

AN INTERACTIVE LEARNING  
EXPERIENCE:  
REVALIDATION OF CLINICAL SKILLS  
FOR A.T. PROFESSIONALS & A.T.  
EDUCATORS

*CCSU SPORTS MEDICINE SYMPOSIUM 2026*



CLINICAL IMAGING FOR LOWER EXTREMITY  
ATHLETIC INJURIES: MRI CASE REVIEWS

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ORTHOPEDIC ASSOCIATES OF HARTFORD

# DISCLOSURES

- NO CONFLICT OF INTEREST
- NO FINANCIAL RELATIONSHIP
- NO OFF-LABEL USE/PRODUCT ENDORSEMENT

# OBJECTIVES

- *INTERPRET COMMON MRI FINDINGS ASSOCIATED WITH LOWER EXTREMITY ATHLETIC INJURIES; MECHANISM OF INJURY; CLINICAL SIGNS*
- *APPLY MRI CASE STUDY INFORMATION RELATIVE TO REHABILITATION PLAN, ACTIVITY MODIFICATION, RTP DECISION-MAKING*
- *COMMUNICATE MRI FINDINGS EFFECTIVELY WITH HEALTH CARE PROVIDERS/ATHLETE/STAFF TO SUPPORT INTERDISCIPLINARY CARE*

# OVERVIEW

## ATHLETIC INJURY

- DISRUPTIVE
  - ATHLETE
    - PHYSICAL, EMOTIONAL, MENTAL HEALTH
  - TEAM
    - IMPACTFUL TO SEASON PERFORMANCE
  - FUTURE
    - ATHLETIC, PERSONAL & PROFESSIONAL CAREER



# KEYS TO SUCCESS

## EARLY DIAGNOSIS

- MECHANISM OF INJURY
- EVALUATION & PHYSICAL EXAM
- REFERRAL AS NEEDED
- APPROPRIATE STUDIES
  - XRAY, CT SCAN, U/S, MRI



## TIMELY TREATMENT PLAN

- BASED ON THE DIAGNOSIS AND SEVERITY OF INJURY
  - CASTING/BRACING
  - THERAPEUTIC MODALITIES
  - SURGERY
  - REHABILITATION
  - RTP



# MRI

## HISTORY

- EVOLVED FROM 1930s NUCLEAR MAGNETIC RESONANCE (NMR) PHYSICS INTO A CLINICAL IMAGING TOOL IN THE 1970s.
- KEY MILESTONES INCLUDE RAYMOND DAMADIAN'S FIRST HUMAN SCAN (1977), PAUL LAUTERBUR'S GRADIENT CONCEPT (1973), AND PETER MANSFIELD'S FAST IMAGING TECHNIQUES.
- THE FIRST COMMERCIAL SCANNERS APPEARED IN THE 1980s, ENABLING DETAILED SOFT-TISSUE IMAGING.

## HOW IT WORKS

- USES A STRONG, CONSTANT MAGNETIC FIELD, GRADIENT MAGNETS, AND RADIO WAVES TO ALIGN AND STIMULATE HYDROGEN PROTONS IN THE BODY'S WATER MOLECULES, CAUSING THEM TO EMIT SIGNALS THAT ARE CAPTURED AND PROCESSED INTO DETAILED, CROSS-SECTIONAL IMAGES

# MRI

## CORE PRINCIPLES & PROCESSES

- **THE MAGNETIC FIELD:** THE SCANNER PRODUCES A POWERFUL, UNIFORM MAGNETIC FIELD, CAUSING THE BODY'S HYDROGEN PROTONS TO ALIGN WITH IT. THESE SCANNERS TYPICALLY OPERATE AT 1.5 OR 3 TESLA.
- **RADIOFREQUENCY (RF) PULSE:** A RADIO WAVE IS SENT INTO THE PATIENT, TEMPORARILY KNOCKING THE PROTONS OUT OF ALIGNMENT AND CAUSING THEM TO ABSORB ENERGY.
- **RELAXATION (SIGNAL EMISSION):** WHEN THE RF PULSE STOPS, THE PROTONS REALIGN WITH THE MAGNETIC FIELD IN A PROCESS CALLED "RELAXATION". AS THEY RETURN TO THEIR ORIGINAL STATE, THEY EMIT A RADIO SIGNAL.
- **GRADIENT COILS:** EXTRA COILS ARE USED TO ALTER THE MAIN MAGNETIC FIELD ACROSS THE BODY, WHICH HELPS PINPOINT THE PRECISE LOCATION OF THE SIGNAL SOURCE, ALLOWING FOR 3D IMAGE CONSTRUCTION.
- **DETECTION AND PROCESSING:** COILS ACTING AS RECEIVERS PICK UP THE SIGNALS. A COMPUTER ANALYZES THE TIMING AND STRENGTH OF THESE SIGNALS, CONVERTING THEM INTO DETAILED, GRAYSCALE IMAGES.

