) + 3cc Lidocaine for anesthetizing the skin and subcutaneous tissues. Or 5cc-Lidocaine

*20cc syringe: 5cc lidocaine + 15cc Omnipaque 300

CT Formula: **Hips ONLY:**

*20cc syringe: 5cc Bupivacaine or Marcaine+15cc Omnipaque 300

KNEE ARTHROGRAMS

*** CT Knee Arthrograms- (Previous surgery or no Surgery OK)**

*5cc syringe: 2cc sodium bicarbonate (optional) + 3cc Lidocaine for anesthetizing the skin and subcutaneous tissues. Or 5cc-Lidocaine

Knee CT Formula: Draw up in two separate syringes in the event that the patient is unable to tolerate the entire 40cc.

(In each 20cc syringe; 15cc-Omni 300 or 240 and 5cc-Lidocaine)

Inject entire 40ml unless it becomes painful or difficult to inject.

****MRI Knee Arthrogram**

* If NO previous Knee surgery, but referred by an orthopedic surgeon:
Perform arthrogram as ordered.

*If NO Knee surgery and ordered by a Dr. that IS NOT an orthopedic Surgeon: Contact Dr. Rodriguez about changing MRI Knee arthrogram to A plain Knee MRI.

Formula

Add .3cc Gadavist or equivalent to 30cc Sodium Chloride.

Or .2cc Gadavist to a 20cc bottle of Sodium Chloride.

0.1 cc Gadavist to every 10cc Sodium Chloride

Draw up in two separate 20cc syringes: 10cc Saline/Gad mixture + 5cc-Lidocaine + 5cc-Omni 300 or 240 = for a total of 40cc

*Mix in separate syringes in case the patient is unable to tolerate the entire 40cc of fluid

Procedures:

Shoulders:

*Place a sand bag weight in palm of the externally rotated hand

*Pre-injection spot image- AP of shoulder in the external rotation.

*Mark injection site: Rotator Cuff Interval-see below image Fig2.

Needle Placement in the Rotator Cuff Interval



- *Using sterile technique; clean anterior shoulder
- *Place eye drape over anterior shoulder
- *Anesthetize skin
- *Insert a 25ga or 22ga needle of appropriate length perpendicular to the bone
- *Take a needle placement image as soon as contrast is confirmed within the joint
- *Inject 12cc of contrast mixture solution
- *Remove needle- clean off Betadine and place band-aide over injection Site
- *Gently exercise the joint before taking post contrast images.

***Post injection spots:** AP External Rotation, AP Internal Rotation

+Please be aware of this special circumstance: per Dr. Rodriguez

added 8-26-2020

Sometimes we get shoulder arthrogram requests with a history of “frozen shoulder”, also known as “adhesive capsulitis”. Basically, the joint capsule is too tight and the patient has very limited range of motion.

For these, one way to diagnose adhesive capsulitis is through arthrography. If you cannot inject a full 12 cc, that is helpful info to know. If you can only inject < 10 cc, that would be diagnostic of adhesive capsulitis. When the Radiologist is reading the MRI, this is useful information to know.

We do not get many of these requests. However, I think it is helpful for you guys to know about this entity. You can put in your notes that you could not inject the full 12 mL, if we have a history of "frozen shoulder", or adhesive capsulitis. Of course, the rad dictating the arthrogram needs to put it in his report.

Example: ACC 30892225

Feel free to call me to discuss.

