



## PtoleMedic System

# Instructions for Use – Clinical MRI Scanning

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Model: Revision D

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This is a quick reference guide for the MRI Technologist as an aid in rapidly setting up the listed MRI scanning equipment. There is a full MRI reference guide for use in positioning and patient orientation which is available upon request if it has not already been supplied or is misplaced. There is also an MRI upload reference guide to assist with uploading completed images to the Lento Medical Innovation cloud database.



**WARNING:** Please note that MRI scanner in patients with metallic implants in or near the knee joint may adversely affect the quality and accuracy of the images obtained. It is recommended that MRI scans not be attempted.



**WARNING:** The use of custom cutting guides in pediatric patients has not been studied and the results of the use of this product in these patients is unknown. We do not recommend that such surgery not be attempted.



**Manufacturer:**

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The following organization is the Authorized Representative for the PtoleMedic System:

**CE 2460**



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Schiffgraben 41  
30175 Hannover, Germany

## **A. PATIENT SET-UP**

1. Patient should be metal/implant free in the scan volume.
2. Place patient supine, feet first, for lower extremity with affected limb as close to IsoCenter as possible
3. Consider using small foam wedges to stabilize or support the joint.
4. Use tape, sponges and/or Velcro straps on extremity to maintain anatomic “toes up” position.
5. Remind patient to remain motionless during the entire scan.
6. Landmark or Zero table
7. Begin scanning at the Distal Tibia (Ankle) for the Coronal T1 Series, move to the Knee series and complete the study with the Hip series (see Figure 11).
8. Phased array coils (receive only coils) or the “Body Coil” may be used in order to scan the hip and ankle without removing the knee surface coil. New GEM suite GE systems have built in phased array coils in table.

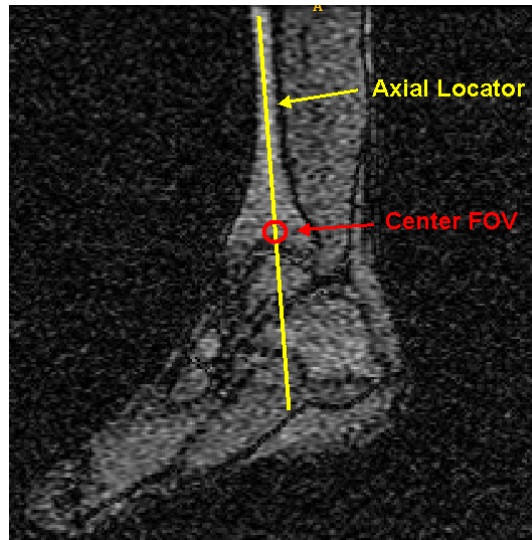
## **B. SCANNER SET-UP**

1. Enter patient name (Last, Middle, First)
2. Enter patient DOB. (dd/mm/yyyy)
3. Enter scan date (dd/mm/yyyy)
4. Enter left or right joint (Right/Left)
5. Enter patient gender (M/F)
6. Enter name of Surgeon (Last, Middle, First)
7. Enter name of imaging center

## **C. CORONAL T1 DISTAL/ANKLE MRI PROTOCOL**

1. Perform one 3 plane (Axial, Coronal, Sagittal) locator scan
2. Perform a Coronal(T1FSE) series using the minimum scan
  - i. parameters:

Slice Plane:	Coronal
Slice thickness (mm):	4
Spacing/Gap (mm):	1
Number of slices:	10
FOV(mm):	240 mm
Matrix:	256 x 160
NEX:	2
NPW/Anti-Aliasing/Fold Over Suppression:	ON
File Series Name:	"Coronal Ankle"



