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Other

- Osteomyelitis
- Soft tissue mass/soft tissue infection

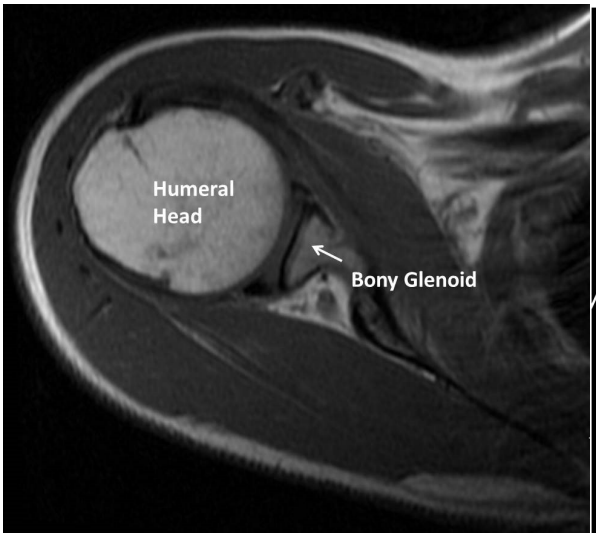
Shoulder MRI

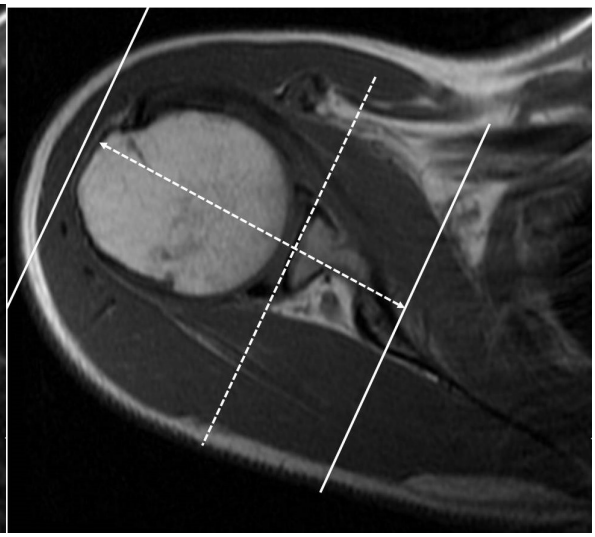
Sequences:

1. Cor Oblique T2 FS
2. Cor Oblique STIR
3. Sag Oblique T1
4. Sag Oblique T2 FS
5. Axial Oblique PD FS
6. Axial Oblique T2 FS/STIR
7. Axial Oblique GRE

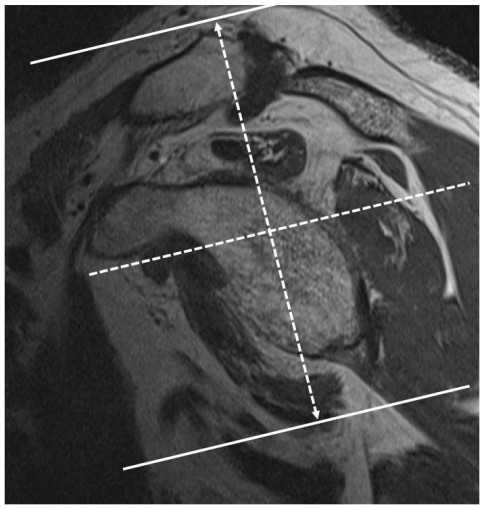
Obtain straight axial images to determine sagittal oblique imaging plane

SAGITTAL OBLIQUE IMAGING PLANE



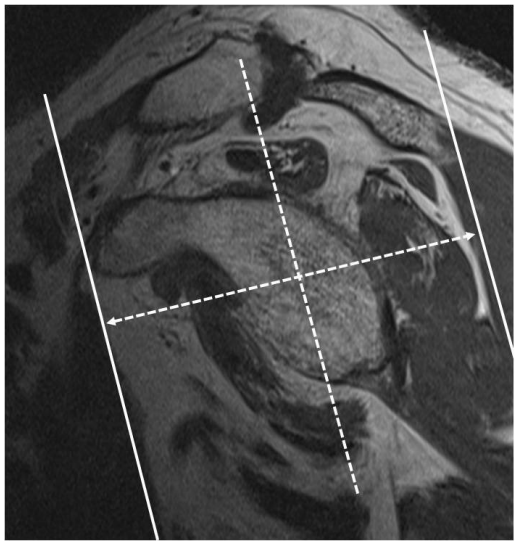


AXIAL OBLIQUE IMAGING PLANE (Based on Sag Obl images)



slightly tilted anteriorly (err on side of under-angling)

CORONAL OBLIQUE IMAGING PLANE (based on Sag Obl images)



slightly tilted anteriorly (err on side of under-angling)

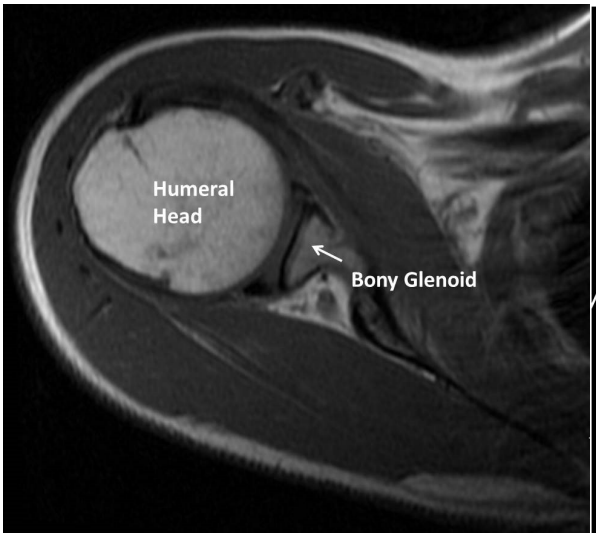
Shoulder MRI Arthrogram

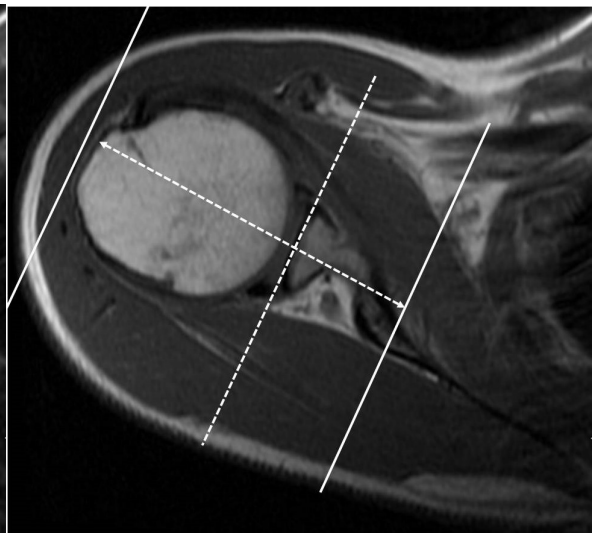
Sequences:

1. Cor Oblique T1 FS
2. Cor Oblique T2 FS
3. Sag Oblique T1
4. Sag Oblique T1 FS
5. Sag Oblique T2 FS
6. Axial Oblique T1 FS
7. Axial Oblique T2 FS

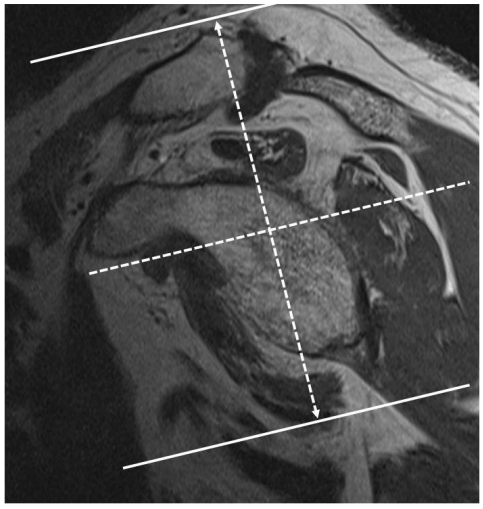
Obtain straight axial images to determine sagittal oblique imaging plane

SAGITTAL OBLIQUE IMAGING PLANE





AXIAL OBLIQUE IMAGING PLANE (Based on Sag Obl images)



slightly tilted anteriorly (err on side of under-angling)

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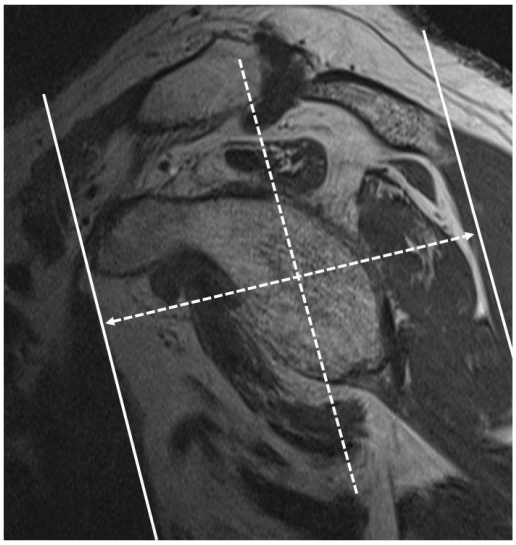
CORONAL OBLIQUE IMAGING PLANE (based on Sag Obl images)



slightly tilted anteriorly (err on side of under-angling)

If there is hardware:

Cor STIR
Cor T1
Sag STIR
Sag T1
Ax STIR
Ax T1

***STIR sequences reduce inhomogeneous fat sat. ***

IF ANY FAT SUPPRESSION FAILS OR IS POOR, THEN IT IS RECOMMENED TO PERFORM A STIR SEQUENCE IN ITS PLACE

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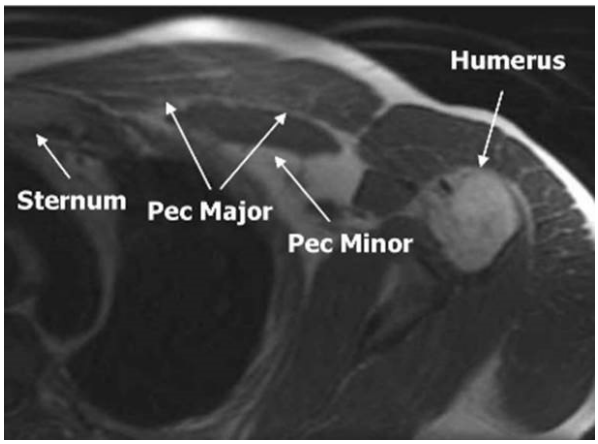
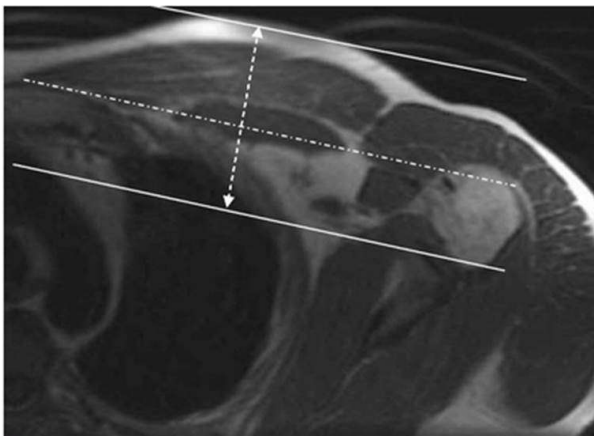
Chest Wall (Pectoralis Muscle Tear Indication) MRI

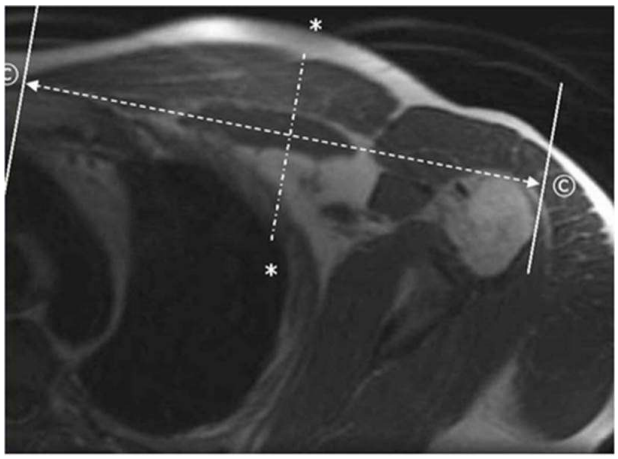
1. Axial T1
2. Axial STIR
3. Cor Oblique T1
4. Cor Oblique STIR
5. Sag Oblique T1
6. Sag Oblique STIR

CORONAL OBLIQUE (parallels line from anterior cortex of sternum to anterior cortex of the humerus)





SAGITTAL OBLIQUE (perpendicular to Coronal Oblique)



Humerus MRI

1. Axial T1
2. Axial STIR
3. Cor T1
4. Cor STIR
5. Sag T1
6. Sag STIR

- Same imaging planes as elbow MRI

Elbow MRI

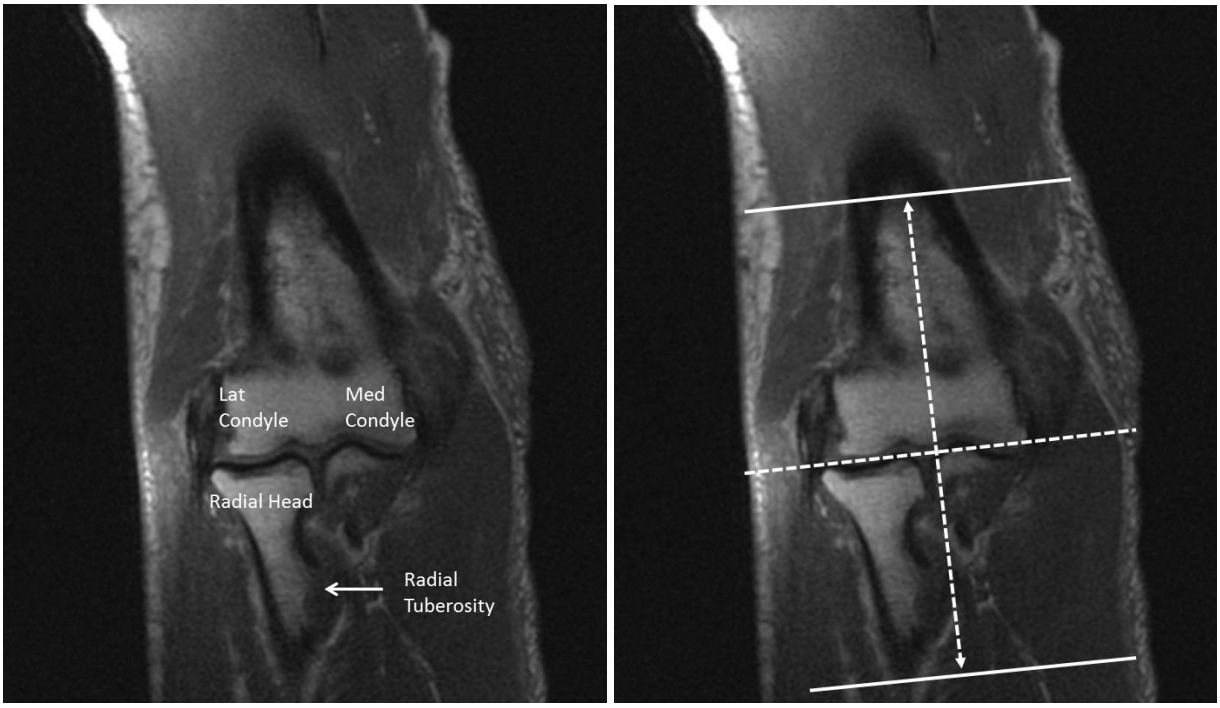
Sequences:

7. Axial T1
8. Axial FSE T2 FS/STIR
9. Cor FSE T2 FS/STIR
10. Cor thin slice GRE
11. Cor T1
12. Sag FSE T2 FS/STIR
13. Sag T1

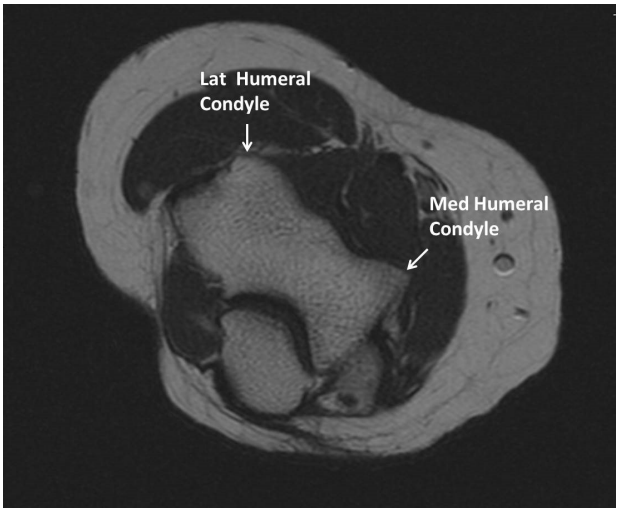
Notes:

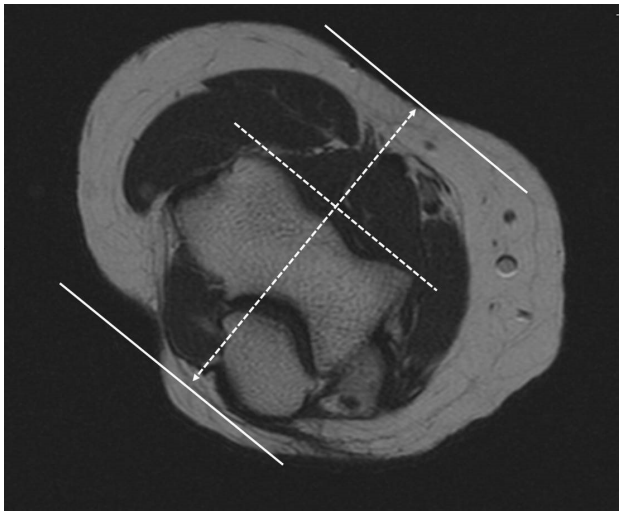
- Elbow must be as straight as possible
- Humerus should be at top of coronal images
- Olecranon should be at bottom of axial images.
- Axials through radial tuberosity for biceps insertion

AXIAL IMAGING PLANE

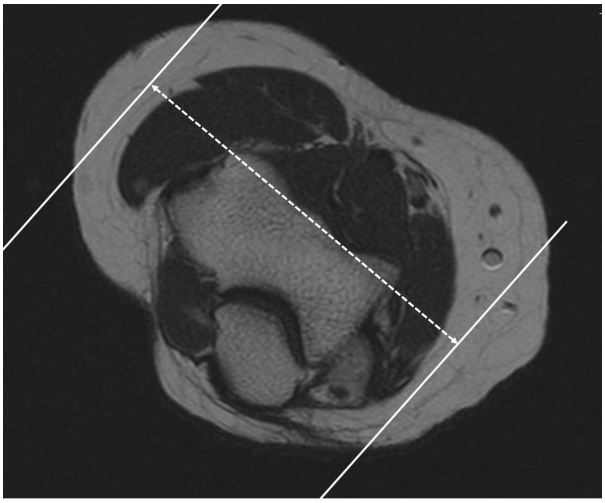


CORONAL IMAGING PLANE





SAGITTAL IMAGING PLANE (perpendicular to coronal plane)



Elbow MRI Arthrogram

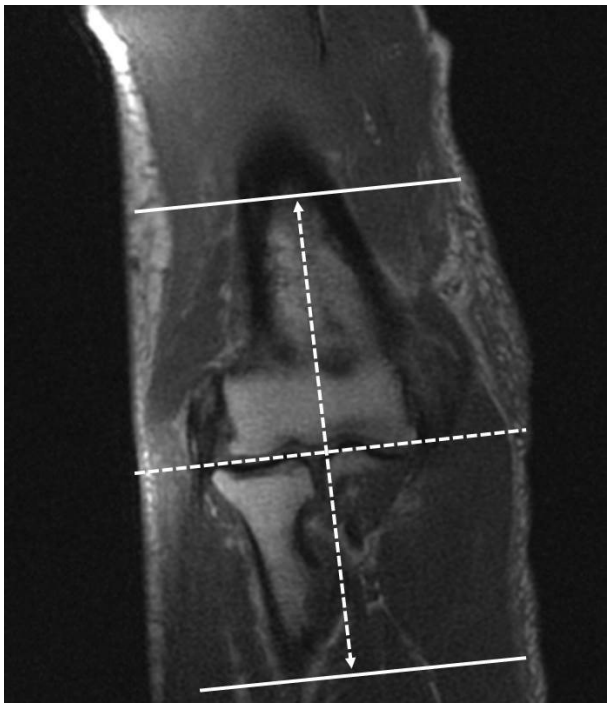
Sequences:

1. Axial T1
2. Axial T2 FS/STIR
3. Cor T1 FS
4. Cor T2 FS/STIR
5. Sag T1 FS
6. Sag T2 FS/STIR

Notes: Elbow must be as straight as possible

IF ANY FAT SUPPRESSION FAILS OR IS POOR, THEN IT IS RECOMMENED TO PERFORM A STIR SEQUENCE IN ITS PLACE

AXIAL IMAGING PLANE



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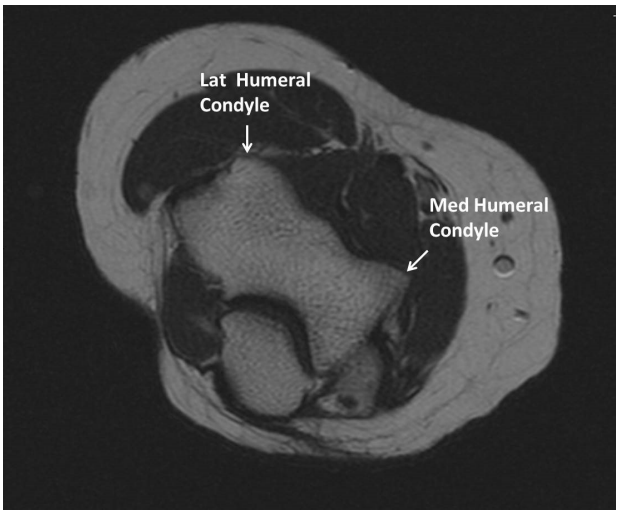
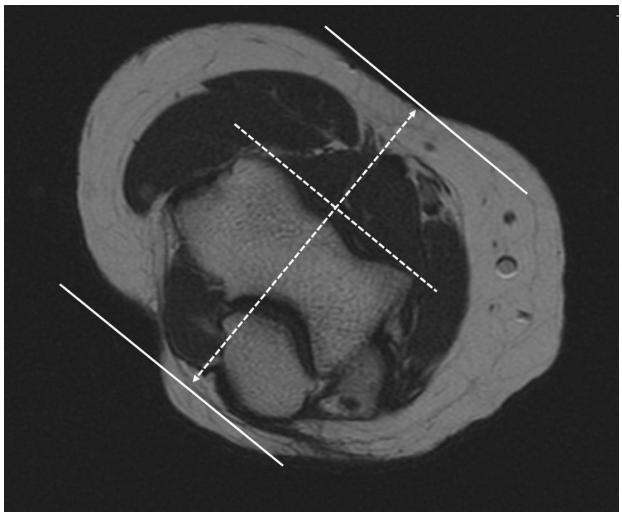
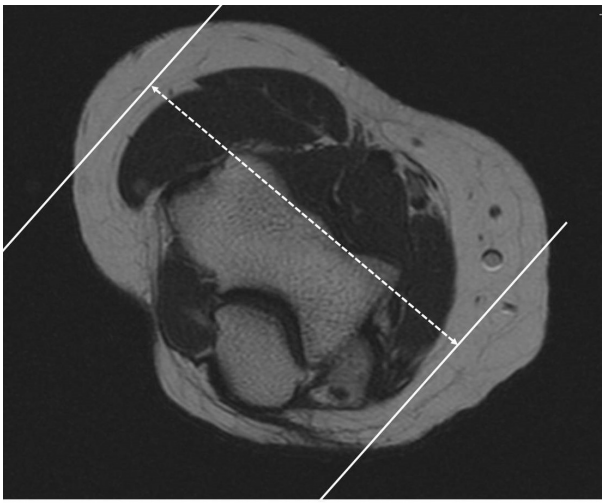
CORONAL IMAGING PLANE





SAGITTAL IMAGING PLANE (perpendicular to coronal plane)



If there is hardware:

Cor STIR

Cor T1

Sag STIR

Sag T1

Ax STIR

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Ax T1

***STIR sequences reduce inhomogeneous fat sat. ***

IF ANY FAT SUPPRESSION FAILS OR IS POOR, THEN IT IS RECOMMENED TO PERFORM A STIR SEQUENCE IN ITS PLACE

Wrist MRI

Without Contrast:

1. Cor T1
2. Cor T2 FS/STIR
3. Cor thin slice GRE
4. Axial T1
5. Axial T2 FS/STIR
6. Sag PD Fat sat

With Contrast (mass, synovitis)

1. Cor T1
2. Cor T2 FS/STIR
3. Axial T1 FS
4. Axial T2 FS/STIR
5. Sag T2 FS/STIR
6. Sag T1 FS
7. Axial T1 FS post
8. Cor T1 FS post
9. Sag T1 FS Post

*****Please make sure thumb on axial images is on the same side of body as on coronal images and carpal tunnel is at bottom of axial images.**

IF ANY FAT SUPPRESSION FAILS OR IS POOR, THEN IT IS RECOMMENED TO PERFORM A STIR SEQUENCE IN ITS PLACE. Example: Hardware present

AXIAL IMAGING PLANE (oriented perpendicular to long axis of the radius and ulna)

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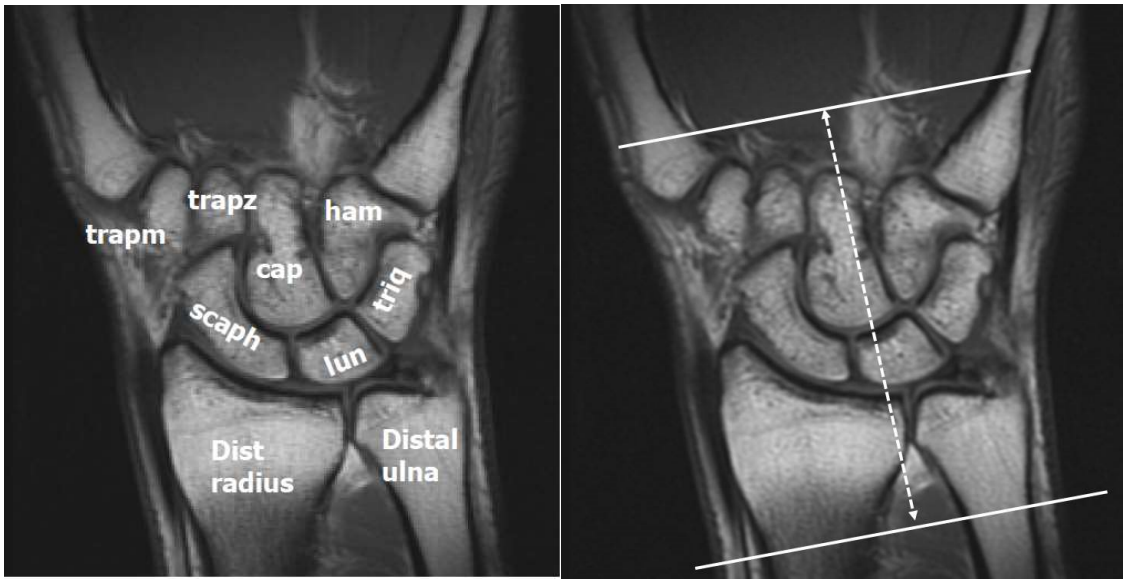
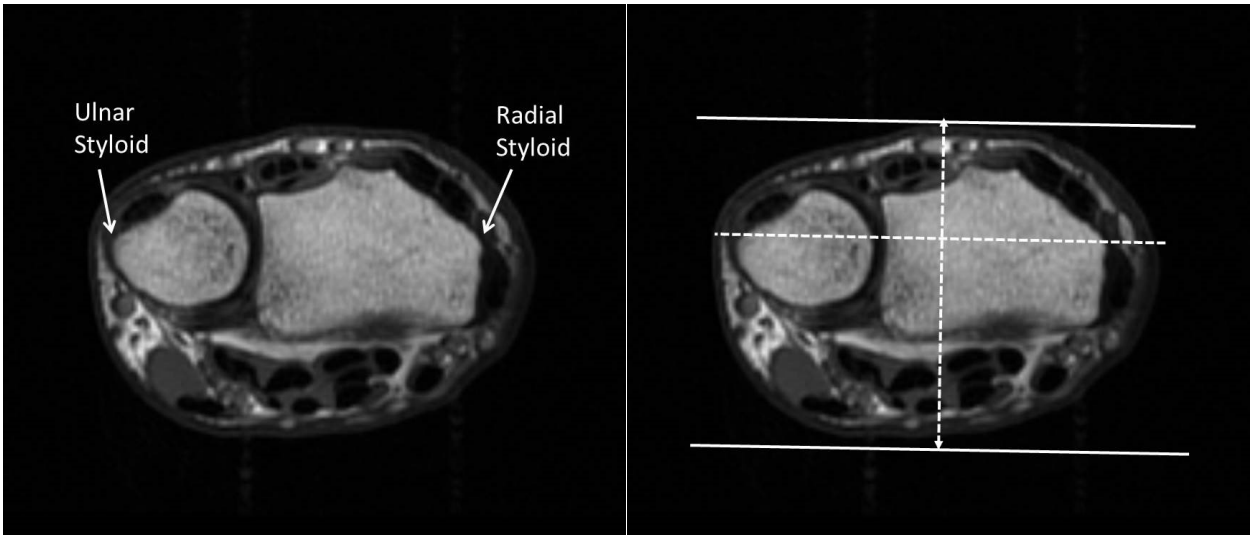