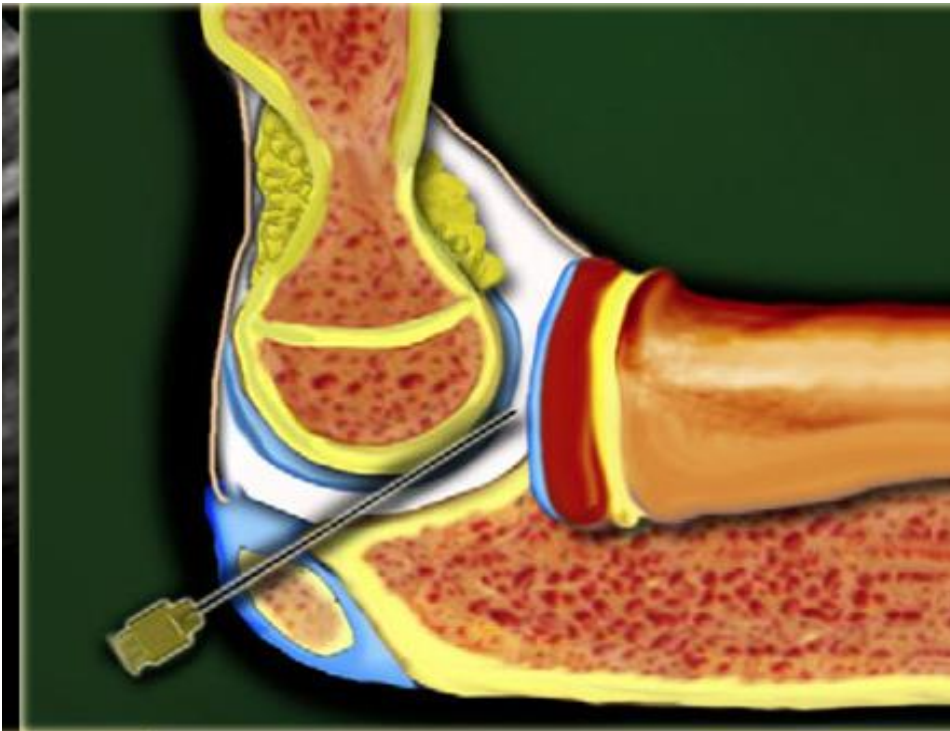
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Fluoro techs: Please inform the reading Radiologist in your notes if you had a difficult time injecting and if you were unable to inject the full 12 cc. Also, enter that information in your additional comments when completing you exam.

Elbows:

*Pre-injection scout image-(Full exposure-overhead-not Fluoro spot)

*AP arm fully extended



*Position patient prone with arm above head with elbow flexed 90 degrees

*Elevate arm (build up with folded sheets) to keep parallel to table

*Localize injection site: Space between capitellum and radial head

*Using standard sterile technique, anesthetize skin

*Place needle into joint using a perpendicular approach 25ga or 22ga

*Take a needle placement image as soon as contrast is confirmed within

the joint

*Inject 7-8cc of contrast solution

*Remove needle- clean off Betadine and a place band-aide over injection Site

*Gently exercise the joint before taking post contrast images.

Post injection spots: AP fully extended, Lateral with elbow bent 90 degrees

Wrists:

Pre-injection image (Full exposure-overhead—not a Fluoro spot)

*PA wrist with hand flat and fingers extended



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*Patient supine with arm by their side, hand pronated with sponge under Wrist for slight flexion

*Localize injection site: posterior radio carpal joint

*Using standard sterile technique, anesthetize the skin

*Place 26ga- 1/2" needle into joint using a perpendicular approach

*This is the most technically demanding arthrogram and the one arthrogram when the Fluoro images are most likely to contribute to the diagnosis. If the Fluoro machine does not have 4 x per second option, then manual rapid fire during the injection.

*If your Fluoro equipment has the feature to save a series of live Fluoro, you may use this in place of rapid exposures.

***The maximum joint capacity is 2 cc. This is the one joint that Should not be fully distended with contrast fluid. Per Dr. Rodriguez**

*Remove needle/ clean off Betadine and place band-aide over injection site

- During injection, obtain a live Fluoro loop of the contrast while it is being injected into the wrist. Save the loop. This is the most technically demanding arthrogram and the arthrogram when the Fluoro images are most likely to contribute to the diagnosis. If the Fluoro machine doesn't have loop save or 4x per second, then manual rapid fire during the injection.
- Post-injection
 - **Immediately after removing the needle, do not exercise, remove any wedge from underneath the wrist.
 - ** live Fluoro the wrist while the patient moves the wrist back and forth in the radial deviated and ulnar deviated positions two to three times. Then have the patient repeat this movement with a clinched fist. Save the Fluoro loops.

**This process will greatly assist the Radiologists in diagnosing ligament tears by allowing them to see the contrast move throughout the carpal joint spaces, and through a possible tear during joint movement.

****Post injection spots:**

- *PA wrist with hand flat and fingers extended
- *PA wrist clenched fist view
- *PA wrist with radial deviation
- *PA wrist with ulnar deviation
- *Lateral wrist

CT / MRI Combination Wrist arthrograms:

Use **Lidocaine or Xylocaine with 1% Epinephrine** instead of the regular lidocaine in the mixture. This will help retain the contrast / lidocaine mixture in the joint to allow time to do both CT and MRI scans.