**Figure 1**  
**Coronal Slice Placement**

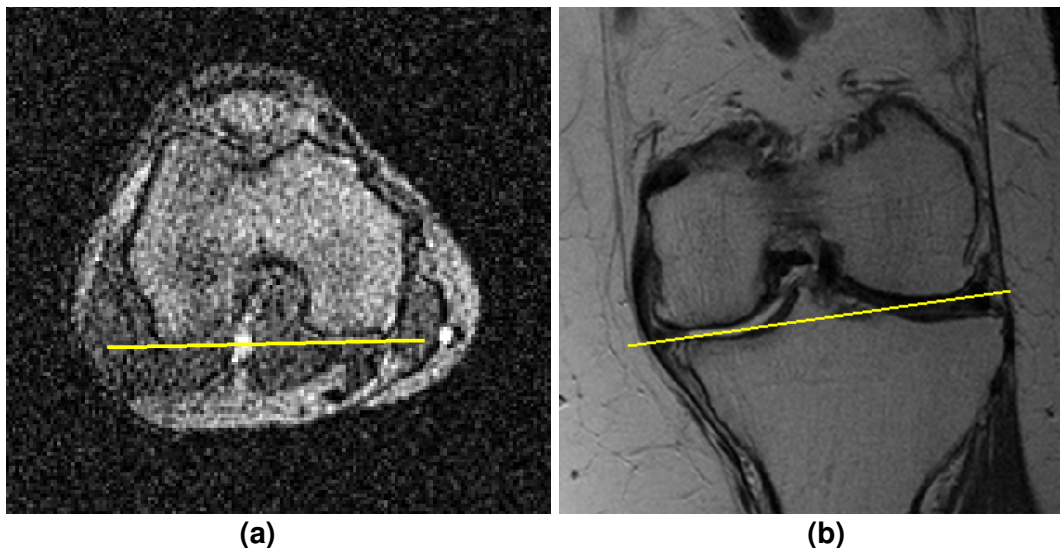
**D. CORONAL T1 DISTAL TIBIA/ANKLE SLICE POSITIONING**

View the **Sagittal** locator to place the slice Coronal through the long axis of the Tibia. *The Axial locator slices are not used for alignment.* Center the FOV approximately one inch above the Tibial Talar joint space. See Figure 1 for slice position and FOV centering.

**E. CORONAL FSE PD KNEE MRI PROTOCOL**

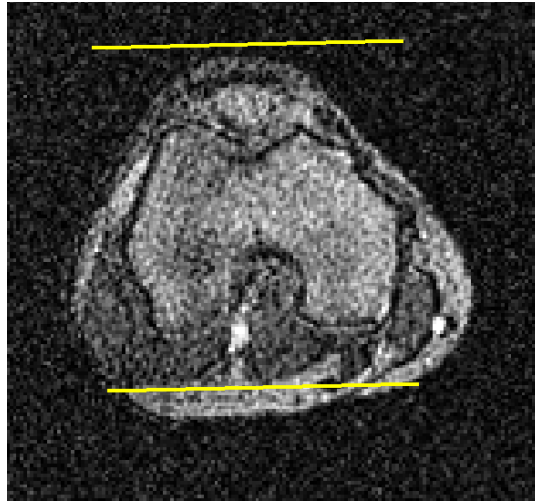
1. Perform one 3 plane (Axial, Sagittal, Coronal) locator series.
2. Refer to "PtoleKnee Imaging Reference for 1.5T and 3T Scanners section for the Coronal scan parameters

**F. CORONAL FSE PD KNEE SLICE POSITIONING**



**Figure 2**  
**Slice Positioning through Posterior Reference and Distal Reference Lines**

1. Using the best axial and coronal locator images that show in Figure 2
  - i. both posterior lateral and medial condyles, place slice parallel through the posterior reference for correct slice angle
  - ii. The both distal lateral and medial condyles, place slice parallel through the distal reference for correct slice angle.



