An aerial photograph of a coastal town and university campus. The town is built on a peninsula with a large blue bay and many sailboats. The university campus features several large brick buildings, green lawns, and a baseball field. A semi-transparent circular graphic is overlaid on the left side of the image, containing text.

**When to Refer**  
A Primary Care  
Physician's Guide  
to Orthopedic Referral

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Medicine  
UNECOM October 2019



# Disclaimer



- The author of this presentation received no payments or services, either directly or indirectly, from a third party in support of any aspect of this work. Furthermore, the author has had no financial relationship with any entity within the biomedical field that could be perceived to influence the content of this presentation.

# Presentation Goals



- Provide the latest recommendations regarding operative vs. nonoperative interventions for a variety of commonly encountered orthopedic conditions.
- Clarify which patients can be best managed with their primary care physician, and which would benefit from an orthopedic surgical evaluation.
- Guidance for those involved in sideline sports coverage / care of athletes.
- Improve the delivery and efficiency of musculoskeletal care.

# Learning Objectives



- **Participants will be able to:**
- Discuss the most common orthopedic injuries and conditions, and initial steps to determine the need for orthopedic referral.
- Define those orthopedic conditions more amenable to conservative measures, and those (possibly) requiring surgical intervention.
- Employ this approach to improve the timing and utility of orthopedic referral.
- Improve outcomes for patients with musculoskeletal injuries and conditions.

# What They Said...

- “Tell everyone to send patients early”
- “Make sure they have an x-ray, not just an MRI”
- “The sooner we get to ‘em, the better off they’ll be”

Doesn't really represent the medical team concept, or best patient care.

# No such thing as benign surgery...

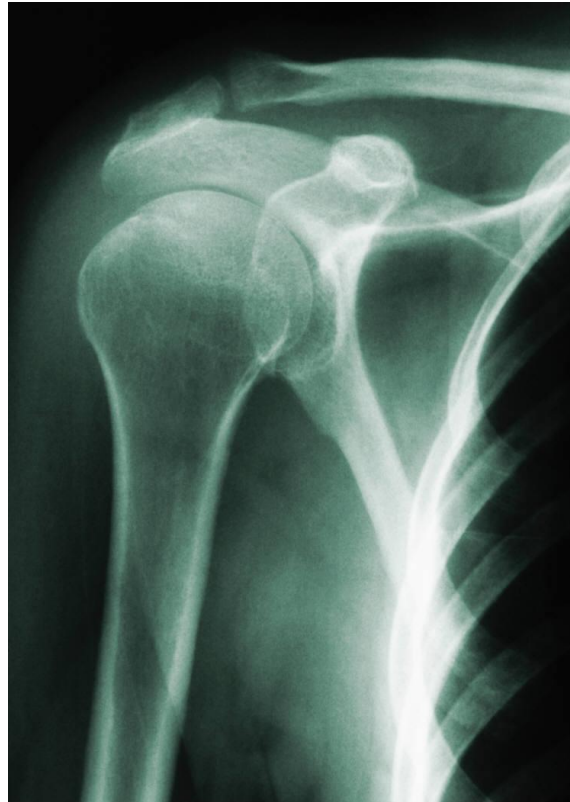


*"Nurse, get on the internet, go to SURGERY.COM, scroll down and click on the 'Are you totally lost?' icon."*

# What We'll Cover

- Primarily shoulder, hip and knee issues.
- Benign neglect:
  - Elbow, wrist, hand.

Too much info.....



# Common Shoulder Issues



- **Dislocation / Instability**

Dislocation, subluxation, MDI

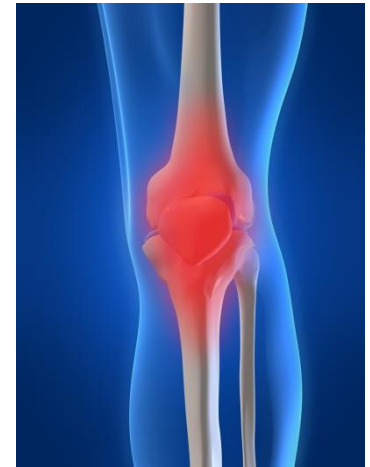
- **Overhead activity pain**

SLAP, RCT, biceps tendinosis.