# AREAS OF FOCUS

- COMMON THINGS ARE COMMON
- WHEN YOU HEAR HOOF BEATS YOU THINK OF A HORSE, BUT, SOMETIMES IT'S A ZEBRA

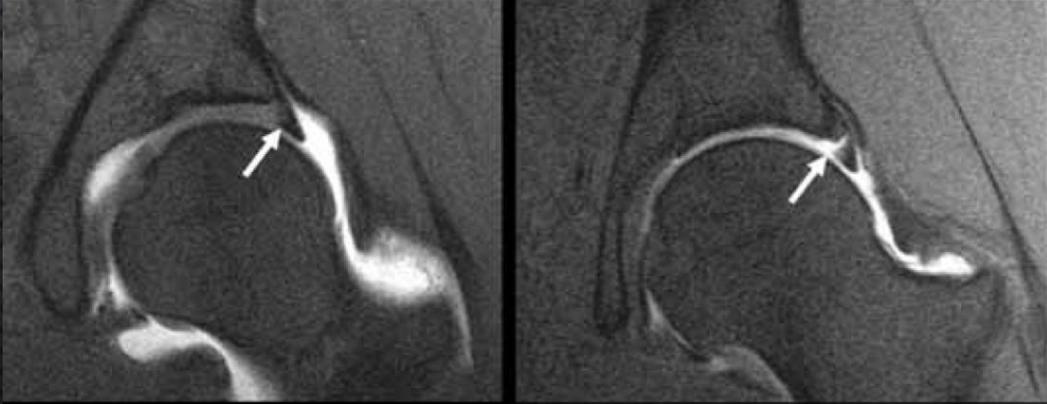
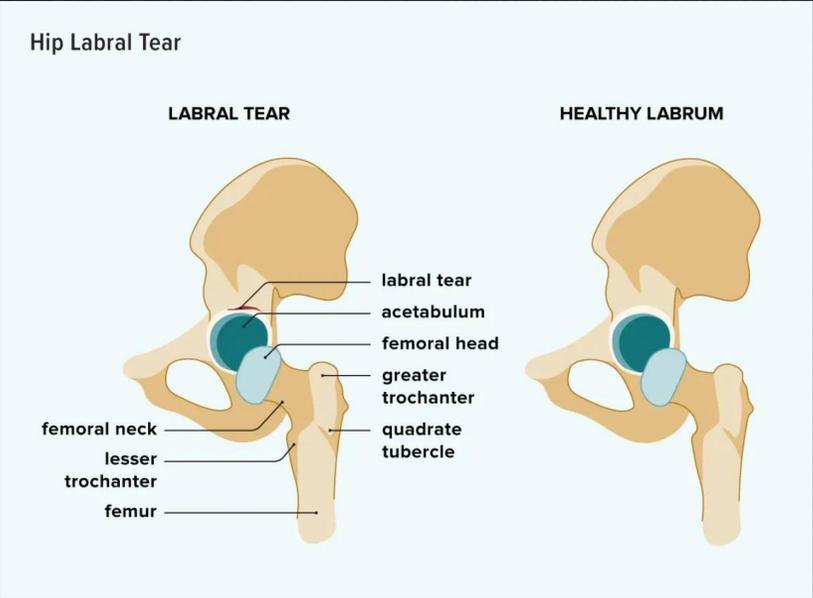


