

ORTHOPEDICS

1

INTRODUCTION TO ORTHOPEDICS/ TYPICAL & ATYPICAL FRACTURES



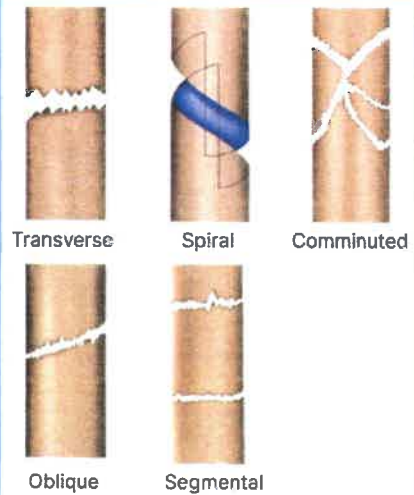
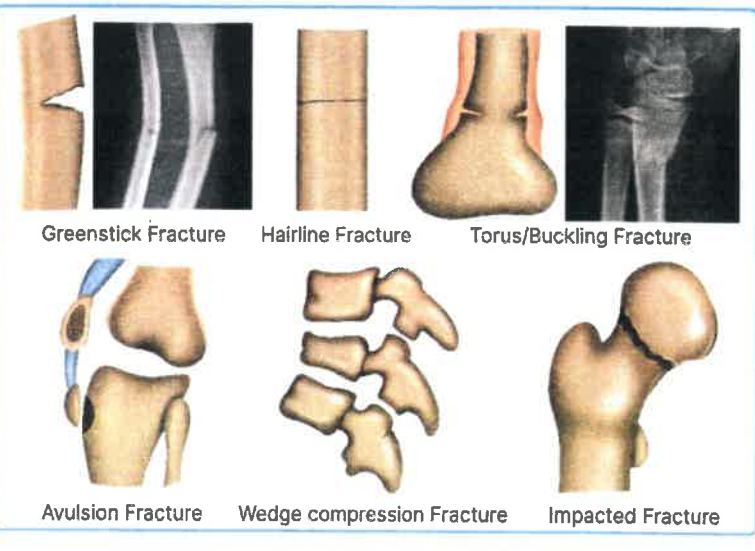
Orthopedics

- Ortho- making straight
- Paedics: child
- Orthopaedics means making bent bones straight of a child
- Term coined and Orthopaedics symbol given by Sir Nicholas Andry
 - He is known as the Father of orthopaedics.

Fractures

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- A breach in the continuity of bone or periosteum or both.
- Can be classified into:

Typical Fractures	Atypical fractures
<ul style="list-style-type: none"> • Pain and tenderness • Abnormal mobility • Loss of transmitted movements • Deformity • Types: <ul style="list-style-type: none"> ○ Transverse fracture ○ Oblique fracture ○ Spiral (twisted) ○ Segmental fracture ○ Comminuted fracture 	<ul style="list-style-type: none"> • The fracture does not exhibit typical features and can be diagnosed only with the help of radiological imaging. • Types: <ul style="list-style-type: none"> ○ Greenstick fracture- only seen in children before epiphysial closure. Most commonly seen in forearm bone- fall on outstretched hand. Treatment- break and open the cortex at the same level then apply cast for 4-6 weeks. Excellent prognosis ○ Hairline/march/ stress/ fatigue fracture- most commonly on the neck of the second metatarsal. Treatment: bed rest for 3 weeks. No cast is needed. ○ Torus/ buckling fracture- most commonly in weight-bearing bone. Treatment- cast(conservative) ○ Avulsion Fracture- the most common site is tibial tuberosity. Treatment- screw fixation. ○ Wedge compression fracture: The most common site is the thoracic vertebra. (T 12 fracture). Pathological fracture (osteoporosis>malignancies) ○ Impacted fracture- most common site is neck of femur. Can also be seen in Pilon fracture. Treatment- disimpaction done surgically.
 <p>Transverse Spiral Comminuted</p> <p>Oblique Segmental</p>	 <p>Greenstick Fracture Hairline Fracture Torus/Buckling Fracture</p> <p>Avulsion Fracture Wedge compression Fracture Impacted Fracture</p>