- **Overuse Injuries**

ACJ conditions, subacromial impingement / bursitis, adhesive capsulitis.

# Common Knee Issues



- **Acute knee injury**
  - MCL, LCL, ACL, PCL, meniscus tear, OCD
- **Chronic knee pain**
  - PFS, chondromalacia, OA.

# Shoulder Dislocation / Instability

- Considerations
  - Degree of instability
  - Frequency of instability
  - Etiology
  - Direction of instability
  - Age (<20 or >40)
  - Position, sport, occupation



# Shoulder Dislocation / Instability



## Data Collection

- Hx: Event, frequency, comorbidities
- PE: ROM, MMT, Provocative Tests
- Imaging: X-ray, MRI, arthrography. (do we need an arthrogram?)

# Shoulder Acute Dislocation

(Must consider age of patient, first time dislocation, assoc. bony injuries, etc.).



- Conservative Management

- Acute dislocations: Acute reduction

- Immobilization: 3 to 6 weeks

- Immobilize in ER, may decrease risk of ant. - dislocation recurrence – (controversial)

- Passive ROM, pendulums

- Rehab: Rotator cuff strengthening

- Limiting abd to 90 deg, and ER to neutral x first 6 wks.

- Goal: FROM / strength at 10 wks.

# Shoulder Dislocation / Instability

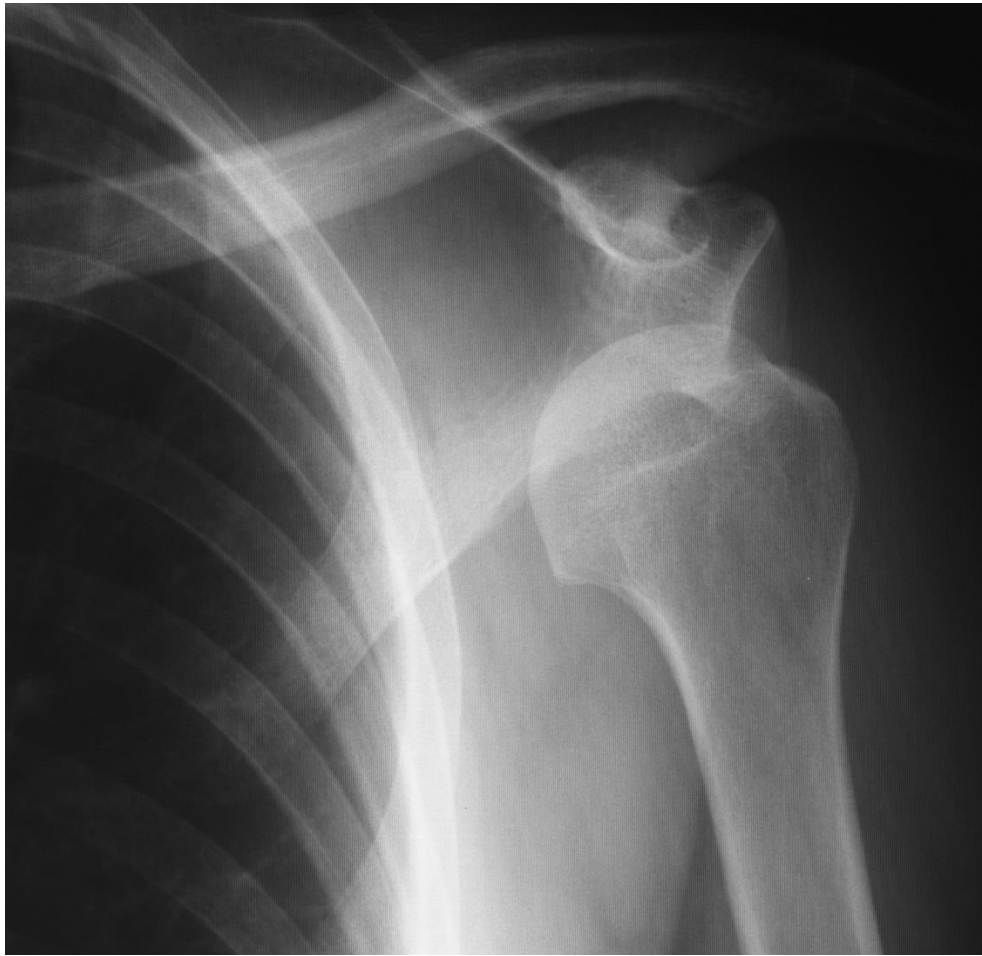
- MDI: Rehab is the cornerstone of treatment, focusing on RC strengthening and proprioception and plyometrics for overhead / upper-extremity based athletes.