# AREAS OF FOCUS

- HIP
  - LABRUM, FEMORAL NECK
- HEMATOMA
  - QUADRICEPS, HAMSTRING, CALF
- KNEE
  - LIGAMENT, MENISCUS, ARTICULAR CARTILAGE
- STRESS FRACTURES
  - TIBIA, METATARSAL
- ANKLE
  - TALAR DOME DEFECT, OSTEOCHONDRAL DEFECT

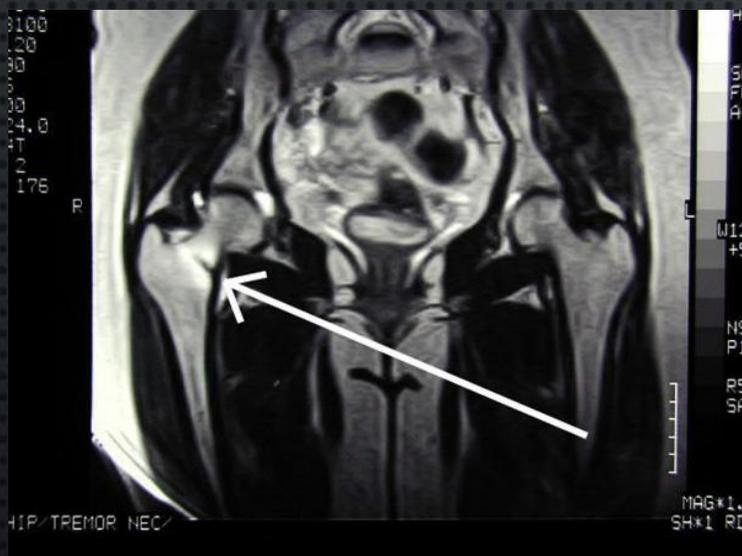