- Fracture union/fracture healing.
 - Stage of impaction
 - Stage of induction
 - Stage of hematoma formation
 - Stage of callus formation
 - Stage of consolidation
 - Remodelling
- Highest raw surface area: best prognosis: oblique fractures
- Prognosis: oblique(best)>transverse>spiral>comminuted>segmental(worst)

Complications of fracture

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Myositis ossificans (Heterotopic Ossification)

- Ossification in unwanted/ abnormal sites: Ectopic ossification
- Ossification should be membranous or endochondral.
- Ill-advised massage to a joint – **most common cause**
- **Four Structures Involved**
 1. Muscle
 2. Tendon
 3. Fascia
 4. Periosteum
- **Common Sites**
 - Elbow joint: Brachialis muscle
 - Hip joint
 - Shoulder joint
 - Knee joint: Rare
- **Clinical Features**
 - Pain
 - Warmth due to excessive vascularity.
 - Glossy skin
 - Bony, hard mass felt on palpation.
 - Restriction of joint movement.

Differential Diagnosis

- **Osteogenic sarcoma**
- It is difficult to differentiate myositis ossificans and osteogenic sarcoma clinically and radiologically.
- The presence of a bony, hard mass indicates possible myositis ossificans or osteogenic sarcoma.
- Medical history assists in differentiating the two.
- If a patient had a violent massage from a traditional bone setter and develops the related clinical features, a diagnosis of myositis ossificans is made.

X-ray

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- Periosteal reaction.
 - The periosteum appears lifted.
- The lifted appearance of the periosteum is seen in both myositis ossificans and osteogenic sarcoma.
- Codman's triangle observed in osteogenic sarcoma.
- **Confirmation** is by biopsy - Ackermann's Zones phenomena.

Ackermann's Zones Phenomena

- 3 layered phenomena
- When the biopsy positive for myositis ossificans is viewed under the microscope.
- Cell and tissue types appear segregated into 3 zones.



3 zones

- Innermost cellular zone
- Middle fibroblastic tissue
- Outermost mature, well-oriented bone

Treatment

1. 1st line of action – rest for at least 6 weeks – immobilization
2. Drug of choice: Indomethacin
3. **Excision**
 - a. It takes about one and a half years for a mass to mature.
 - b. Excision is done if the mass restricts normal joint movement.
4. **Radiotherapy**
 - Performed following excision to remove any remaining mass and prevent recurrence.

Important Information

- Myositis ossificans progressive is an entirely different condition.
- Myositis ossificans is broadly divided into two categories:
 - Myositis ossificans traumatica (acquired).
 - Myositis ossificans progressiva (congenital).

Myositis Ossificans Progressiva (Fibrodysplasia Ossificans Progressiva)

- Congenital condition
- The average age of presentation is 5-15 years.
- Usually starts in the trapezius and latissimus dorsi region, then spreads to all the joints.
 - Trapezius muscle found in the back.
 - The disease progresses from the trapezius towards the chest wall before affecting all joints.

Common Association

- Macroductyly: **Short fingers**.
- Klippel-Feil syndrome: Congenitally fused cervical vertebrae.
 - Associated with the
 - Myositis ossificans progressiva
 - Sprengel shoulder
- Patient dies due to an intercurrent infection.
- Rib cage joints are also affected.
- Patient succumbs to respiratory failure.
 - **Myositis ossificans progressiva** causes **morbidity** while myositis ossificans traumatica causes morbidity.



Treatment

- No cure
- Bisphosphonates after excision of bony bars may retard their regeneration.

