Common Orthopaedic Conditions of the Knee (Part 1) Intra articular injuries

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Disclosures

- I have no relevant commercial relationships to disclose

Learning Objectives

- At the conclusion of the session, participants should be able to understand the presentation, diagnosis and treatment of common intra-articular injuries of the knee including ACL tears, meniscal tears and cartilage injuries.

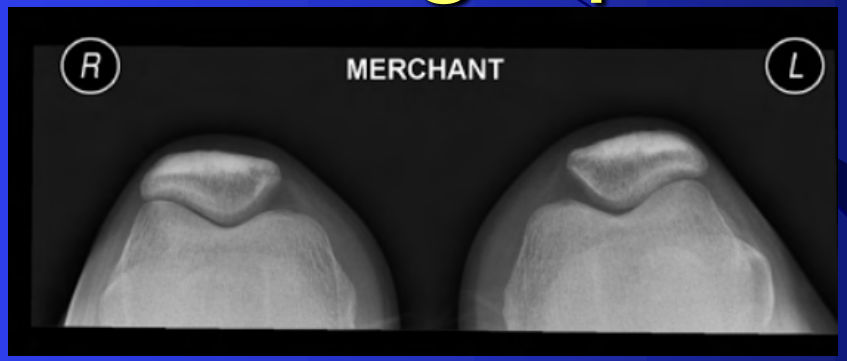
Case 1

- 17 yo female rugby play with left knee pain
- Felt a ”pop” in her knee while making a cut
- Immediate pain and swelling
- Unable to return to play
- Difficulty bearing weight
- No previous history of knee injury or pain

Physical Examination

- Moderate Effusion
- Motion 0-120 degrees
- Stable to varus stress at 0-30 degrees, grade 2 instability to valgus stress at 0 and 30
- 2B Lachman, + Ant drawer, guarding pivot
- Neg Post drawer
- Neg Dial at 30 and 90 degrees
- NVI

Radiographs



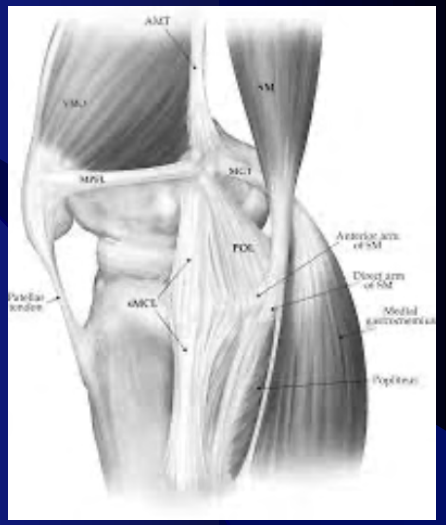
MRI

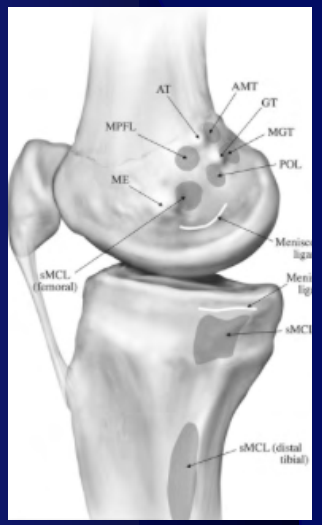
Diagnosis

- ACL tear
- MCL Tear

MCL Tears

- Most frequently injured ligament of the knee
- Primary restraint to valgus stress
- Isolated and combined injuries
- Femoral side vs tibial sided injuries





LaPrade JBJS 2007

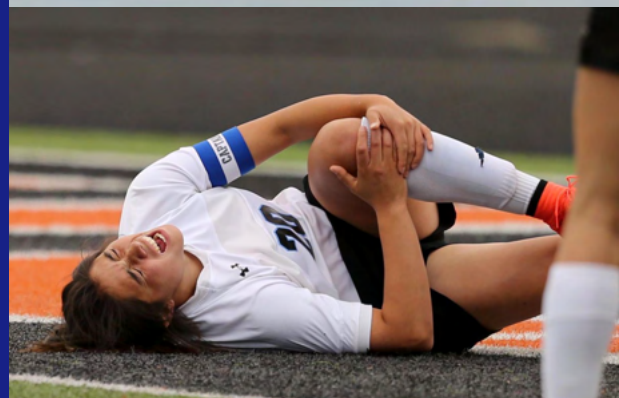
Treatment

- Nonoperative management >>>>Surgical reconstruction and/or repair
- Bracing for 4-6 weeks
- When combined with ACL tear, delay ACL recon until after MCL healing

ACL TEARS

Epidemiology

- Commonly injured knee ligament
- 100,000 – 200,000 each year in the US
- NCAA Surveillance System (1988)
  - Football highest numbers (53%)
  - Female gymnast highest rate (1/330)
  - Females > males
    - Soccer: 3.5, Basketball: 2.7
  - Hockey / Baseball – low incidence
- Skiing (beginners > experts)

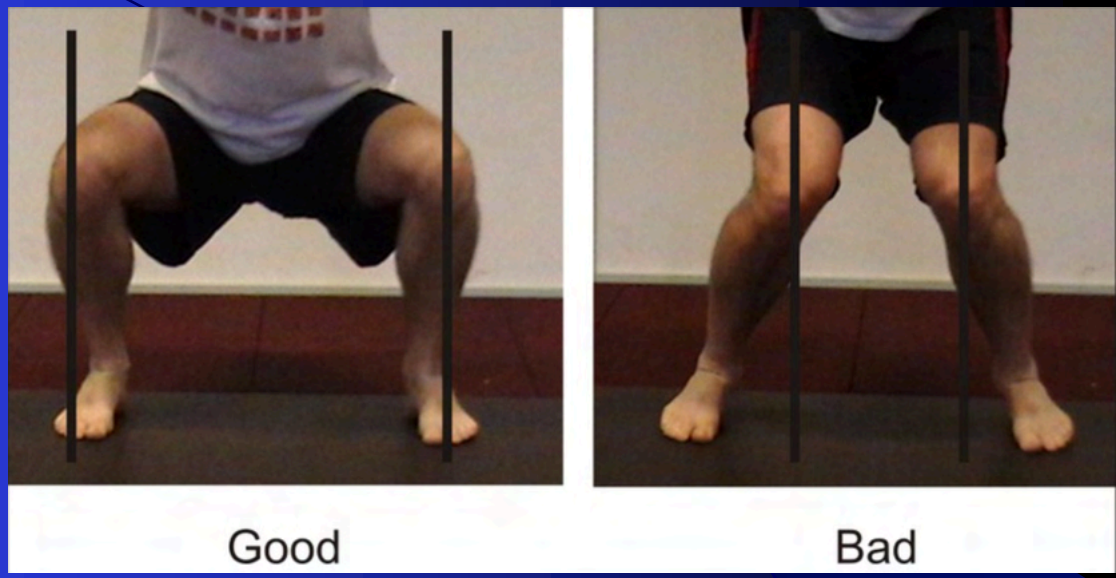


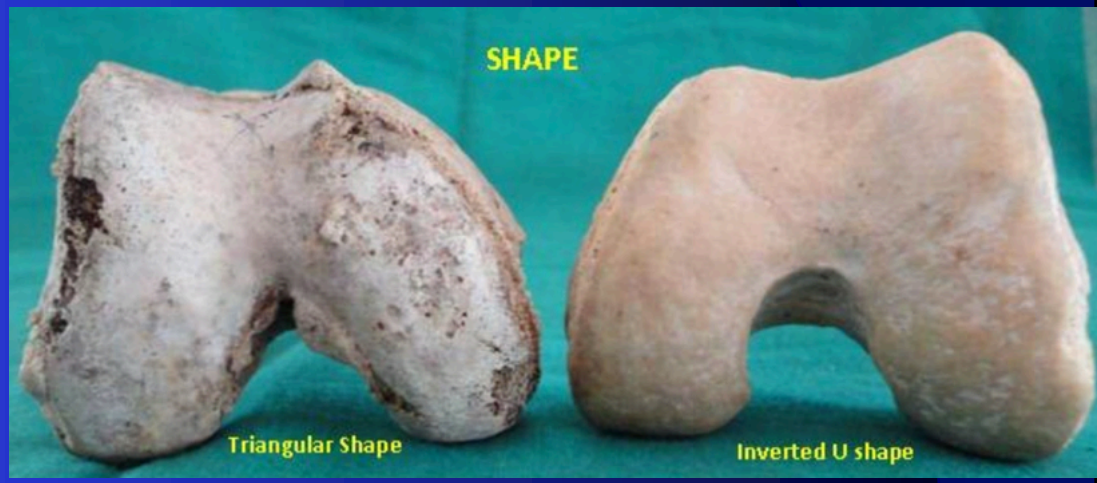
Mechanism of Injury

- Often non contact (70%)
  - Sudden change in direction
    - Quick deceleration, hyperextension or rotational injury
- Contact

Risk Factors

- Female gender
- Knee valgus with pivot, deceleration or landing
- Quadriceps dominance
- Playing surface: ⇧ with traction
- Decrease notch width / Increased tibial slope





Patient Presentation

ACUTE

- Report a "pop"
- Unable to return to play
- Effusion (24 hrs / 70%)
- Pain with weight bearing

CHRONIC

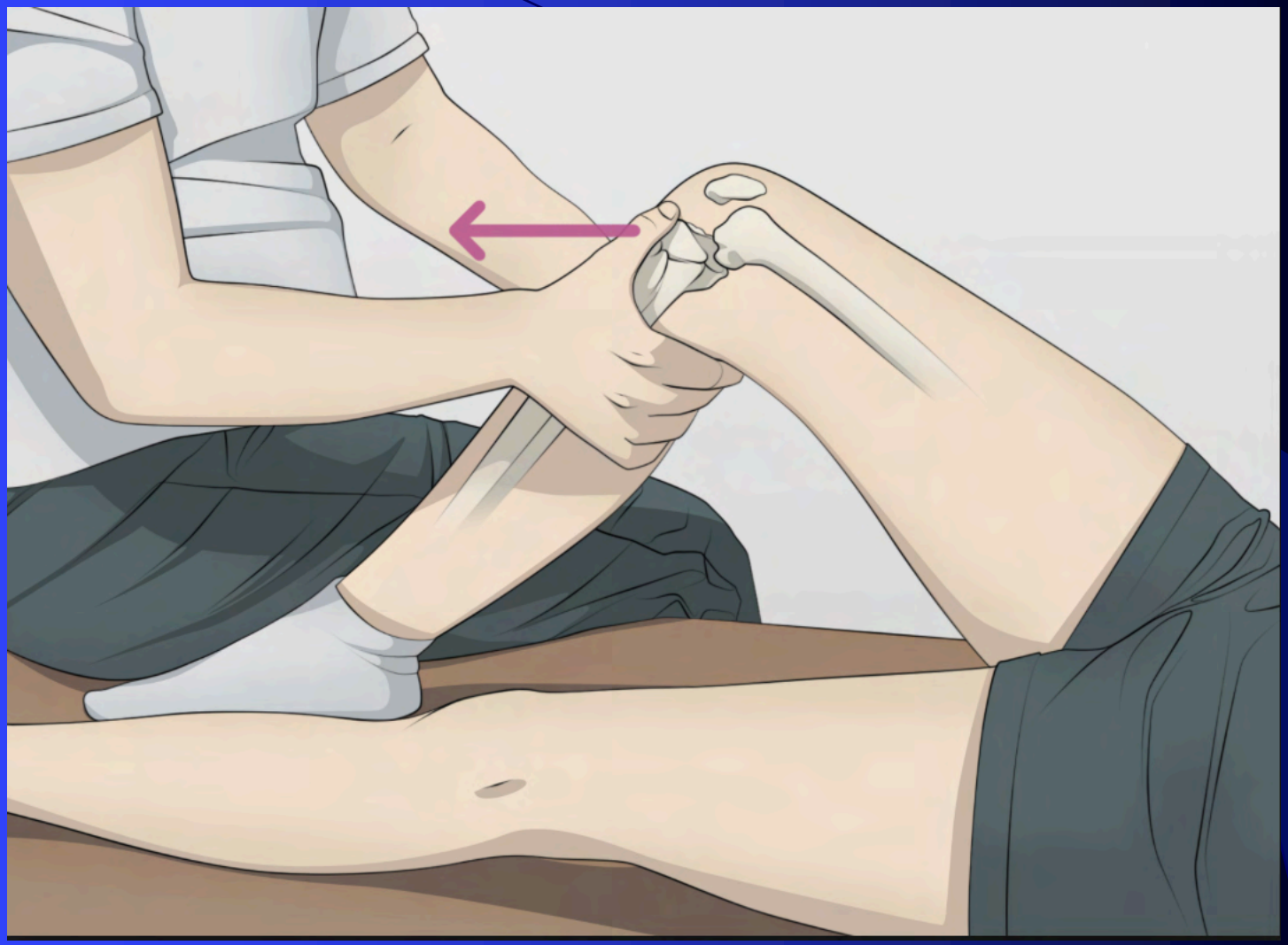
- Shifting events
- Restored ROM
- Minimal to no swelling

Physical Examination

- Often limited in the subacute setting
- Effusion
- Limited ROM
- Lateral joint line tenderness
- Assessment for concomitant inju
  - Varus/valgus laxity (LCL/MCL)
  - Posterior drawer (PCL)
  - Dial test (PCL/PLC)
- Generalized laxity and excessive hyperextension

COMPARE TO THE NORMAL KNEE!!!!