**Figure 3**  
**Slice Coverage**

2. Slice coverage must include all of the Femur including the condyles, Tibia and Patella as shown in Figure 3



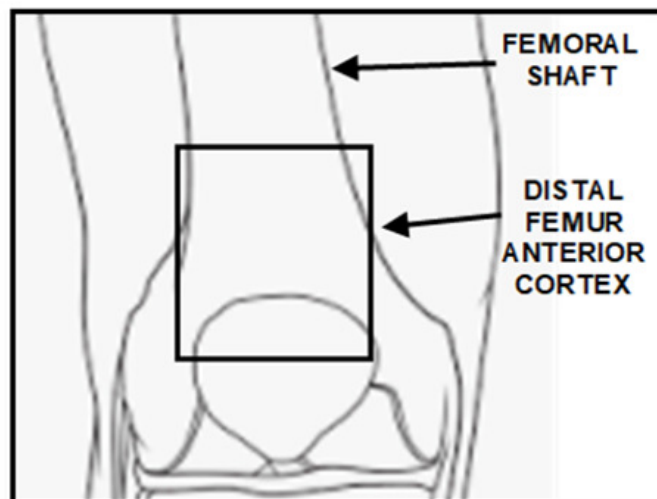
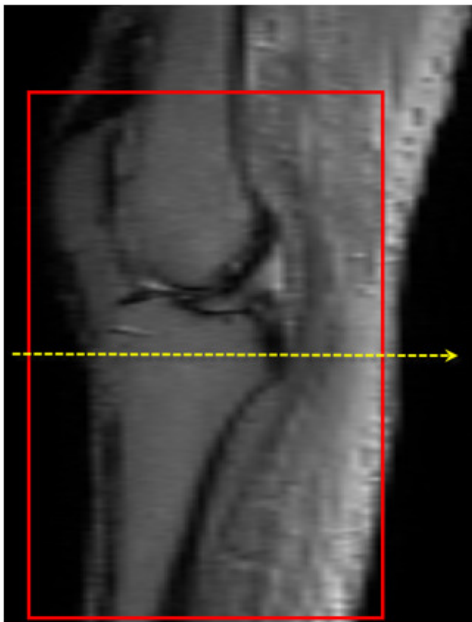
**Figure 4**  
**Centering FOV**

- Using the best sagittal locator image that **approximately** shows the **tibial tubercle**, adjust the FOV to be centered at the “point” of the **tibial tubercle** as shown above in Figure 4.



**Figure 5**  
**Axial axis of the Knee joint**

- Find the true Axial plane or axis of the knee joint as shown in Figure 5 by the yellow dash line. The upper bound of femur coverage must include femur anterior cortex or the beginning of the femoral shaft. The lower bound of tibial coverage must include the tibial shaft as much as possible, shown in Figure 6.



**Figure 6**  
**Slice Coverage**

5. Enter File Series Name: "Coronal Knee."

**PtoleKnee Imaging Reference for 1.5T and 3T MRI Scanners**

**1. General Electric**

<b>3plane Localizer Scan Parameter</b>	GP FLEX (GE Users), 4mm x 1mm Skip 24cm FOV, Matrix 256x192
<b>Coronal Knee: Pulse Sequence</b>	FRFSE-XL CORONAL
<b>Mode</b>	2D
<b>Imaging Option</b>	No Phase Wrap ON, Tailored RF, 3DGR (3D Geometry Correction for software version 23+)
<b>TE (Echo Time)</b>	Min Full
<b>TR (Repetition Time)</b>	Use TR to get series in one acquisition
<b>Flip Angle (deg)</b>	90
<b>Echo Train Length (ETL) Turbo Spin Factor (TSF)</b>	7
<b>FOV (Field of View)</b>	18cm
<b>Slice Thickness(mm)</b>	3mm
<b>Spacing/Skip/Gap/Distance Factor(mm)</b>	0mm
<b>Scan Matrix/Voxel Size (Base Resolution x Phase Resolution)</b>	256 x 256
<b>NEX/NSA/Averages</b>	2
<b>Frequency Direction</b>	S/I