# HIP

## LABRUM



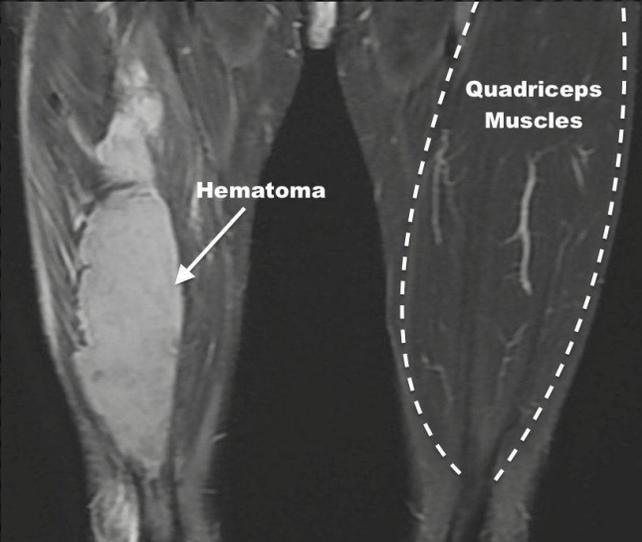
# HIP

## FEMORAL NECK STRESS FRACTURE

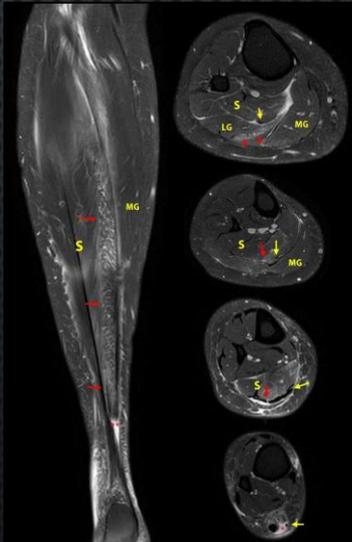


# QUADRICEPS/HAMSTRING/CALF INJURY

## HEMATOMA

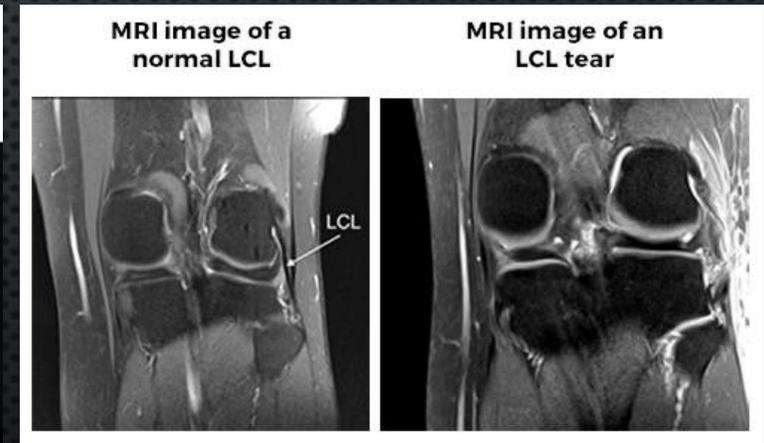
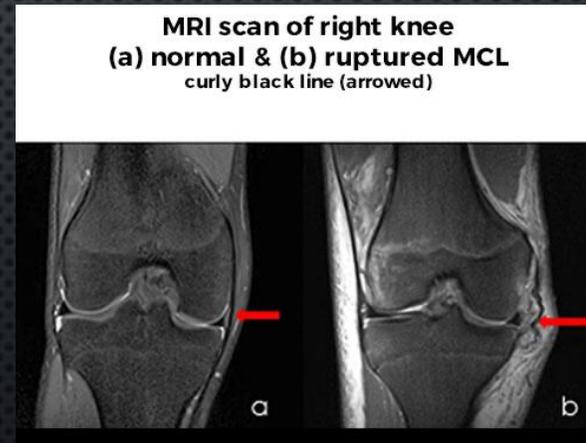
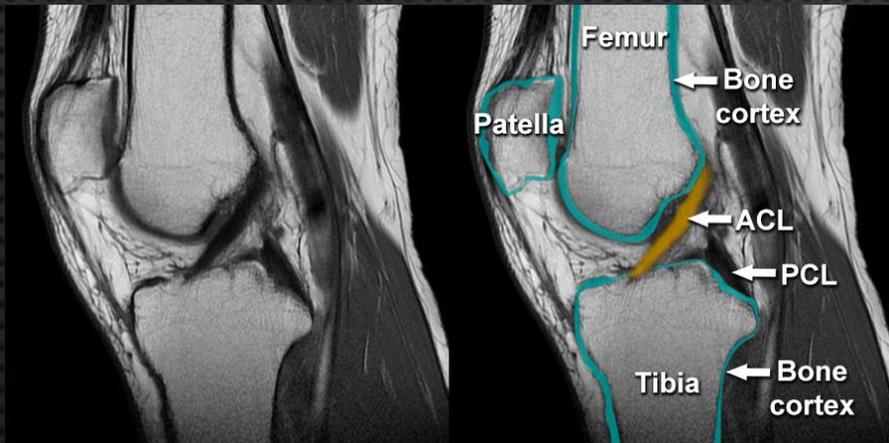