2 MRI IN ORTHOPEDICS



Introduction

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- MRI is a non-invasive procedure that allows to visualize soft tissue structures
- Invented by **Felix Bloch and Purcell** in 1946

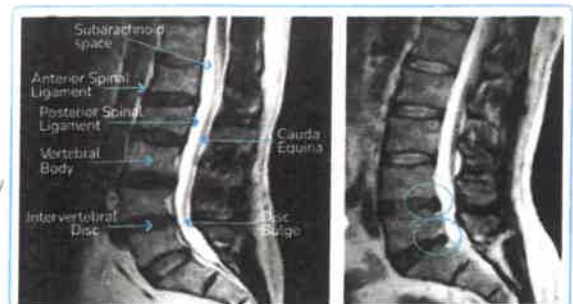
T1 Weighted Sequence	<ul style="list-style-type: none"> • The contrast created in the image is determined by the difference in T1 relaxation times between fat and water. <ul style="list-style-type: none"> ○ Fat has high signal intensity- White ○ Water has low signal intensity- Black • T1 weighted images are sharp and well-defined • T1 weighted images are excellent for detecting <ul style="list-style-type: none"> ○ Normal Anatomy ○ Hemorrhage ○ Marrow changes
T2 Weighted Sequence	<ul style="list-style-type: none"> • The characteristic of the T2 weighted image is high signal intensity for water. <ul style="list-style-type: none"> ○ Water has High signal intensity - White ○ Fat has Low signal intensity - Black • T2 weighted images are excellent for detecting <ul style="list-style-type: none"> ○ Pathologies ○ Fluid (Edema)

MRI Spine

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- MRI spine is the IOC for Intervertebral Disc pathologies such as:
 - Bulge
 - Protrusion
 - Extrusion
 - Sequestration
- IOC to find Spinal tumors
 - Excellent delineation of vertebral body marrow allows primary and metastatic disease detection on T1 weighted sequence.
 - It helps in detecting
 - Spinal cord injury
 - **Epidural hematoma**
 - Disc herniation

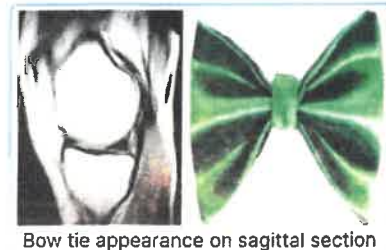
PYQ: FMGE 2019



MRI Knee

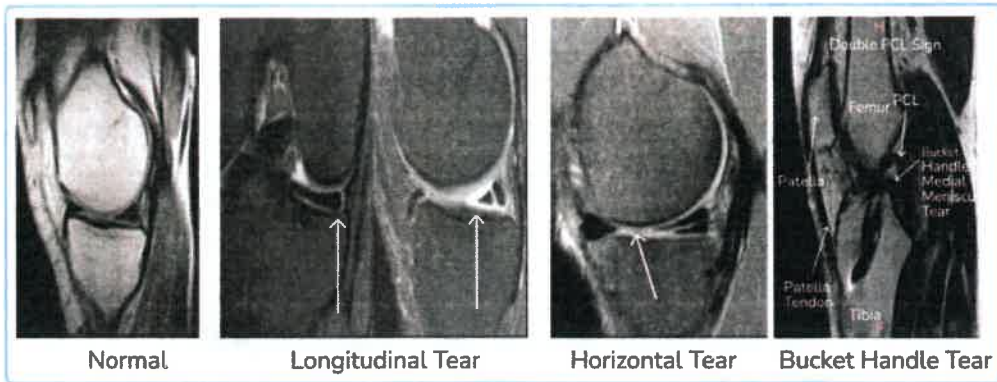
Meniscal Injury

- **MRI is the investigation of choice for meniscal injury**
- Menisci appears as a low-intensity structure in MRI
- On the sagittal image, normal menisci appear like a "Bow tie."
- On Coronal Image- Normal menisci appears like a "Triangle" or wedge
- **The posterior horn of the medial menisci is larger than the Anterior Horn, whereas the Lateral menisci are similar in size and shape.**
- MRI detects:
 - Meniscal tear
 - Meniscal cyst
 - Discoid meniscus