**\*Higher resolution than 256 x 256 is allowed, using software.**

## **2. Philips**

<b>3plane Localizer Scan Parameter</b>	4mm x 1mm Gap, 240mm FOV, Voxel Size to equal 256 x 192
<b>Coronal Knee: Pulse Sequence</b>	TSE CORONAL
<b>Mode</b>	2D
<b>Imaging Option</b>	Fold Over, Suppression ON, 100% Sampling, "Default" Selected for Distortion Correction
<b>TE (Echo Time)</b>	~24 to 35 (28 nominal)
<b>TR (Repetition Time)</b>	Use TR to get shortest scan time
<b>Flip Angle (deg)</b>	90
<b>Echo Train Length (ETL) Turbo Spin Factor (TSF)</b>	8
<b>FOV (Field of View)</b>	180mm
<b>Slice Thickness(mm)</b>	3mm
<b>Spacing/Skip/Gap/Distance Factor(mm)</b>	0mm
<b>Scan Matrix/Voxel Size</b> (Base Resolution x Phase Resolution)	256 x 256
<b>NEX/NSA/Averages</b>	2
<b>Frequency Direction</b>	S/I

**\*Higher resolution than 256 x 256 is allowed, using software.**



### **3. Siemens**

<b>3plane Localizer Scan Parameter</b>	4mm x 25% Distance Factor, 240mm FOV, Base Resolution 256 x 80% Phase Resolution
<b>Coronal Knee: Pulse Sequence</b>	TSE CORONAL
<b>Mode</b>	2D
<b>Imaging Option</b>	100% Phase Oversampling 3D Distortion Correction Filter ON
<b>TE (Echo Time)</b>	~24 to 35 (28 nominal)
<b>TR (Repetition Time)</b>	Use TR to get shortest scan time
<b>Flip Angle (deg)</b>	120
<b>Echo Train Length (ETL) Turbo Spin Factor (TSF)</b>	7
<b>FOV (Field of View)</b>	180mm
<b>Slice Thickness(mm)</b>	3mm
<b>Spacing/Skip/Gap/Distance Factor</b>	0%
<b>Scan Matrix/Voxel Size (Base Resolution x Phase Resolution)</b>	256 x 256
<b>NEX/NSA/Averages</b>	2
<b>Frequency Direction</b>	H/F

**\*Higher resolution than 256 x 256 is allowed, using software.**

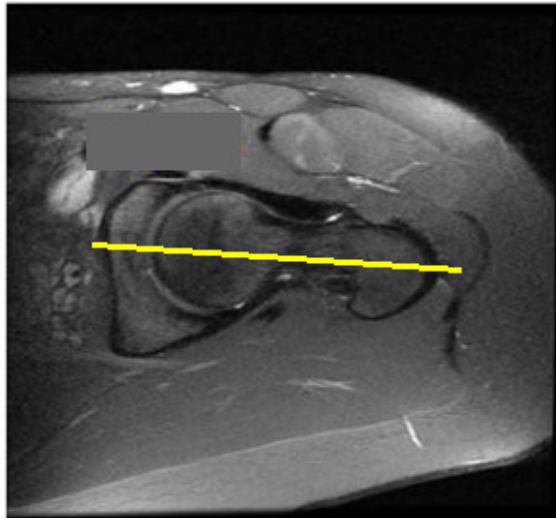
#### **4. Toshiba**

<b>3plane Localizer Scan Parameter</b>	4mm x 1mm Spacing, 24cm FOV, Matrix 256 x 192
<b>Coronal Knee: Pulse Sequence</b>	TSE CORONAL
<b>Mode</b>	2D
<b>Imaging Option</b>	Fold Over Suppression ON, IDC (Intelligent Distortion Correction) Selected
<b>TE (Echo Time)</b>	~24 to 35 (28 nominal)
<b>TR (Repetition Time)</b>	Use TR to get shortest scan time
<b>Flip Angle (deg)</b>	90, Flop Angle 160
<b>Echo Train Length (ETL) Turbo Spin Factor (TSF)</b>	7
<b>FOV (Field of View)</b>	18cm
<b>Slice Thickness(mm)</b>	3mm
<b>Spacing/Skip/Gap/Distance Factor(mm)</b>	0mm
<b>Scan Matrix/Voxel Size (Base Resolution x Phase Resolution)</b>	256 x 256
<b>NEX/NSA/Averages</b>	2
<b>Frequency Direction</b>	S/I