## MUSCULOTENDINOUS TEAR



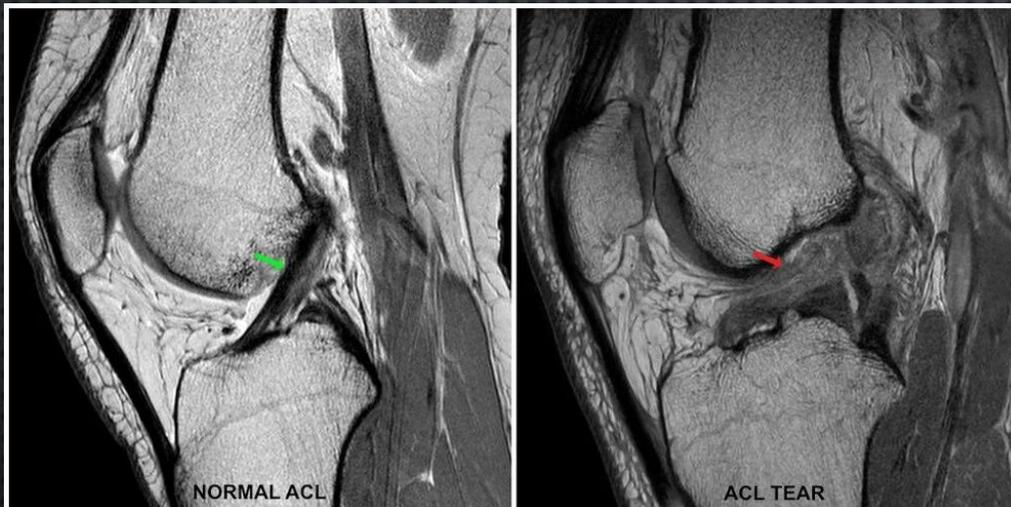
# KNEE

## LIGAMENT: ACL, PCL, MCL, LCL



# KNEE

## ACL

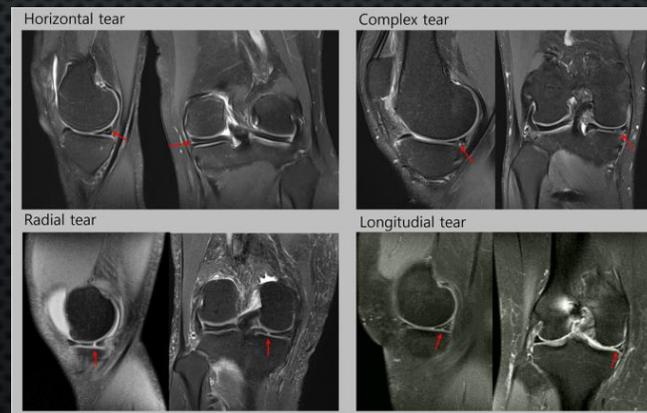
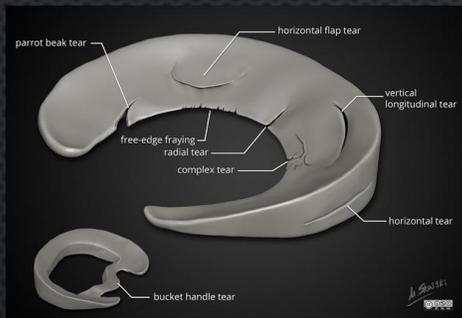