# Shoulder Dislocation / Instability When to Scope



- Risk of recurrence highest in pt.s < 20, decreasing for those >40
- Primary, early bankart repair in young, active pts. recommended, w/ functional outcomes better than rehab alone.
- Middle-aged: Failed rehab, recurrent dislocations.
- Over 40: Less likely to develop chronic instability
  - Fair better w/ rehab, or primary RCT treatment, (increased cuff tear risk over age 40).



# Dislocation and Hill – Sachs Lesion

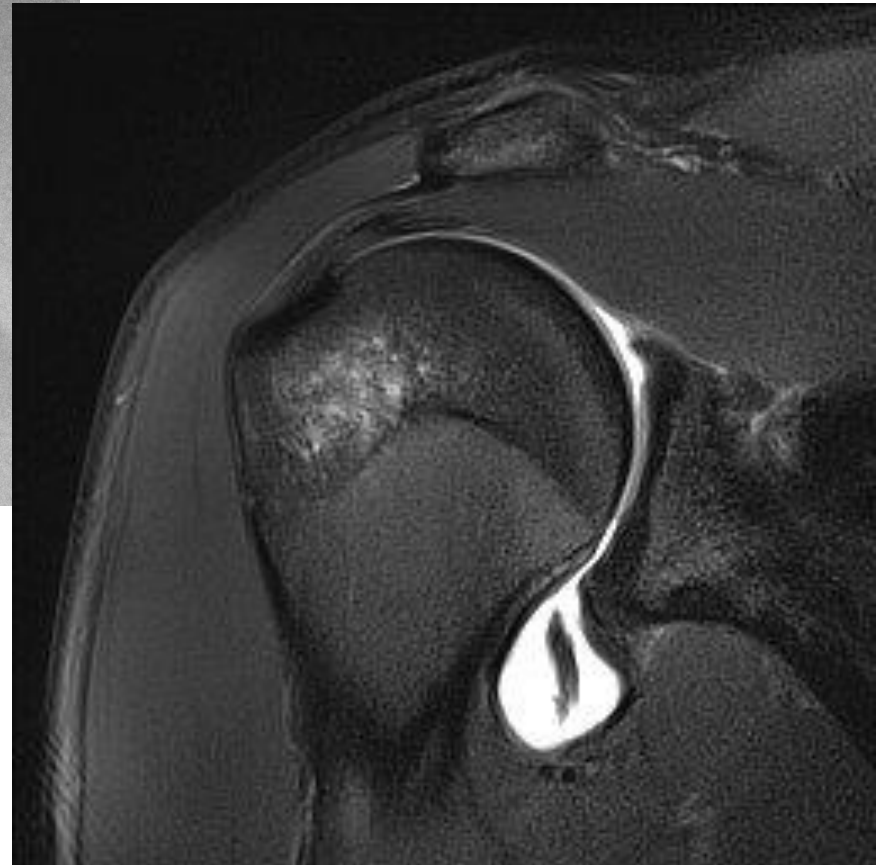
(off-track / engaging vs. on-track  
/non-engaging)



# Bankart Lesion



Bony Bankart



# Shoulder Dislocation / Instability Arthroscopic Interventions

Repair of labral pathology

Capsular imbrication

Address Hill-Sachs (if necessary)

Address glenoid (if necessary – may require  
open procedure)

More accurate eval under anesthesia



# Shoulder Dislocation /

## Instability

## Return to Play



Many can return to finish their season, often within 3 – 4 weeks of injury w/ use of rehab, bracing (limiting ER) and activity modifications.

Athlete may undergo operative intervention at conclusion of season, depending on severity of instability symptoms and overall function.

(controversial)

# Shoulder Dislocation / Instability Final Thoughts

- Continued subluxation / dislocation – Further chondral / soft tissue damage.
- Beware of axillary nerve / brachial plexus injuries
- <25 y/o = surgical repair recommended
- Glenoid bone loss >20 % and / or off-track (engaging) Hill Sachs Lesion = Surgery recommended
- Early referral to orthopedics is appropriate.