**\*Higher resolution than 256 x 256 is allowed, using software.**

### **G. CORONAL T1 HIP MRI PROTOCOL AND SLICE POSITIONING**

1. Perform one 3 plane (Axial, Sagittal, Coronal) locator scan.
2. Perform a Coronal (T1 FSE) series using the minimum scan parameters total below:
3. Place Coronal slice plane parallel through long axis of the femoral neck when viewing the axial locator as shown in Figure 8. Center the 14 slices to cover the Femoral Head, Neck, and Greater Trochanter as shown in Figure 9.



**Figure 10**  
**Center Hip FOV**

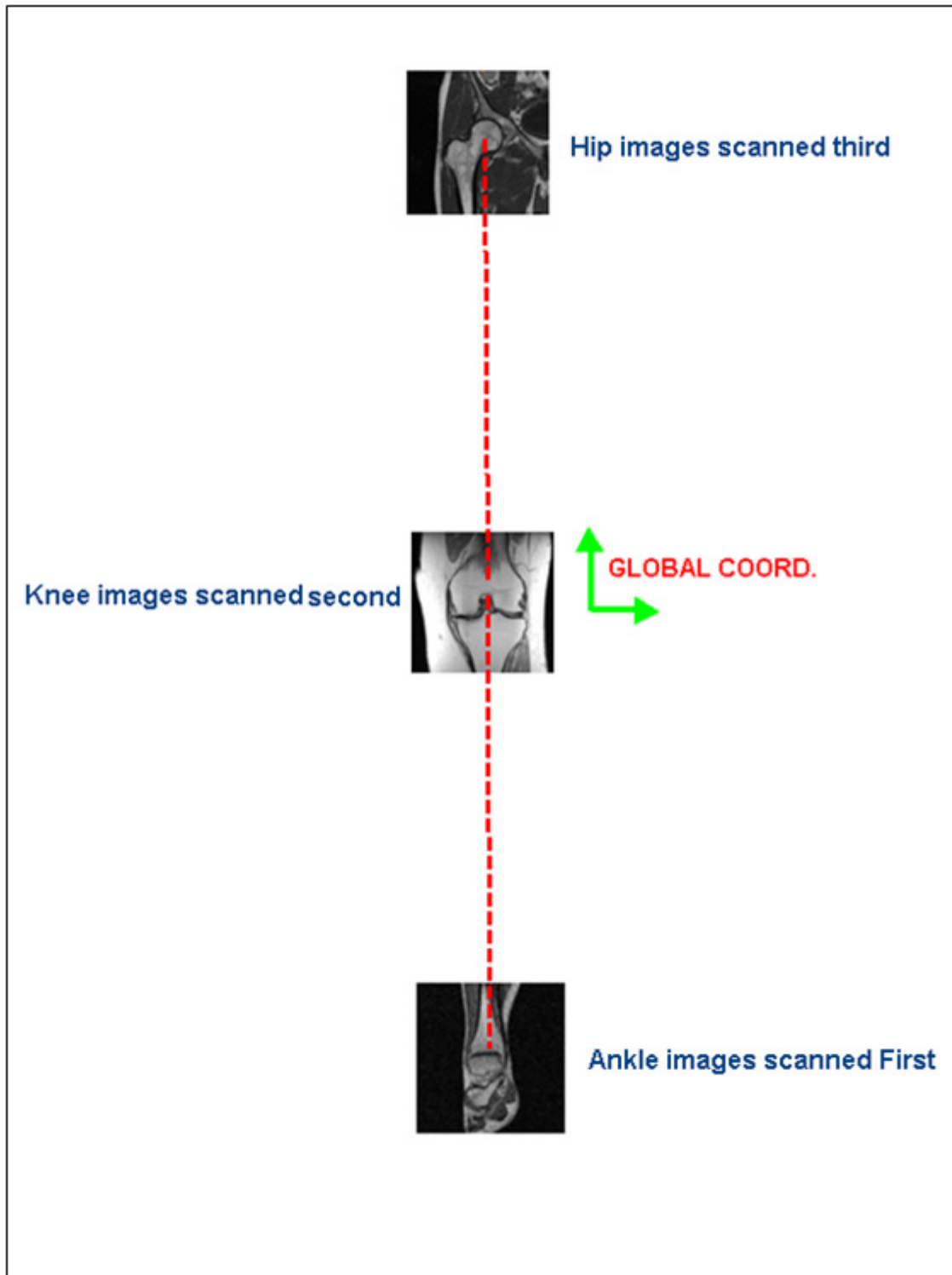
Slice Plane:	Coronal
Slice thickness (mm):	4
Spacing/Gap (mm):	1
Number of slices:	14
FOV(mm):	240 mm
Matrix:	256 x 160
NEX:	2
NPW/Anti-Aliasing/Fold Over Suppression:	ON
File Series Name:	"Coronal Hip"