Bow tie appearance on sagittal section

Meniscal tear



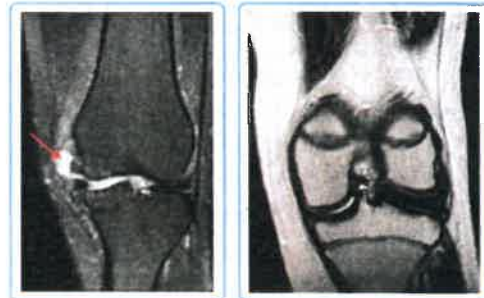
- Normal menisci appear- "Bow-Tie"
- White color area- Longitudinal tear
- White color in between bow-tie- **Horizontal tear**

Meniscal cyst

- Protrusion into an extra area

Discoid meniscus

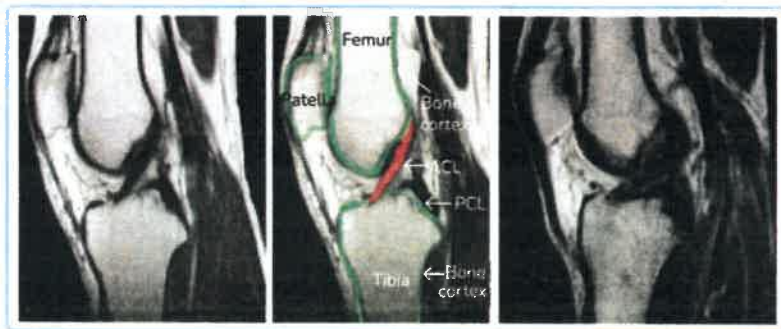
- On Coronal imaging, a Meniscal body width of 15mm or more is considered diagnostic of discoid meniscus.



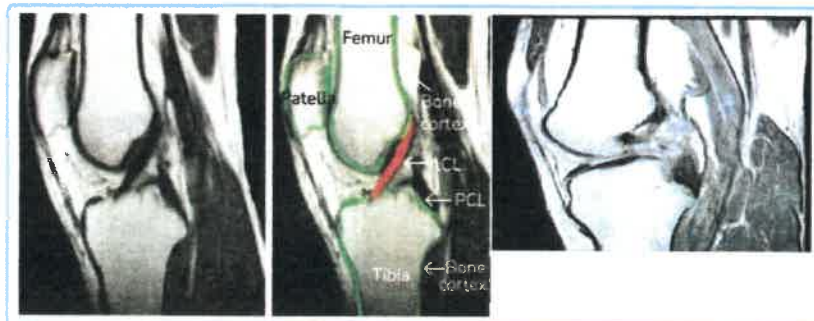
Anterior Cruciate Ligament (ACL) Injuries

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- On sagittal T2 Weighted images- Normal ACL appears as a straight band parallel to the Intercondylar Roof
- A common presentation of acute ACL Tear is non-visualization of the ligament
- A torn ACL stump will give a **"Bell-hammer Sign."**

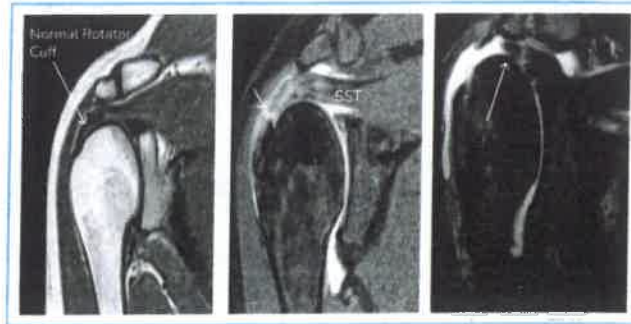


Posterior Cruciate Ligament (ACL) Injuries



**MRI Shoulder
Rotator Cuff Injuries**

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- Image 1 : Black band- Normal rotator cuff
- Image 2: White color structure- Supra spinal distended tear
- Image 3: Retracted tendon- Completely RC tear, retracted tendon