CORONAL IMAGING PLANE



SAGITTAL IMAGING PLANE (perpendicular to coronal plane)

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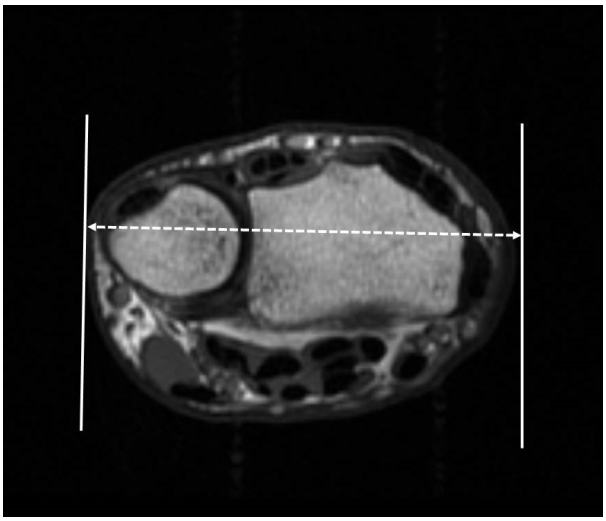


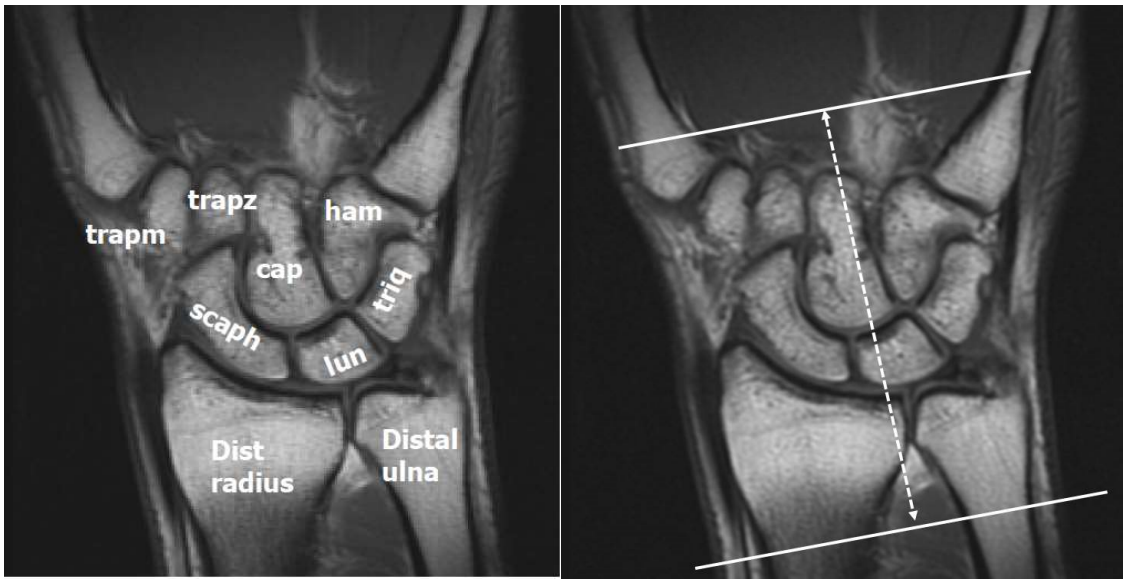
Wrist MRI Arthrogram

Sequences:

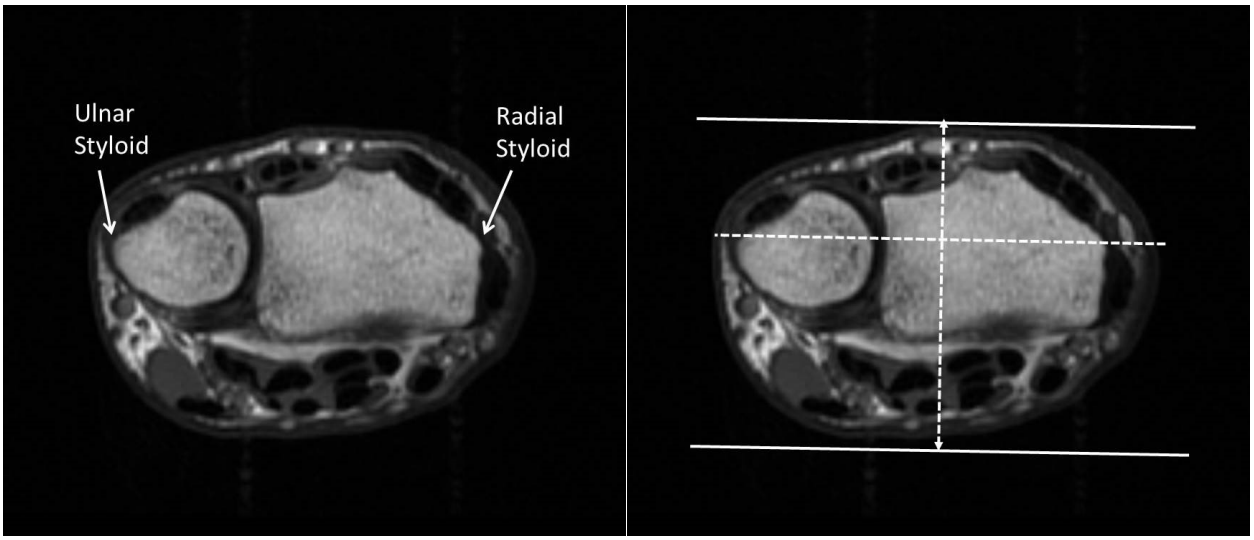
1. Cor T1 FS
2. Cor T2 FS?STIR
3. Axial T1
4. Axial T1 FS
5. Axial T2 FS/STIR
6. Sag T2 FS/STIR

IF ANY FAT SUPPRESSION FAILS OR IS POOR, THEN IT IS RECOMMENED TO PERFORM A STIR SEQUENCE IN ITS PLACE. Example: Hardware present

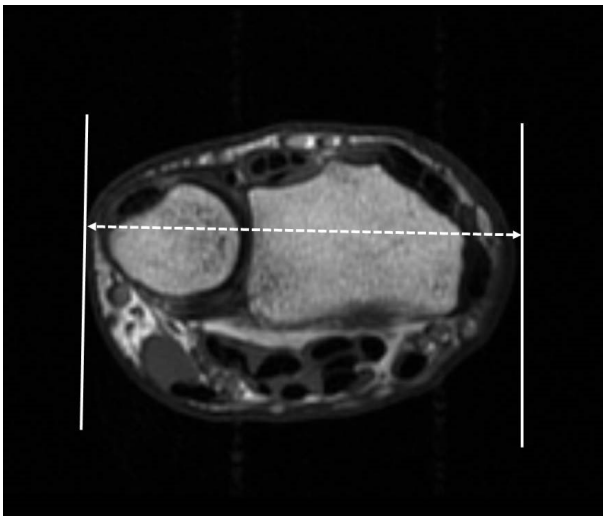
AXIAL IMAGING PLANE (oriented perpendicular to long axis of the radius and ulna)



CORONAL IMAGING PLANE



SAGITTAL IMAGING PLANE (perpendicular to coronal plane)



Finger MRI

Sequences:

7. Axial T1
8. Axial FSE T2 FS/STIR
9. Cor T1
10. Cor FSE PD FS
11. Cor T2 FS/STIR
12. Sag PD FS

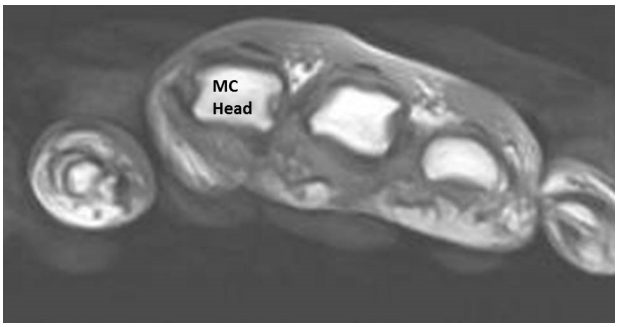
Coverage:

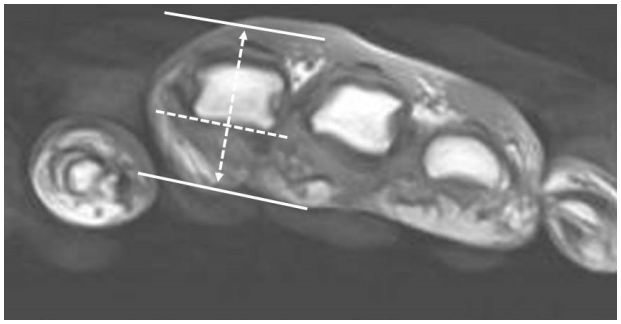
- FOV to include bases of the metacarpals
- Sagittal images should include 2 consecutive fingers for comparison purposes, unless a “hand MRI” is ordered in which case sagittals can extend through whole hand.
- Fingers must be as straight as possible

IF ANY FAT SUPPRESSION FAILS OR IS POOR, THEN IT IS RECOMMENED TO PERFORM A STIR SEQUENCE IN ITS PLACE. Example: Hardware present

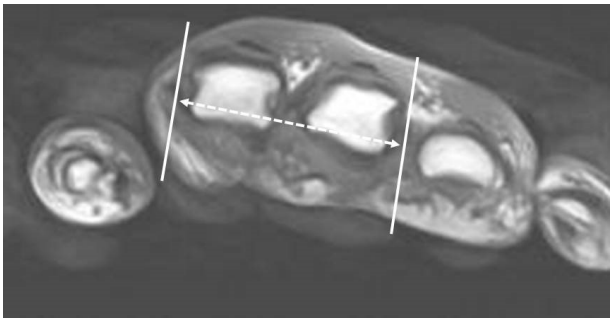
AXIAL IMAGING PLANE

CORONAL IMAGING PLANE





SAGITTAL IMAGING PLANE (perpendicular to coronal plane)



Finger Mass MRI

1. Axial T1
2. Axial T2 FS/STIR
3. Axial GRE
4. Cor T1
5. Cor T2 FS/STIR
6. Sag T1
7. Sag T2 FS/STIR
8. Axial T1 FS
9. Axial T1 FS post
10. Cor or Sag T1 FS post(Cor if medial or lateral, Sag if anterior or posterior)
11. Cor or Sag T1 FS post(Cor if medial or lateral, Sag if anterior or posterior)

Coverage:

- FOV to include bases of the metacarpals
- Sagittal images should include 2 consecutive fingers for comparison purposes
- Fingers must be as straight as possible

AXIAL IMAGING PLANE

CORONAL IMAGING PLANE

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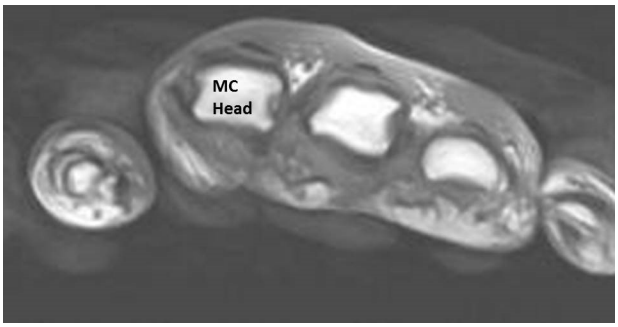
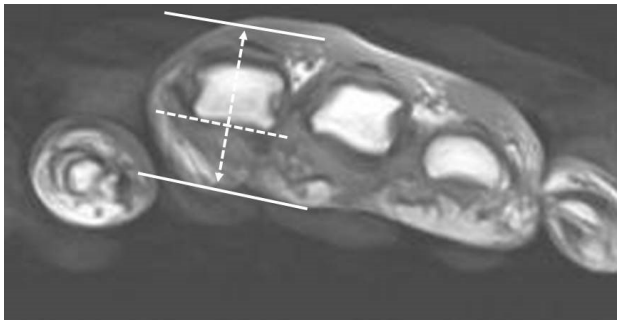
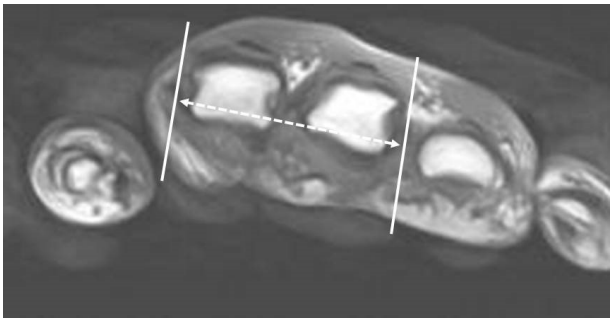




SAGITTAL IMAGING PLANE (perpendicular to coronal plane)