**Escort the patient to CT immediately following the injection.

**The MRI is to be done last.

HIPS:

*Pre-injection spot- AP with foot internally rotated



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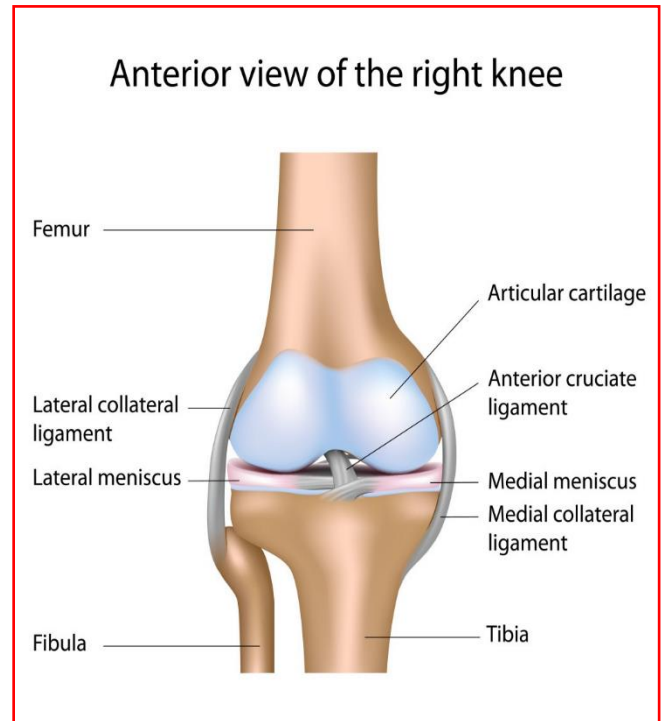
- * Patient in supine position with toe pointed medial-use a mobilization
Devise; such as a sand bag to support patient's position
- * Localize injection site: superior 1/3 of proximal femoral neck
- *Using standard sterile technique, anesthetize skin and deeper tissues
- *Place 22ga 3-1/2" needle in perpendicular approach until needle reaches
The bone
- *Take a needle placement image as soon as contrast is confirmed within the
joint
- *Inject **15cc** of contrast solution and **5cc** of .25% Bupivacaine for a total of
20cc of fluid.

- **If orders request any additional fluids, such as a steroid or lidocaine,
Adjust the total volume by subtracting from the Bupivacaine.
- *Total fluid volume should not be more then 20cc
- *Reinsert the stylet and remove needle/ clean off Betadine and place band-
aide over injection site
- *Gently exercise the joint before taking post contrast images.

Post injection spots: AP with foot internally rotated and frog leg lateral

KNEES:

- *Pre-injection spot: AP with leg extended



* **Anterior approach** - enter at the medial femoral condyle

- *Using standard sterile technique, anesthetize the skin on the anterior
Relaxed knee
- *Place a 22GA needle, perpendicular to the medial femoral condyle
- *Ensure that the needle tip is making contact with the bone
- *Take a needle placement image as soon as contrast is confirmed within the
joint
- *Inject 40cc of contrast/ saline/ Lidocaine solution
- *Remove needle/ clean off Betadine and place band-aide over injection site
- *Gently exercise the joint before taking post contrast images.

Post injection spots: AP with leg extended, lateral with leg extended

OR

Lateral or medial approach:

- *Supine with leg relaxed to allow for manipulation of patella
- *Localize injection site: Patellofemoral joint
- *Using standard sterile technique, anesthetize the skin

- *Place appropriate size needle in the medial or lateral aspect of the Joint
- *Optional approaches include medial or lateral patellofemoral joint
- *Inject 40cc of contrast/ saline/ Lidocaine solution
- *Remove needle/ clean off Betadine and place band-aide over Injection site
- *Gently exercise the joint before taking post contrast images.