## PCL

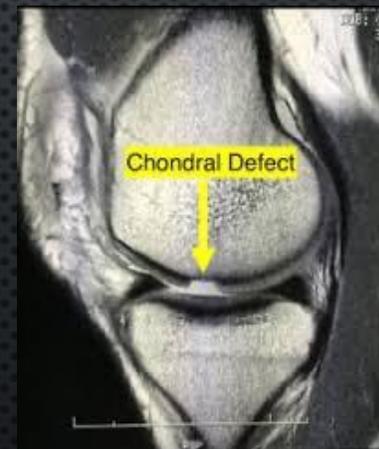


# KNEE

## MENISCUS

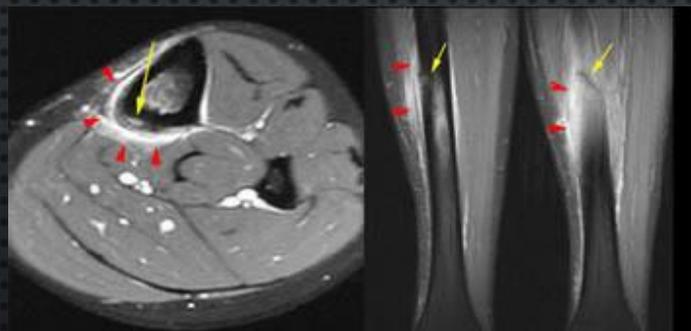


## CHONDRAL DEFECT



# STRESS FRACTURES

TIBIA

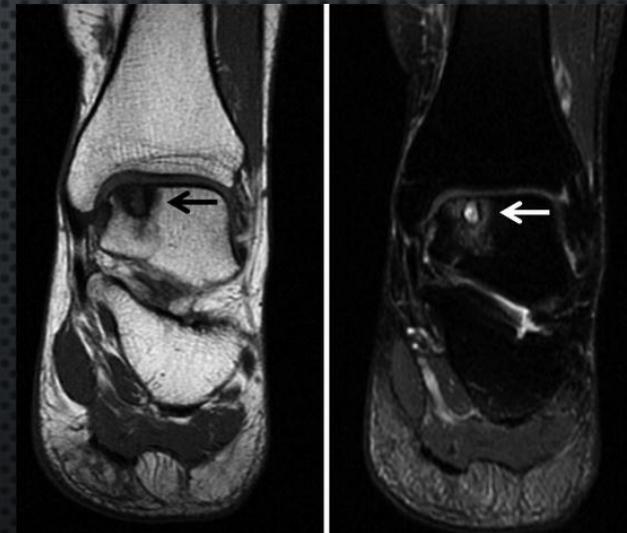
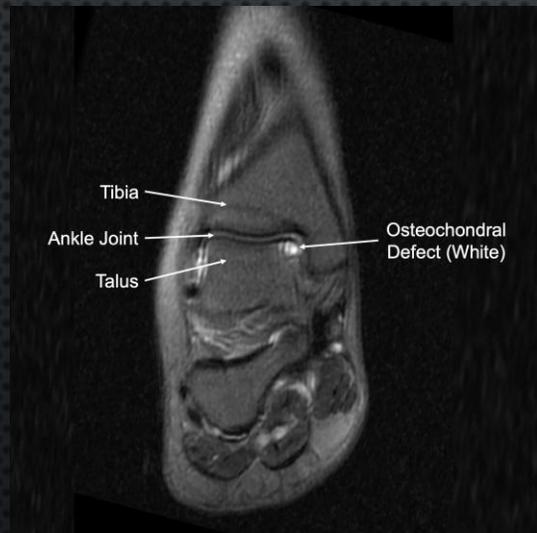


METATARSAL



# ANKLE

## TALAR DOME DEFECT (TRAUMA VS OCD)



# TAKE AWAY

LEARN YOUR ANATOMY...

...KNOW YOUR ANATOMY...

...TRUST YOUR ANATOMY



# REFERENCES

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2. 2017 Dec 16;101(Suppl 2):1. doi: [10.5334/jbr-btr.1377](https://doi.org/10.5334/jbr-btr.1377)

## **Staging of Osteochondral Lesions of the Talus: MRI and Cone Beam CT**

[Magdalena Posadzy](#)<sup>1</sup>, [Julie Desimpel](#)<sup>2</sup>, [Filip Vanhoenacker](#)<sup>3</sup>

3. StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2025 Jan-.

## **Stress Fractures**

### **Authors**

Todd May<sup>1</sup>; Raghavendra Marappa-Ganeshan<sup>2</sup>.

## **4. Meniscus Tear: Pathology, Incidence, and Management**

[Enkhmaa Luvsannyam](#)<sup>1,✉</sup>, [Molly S Jain](#)<sup>2</sup>, [Ayola R Leitao](#)<sup>3</sup>, [Nicolle Maikawa](#)<sup>4</sup>, [Ayesha E Leitao](#)<sup>5</sup>

## **5. Incidence and trends of anterior cruciate ligament reconstruction in the United States**

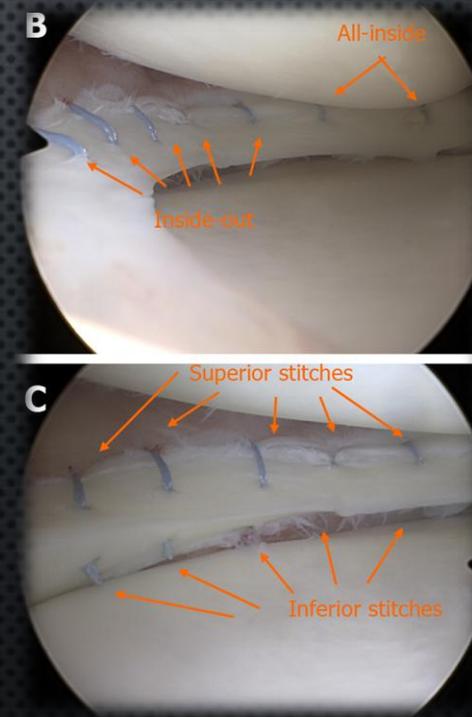
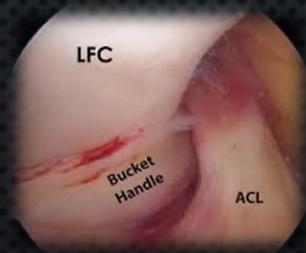
[Nathan A Mall](#)<sup>1</sup>, [Peter N Chalmers](#)<sup>2</sup>, [Mario Moric](#)<sup>3</sup>, [Miho J Tanaka](#)<sup>4</sup>, [Brian J Cole](#)<sup>5</sup>, [Bernard R Bach Jr](#)<sup>2</sup>, [George A Paletta Jr](#)<sup>4</sup>