## **I. QUALITY CHECK AND METAL ARTIFACT INSTRUCTIONS**

- a. Coverage: Include 1 or 2 slices of soft tissue on both medial and lateral side of bony knee anatomy.
- b. Motion: Make sure sequential transition of the bone/cartilage outline does not jump or shift back and forth between slices
- c. If patient presents with metal in the affected lower extremity, follow these instructions
  - Metal Hardware Knee – Do **NOT** Scan the patient. Refer them back to the surgeon
  - Metal Hardware Hip and/or Distal Tibia – Use MARS (Metal Artifact Reduction Sequence) series. Keep in mind the FOV, Slice Thickness, and Spacing/Gap/Skip/Distance Factor must be set to our parameters. Do not use FAT SAT at any time.
  - For those facilities that do not use a MARS series, increase the bandwidth and NEX/NAQ/NSA to help increase signal to noise ratio.

## **II. FILE FORMAT & OUTPUT**

- a. Save all image series in DICOM format
- b. Upload the following DICOM files to Lento Medical Innovation's database ([www.LentoMedical.net](http://www.LentoMedical.net))
  - i. Coronal FSE PD Knee Series
  - ii. Coronal FSE PD Hip Series
  - iii. Coronal FSE PD Ankle Series



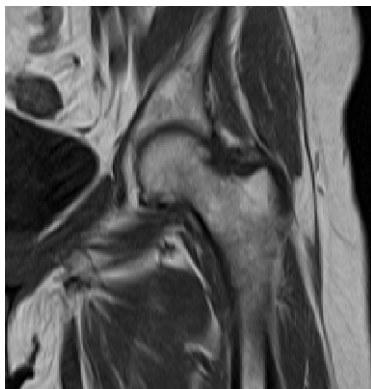
**Figure 11**  
**Scanning Order**

### III. HIP, ANKLE, AND KNEE MRI SAMPLE IMAGES

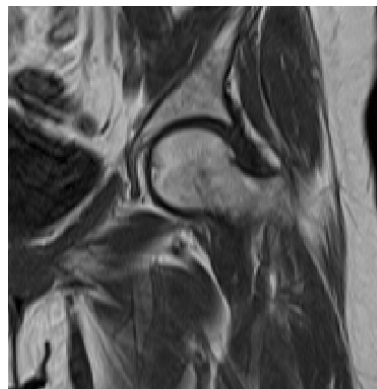
#### a. HIP MRI



(a)



(b)



(c)

#### b. ANKLE MRI



(a)