Anterior Drawer



Make Sure No Posterior SAG

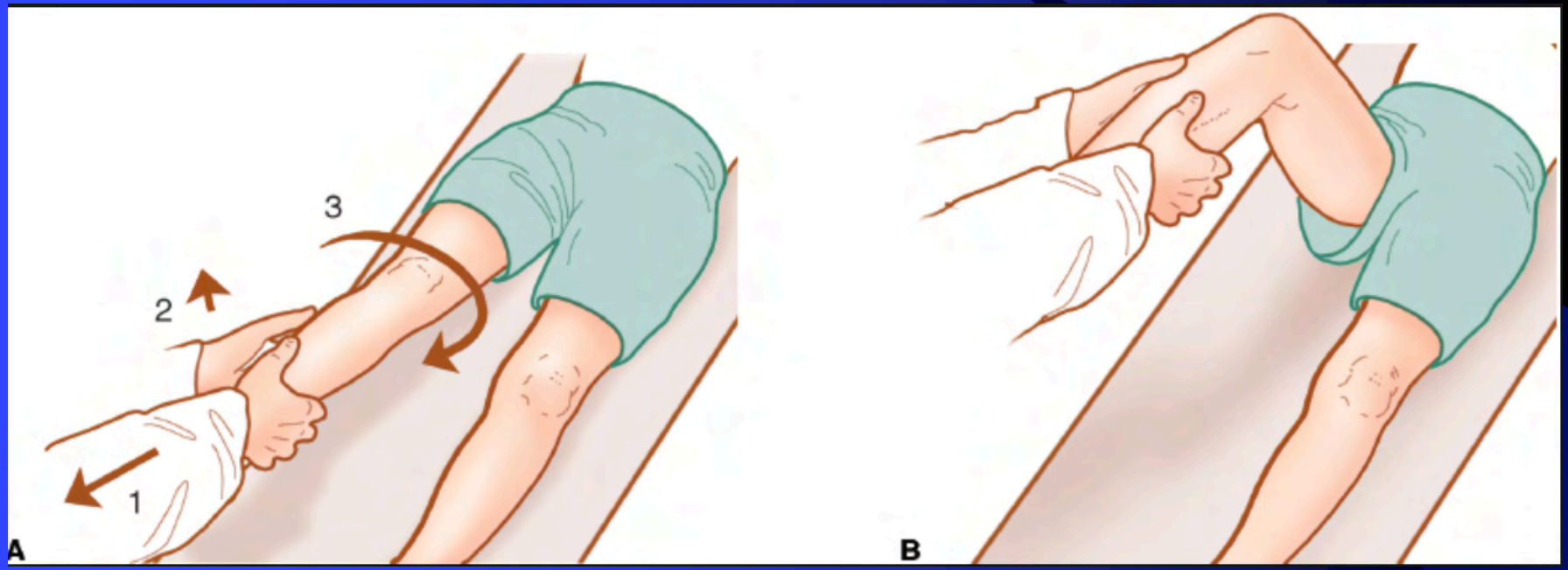
Lachman

Most Sensitive 85%

Grade 1 (0 – 5mm), Grade 2 (5 – 10mm), Grade 3 (>10mm)

Endpoint: A (Firm), B (Soft)

Pivot Shift



Most Specific 94%

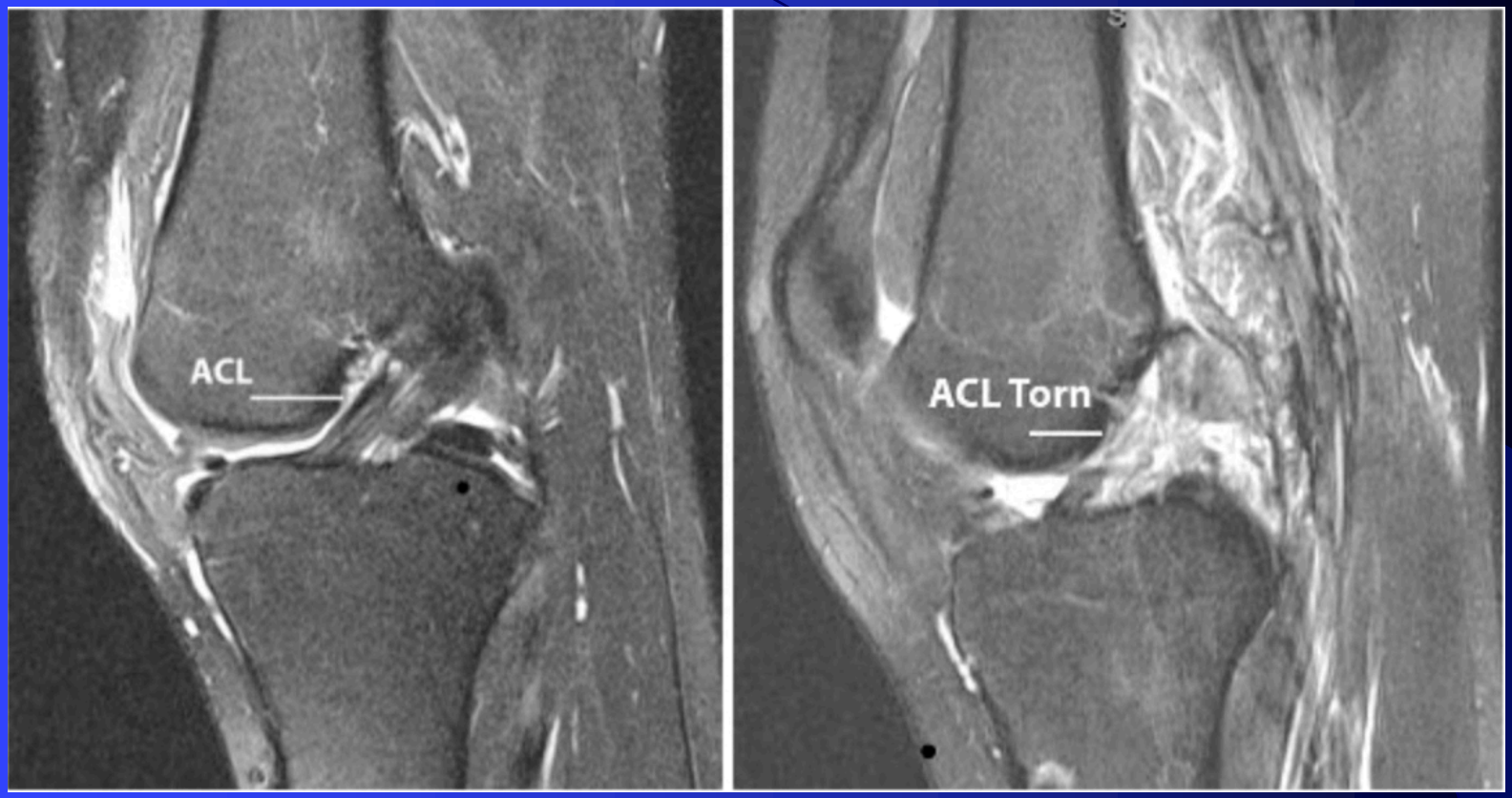
Imaging: Xrays

Segond Fracture

- Avulsion of the anterolateral capsule
- Pathognomonic for ACL injury

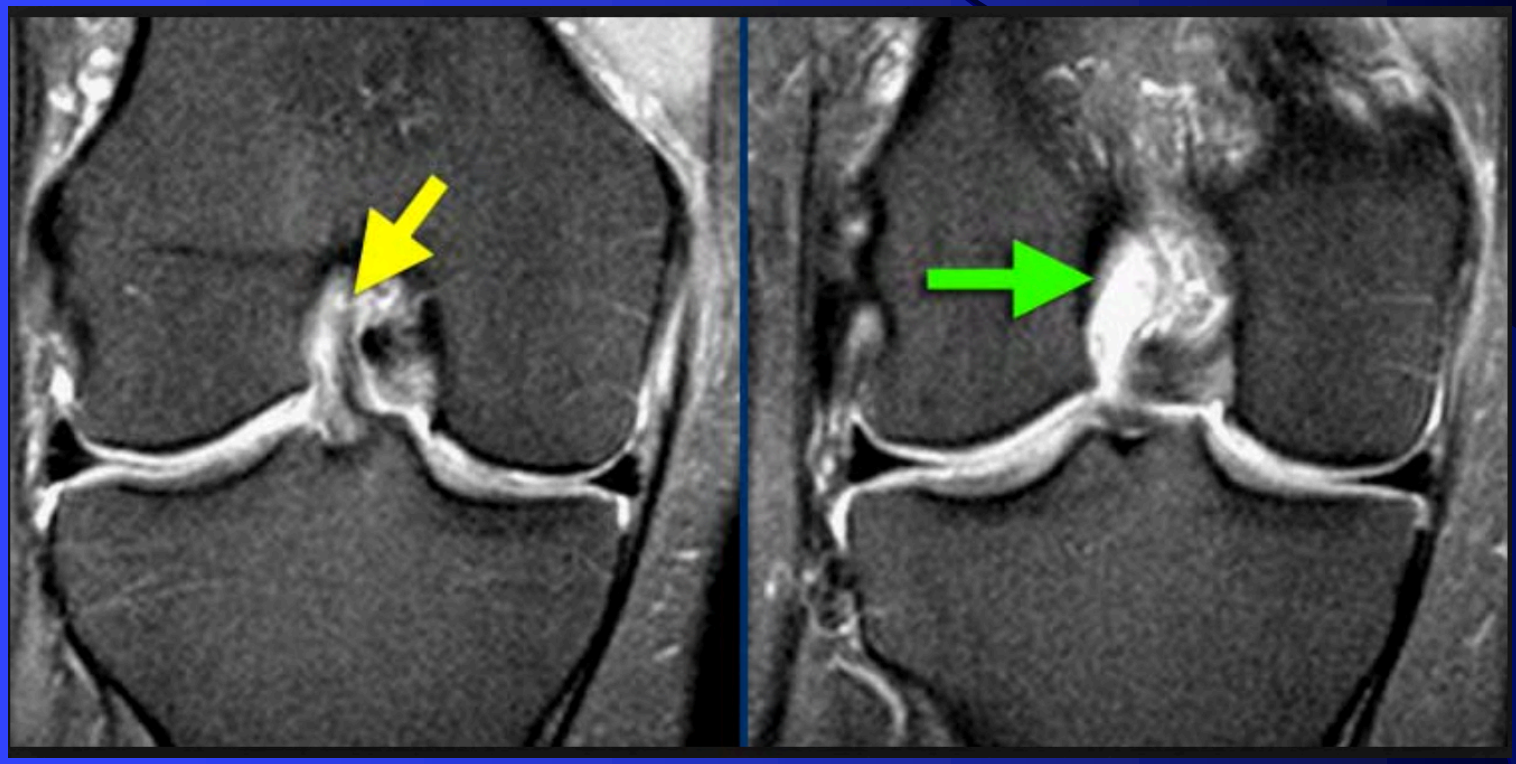
Impaction at the sulcus terminalis on the lateral femoral condyle

Imaging: MRI



SAGITTAL

MRI Imaging

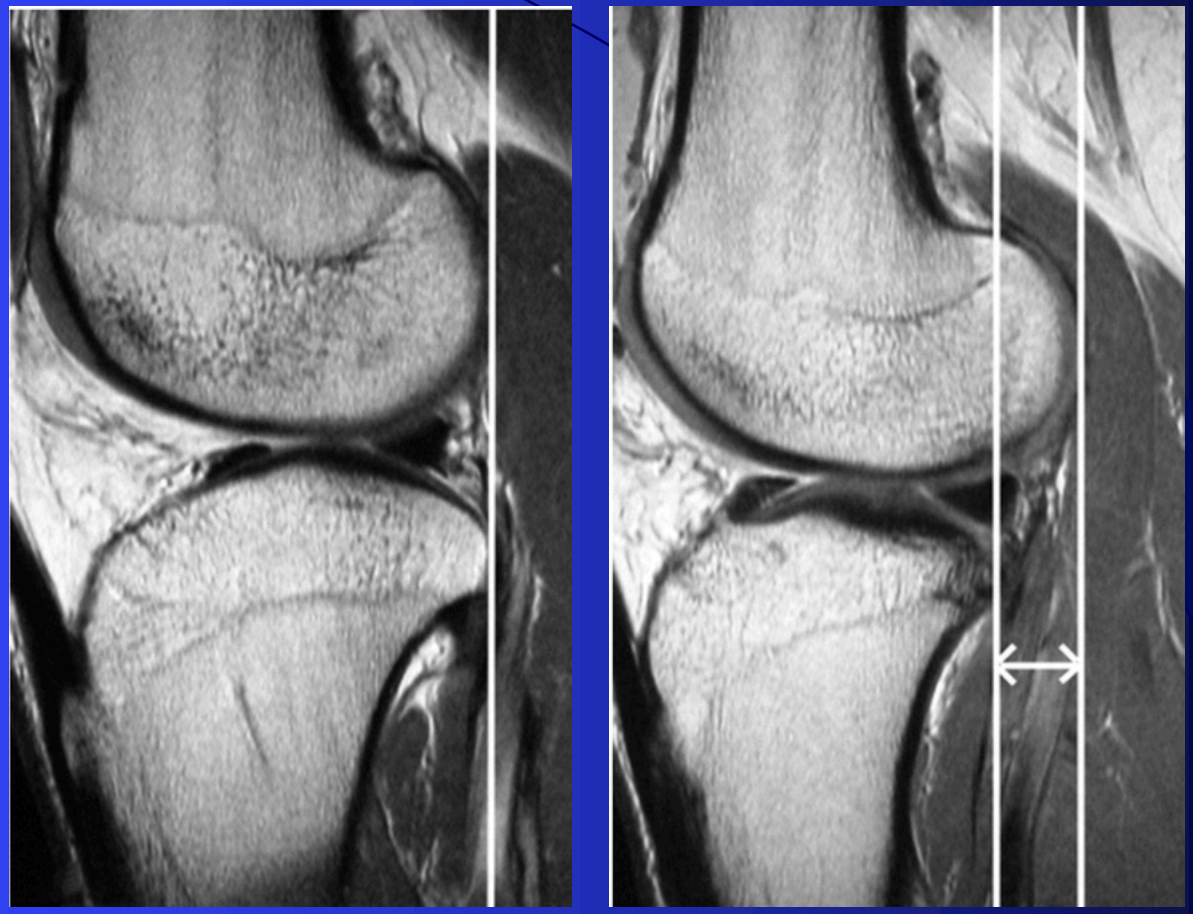


CORONAL – "Empty wall"

Imaging: MRI

SAGITTAL T2 – "Bone bruise"

Imaging: MRI



SAGITTAL – "Anterior tibial translation sign"

Treatment

Initial

- R.I.C.E, restore ROM, wean from crutches

Long Term

- Nonoperative
- Operative

GOAL is to AVOID SHIFTING EVENTS

Activity Limitations ***Bracing***

Surgery

Nonoperative

Indications

- Low demand
- Straight line activities (walking, cycling, etc)
- Failure nonoperative treatment / Instability with ADLS (33%) Grindmen JBJS 2014

- **Treatment**
  - Physical therapy: optimize quad, hamstring, gluteal and core strength

Operative

Indications

- Cutting, jumping, pivoting sport
- Younger age
- Failed trial of nonop

Considerations

- Autograft vs Allograft
- Autograft choice:

BTB, hamstring, quad, contralateral BTB

Autograft vs Allograft

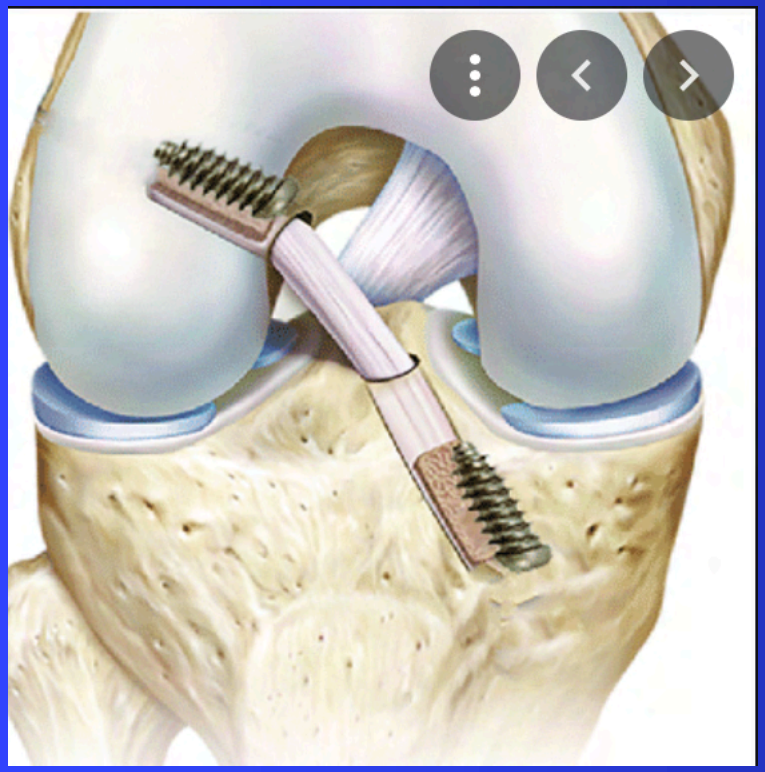
Autograft

- Lower failure rate
- Faster maturation
- Donor site pain
- Not always an option in revision and multilig

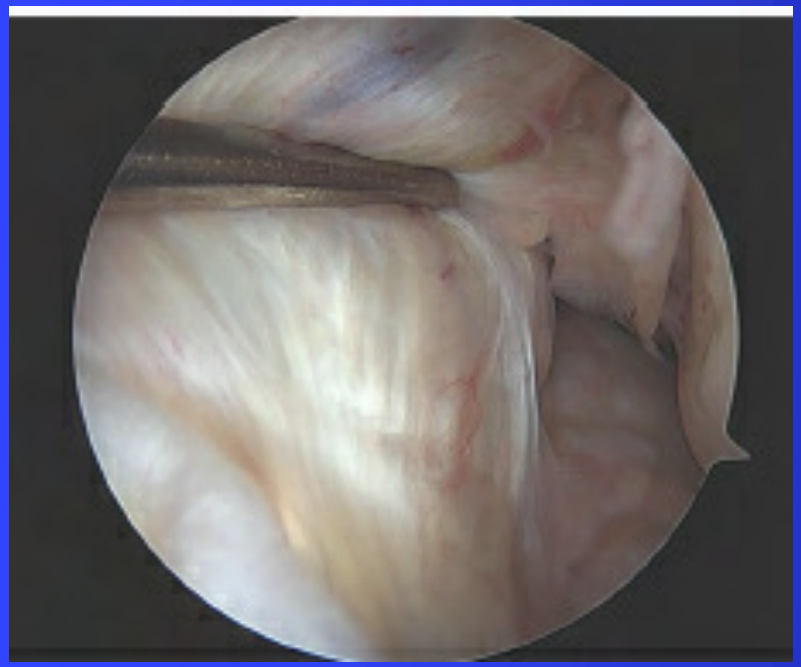
Allograft

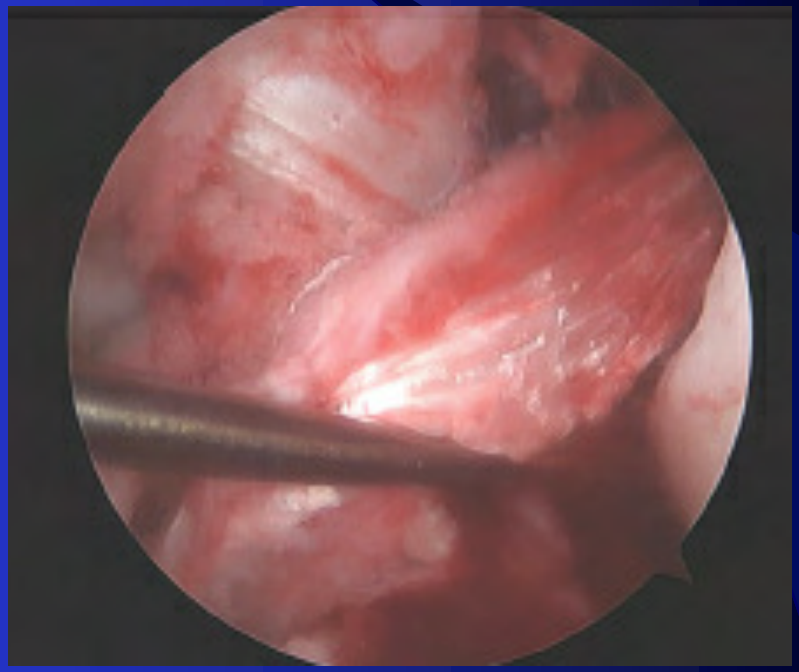
- Decreased morbidity
- Decreased OR time
- Disease transmission (< 1.1 million)
- Increased time to incorporation
- **INCREASED FAILURE RATE (> 4 X higher)**

ACL Tears



ACL Tears





Postoperative

- Weight bear as tolerated immediately after
- No routine DVT prophylaxis
- Physical therapy within 5 days
- Elliptical at 6 weeks, straight line running at 12 weeks
- Return to sports 6-8 months post op

Outcomes

- Recurrent ACL tears after reconstruction can happen
  - Younger and more active patients are more likely to re-injure their ACL 10-20%
- Allograft has a 4x higher failure rate than autograft
  - Over 30, this difference is not clinically important
- Post-operative recovery 6-12 months back to sports

Case 2

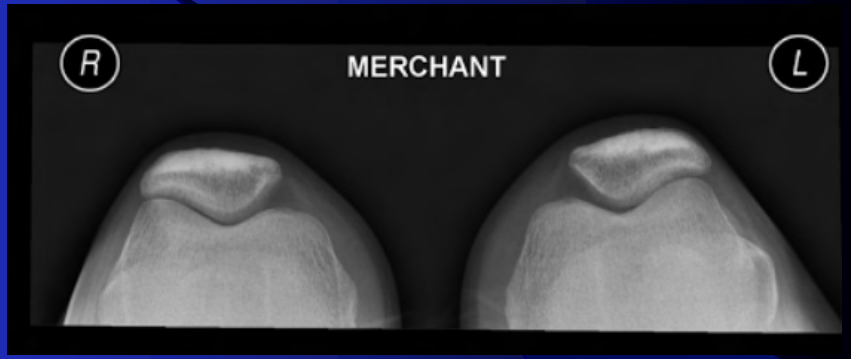
- 55 yo male with left knee pain and swelling
- No specific injury
- Worse with squatting and twisting
- Occasionally catching and popping
- Pain rolling over in bed
- Minimal improvement with ice and NSAIDs

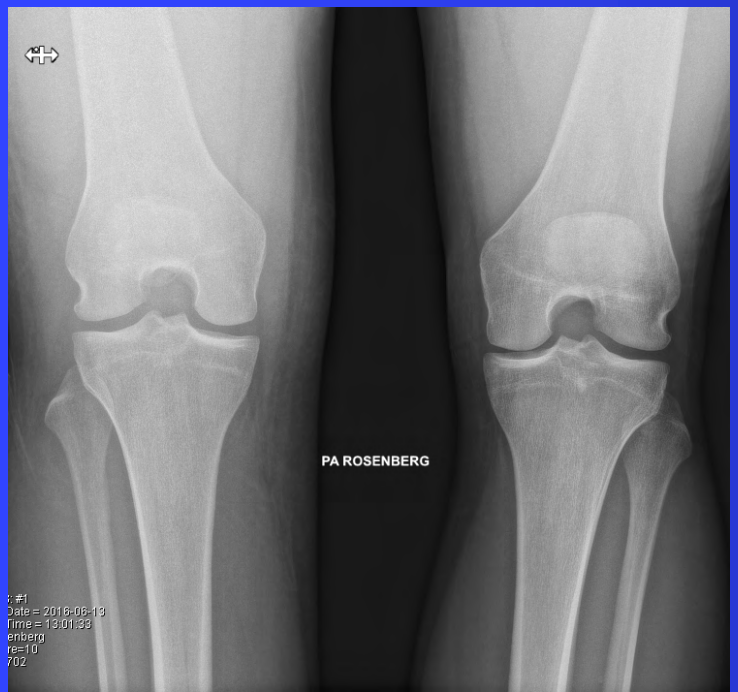
Physical Examination

- Moderate swelling
- Stable to varus and valgus stress
- Negative Lachman, Ant/Post Drawer
- Medial joint line tenderness
- Positive McMurray (medial)
- NVI

Radiographs

- Weight bearing!!!!
  - Need to rule out arthritis

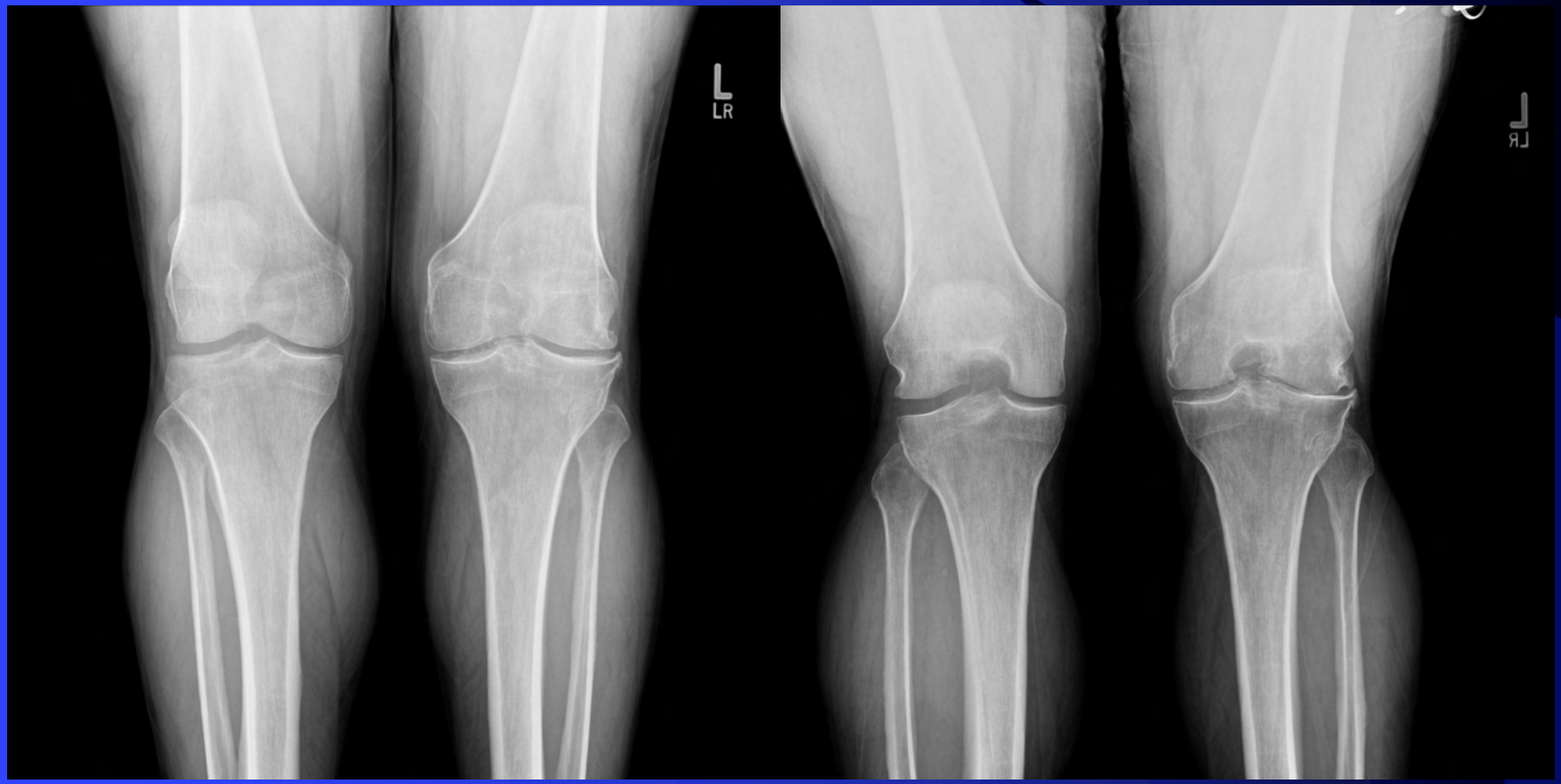




Rosenberg View

AP

30 degree flexion PA

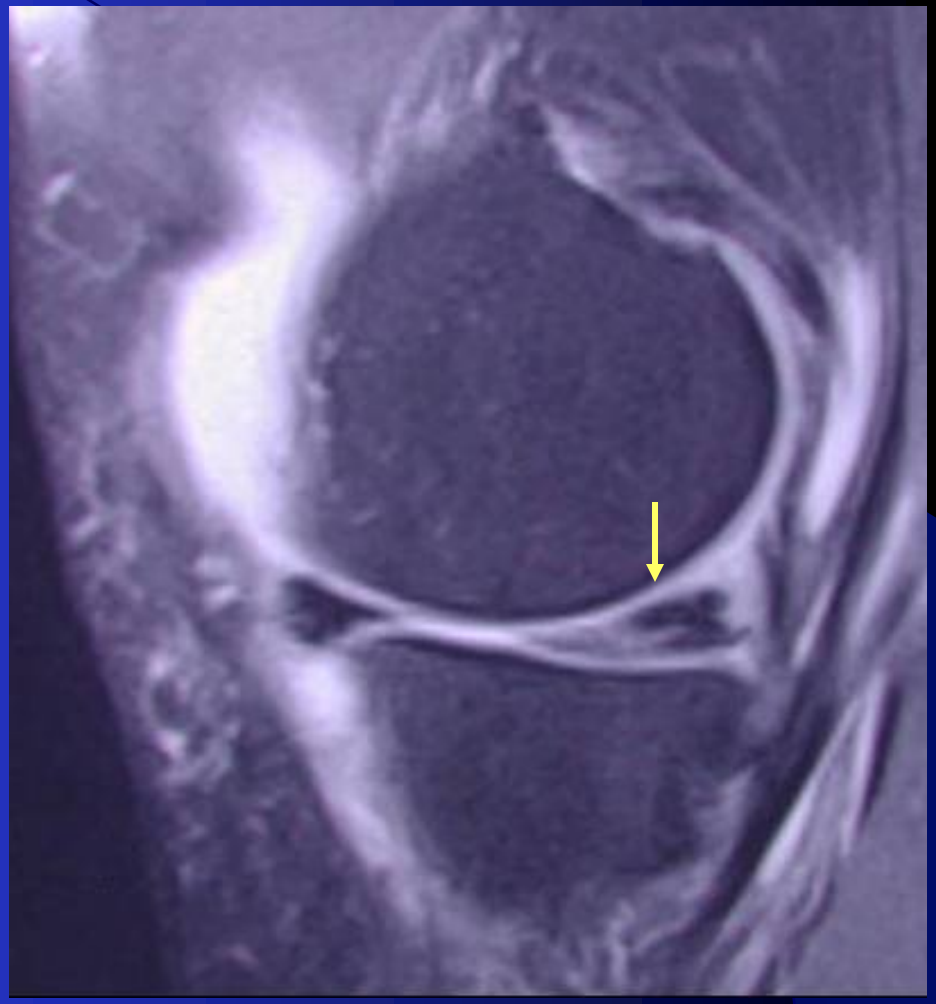


Profiles the posterior condyle. More sensitive in early OA

Next Step

- Trial of Nonoperative management
  - Cortisone Injection (decrease inflammation)
  - Physical Therapy (increase lower extremity strength and mobility)
- Advanced imaging with MR
  - Reasonable in patients with meniscal symptoms but minimal to no evidence of OA on plain films
  - Consider in patients with normal plain films and mechanical symptoms