MRI Hip

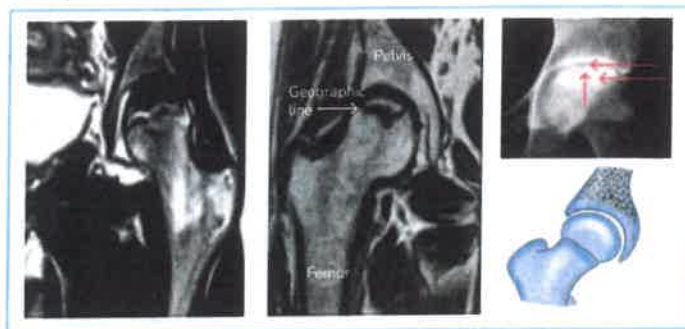
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- Used to detect
 - Osteonecrosis- Earliest non-invasive investigation
 - Occult femoral fractures
 - Labral tear of the hip joint

Avascular Necrosis (AVN)

PVQ: FMGE 2021 PVQ: INICET 2022 PVQ: NEET PG 2022

- T2 weighted images- Subchondral lesion shows a high signal intensity inner border with a low signal intensity peripheral rim
- This is termed the "Double-line" Sign, which may add to the specificity in the diagnosis of AVN
 - Other Name- Geographic sign
 - X-ray- Crescent sign
 - Semilunar crescent-shaped opacity



MRI in Osteomyelitis

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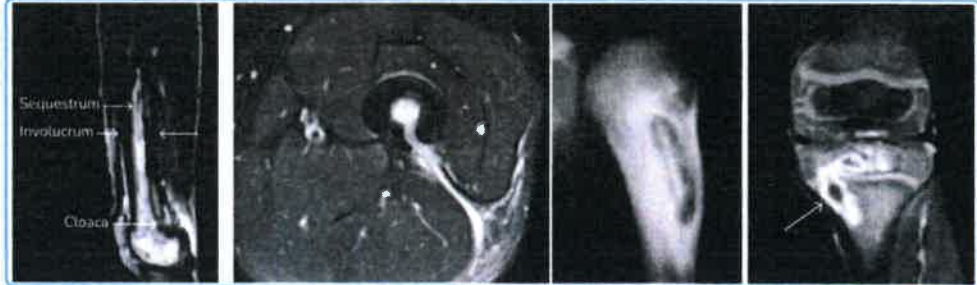
Acute Osteomyelitis

- The Earliest (2 days) MRI finding is Bone marrow edema
- T2 and fat suppression sequences or gadolinium uptake images are very important in detecting this
- It will show a subperiosteal abscess



Chronic Osteomyelitis

- MRI shows
 - Abscess
 - Sequestrum
 - Sinus tract
 - Penumbra sign (**Rim sign**) seen only in MRI

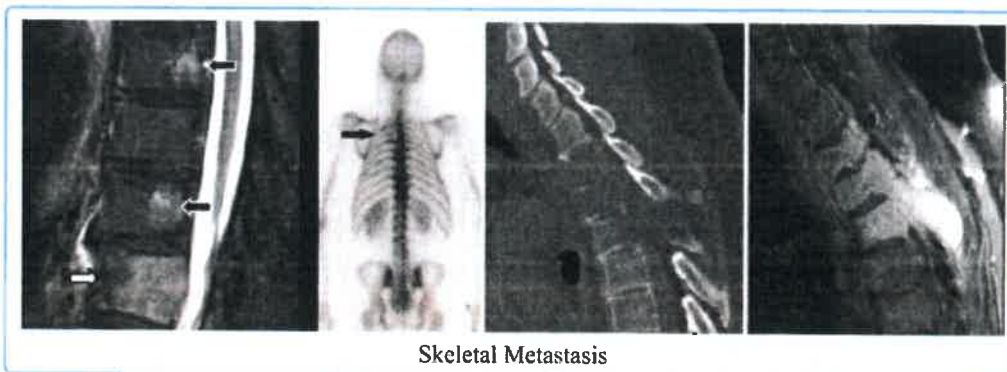


- White color- Sequestrum
- Black color- **Involucrum**
 - New bone formation
- Opening of bone- **Cloaca**
- White color tract- Sinus tract (MRI)