# Overhead Shoulder Pain

- Chronic Instability / Multi-Directional Instability

- Conservative measures include:

Progressive strengthening and range of motion

Sport-specific rehabilitation

No need to immobilize



# Multi-Directional Instability

## Operative Indications

- Ant. capsular shift considered in cases of MDI that have failed PT / home exercise program.
- May defer until end of season.

## Return to play

- Pain-free, full ROM
- Strength 90% of uninjured side

NOTE: Chronic MDI can lead to labral pathology.

**Consider ortho referral if no improvement w/ PT**



# SLAP Tears

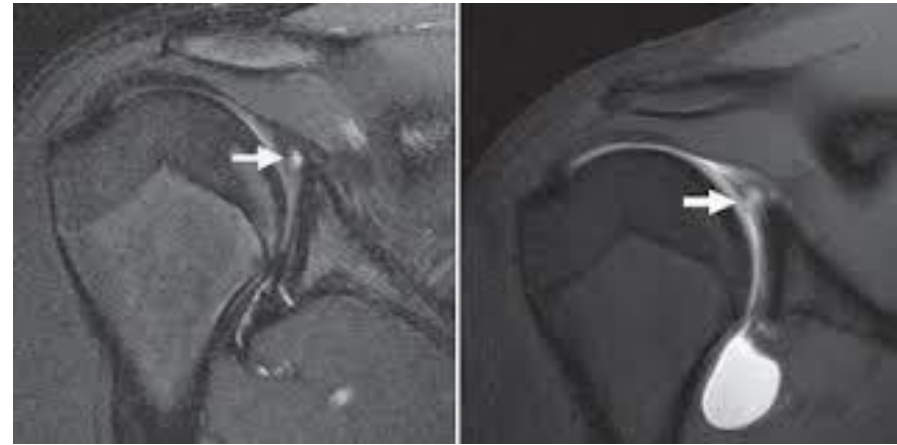
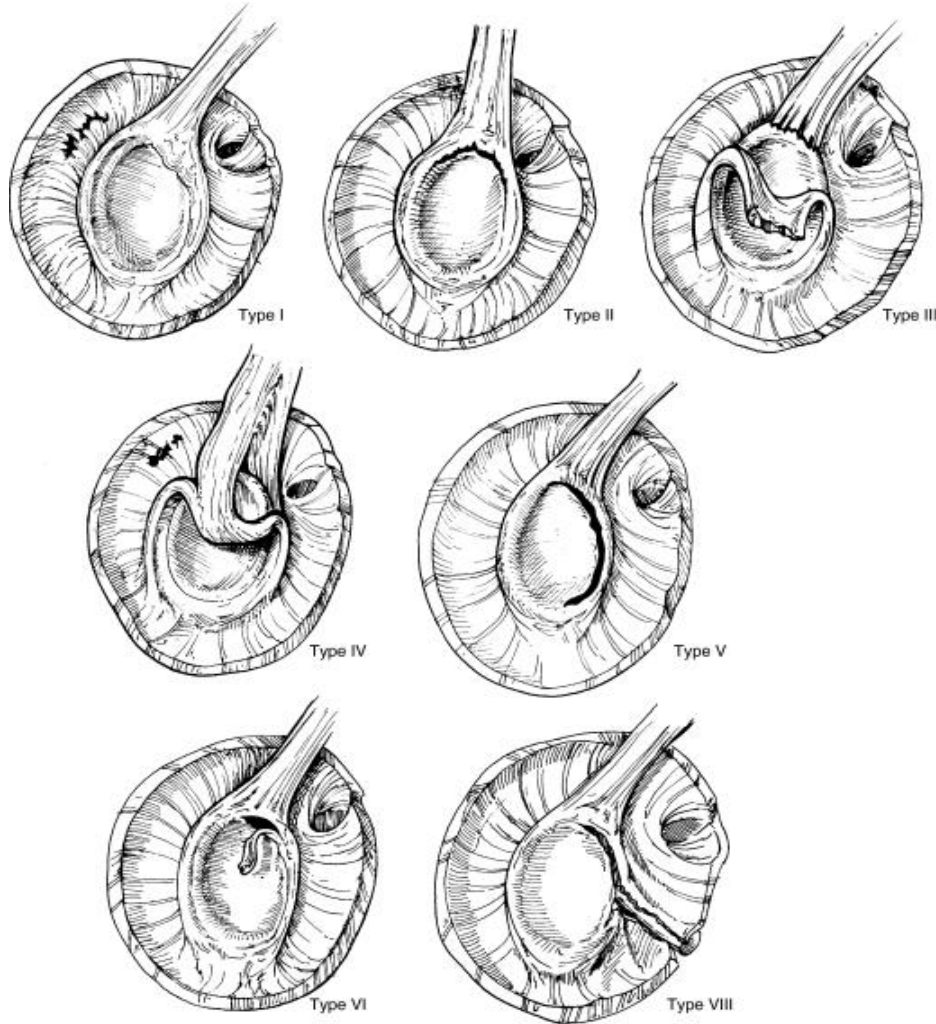