MRI

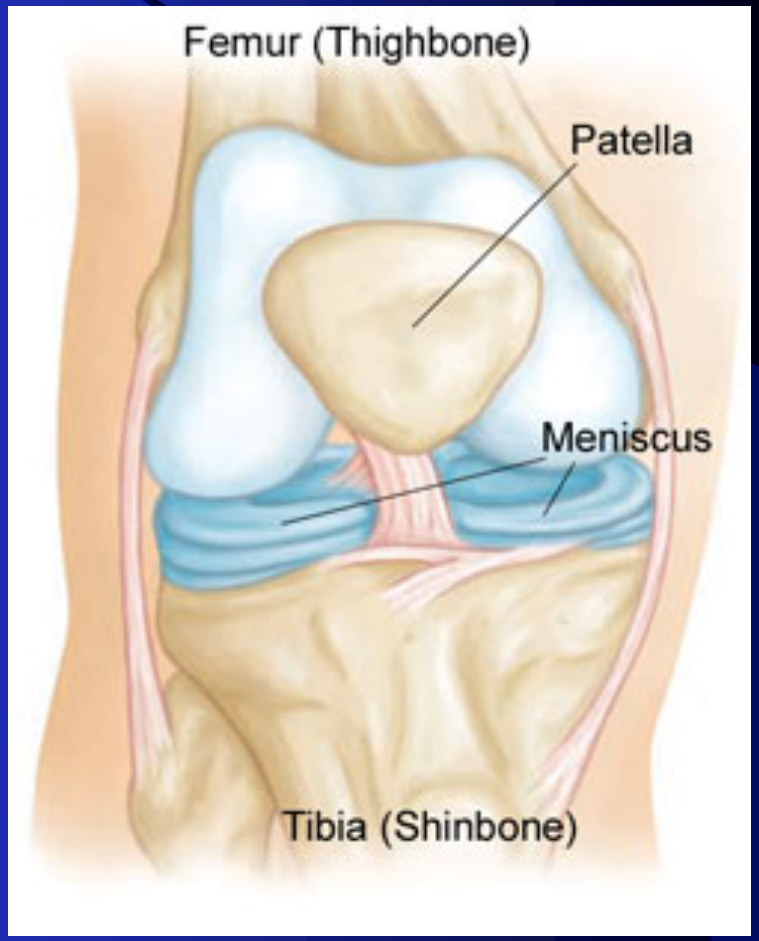


Diagnosis

- Meniscal Tear

Mensicus

- Wedge-shaped cartilage between the femur and the tibia
- Act as "shock absorbers" for the knee joint
  - Protects the joint cartilage



Meniscus Tear

- 12-14% of knee related injuries
- Occur as a result of
  - Sports injuries
    - Squatting
    - Twisting
    - Associated ligament injury
  - Degeneration due to age
    - Tear with awkward twist
    - Getting out of a chair
    - Deep knee bends
  - Seen with arthritis as well

Symptoms

- Pain or popping with squatting or twisting
  - Usually isolated to one side of the knee or in the back of the knee
- Swelling or tightness
  - within a couple of days after injury
- Catching or locking (mechanical symptoms)
- Sensation of the knee "giving way"
- Pain rolling over in bed

Physical Exam

- Swelling
- Pain at end ROM
- Joint line tenderness
- + McMurray

Treatment: Nonoperative

- Physical Therapy
  - Quad, Glute, Core strengthening
- Anti-inflammatory medication
  - NSAIDs (oral and topical)
  - Cortisone Injection

Treatment: Operative

- Arthroscopic Surgery
  - Symptoms without arthritis = good indication
  - Mild to moderate associated arthritis + meniscus tear = surgery may help depending pattern of symptoms
  - Advance arthritis = surgery rarely indicated

Post Operative

- WBAT immediately post operative
- No DVT prophylaxis
- 6 weeks of physical therapy starting week 2
- Avoid impact activities for 6 weeks
- Return to full activity at 6 weeks

Case 3

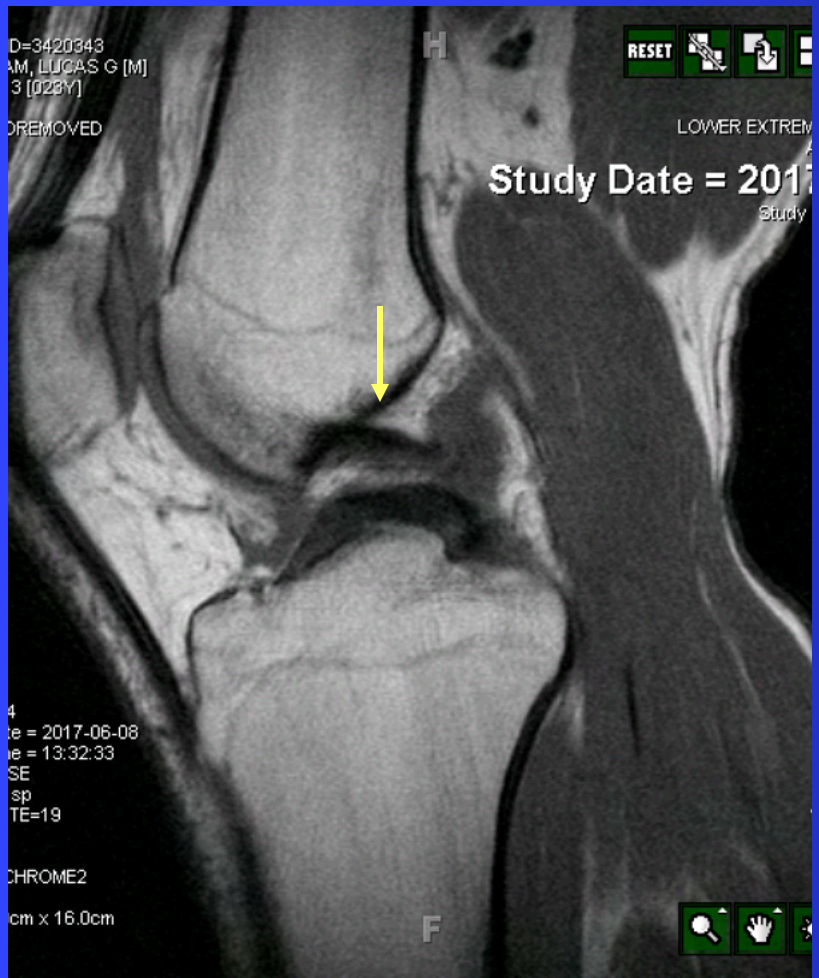
- 16 yo female soccer player with left knee pain
- Felt a ”pop” during the game
- Immediate swelling
- Inability to extend the knee
- No previous history of knee injury

Physical Examination

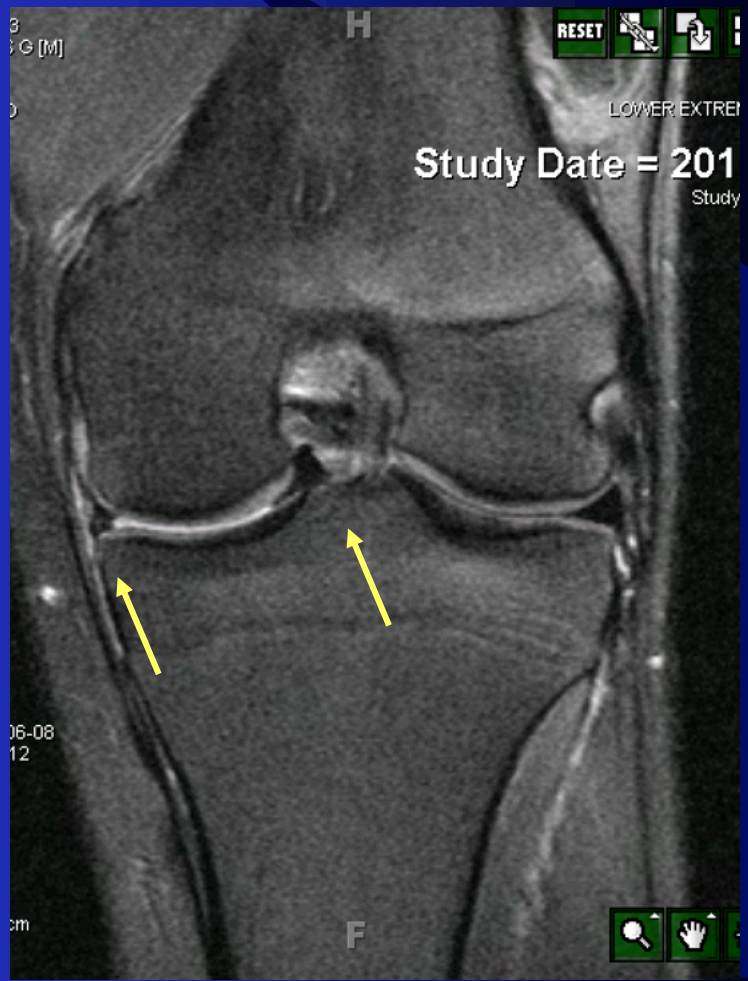
- Moderate swelling
- Motion from 20-60 degrees
- Stable to varus and valgus stress
- Negative Lachman
- Tenderness of the medial joint line
- NVI
- Radiographs normal