MRI In Bone Tumors

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- The T1 Weighted is important in the evaluation of bone marrow
- Most of the Bone marrow tumors will be evident as a lesion with low signal against a background of surrounding **fatty marrow**
- MRI helps to differentiate Benign from Malignant lesions
 - Benign lesions are usually well defined & sharply demarcated
 - Malignant lesions are extensive & involve surrounding tissue
- MRI is very useful in the local staging of bone tumors as it assesses the Intramedullary extension & surrounding invasion
- Lytic Bone lesions by X-ray can be determined only when it has 50% **trabecular bone destruction**, but MRI may be helpful in detection without destruction
- MRI is very sensitive in detecting Skeletal Metastasis



Skeletal Metastasis

- MRI- Investigation of choice in a suspected case of **Cord compression from pathological vertebral body fractures**
- Since MRI doesn't involve **ionizing radiation**, it is an investigation of suspected bony metastasis in a pregnant woman.
- MRI can be used to assess treatment response by evaluating the size and number of osseous metastasis over time - So it has a **prognostic significance**

Advantages and Disadvantages of MRI

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Advantages	Disadvantages
Non ionizing radiation	• Takes a longer time for sequence and is costly
Better soft tissue contrast than CT	• More expensive & Claustrophobic
Non-invasive, specific, accurate	• Dynamic Testing is not possible. • The gantry is narrower than in CT. • Gadolinium contrast can't be used in pregnant women. • Noisy

Contraindications of MRI

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- Intra Cerebral Aneurysm Clips
- Internal Hearing Aids
- Middle Ear Prosthesis - Cochlear implants
- Cardiac Pacemakers
- Implants
- 1st Trimester of Pregnancy
- Metallic Orbital Foreign Bodies

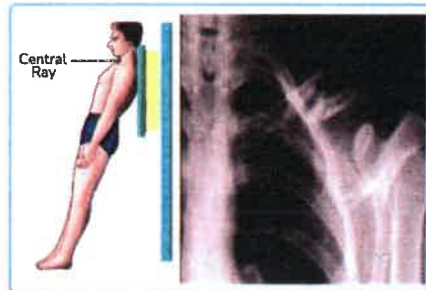
3 SPECIAL X-RAY VIEWS IN ORTHO



45° Lordotic View (Cephalic Tilt View)

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- Specific view for visualizing clavicle
- The patient is in a standing position with a 45° tilt.



Serendipity View

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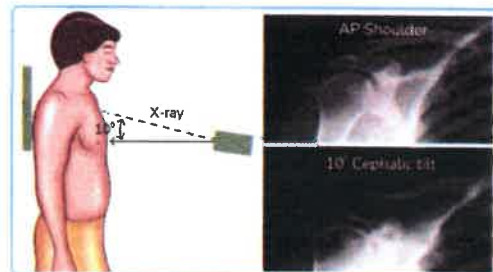
- Also called **Rockwood View**
- Specific view for visualizing sternoclavicular joint
- The patient lies in a supine position
 - Ray is passed at 45-60°



Zanca's View

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- It is a standing radiograph for the Acromioclavicular joint
- The X-ray beam is directed 10 to 15° Cephalad
- Demonstrates AC Joint & Distal Clavicle
 - AC Joint Dislocation
 - AC Joint Arthritis
 - Distal Clavicular Osteolysis
 - Measuring the Coracoclavicular Distance



WestPoint View

00:02:31