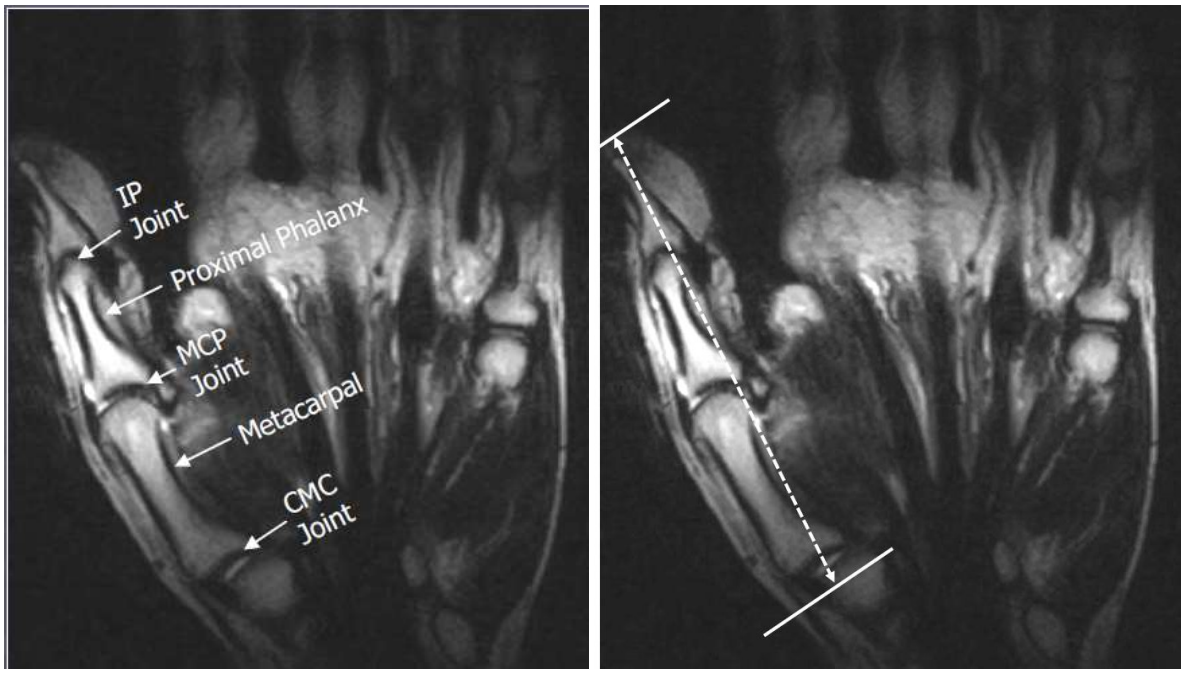
Thumb MRI

Sequences:

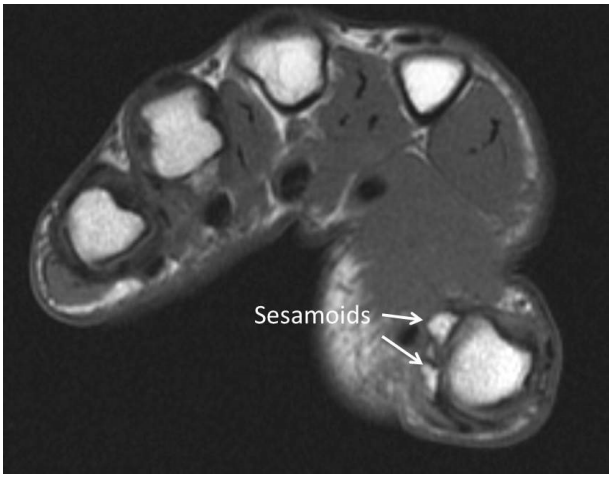
1. Axial T1
2. Axial FSE T2 FS/STIR
3. Axial PD FS
4. Cor FSE T2 FS/STIR
5. Cor FSE PD FS
6. Sag PD

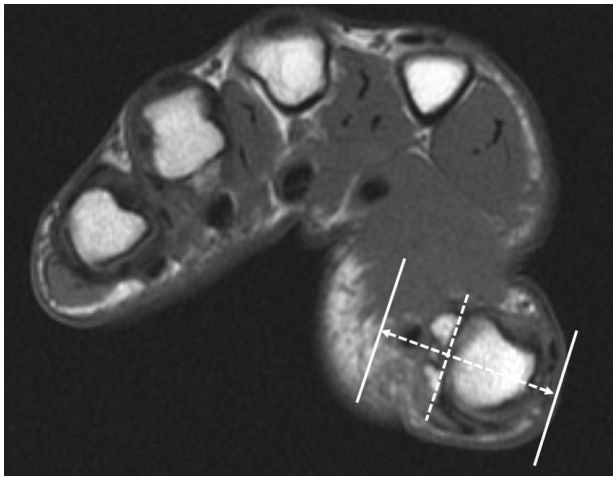
IF ANY FAT SUPPRESSION FAILS OR IS POOR, THEN IT IS RECOMMENED TO PERFORM A STIR SEQUENCE IN ITS PLACE. Example: Hardware present

AXIAL IMAGING PLANE

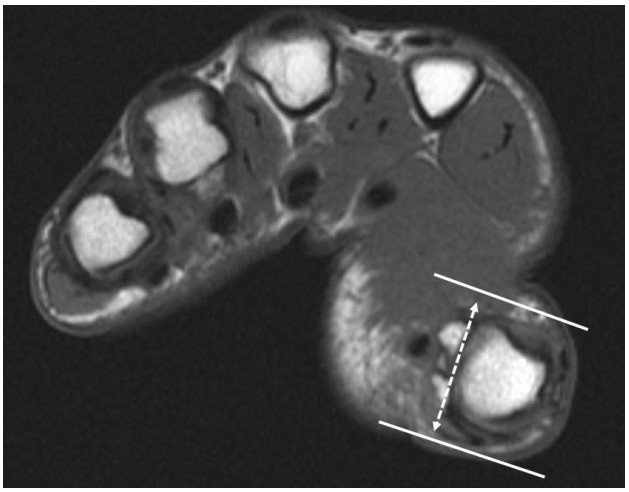


CORONAL IMAGING PLANE (sesamoids as reference point)





SAGITTAL IMAGING PLANE (perpendicular to coronal plane)



Brachial Plexus

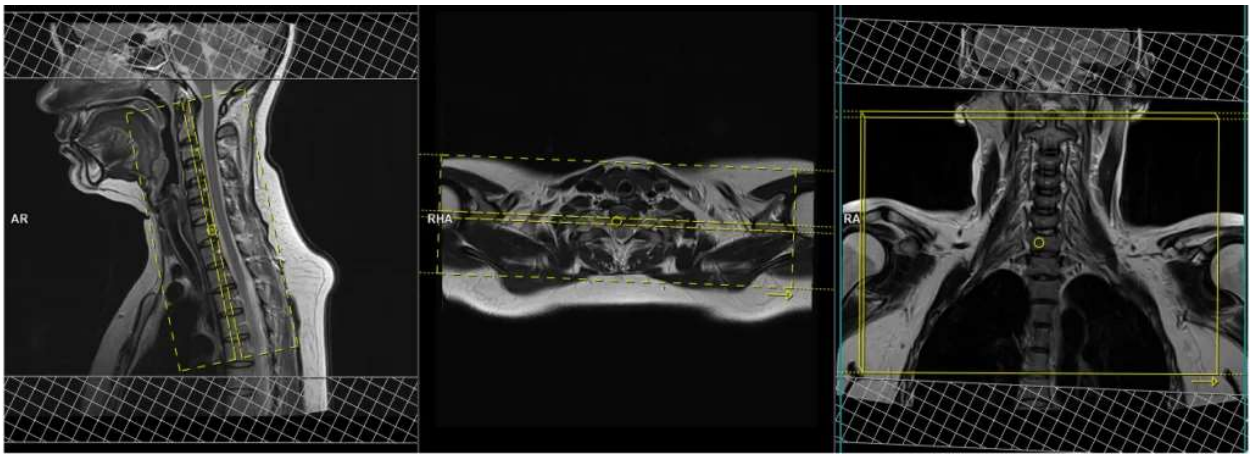
1. Ax T1 (affected side)
2. Sag T1 (affected side)
3. Sag STIR (affecteed side)
4. Cor T1 (shoulder to shoulder)
5. Cor DIXON FS T1 (shoulder to shoulder)
6. Cor STIR (shoulder to shoulder)
7. Axial CISS (if trauma for nerve root avulsion)
8. Axial Pre FS T1 (affected side)
9. Axial Post FS T1 (affected side)
10. Sag post FS T1 (affected side)
11. Cor Post FS T1 (shoulder to shoulder)

Important notes:

FOV: Shoulder to shoulder or affected side where stated,, Vertical C2-T2

Coronal:

Plan coronal slices on the sagittal plane and angle the positioning block parallel to the spinal cord. Phase direction should be right right to left to avoid artifacts from chest and heart motion. Instruct patient to avoid swallowing during sequence acquisition to prevent motion artifacts.



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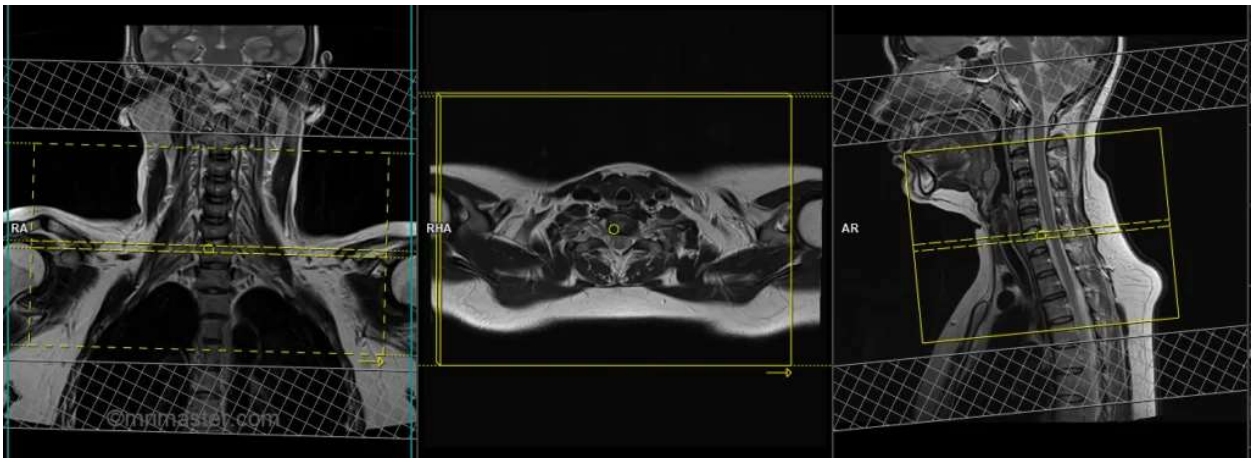
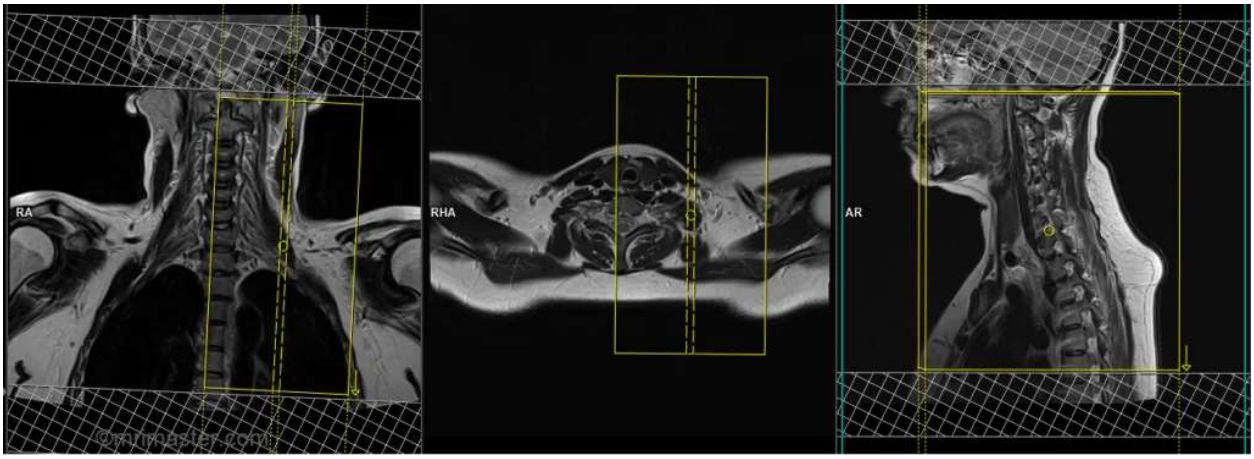
Axial:

Plan axial slices on the sagittal plane and angle the positioning block perpendicular to the spinal cord. Affected side only. Phase direction must be right to left with 100% oversample. This will help reduce arterial pulsation and swallowing artifacts. It is important to instruct the patient to avoid swallowing during sequence acquisition.



Sagittal:

Plan sagittal slices on the coronal plane, angling the positioning black parallel to the cervical spine. Cover the affected side from the spinal cord out to the shoulder. Phase dirction head to feet with 100-150% oversample to reduce arterial pulsation and swallowing artifacts. Essential to instruct patient to avoid swallowing during sequence acquisition.



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Pelvis MRI

Without Contrast:

1. Axial T1 entire pelvis
2. Axial T2 FS/STIR entire pelvis
3. Cor T1 entire pelvis to include iliac crests
4. Cor T2 FS/STIR entire pelvis to include iliac crests
5. Sag T2 FS/STIR entire pelvis (include both hips)
6. Sag T1 entire pelvis (include both hips)

With Contrast:

1. Axial T1 entire pelvis
2. Axial T2 FS/STIR entire pelvis
3. Cor T1 entire pelvis to include iliac crests
4. Cor T2 FS/STIR entire pelvis to include iliac crests
5. Sag T2 FS/STIR entire pelvis
6. Sag T1 entire pelvis
7. Axial T1 FS
8. Axial T1 FS Post
9. Coronal T1 FS Post

Coverage:

- FOV to include from iliac crests through lesser trochanters
- Axial FOV must include all muscles, but does not require all subcutaneous fat to be imaged.