MRI

Double PCL



Flipped in Notch



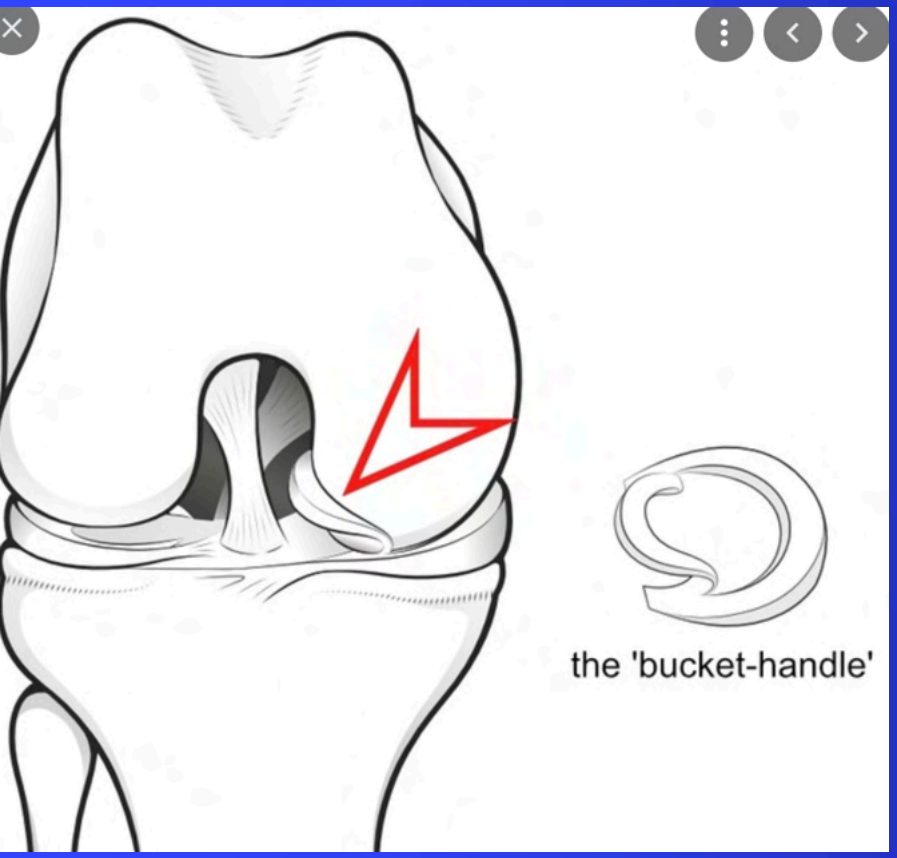
Diagnosis

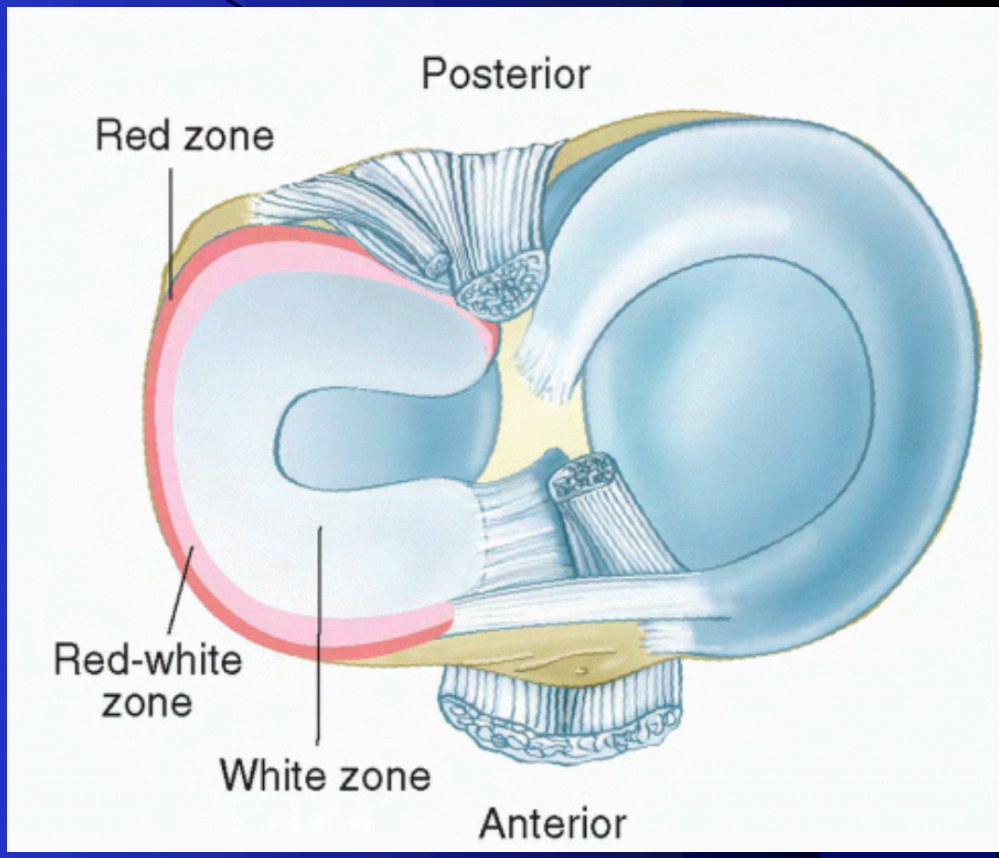
- Bucket Handle Meniscal Tear

Treatment

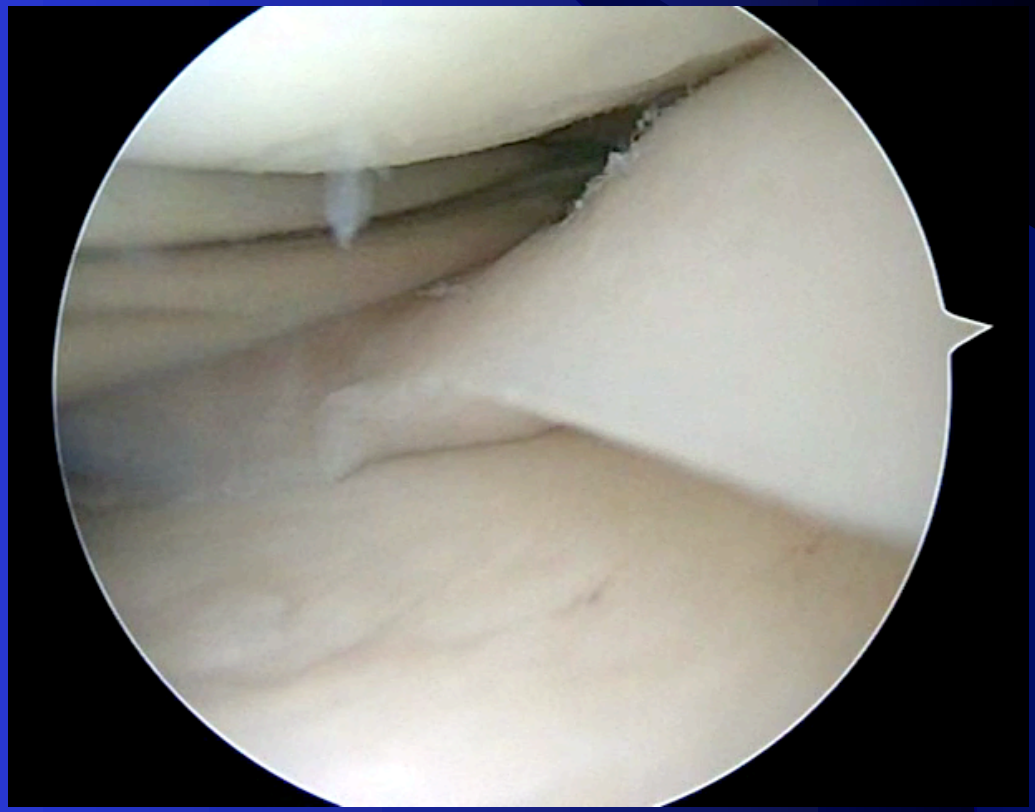
- Nonoperative????
  - NO role for nonoperative treatment in a locked bucket handle meniscus tear
- Operative
  - Relative sports surgical emergency!
  - Keep patients nonweight bearing until surgery
  - Goal is repair if possible in especially in younger patients.

Treatment


the 'bucket-handle'

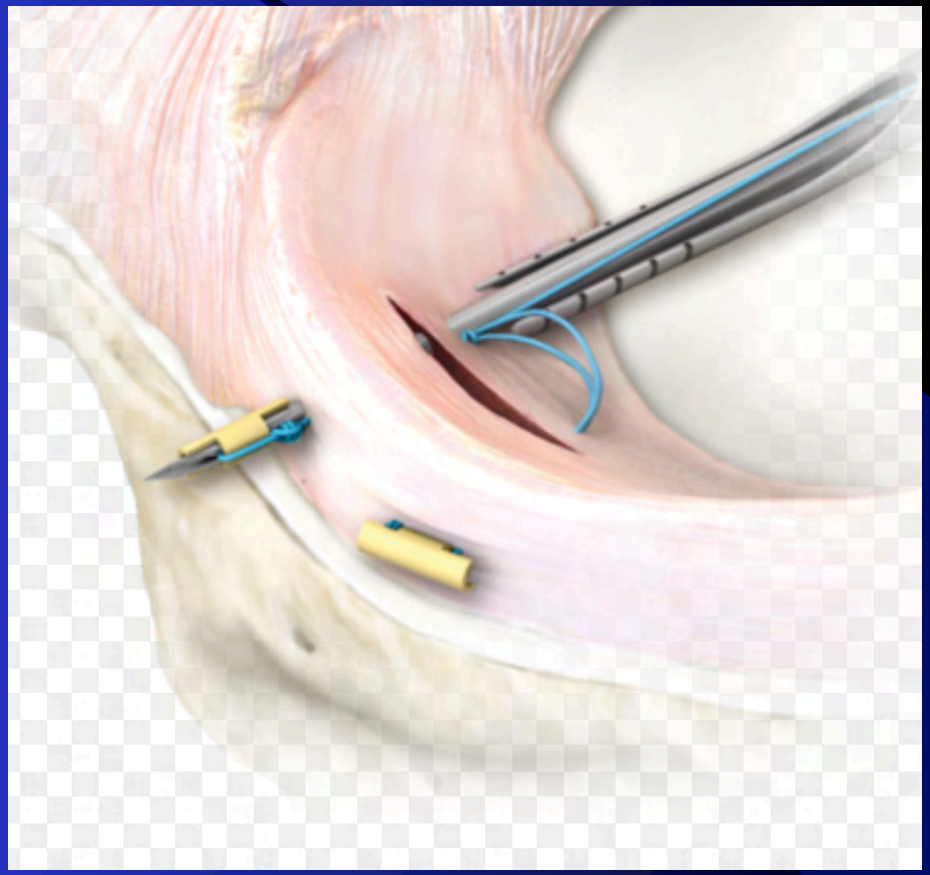

Posterior
Red zone
Red-white zone
White zone
Anterior

Repair Techniques: Inside-Out



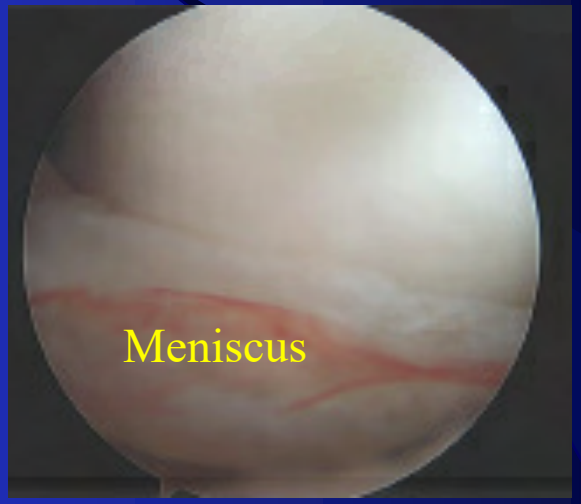
Repair Technique: All Inside

- Single use implant
- Less invasive
- Data shows no difference in terms of healing rates
- Can be difficult to reduce to capsule with true bucket
- $$$$$$



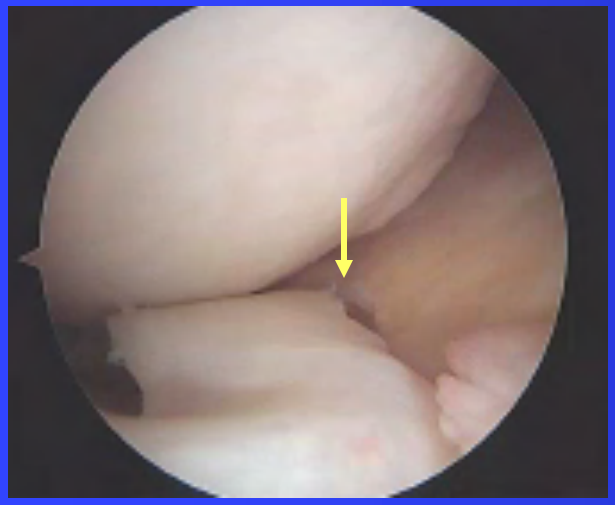
Meniscal Repair

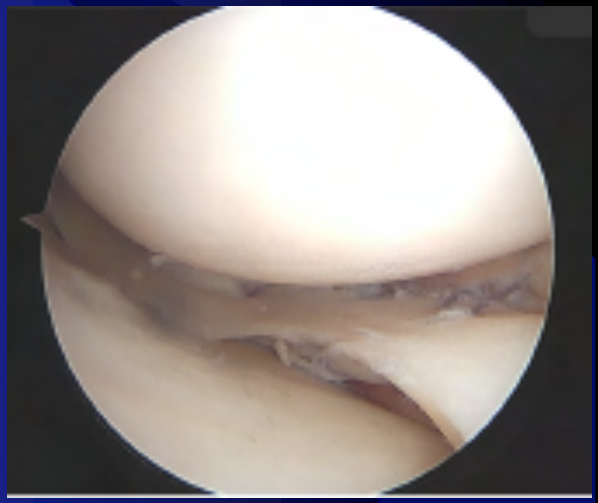
Displaced medial meniscus sitting anterior to the medial femoral condyle



Post reduction

Inside Out Medial Meniscal Repair





Post Operative

- Hinged knee brace
- PWB x 2 weeks
- WBAT brace locked in extension 4-6 weeks
- No routine DVT prophylaxis
- Return to running 12 weeks
- Return to sports 6 months

Outcome

- 84% success at a minimum of 5 yr follow up for 2nd generation all inside devices
  - Bogunovic et al. JBJS. 2014
- Slight improvement in failure rate for inside out (10%) vs all inside (16%) in a meta analysis of combined ACL/meniscal repair
  - Westerman et al. AJSM. 2017

Case 4

- 45 yo female with left knee pain
- Felt a “pop” while running
- Pain and swelling
- Occasional catching and popping
- No previous history of knee injury

Physical Examination

- Moderate effusion
- Motion 0-120 degrees
- Stable to varus/valgus
- Negative Lachman, ant/post drawer
- Tenderness over the medial joint line
- Pain with McMurray manuever
- Normal weight bearing radiographs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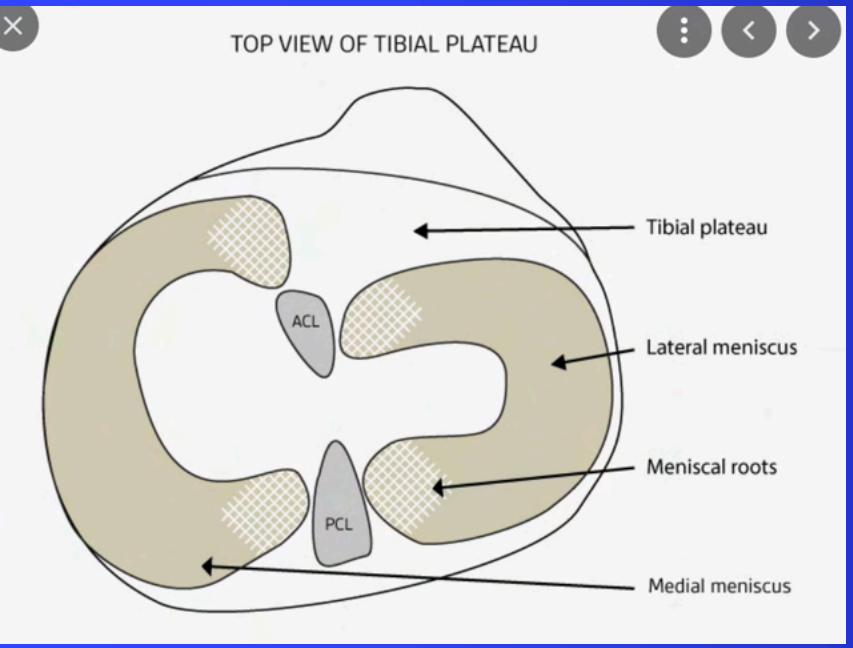
Diagnosis

Meniscal Root Tear



Meniscal root tears

- 7-9% of all meniscal tears
- 2/3rd medial and 1/3rd lateral
- Biomechanically equivalent to a complete menisectomy (50-70% increase in stress)
- Poor natural history with up to 30% of patients requiring TKA in 3 years.