- Pain during acceleration phase of throwing.
- + O'Brien's Test, pain w/ FROM
- X-rays, AP and grashey (true AP), West Point View (glenoid rim), or Stryker-Notch, (Hill-Sachs lesion).
- Plain MRI – Only 30 – 50 % sensitivity, 70 -80% specificity for labral pathology.<sup>13</sup>
- Recommend – MRA – 89% sensitive, 91% specific for labral pathology. (May no longer be needed w/ 3T MRI)<sup>22</sup>

# SLAP Tears

<b>Type</b>	<b>Description</b>	<b>Treatment</b>
<b>I</b>	Biceps fraying, intact anchor on superior labrum	Arthroscopic débridement
<b>II</b>	Detachment of biceps anchor	Reattachment/stabilization
<b>III</b>	Bucket-handle superior labral tear; biceps intact	Arthroscopic débridement
<b>IV</b>	Bucket-handle tear of superior labrum into biceps	Repair or tenodesis of tendon based on symptoms and condition of remaining tendon
<b>V</b>	Labral tear + SLAP	Stabilize both
<b>VI</b>	Superior flap tear	Débride
<b>VII</b>	Capsular injury + SLAP	Repair and stabilize

# SLAP Tear

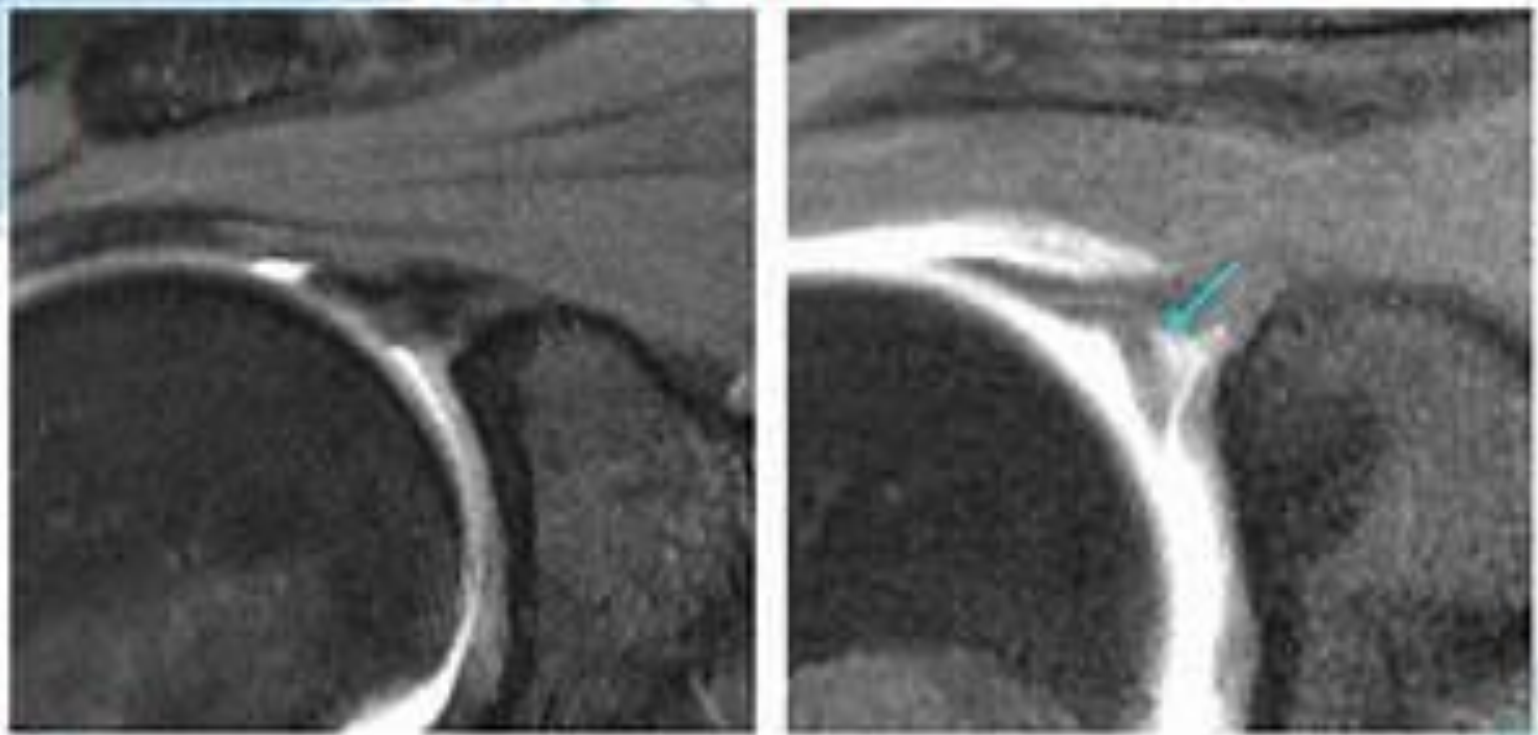


Anterior and posterior lesion types I-IV and V-VII of the superior labrum.

*(From Miller MD, Osborne JR, Warner JJP, et al: MRI-Arthroscopy Correlative Atlas, p 157. Philadelphia, WB Saunders, 1997.)*

# SLAP Tear

HIGH SIGNAL EXTENDS INTO LABRUM

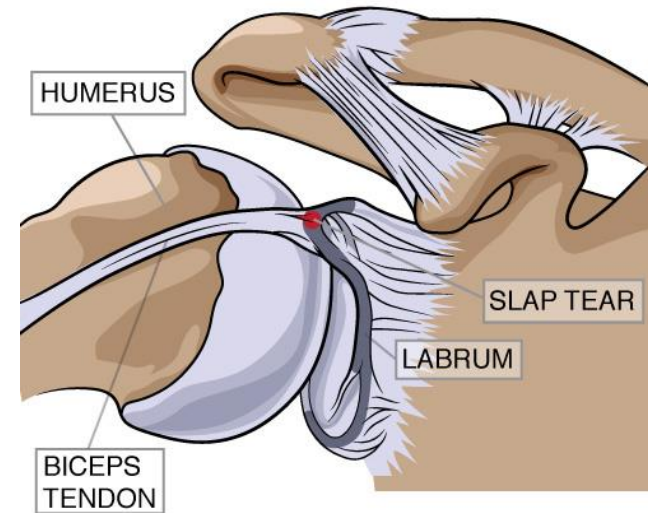


# SLAP Tears

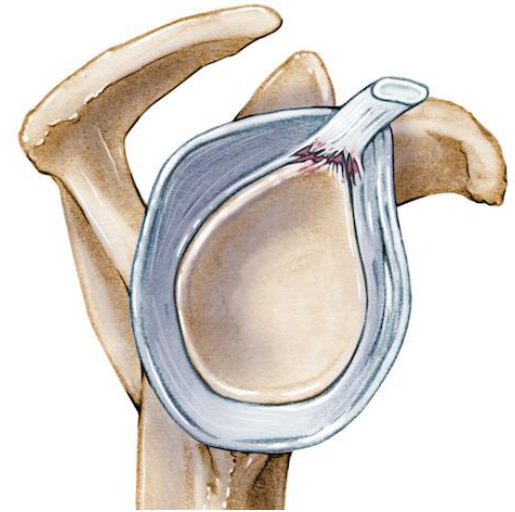
## Nonoperative

- Activity modification
- Progressive strengthening / ROM

Those unresponsive to periscapular program / PT – consider referral.



# SLAP Tear



## Operative

- As previously noted.
- Treatment of biceps tendon – SLAP repair vs. tenodesis vs. tenotomy...controversial

## Prognosis

Better for operative vs. nonoperative management.