IF ANY FAT SUPPRESSION FAILS OR IS POOR, THEN IT IS RECOMMENED TO PERFORM A STIR SEQUENCE IN ITS PLACE. Example: Hardware present

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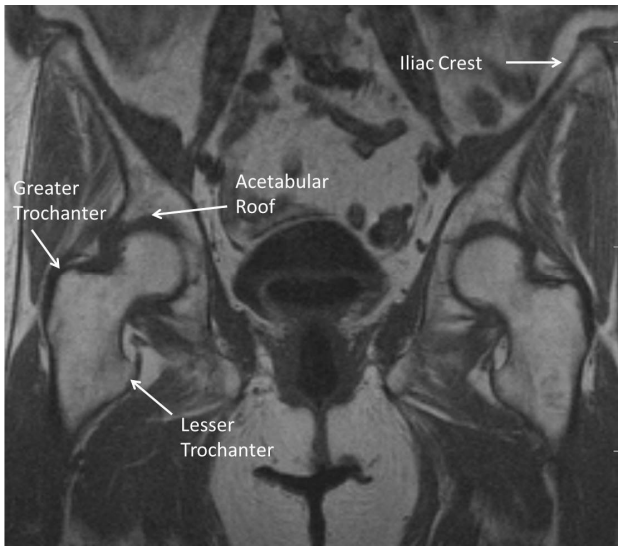
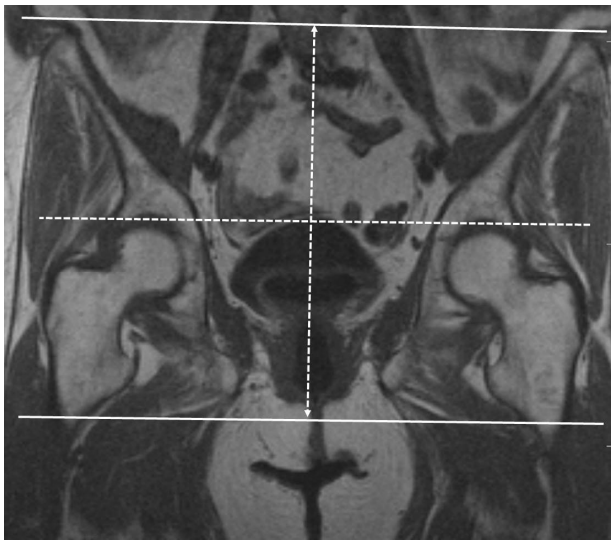
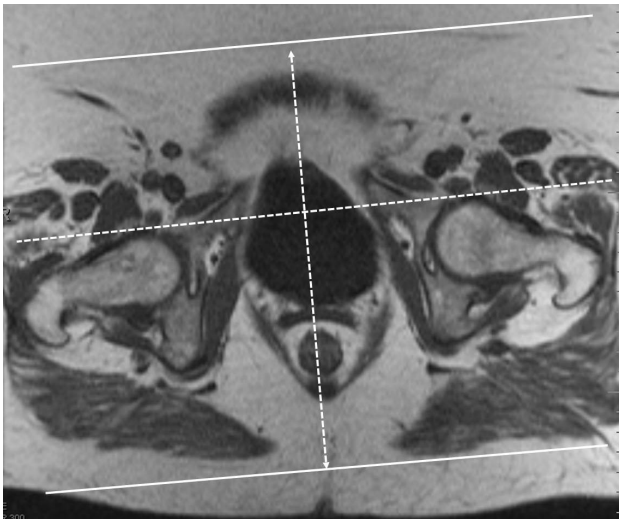
AXIAL IMAGING PLANE (parallels acetabular roofs)





CORONAL IMAGING PLANE (parallels anterior cortex of femoral heads)



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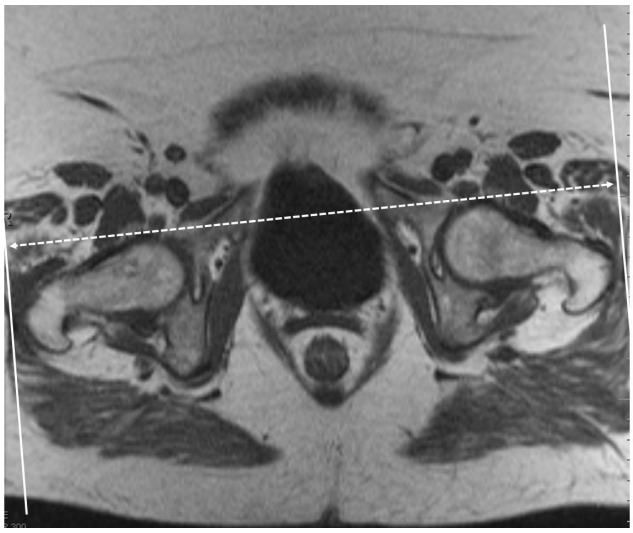
SAGITTAL IMAGING PLANE (perpendicular to coronals)



Hip MRI

Sequences:

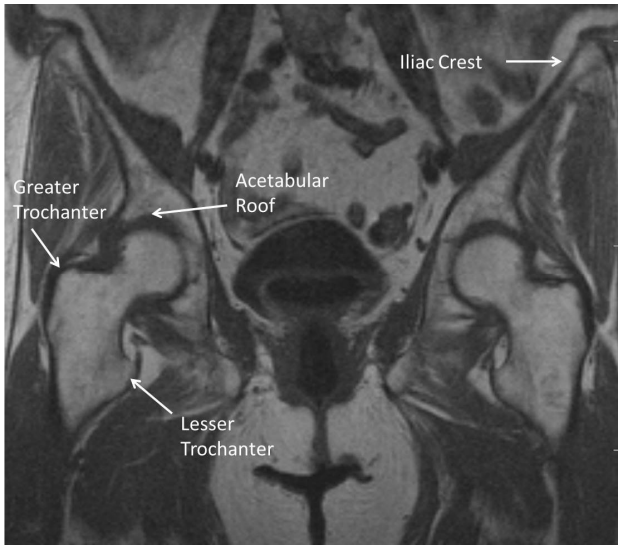
1. Cor T1 entire pelvis
2. Cor T2 FS/STIR entire pelvis
3. Cor T2 FS/STIR small FOV of affected hip
4. Axial T2 FS/STIR small FOV of affected hip
5. Sag T2 FS /STIR small FOV of affected hip
6. Sag T1 small FOV of affected hip

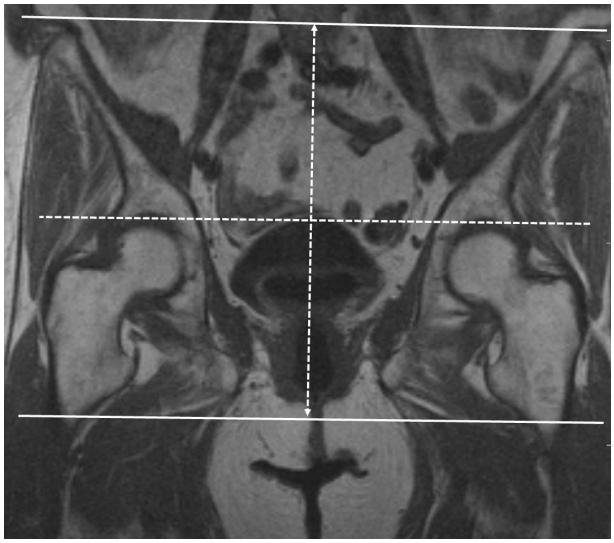
Coverage:

- Entire pelvis FOV to include from iliac crests through lesser trochanters

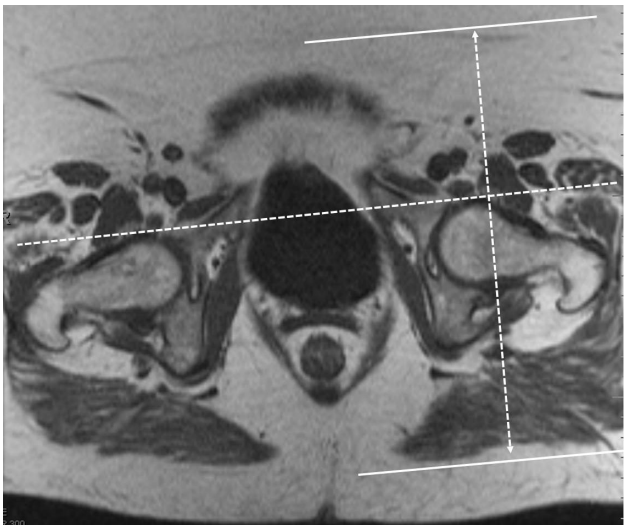
IF ANY FAT SUPPRESSION FAILS OR IS POOR, THEN IT IS RECOMMENED TO PERFORM A STIR SEQUENCE IN ITS PLACE. Example: Hardware present

AXIAL IMAGING PLANE (parallels acetabular roofs)

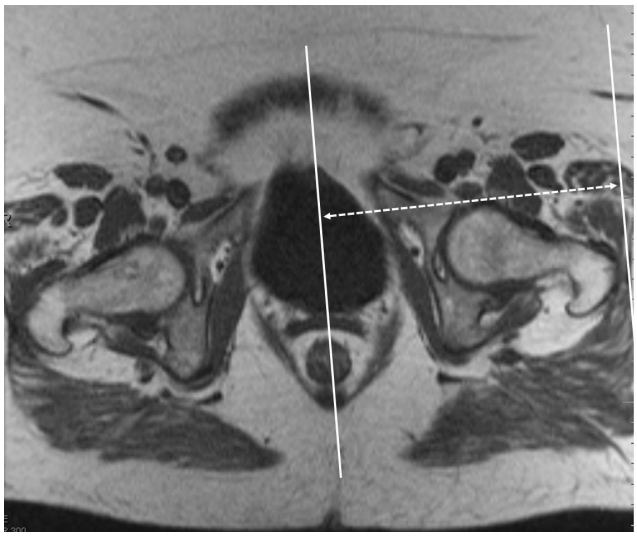




CORONAL IMAGING PLANE (parallels anterior cortex of femoral heads)



SAGITTAL IMAGING PLANE (Perpendicular to coronal, from midline through all muscles)



Hip MRI Arthrogram

Sequences:

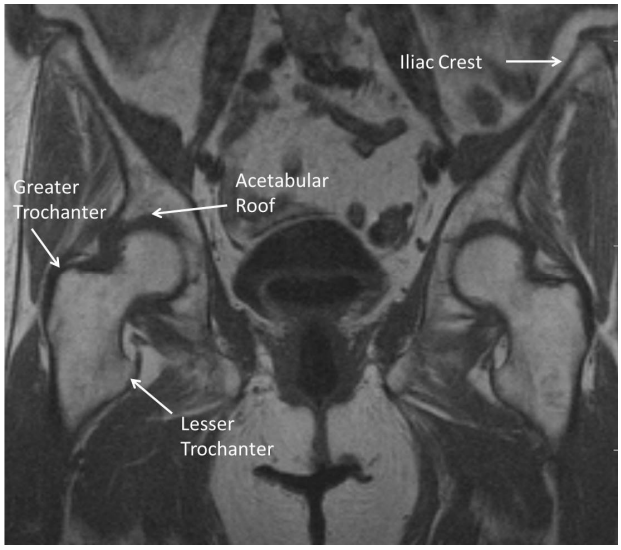
1. Cor T1 entire pelvis
2. Cor T2 FS/STIR entire pelvis
3. Axial T1 FS small FOV of affected hip
4. Axial T2 FS/STIR small FOV affected hip
5. Cor T1 FS small FOV of affected hip
6. Cor T2 FS/STIR small FOV of affected hip
7. Sag T1 FS small FOV of affected hip
8. Sag T2 FS/STIR small FOV of affected hip

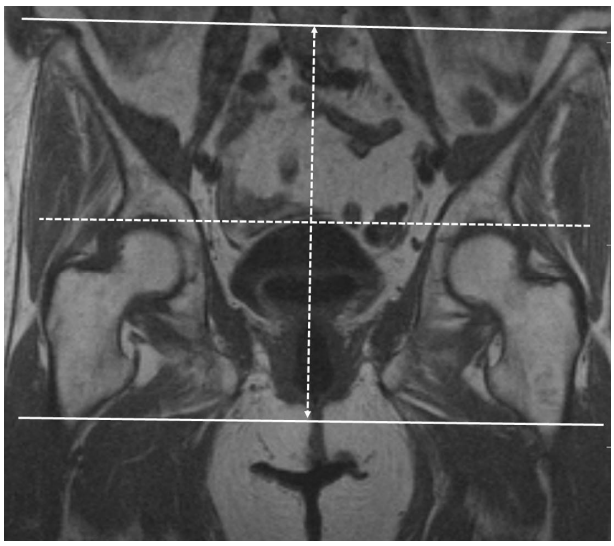
Coverage:

- Entire pelvis FOV to include from iliac crests through lesser trochanters

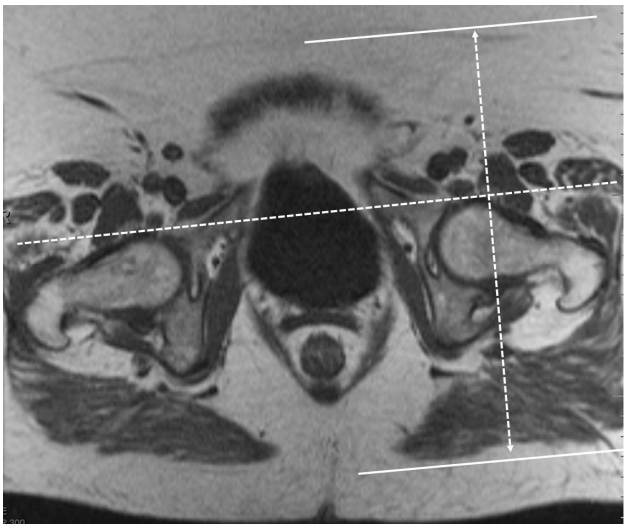
IF ANY FAT SUPPRESSION FAILS OR IS POOR, THEN IT IS RECOMMENED TO PERFORM A STIR SEQUENCE IN ITS PLACE. Example: Hardware present

AXIAL IMAGING PLANE (parallels acetabular roofs)

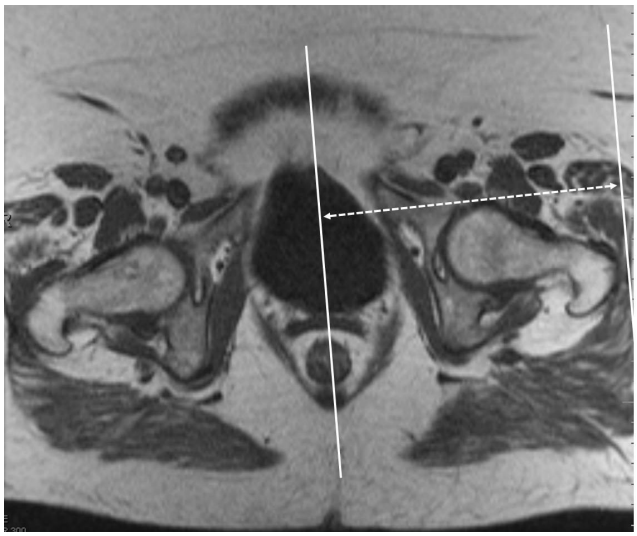




CORONAL IMAGING PLANE (parallels anterior cortex of femoral heads)



SAGITTAL IMAGING PLANE (Perpendicular to coronal, from midline through all muscles)



Sacrum/SI Joint MRI

Sequences:

Without Contrast (this also includes sacral decubitus ulcer indication)

1. Axial T1
2. Axial T2 FS/STIR
3. Coronal Oblique T1
4. Coronal Oblique T2 FS/STIR
5. Sag T1
6. Sag T2 FS/STIR

With Contrast

1. Axial T1
2. Axial T2 FS/STIR
3. Axial T1 FS
4. Coronal Oblique T1
5. Coronal Oblique T2 FS/STIR
6. Sag T1
7. Sag T2 FS/STIR
8. Axial T1 FS Post
9. Coronal Oblique T1 FS Post

Coverage:

- FOV includes sacrum and SI joints, not the entire pelvis.