Presentation

- Posterior pain
- Pain with end range of motion
- Joint line pain
- Positive McMurray
- Less likely to have catching and locking compared to standard meniscal tear

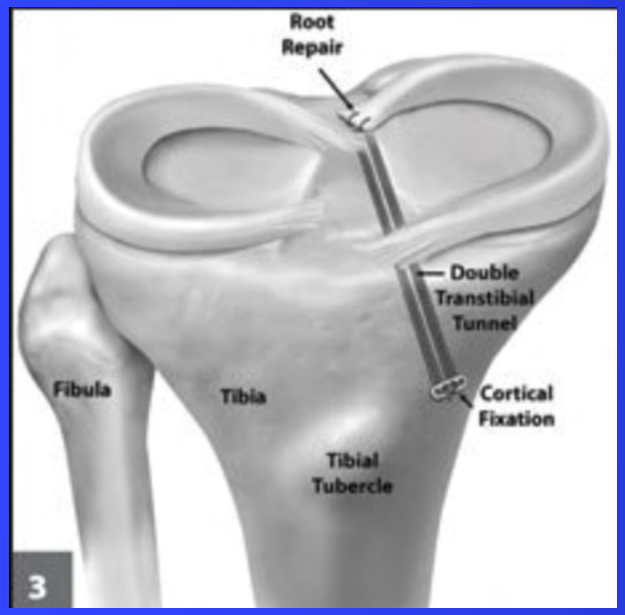
Diagnosis: MRI

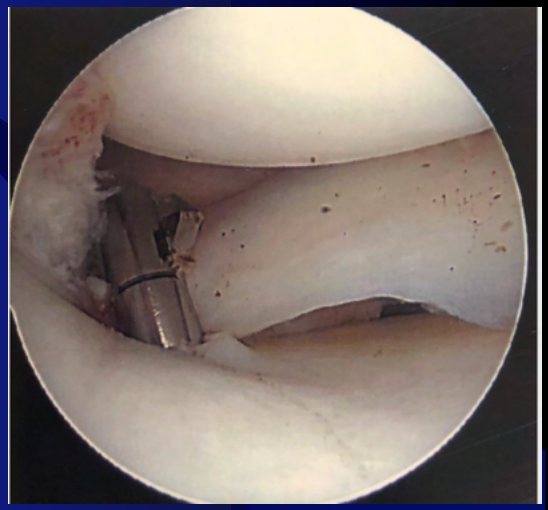
- Sensitivity 82% (medial) and 60% (Lateral)

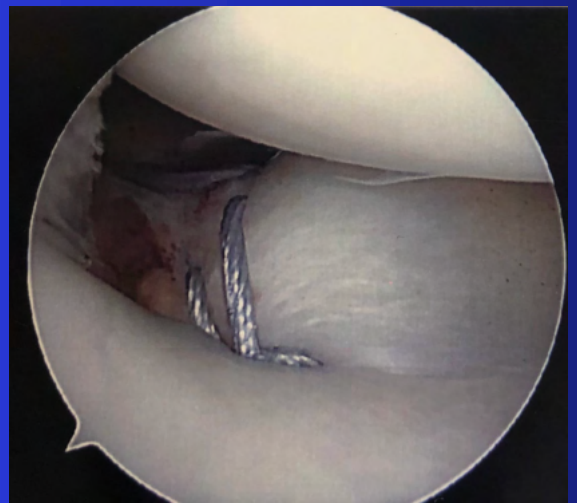
Treatment

- In the setting of normal cartilage and BMI< 35 operative repair is recommended to preserve underlying cartilage
- Nonoperative management and/or debridement can lead to rapid chondral degeneration (3-5 years progress to TKA)

Meniscal Root Repair







Postoperative

- NWB x 6 weeks
- ASA for DVT prophylaxis
- Motion 0-90 X6 weeks
- PWB and full motion 6-10 weeks
- Full return to activity 6 months

Outcome

- Improved function and decreased conversion to total knee (35% vs 0%) in patients treated with repair compared to menisectomy
- At 6 years on 14% of repairs had progressive OA
- Only 1% converted to TKA at 7 years
- Poorer results in patients with BMI > 35

Case 5

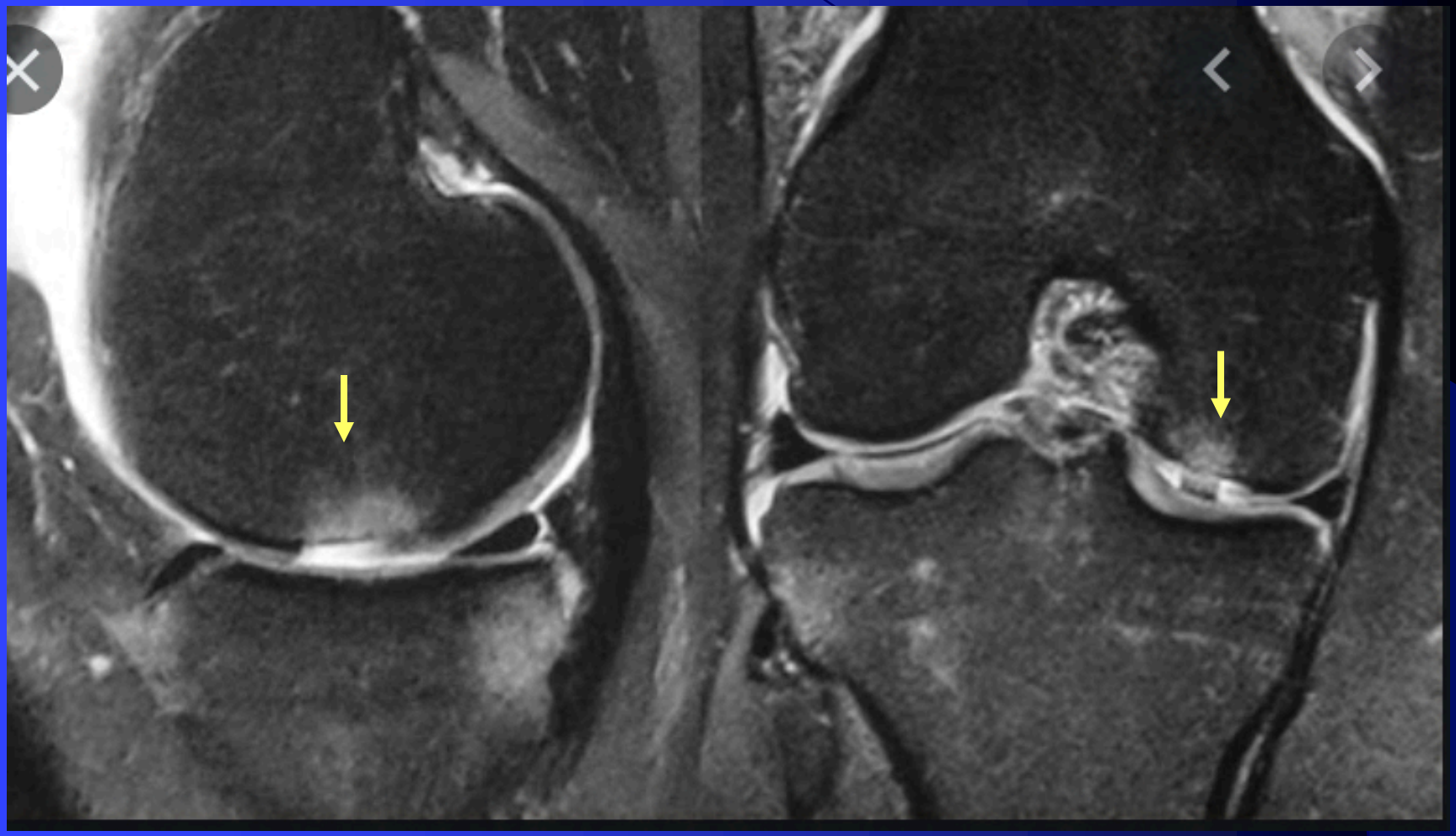
- 15 yo female with left knee pain
- Injury while playing basketball in 2008, treated with microfx of the medial tibial plateau
- Continued pain and underwent revision microfracture in 2011
- Did well until car accident in 2013
- Persistent pain and underwent diagnostic knee scope in 2014
- Pain despite PT, injections (cortisone and HA), improvement with unloader brace

Physical Exam

- Mild swelling
- Motion from 0-140 degrees
- Stable on ligamentous exam
- Tenderness over the medial joint line
- No tenderness laterally
- Normal standing and alignment radiographs

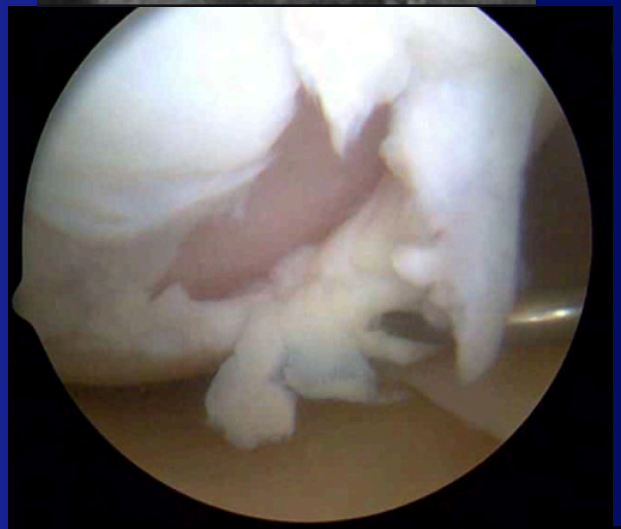
Standing Alignment Films

MRI



Cartilage Defects

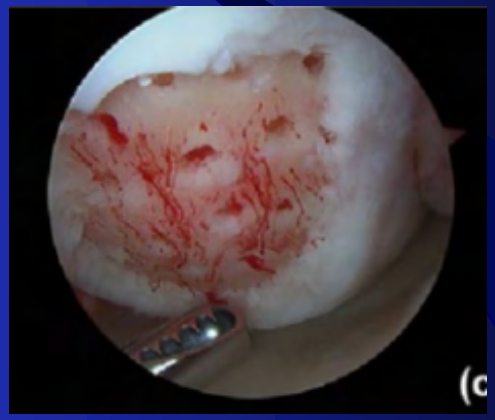
- Traumatic vs Insidious
- Partial vs Full Thickness
- With and without subchondral edema



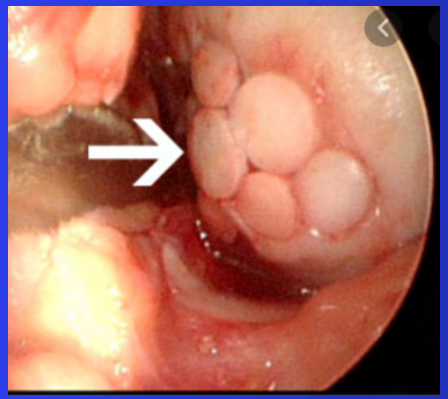
Treatment Options

Chondroplasty

Microfracture



Osteochondral Autograft



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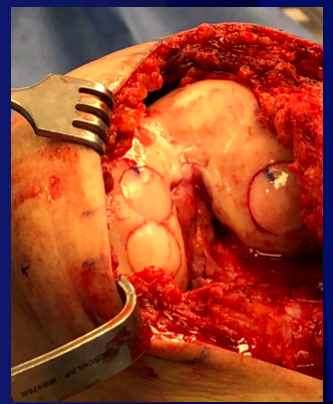
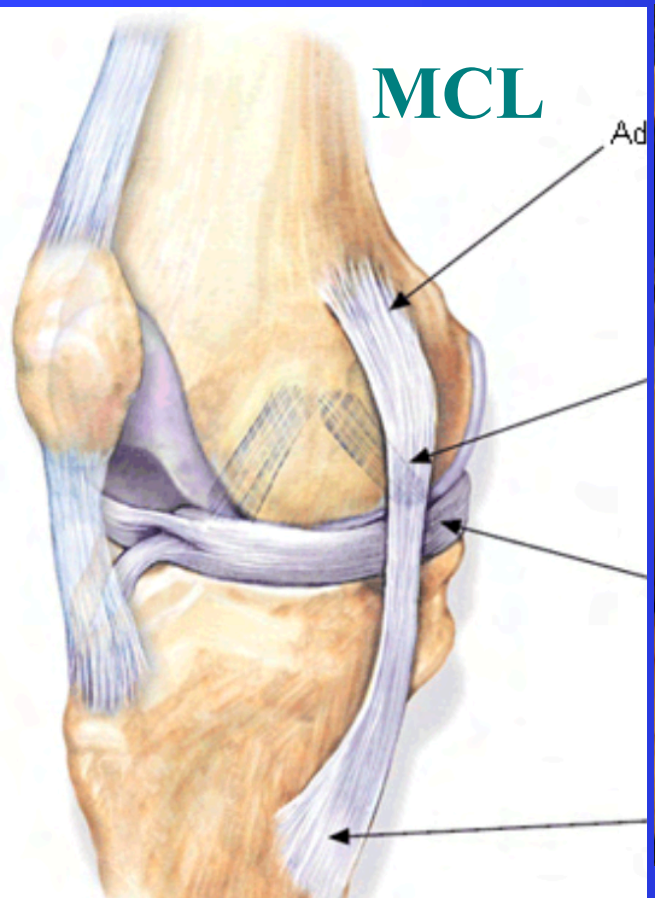
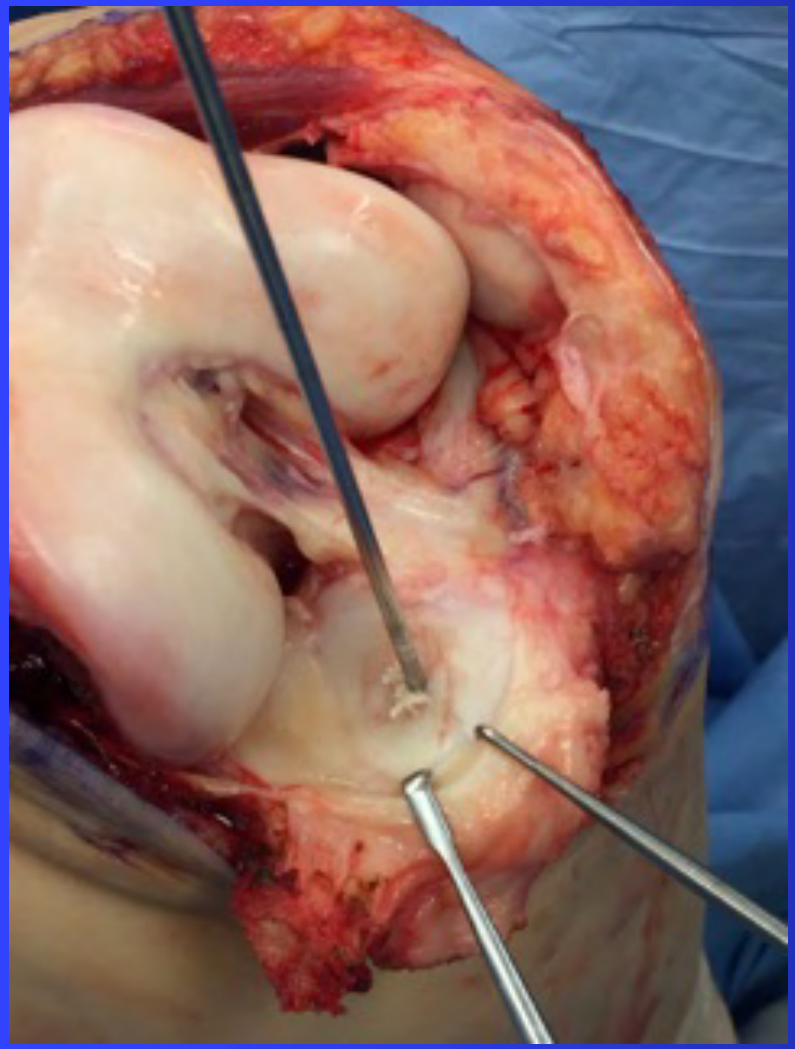