Return to Play / Activity – Pain-free FROM, 90% strength of uninjured side.

# Overuse Injuries

- Acromioclavicular Joint OA



Pain at ACJ, increased w/ deep palpation and cross-arm testing. Pain relieved temporarily w/ inj. of local anesthetic...confirmatory.

X-ray and PE confirmatory, MRI if uncertain.

Often an incidental (asymptomatic) finding on imaging

# Overuse Injuries

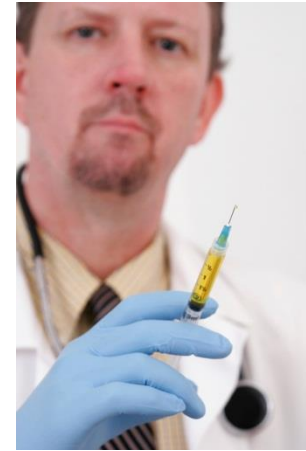
## Nonoperative:

- NSAIDS
- Activity Modification / PT
- Corticosteroid Inj

## Operative:

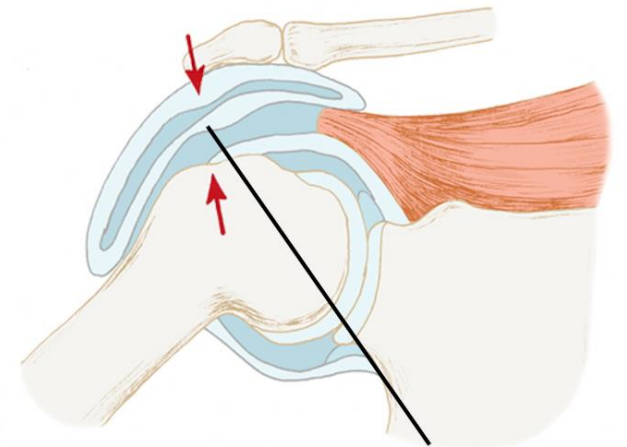
Often not necessary, but in refractory cases can be done arthroscopically or open.

**Consider ortho referral for refractory cases**



# Subacromial Impingement

- One of the most common causes of shoulder pain.
- Neer: 3 stages: <sup>23</sup>
  1. Edema of bursa /tendon
  2. Irreversible fibrosis / tendinitis (25 – 40 y/o)
  3. Partial / complete tear of RC (>40)



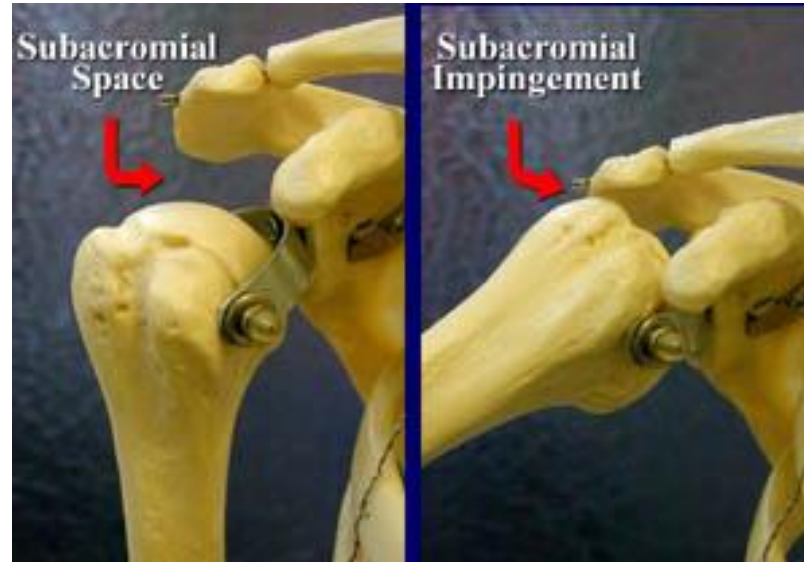
Impinged bursa and tendon

# Subacromial Impingement

- PE, provocative test, x-rays (incl scap Y to assess acromion type), MRI (if concerned for RCT).
- **Nonoperative (main treatment)**  
PT, (periscapular program), NSAIDS, activity modification and subacromial corticosteroid injection(s) - can be diagnostic and therapeutic.