GUESS WHAT I'M THINKING

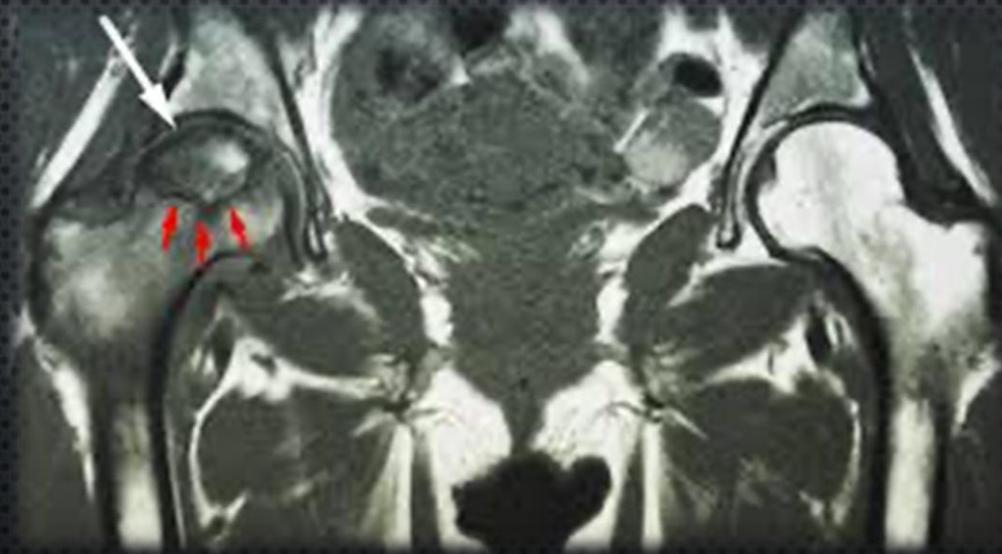


# BUCKET HANDLE MENISCUS TEAR

- “DOUBLE MENISCUS’ SIGN

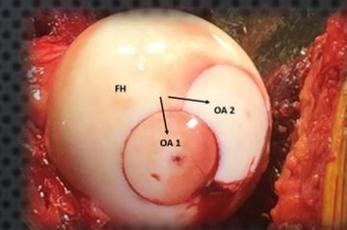
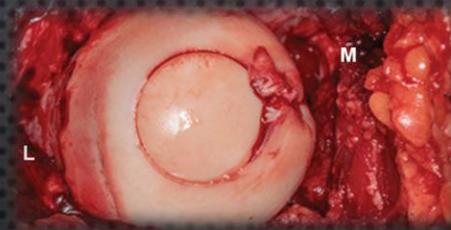


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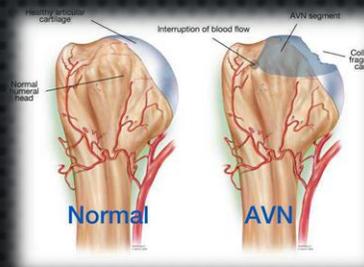