IF ANY FAT SUPPRESSION FAILS OR IS POOR, THEN IT IS RECOMMENED TO PERFORM A STIR SEQUENCE IN ITS PLACE. Example: Hardware present

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CORONAL OBLIQUE PLANE

Athletic Pubalgia (Sports Hernia) MRI

Sequences:

7. Cor T1 including both hips
8. Cor T2 FS/STIR including both hips
9. Axial T2 FS/STIR including both hips
10. Sag T2 FS small FOV centered on pubic symphysis
11. Axial Oblique T1 small FOV centered on pubic symphysis
12. Axial Oblique T2 FS/STIR small FOV centered on pubic symphysis

Coverage:

- Large FOV= 28-32, small FOV= 20

IF ANY FAT SUPPRESSION FAILS OR IS POOR, THEN IT IS RECOMMENED TO PERFORM A STIR SEQUENCE IN ITS PLACE. Example: Hardware present

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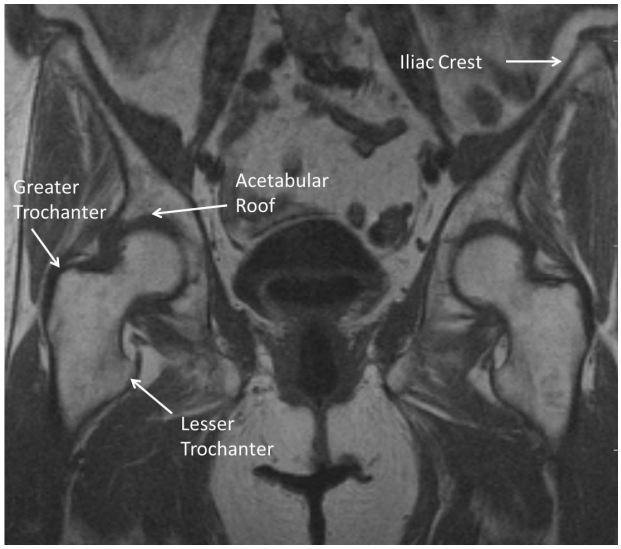
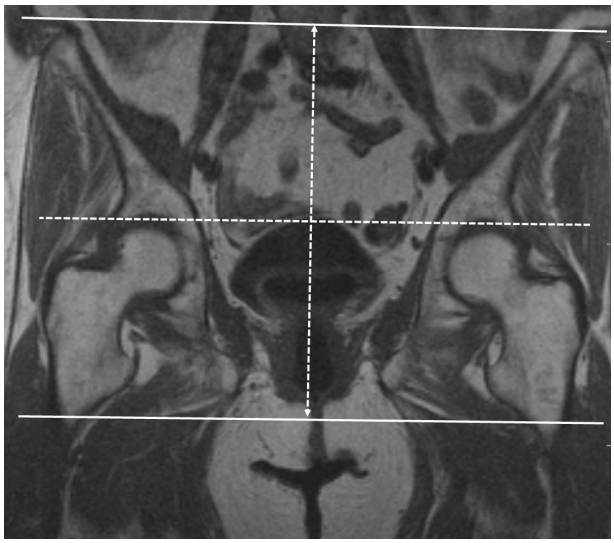
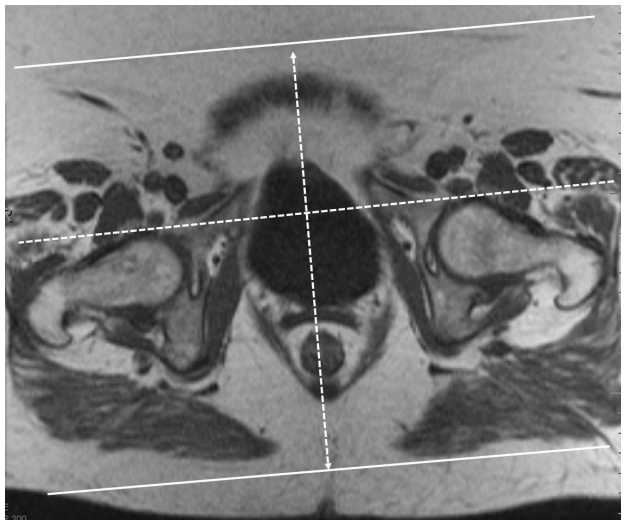
AXIAL IMAGING PLANE (parallels acetabular roofs)





CORONAL IMAGING PLANE (parallels anterior cortex of femoral heads)



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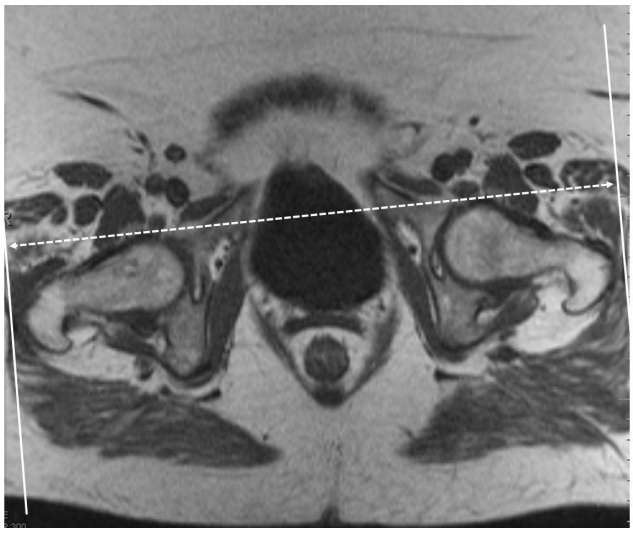
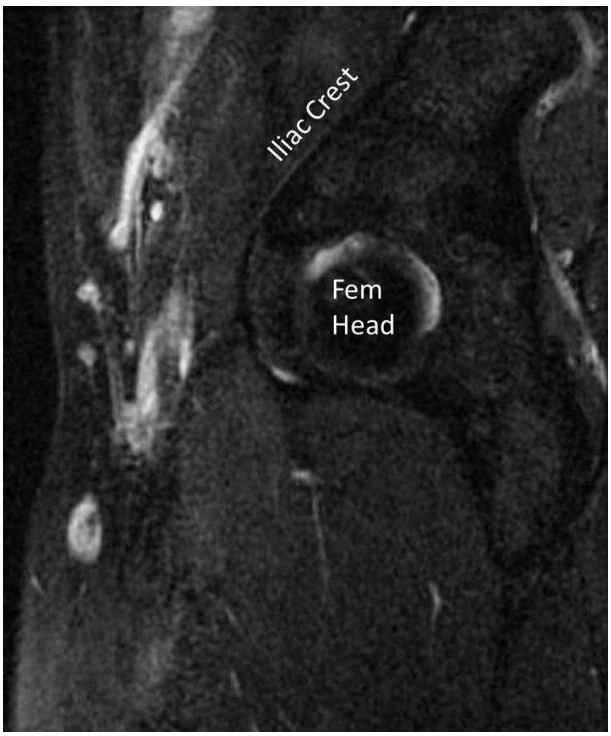
SAGITTAL IMAGING PLANE (perpendicular to coronals)



AXIAL OBLIQUE IMAGING PLANE (Images of pubic symphysis, not hip)



Thigh MRI

Sequences:

Without Contrast:

1. Axial T1
2. Axial T2 FS/STIR
3. Cor T1
4. Cor T2 FS/ STIR
5. Sag T1
6. Sag T2 FS/STIR

With Contrast:

1. Axial T1
2. Axial T2 FS/STIR
3. Axial T1 FS
4. Cor T1 FS
5. Cor T2 FS/STIR
6. Sag T2 FS/STIR
7. Cor T1 FS Post
8. Axial T1 FS Post
9. Sag T1 FS Post

IF ANY FAT SUPPRESSION FAILS OR IS POOR, THEN IT IS RECOMMENED TO PERFORM A STIR SEQUENCE IN ITS PLACE. Example: Hardware present

Imaging planes should follow that of the pelvis/hip. Please have toes pointing straight up to maintain positioning of thigh.

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Knee MRI

Sequences:

7. Axial T2 FS/STIR
8. Sag PD
9. Sag T2 FS/STIR
10. Cor T1
11. Cor T2 FS/STIR

Coverage:

- From distal femoral diaphysis above the patella through the proximal tibial metaphysis to include the entire fibular head
- If there is pathology that extends superiorly or inferiorly to the FOV, perform additional sequences with the FOV centered to include pathology. Do not change FOV to fit pathology.

IF ANY FAT SUPPRESSION FAILS OR IS POOR, THEN IT IS RECOMMENED TO PERFORM A STIR SEQUENCE IN ITS PLACE. Example: Hardware present

AXIAL IMAGING PLANE

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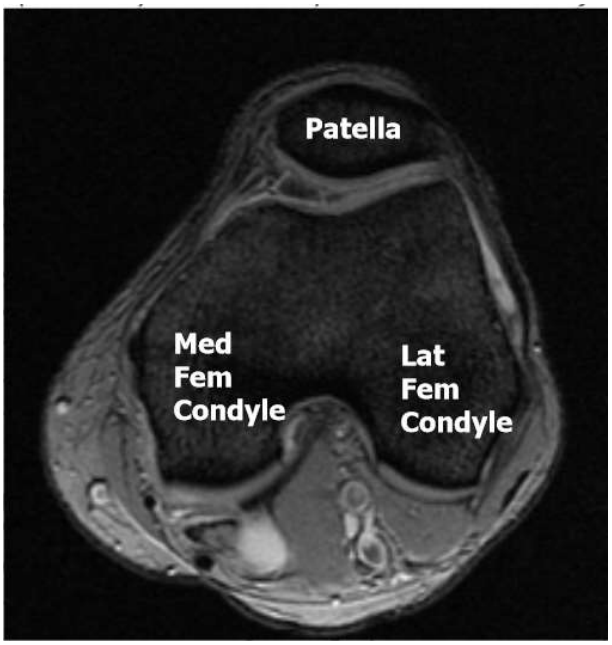
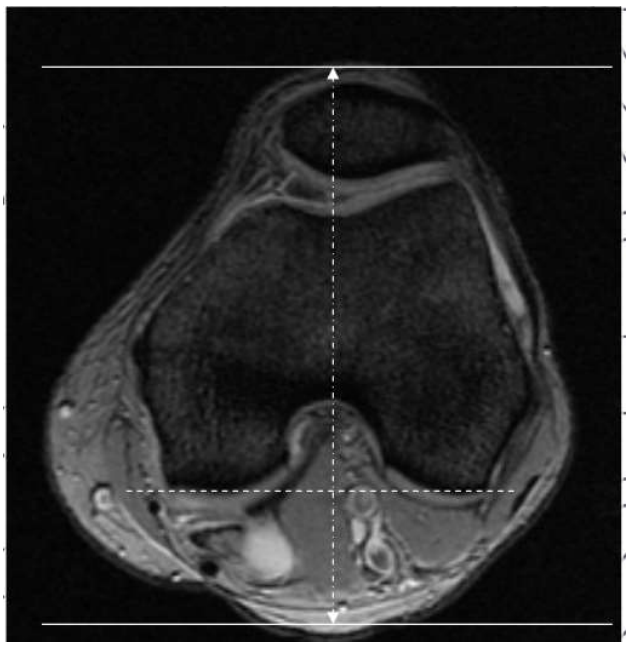
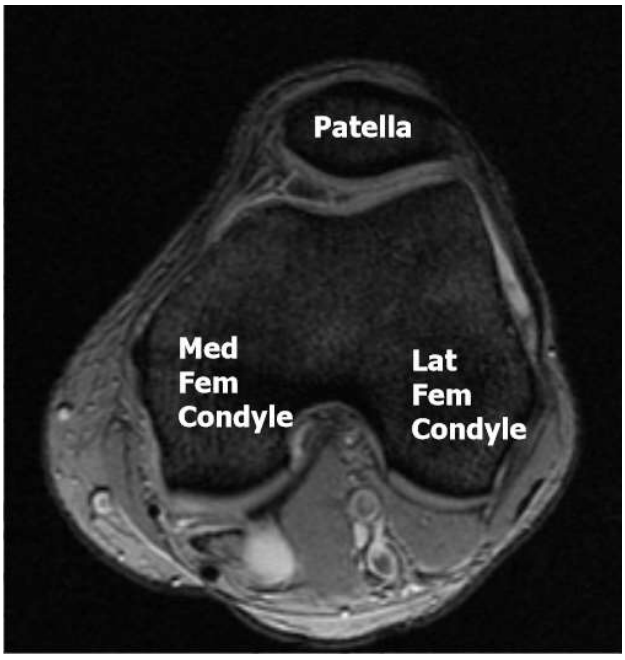
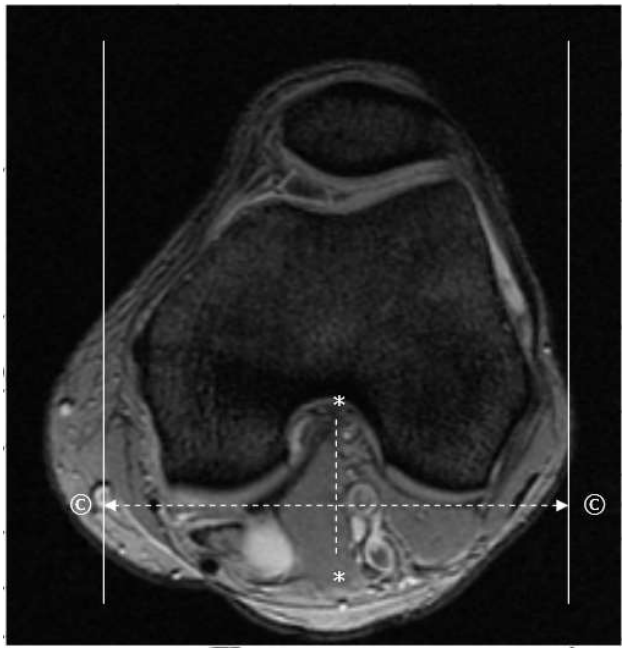
CORONAL IMAGING PLANE