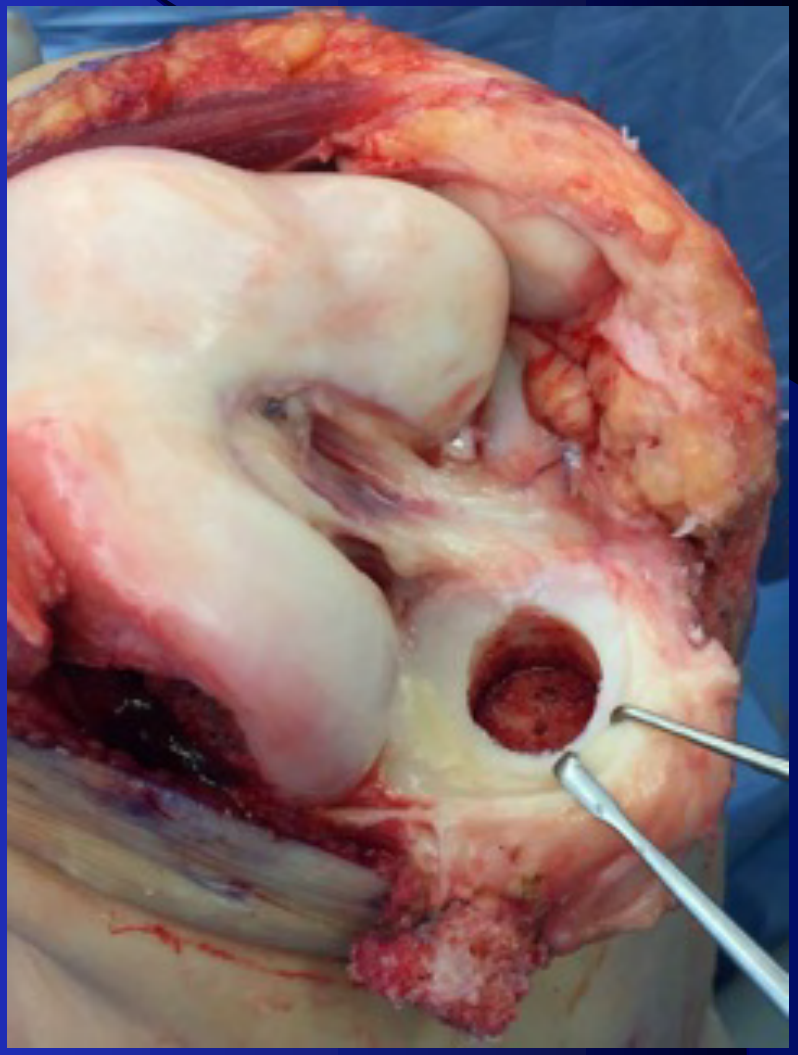
Back to our Patient: Arthroscopy

Exposure

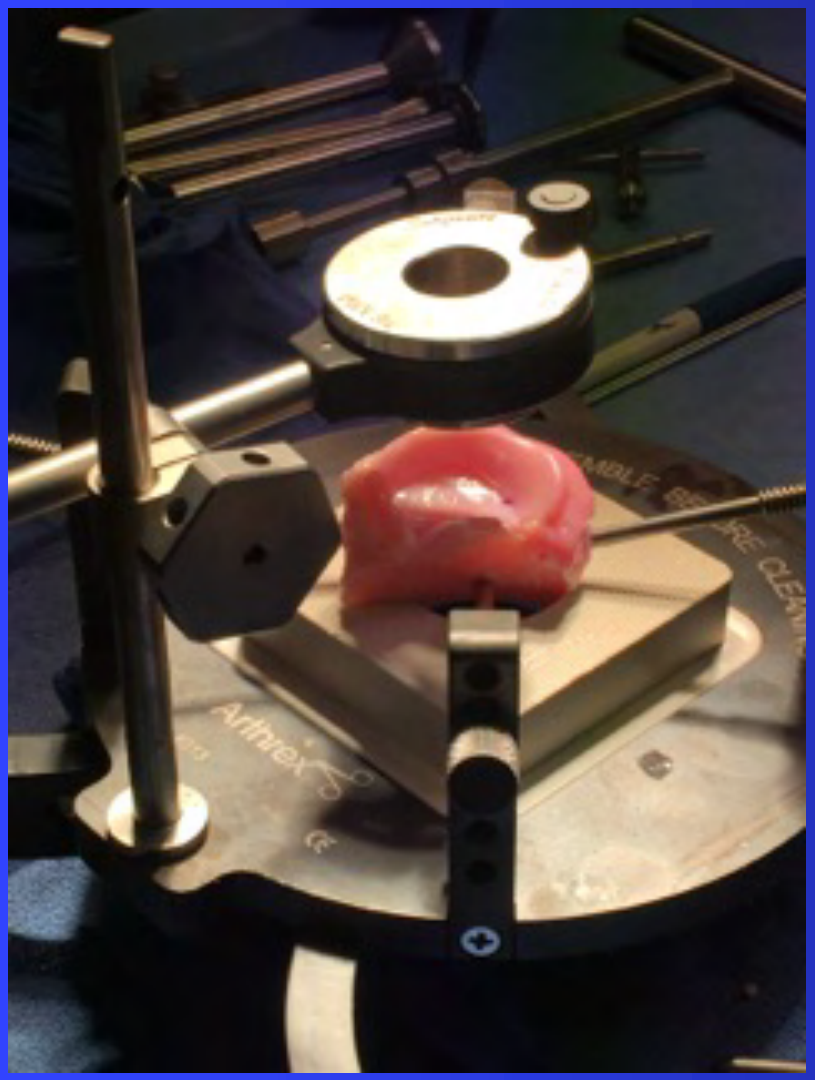


Defect Prep

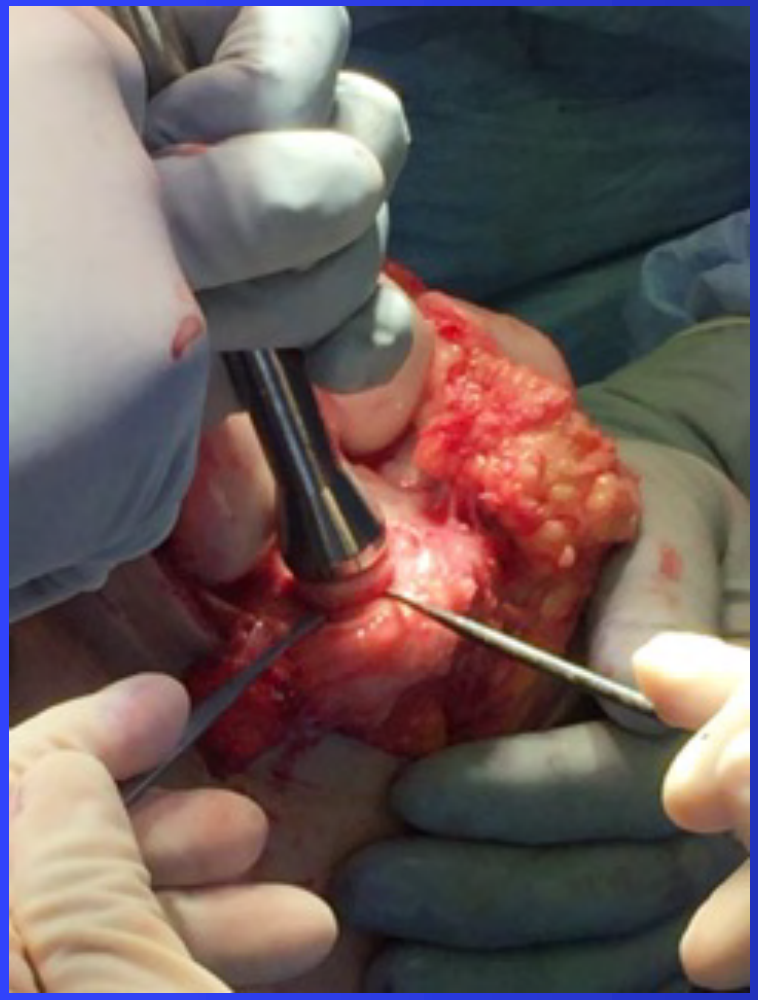


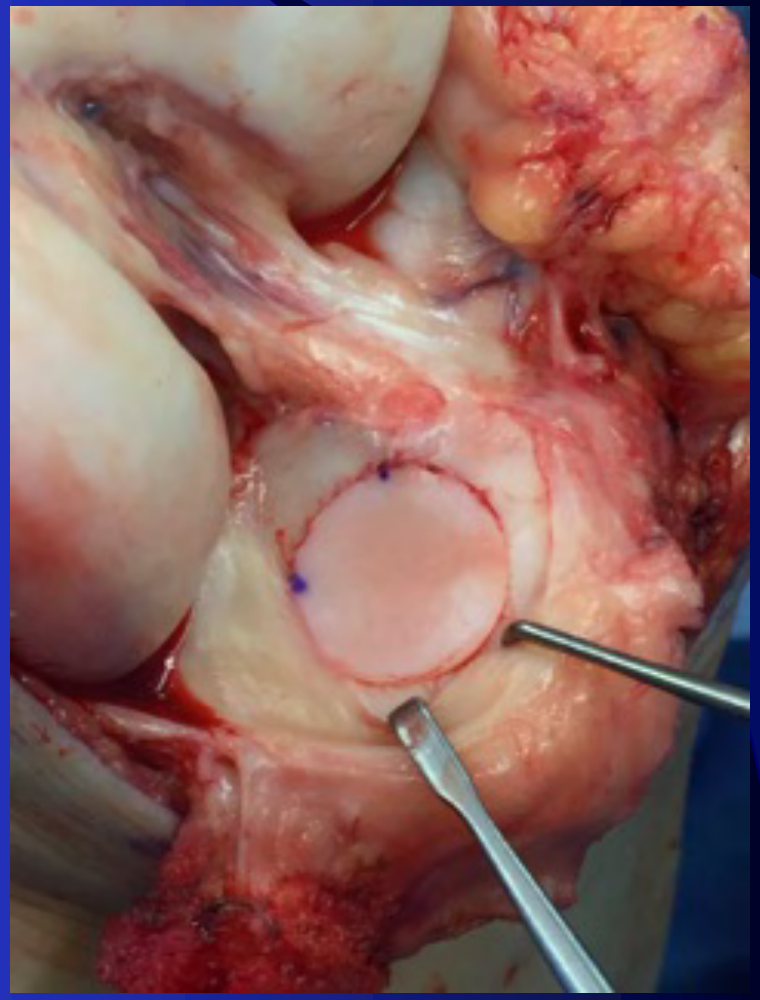


Donor Prep



Graft Placement





Post Radiographs

Post Operative Plan

- NWB x 6 weeks
- CPM 6-8 hrs a day x 6 weeks
- ASA 325 BID
- Return to impact 9-10 months
- Continue to experience improvement for up to 1 year

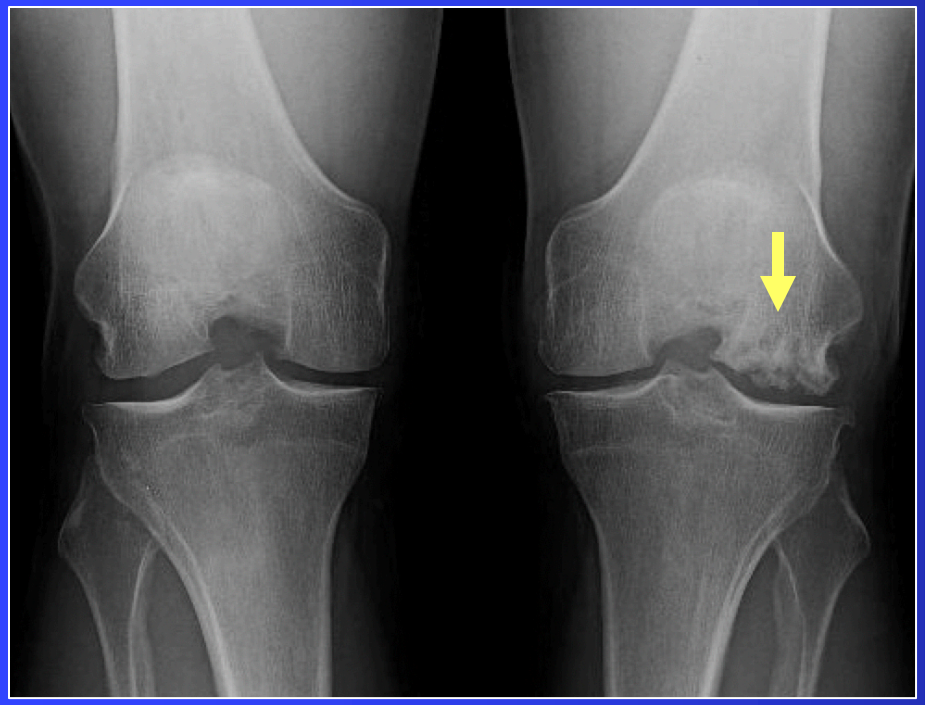
Case 6

- 25 yo male football player with left knee pain
- History of previous
  - Arthroscopic debridement
  - Microfracture
- Now with persistent pain & swelling
- Locking