# OCD VS AVN

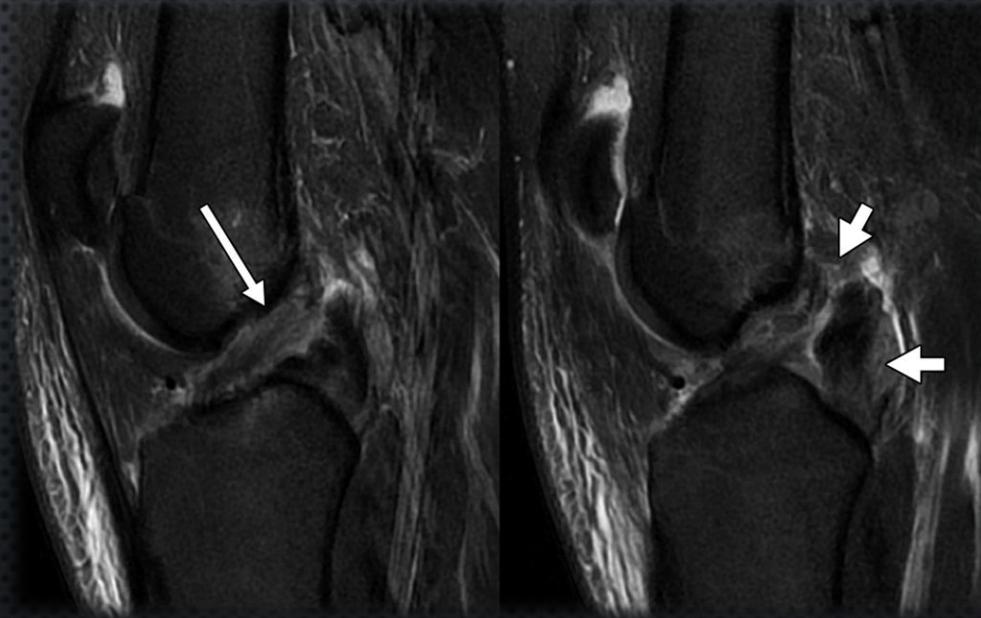
- TRAUMA
  - IMPACT/SHEAR



- BLOOD SUPPLY
  - STRUCTURAL COLLAPSE



GUESS WHAT I'M THINKING



# KNEE DISLOCATION/MULTI-LIGAMENT INJURY

- HIGH-IMPACT TRAUMA
- KNEE DISLOCATION
  - CONCERN IS VASCULAR INJURY
- REDUCTION/STABILIZATION
- SURGICAL TIMING



GUESS WHAT I'M THINKING



# PATELLAR DISLOCATION MPFL INJURY

- REDUCTION TECHNIQUE

- STUDIES

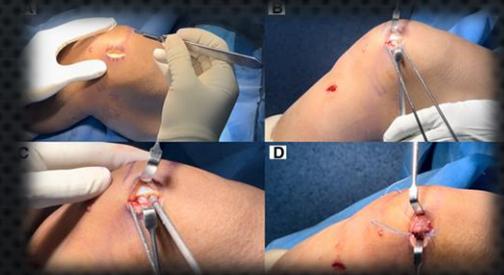
- XRAY, MRI



- TREATMENT

- REHAB

- SURGICAL RECONSTRUCTION



GUESS WHAT I'M THINKING



# OSTEITIS PUBIS VS STRESS FRACTURE

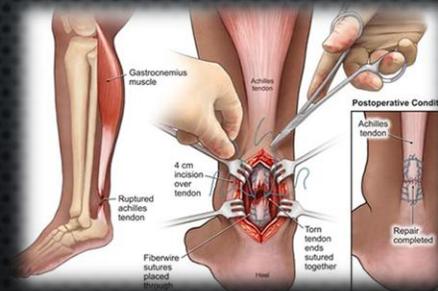
- REPETITIVE STRESS
- ANTERIOR PELVIC PAIN
- PROTECTED WEIGHT BEARING
- REST
- ICE
- NSAIDS
- INJECTION???

GUESS WHAT I'M THINKING



# ACHILLES TENDON RUPTURE

- MOI: FORCED DORSIFLEXION ON PLANTAR FLEXED FOOT
  - LAND FROM HEIGHT
  - PLYOMETRIC OVERLOAD
- ECCENTRIC VS CONCENTRIC
  - LOADING WHILE LENGTHENING
  - LOADING WHILE SHORTENING
- CAST VS SURGERY



GUESS WHAT I'M THINKING



# LISFRANC INJURY

- MOI: DIRECT/INDIRECT TRAUMA TO MIDFOOT WHEN FOOT IS PLANTAR FLEXED
- CAN INVOLVE LISFRANC'S LIGAMENT BETWEEN BASE OF 1<sup>ST</sup> AND 2<sup>ND</sup> METATARSALS W/ FX
- UNSTABLE
  - CAST: POOR RESULTS
  - SURGICAL ORIF/REPAIR