SAGITTAL IMAGING PLANE





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Knee MRI Arthrogram

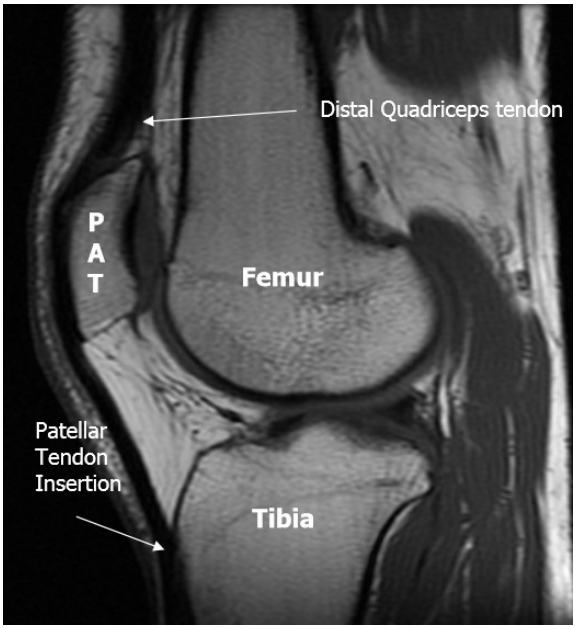
The only indications for arthrograms of the knee are:

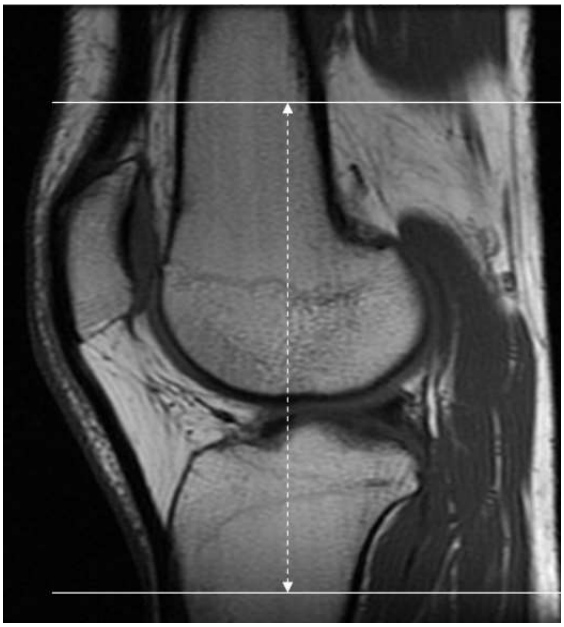
- Recurrent meniscal tear after meniscal repair
- Loose body

Sequences:

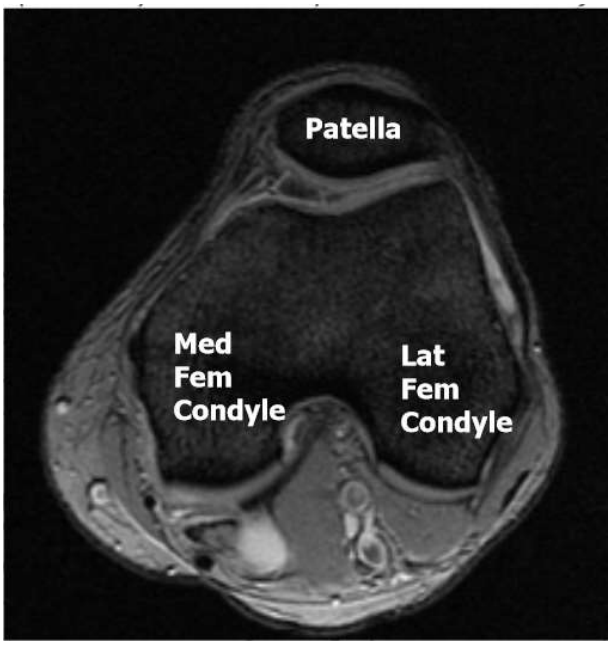
12. Axial T1 FS
13. Axial T2 FS/STIR
14. Sag T1
15. Sag T1 FS
16. Sag T2 FS/STIR
17. Cor T1 FS
18. Cor T2 FS/STIR

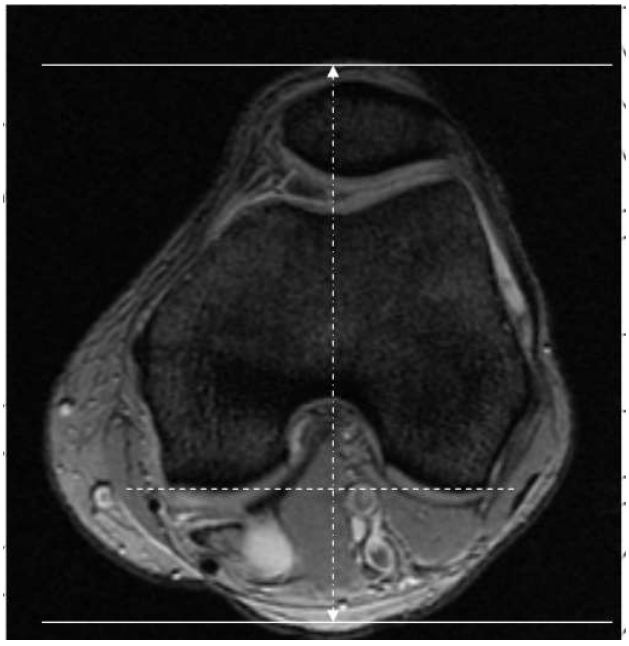
AXIAL IMAGING PLANE



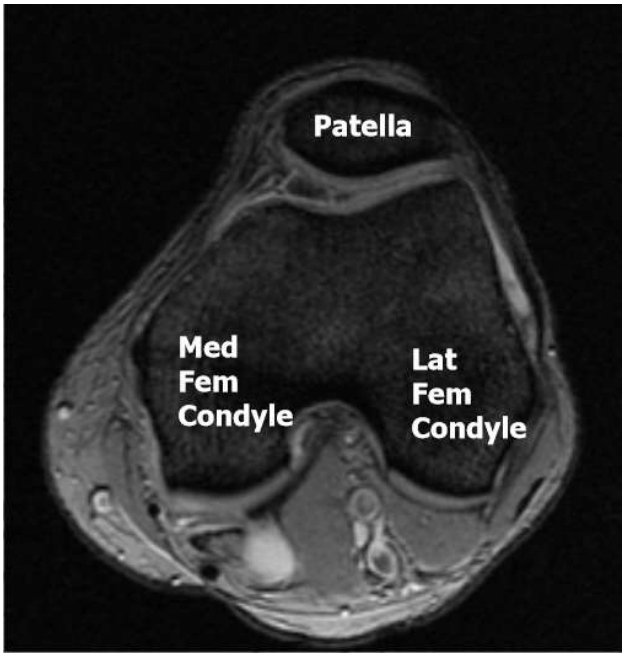


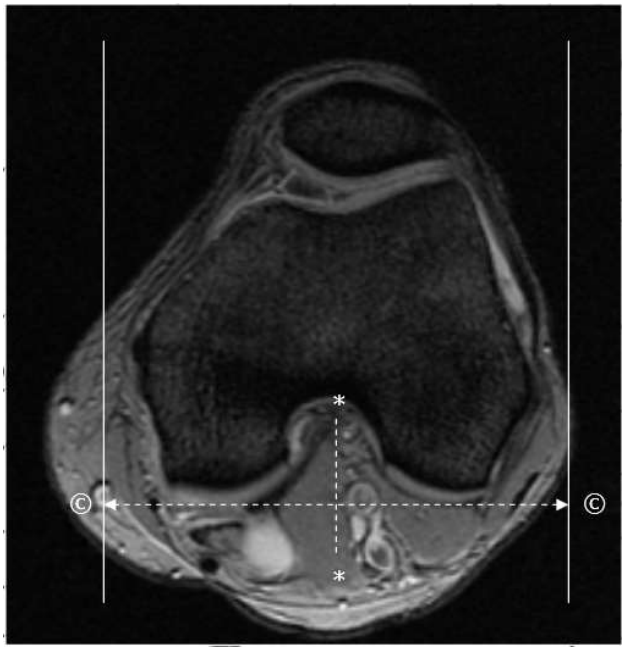
CORONAL IMAGING PLANE





SAGITTAL IMAGING PLANE





Tib Fib MRI (STRESS FRACTURE INDICATION/PAIN)

Sequences:

19. Axial T1 of both legs
20. Axial T2 FS/STIR of both legs
21. Cor T1 of both legs
22. Cor T2 FS/STIR of both legs
23. Sag T2 FS/STIR of affected leg
24. Axial PD FS of affected leg

Notes:

- Place marker at site of pain
- Please make sure legs are positioned directly next to each other with toes pointing straight up and taped together
- FOV on all axial sequences should be small to preserve spatial resolution.

Only do bilateral if stress/PAIN is the indication* If soft tissue mass or bone lesion follow contrast protocol ONLY the affected side:

1. Axial T1
2. Axial T2 FS/STIR
3. Axial T1 FS pre
4. Sag T1
5. Sag T2 FS/STIR
6. Coronal T1
7. Coronal T2 FS/STIR
8. Axial T1 FS post
9. Sag T1 FS post
10. Coronal T1 FS post

IF ANY FAT SUPPRESSION FAILS OR IS POOR, THEN IT IS RECOMMENED TO PERFORM A STIR SEQUENCE IN ITS PLACE. Example: Hardware present

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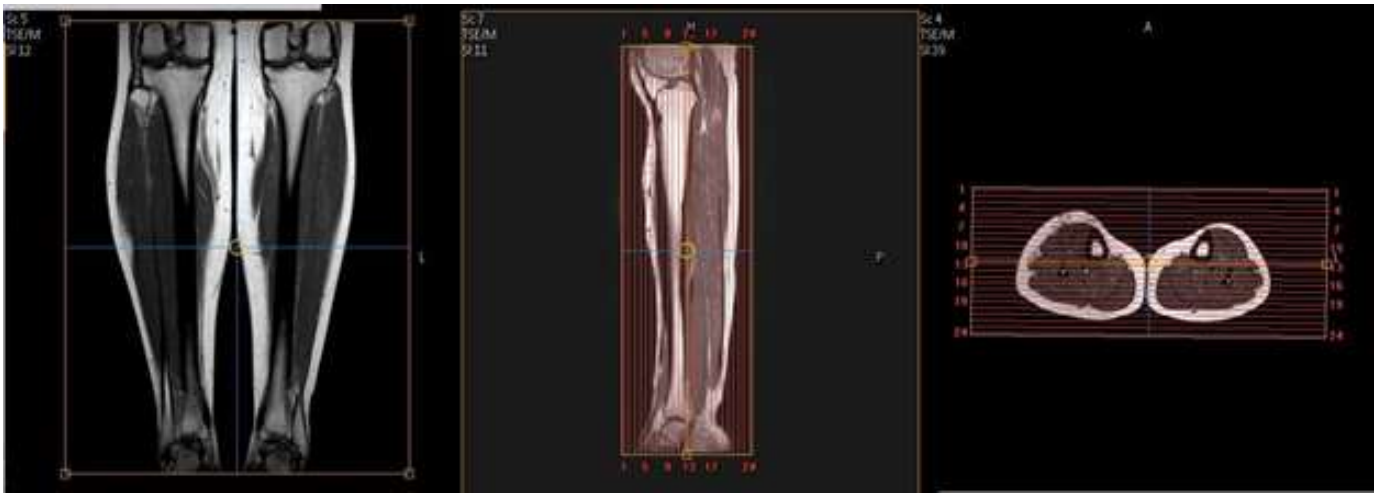
Standard Imaging Planes



Ankle and Hindfoot MRI

Without Contrast

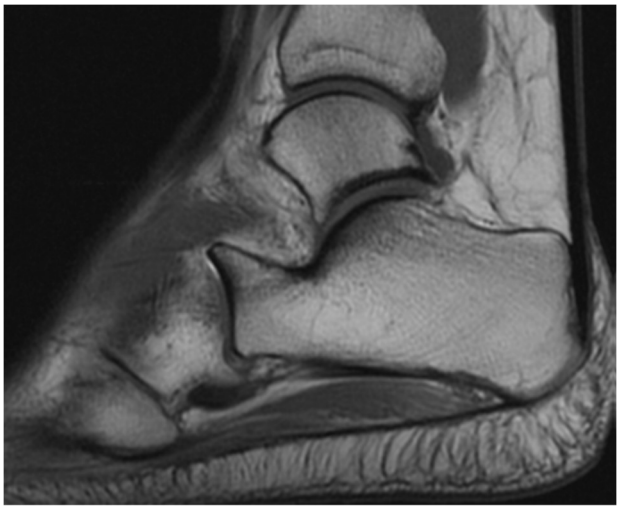
25. Sag T1
26. Sag T2 FS/STIR
27. Axial T1
28. Axial T2 FS/STIR
29. Cor T2 FS/STIR
30. Coronal T1
31. Axial Oblique PD

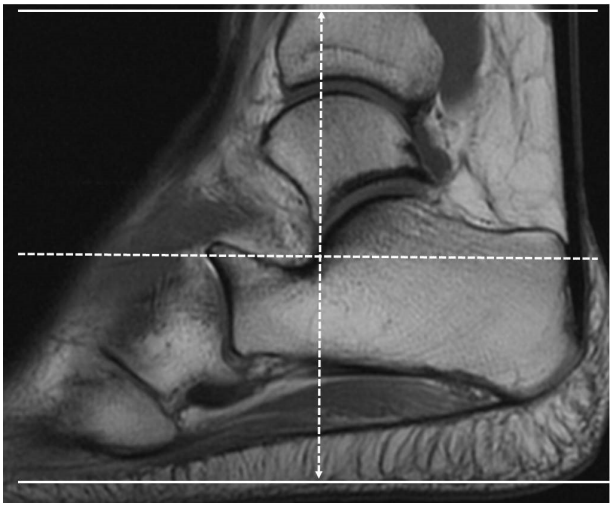
There are no indications for a contrasted exam other than mass or osteomyelitis, which is a separate protocol.