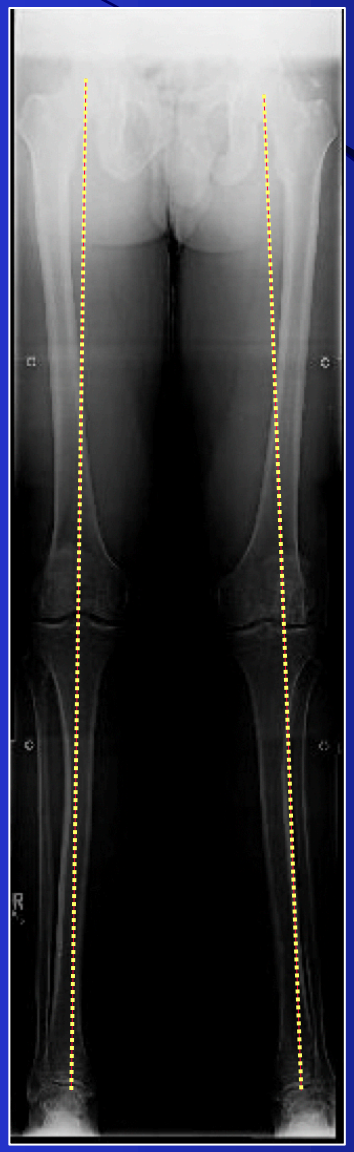
Physical Examination

- Knee effusion
- Motion 0-130 degrees
- Genu valgum on standing exam
- Tenderness over the lateral femoral condyle and lateral joint line
- Stable on ligamentous exam

Xrays

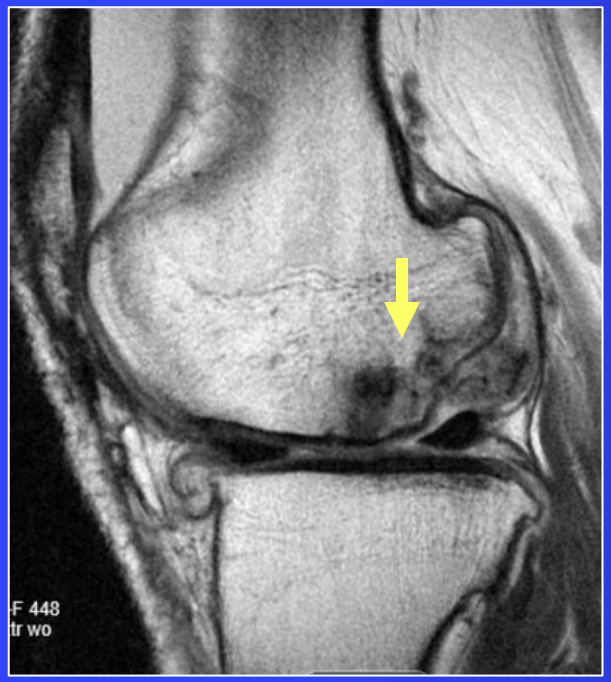


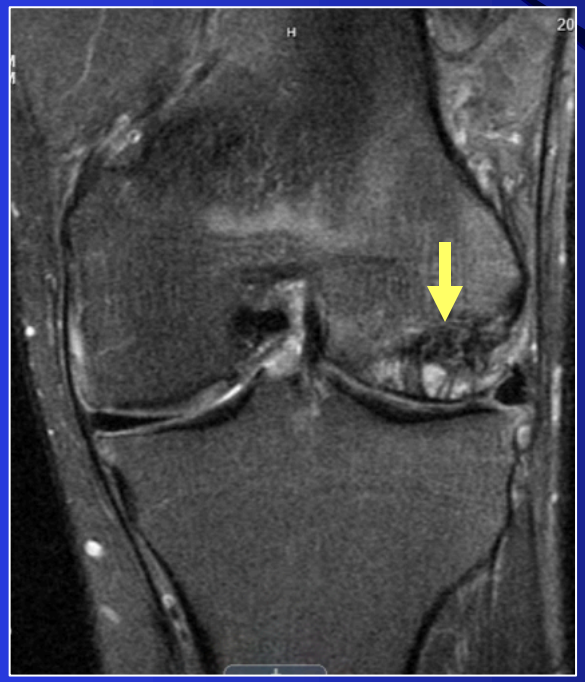
J.M. – Radiographic Alignment



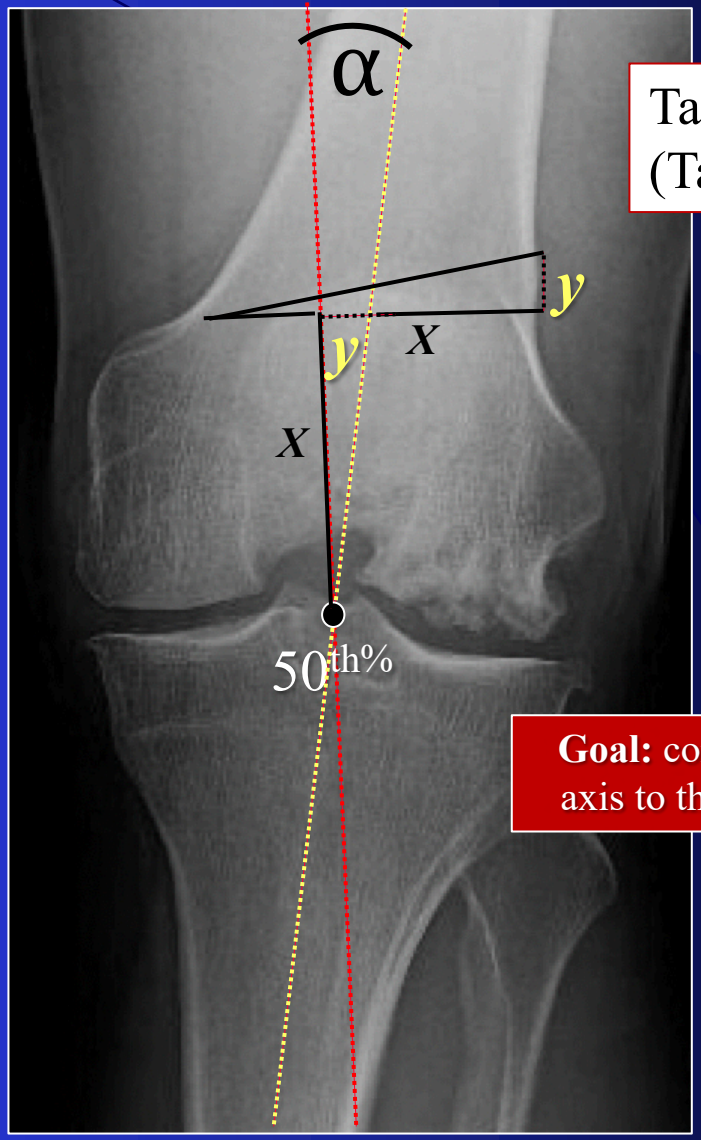
Mechanical axis

J.M. – MRI





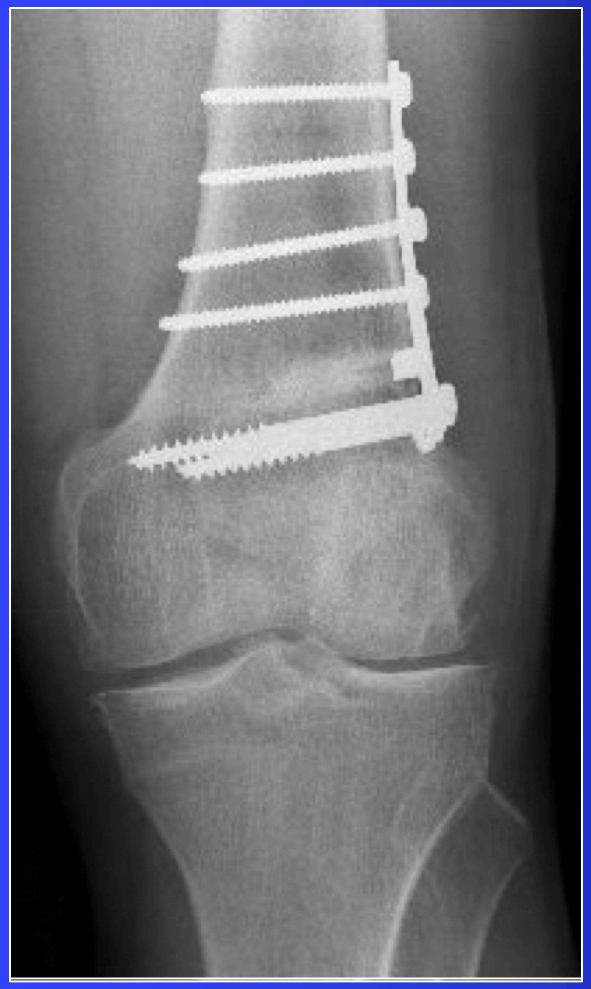
J.M. – Goal of Correction



Tan α = y/x
(Tan α) $x = y$

Goal: correct mechanical axis to the 50th percentile

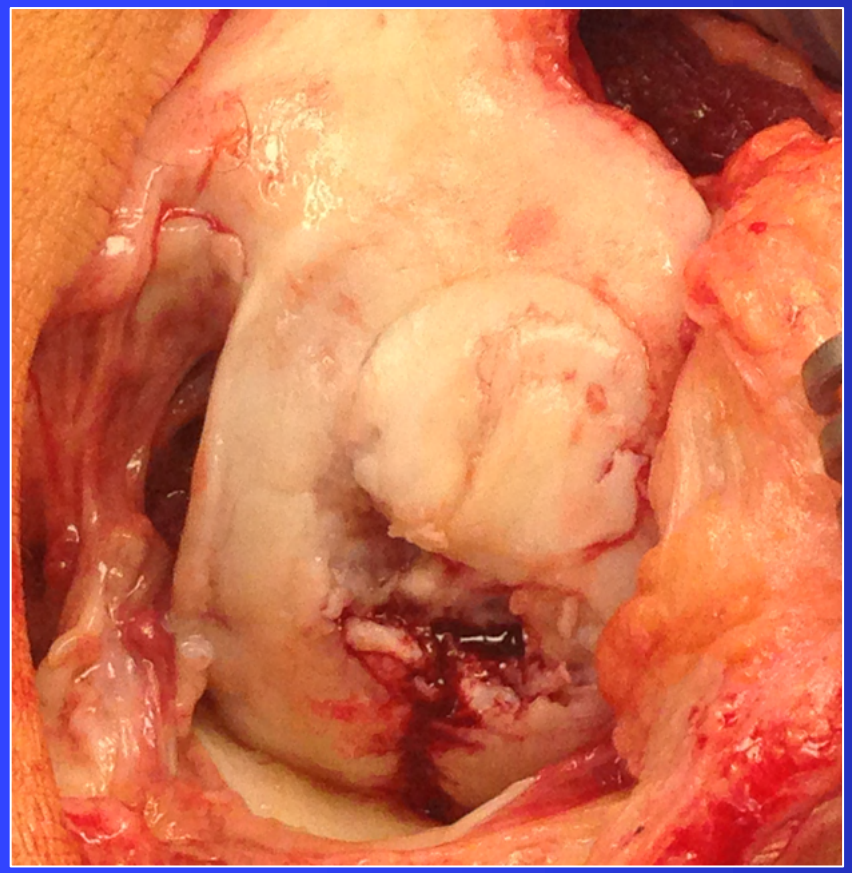
J.M. – Distal Femoral Osteotomy



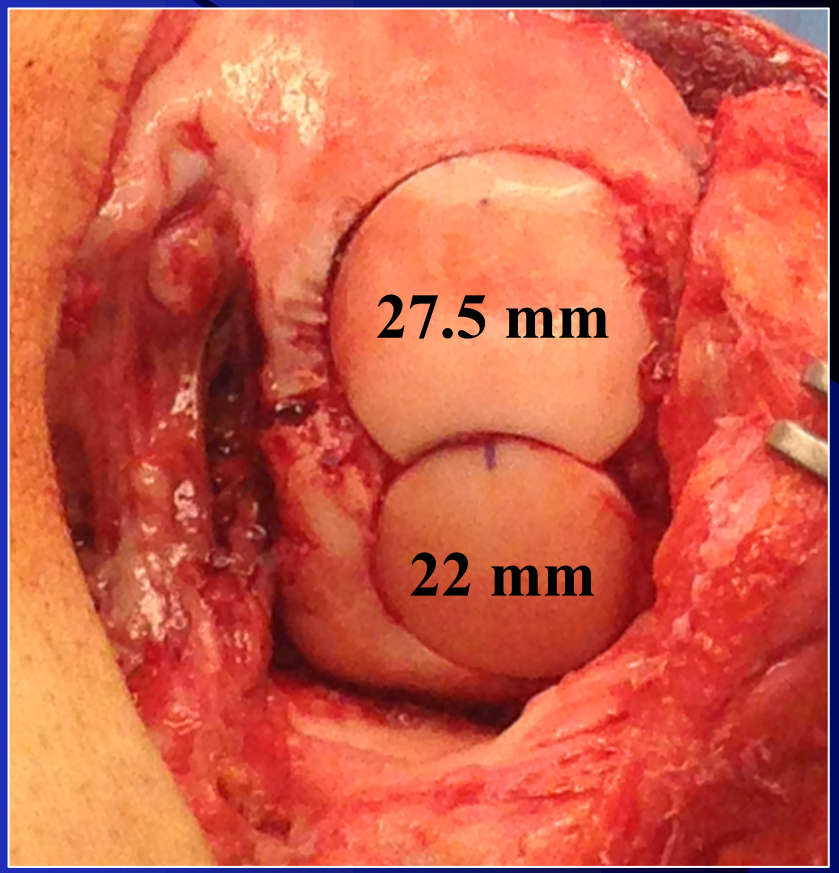
9 months postoperative

J.M. – Surgery:

Open osteochondral allograft x 2
Distal femoral osteotomy (5 mm)



PREoperative



POSToperative

Outcome

- For lesions greater than 3 cm^2 OAT shows benefit over microfx in terms of patient post op activity and graft failure rate
- OA graft survival rate at 10 years 79%
- In a military pop. 64% able to return to previous activity level after OA graft

Take Home Points

- ACL reconstruction indicated in patient wanted to return to jumping, twisting and pivoting activity
- Allograft ACL reconstruction associated with a higher failure rate compared to autograft tissue and not recommended in young athletes
- Treatment of meniscal tears is dependent on the type of tear, age of the patient and degree of underlying osteoarthritis
- Bucket handle meniscal tear is a relatively surgical emergency and repair recommend
- Repair of meniscal root tears recommended in patient with minimal OA and appropriate BMI to decrease the progression of arthritis and need or TKA
- Treatment of chondral defects dependent on size of the lesion

References

- Gee S. et al. Anterior Cruciate Ligament Repair: Historical Perspective, Indications, Techniques and Outcomes. JAAOS. 2020. 23(23)936-971
- Krych A.et al., Meniscal Root Injuries. 2020. 28(12):491-499
- Krych A. et al. Cartilage Injury in the Knee: Assessment and Treatment Options. JAAOS. 2020. 28(22):941-922

Thank You

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