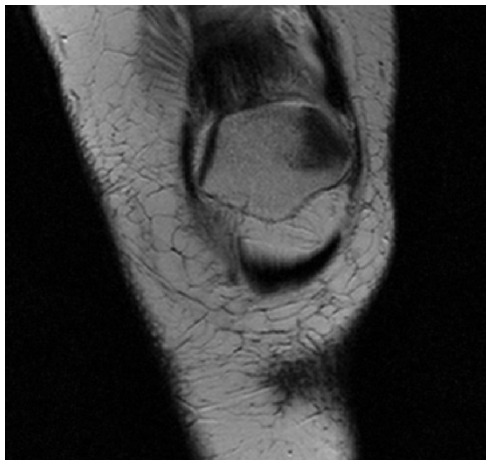


(b)

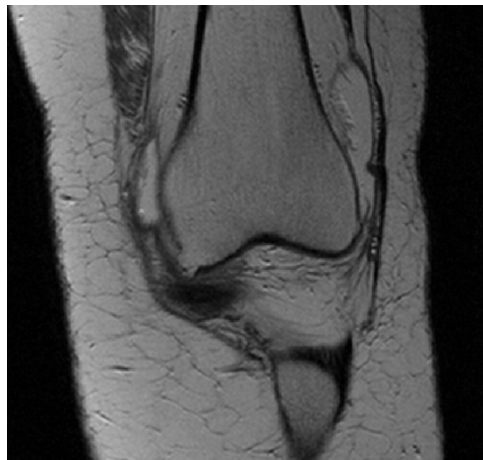


(c)

#### c. KNEE MRI



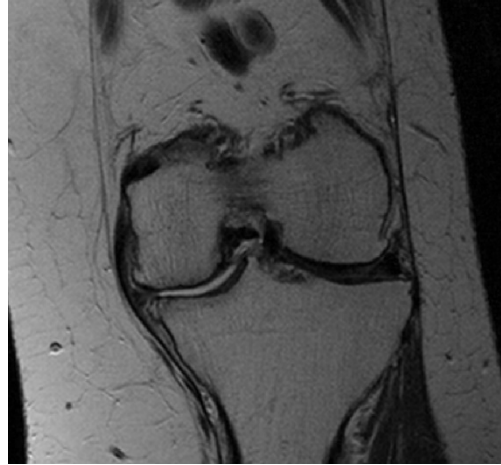
(a)



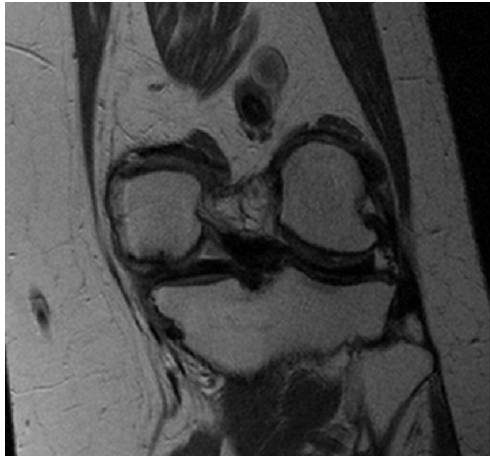
(b)



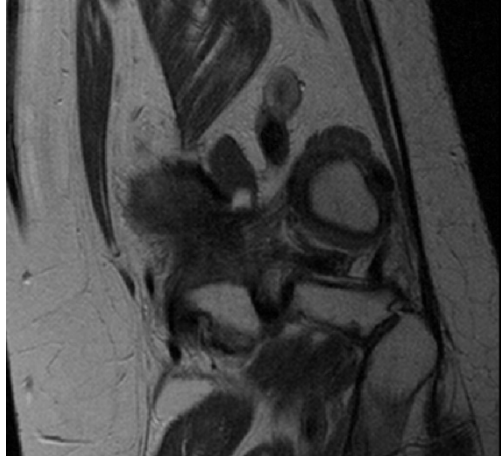
(c)



(d)



(e)



(f)