Coverage:

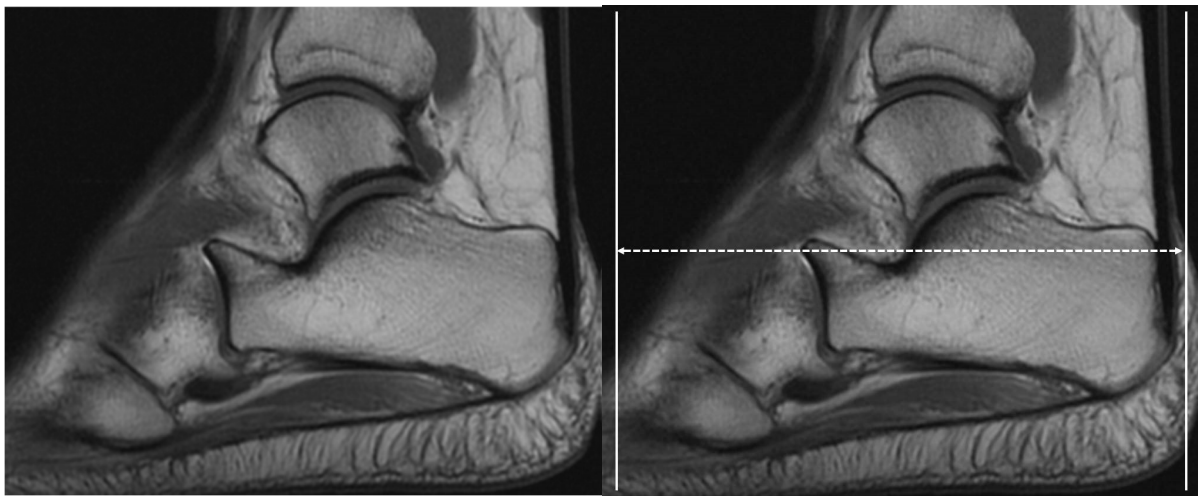
- FOV should only include only bases of the metatarsals

AXIAL IMAGING PLANE

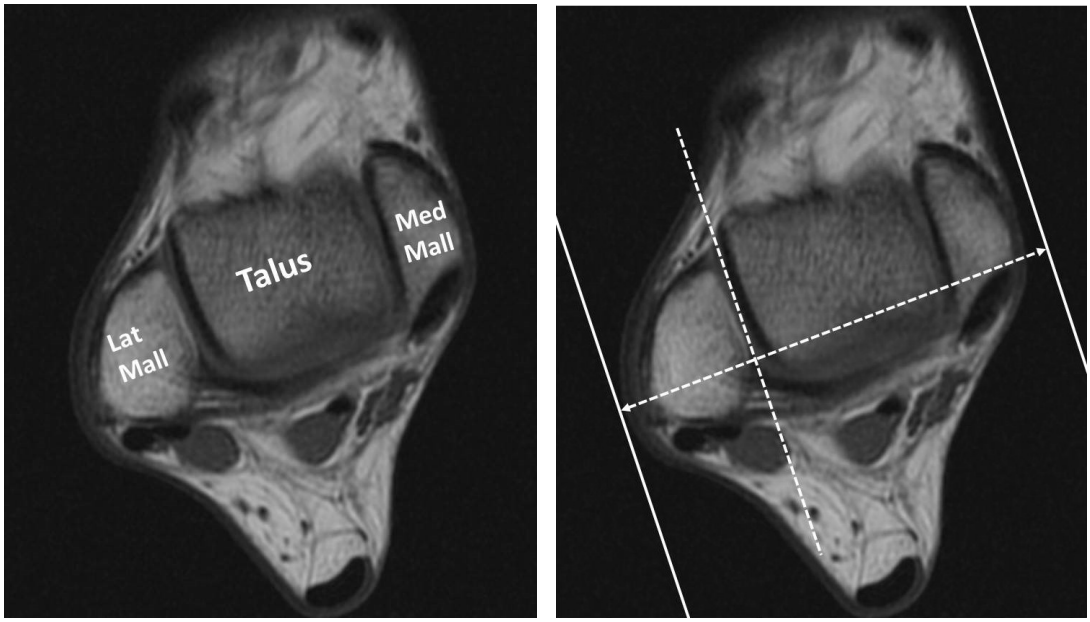




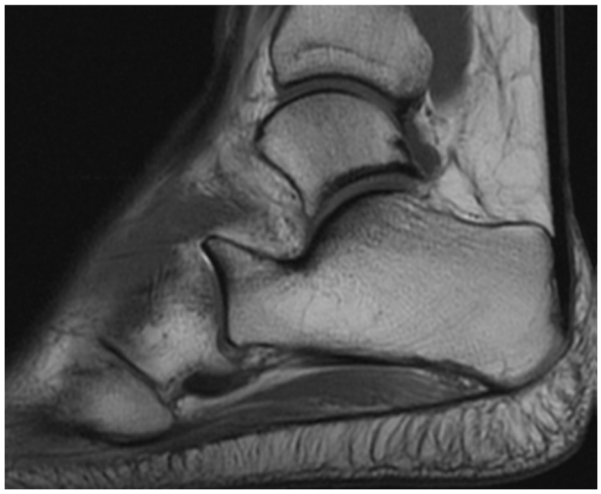
CORONAL IMAGING PLANE

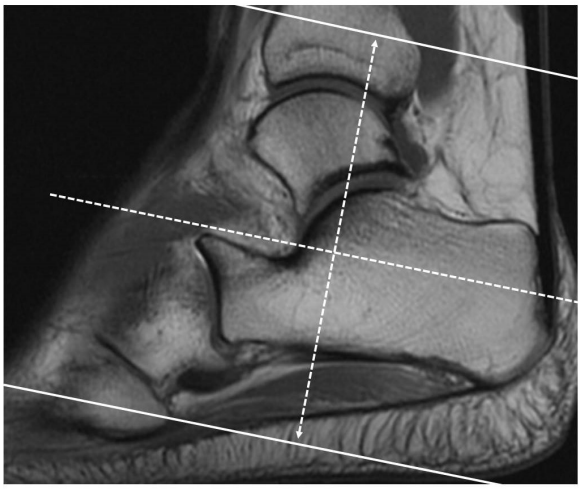


SAGITTAL IMAGING PLANE



AXIAL OBLIQUE PLANE





Forefoot MRI

Without Contrast (stress fx, plantar plate injury, turf toe, metatarsalgia)

- Long axis T1
- Long axis T2 FS/STIR
- Short Axis T1
- Short axis T2 FS/ STIR
- Sag T1
- Sag T2 FS/STIR

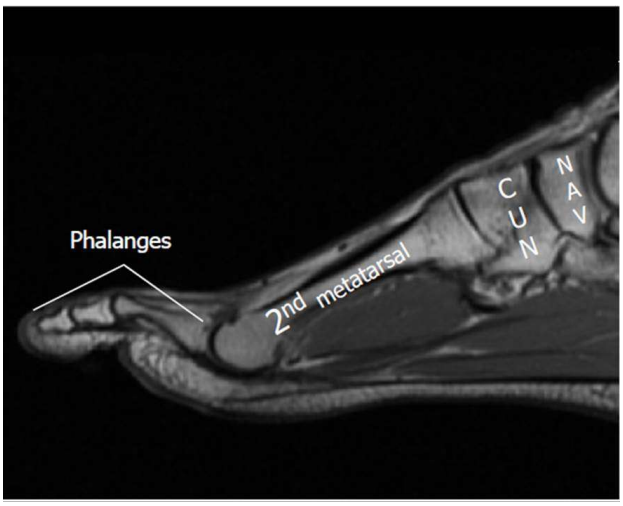
There are no indications for a contrasted exam other than mass or osteomyelitis, which is a separate protocol.

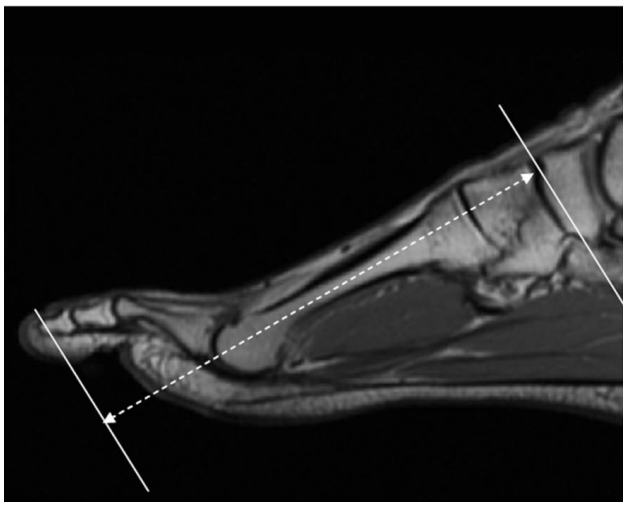
IF ANY FAT SUPPRESSION FAILS OR IS POOR, THEN IT IS RECOMMENED TO PERFORM A STIR SEQUENCE IN ITS PLACE. Example: Hardware present

Coverage:

- FOV should only include from TMT joints through toes

SHORT AXIS IMAGING PLANE





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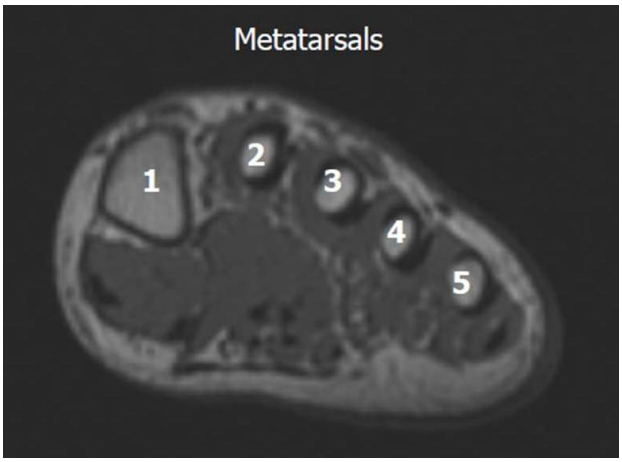
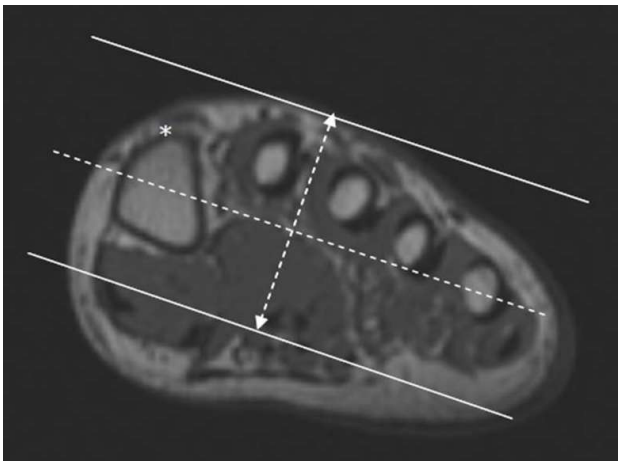
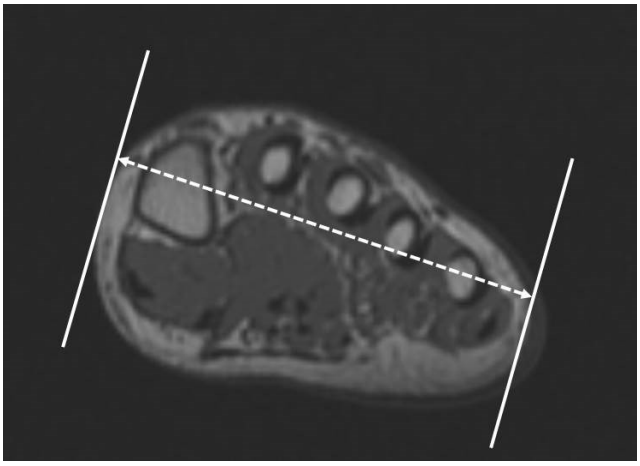
LONG AXIS IMAGING PLANE





SAGITTAL IMAGING PLANE (Perpendicular to Long Axis)



Osteomyelitis

Examination should be performed without contrast unless they are specifically looking for a soft tissue abscess.

Without contrast:

- 3 planes of T1 and either T2 FS or STIR. Imaging planes should be according to anatomic location (forefoot, hindfoot, tib/fib, hand, etc)
- ***IF ANY FAT SUPPRESSION FAILS OR IS POOR, THEN IT IS RECOMMENED TO PERFORM A STIR SEQUENCE IN ITS PLACE. Example: Hardware present***

With contrast:

- 3 planes of T1
- 3 planes of STIR or T2 FS
- 3 planes of T1 FS
- 3 planes of T1 FS post
- ***IF ANY FAT SUPPRESSION FAILS OR IS POOR, THEN IT IS RECOMMENED TO PERFORM A STIR SEQUENCE IN ITS PLACE. Example: Hardware present***

Soft Tissue Mass/soft tissue infection MRI

Unless otherwise directed above, please refer to sequences below:

Place Vitamin E tablet on skin over area of concern

1. Axial T1
2. Axial STIR
3. Axial T1 FS
4. Coronal T1
5. Coronal STIR
6. Coronal T1 FS
7. Sag T1
8. Sag STIR
9. Sag T1 FS
10. Axial T1 FS post
11. Coronal T1 FS post
12. Sag T1 FS post

Notes:

- Follow imaging planes of the appropriate body part
- If mass is small and the body part is large (e.g. pelvis) the above additional sequences may require a smaller FOV centered on the mass
- ***IF ANY FAT SUPPRESSION FAILS OR IS POOR, THEN IT IS RECOMMENED TO PERFORM A STIR SEQUENCE IN ITS PLACE. Example: Hardware present***