Post injection spots: AP with leg extended, lateral with leg extended

OR

* True lateral patellofemoral approach:

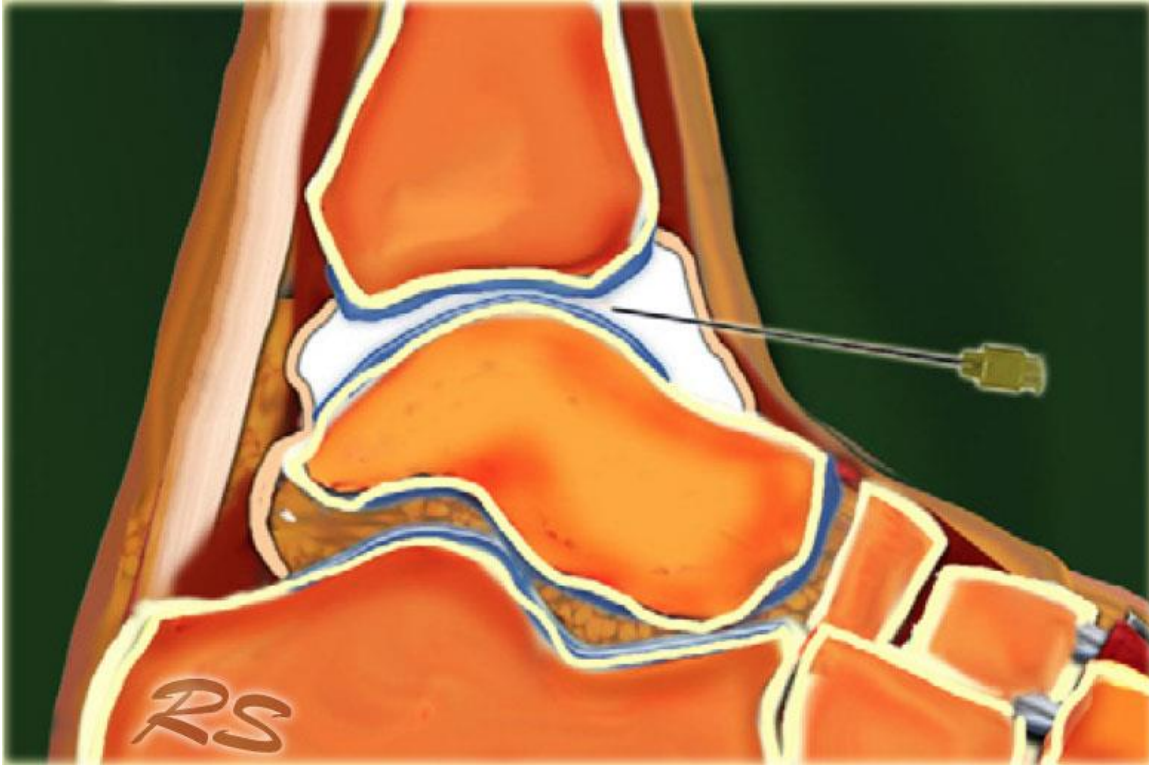
- *Affected knee in a lateral position
- *Localize injection site: Patellofemoral joint
- *Using standard sterile technique, anesthetize the skin
- *Place appropriate size needle into the medial aspect of the joint space
- *Take a needle placement image when contrast is confirmed within The joint

- *Inject 40cc of contrast/ saline/ Lidocaine solution
- *Remove needle/ clean off Betadine and place band-aide over Injection site
- *Gently exercise the joint before taking post contrast images.

Post injection spots: AP with leg extended, lateral with leg extended

ANKLES:

Pre-injection spot image: AP with foot in neutral position (not flexed Or extended) & Lateral in neutral position



- *Draw a 2-3" line superior to inferior on the anterior ankle to mark
The center of the lower leg
- *Place the patient in lateral position with affected foot closer to table
- *Mark injection site: Anterior tibiotalar joint
- *Place a sterile drape under ankle
- *Angle the needle at the same angle as the tibiotalar joint.
- *Maintain a horizontal trajectory to stay in the center of the ankle.
- *Using standard sterile technique anesthetize the skin
- *Place 25ga or 22ga needle of appropriate length
- *Take a needle placement image as soon as contrast is confirmed
within the joint
- *Inject 7-8cc of contrast solution
- *Remove needle / clean off Betadine and place band-aide over the
Injection site
- *Gently exercise the joint before taking post contrast images.

Post injection spots: AP-ankle in neutral position, lateral-ankle in neutral position, Oblique-ankle in neutral position

*After injection, escort the patient to the MRI or CT Department in a wheel-

chair

*Dispose of all needles in the appropriate sharps container

*Dispose of any leftover medications in the “Cactus” Pharma lock container

*These are the minimum images needed to demonstrate the proper anatomy For these exams. When deemed necessary, more images can be taken to Demonstrate pathology or for other reasons such as per the Radiologist’s Request. Take care to minimize patient and technologist exposure.

Reviewed and Revised: January 23, 2024