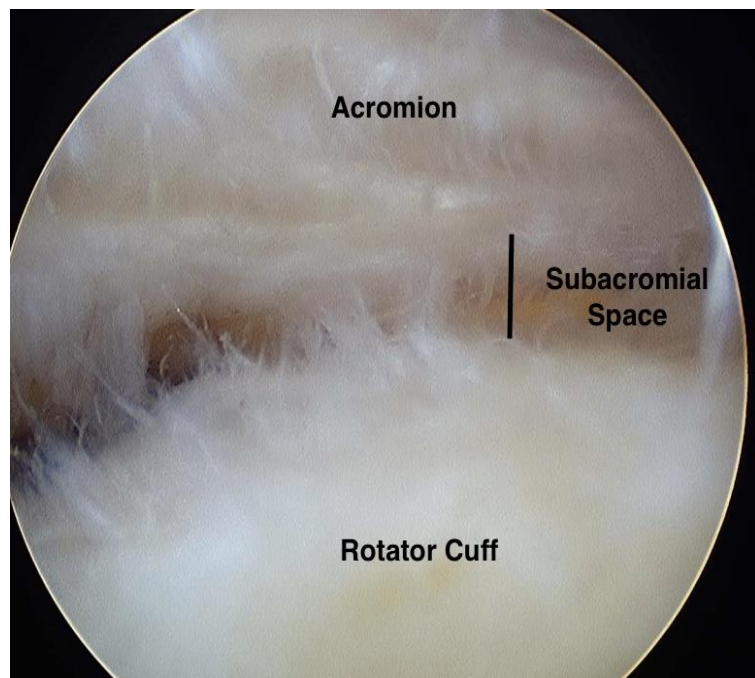
# Subacromial Impingement

- Operative



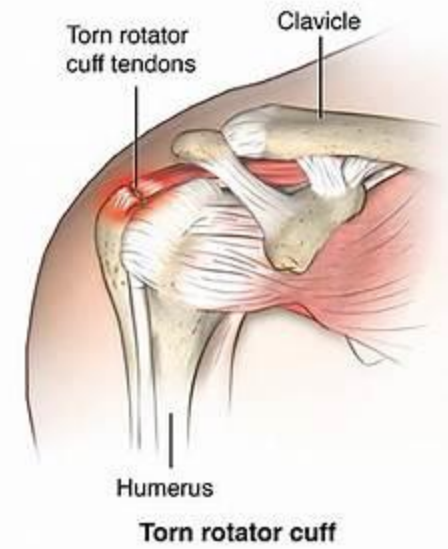
Arthroscopic subacromial decompression indicated if **6 months** of conservative measures unsuccessful. Possible progression to RCT if neglected, (controversial).

# Subacromial Decompression



# Rotator Cuff Tear

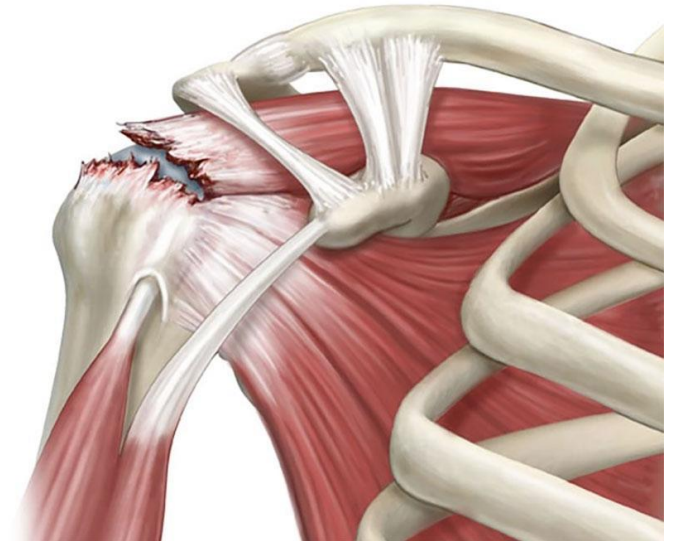
- Complete
- Partial - Ellman Classification<sup>9</sup>
  1. Grade I - <3 mm in depth
  2. Grade II – 3-6 mm in depth
  3. Grade III - >6 mm in depth



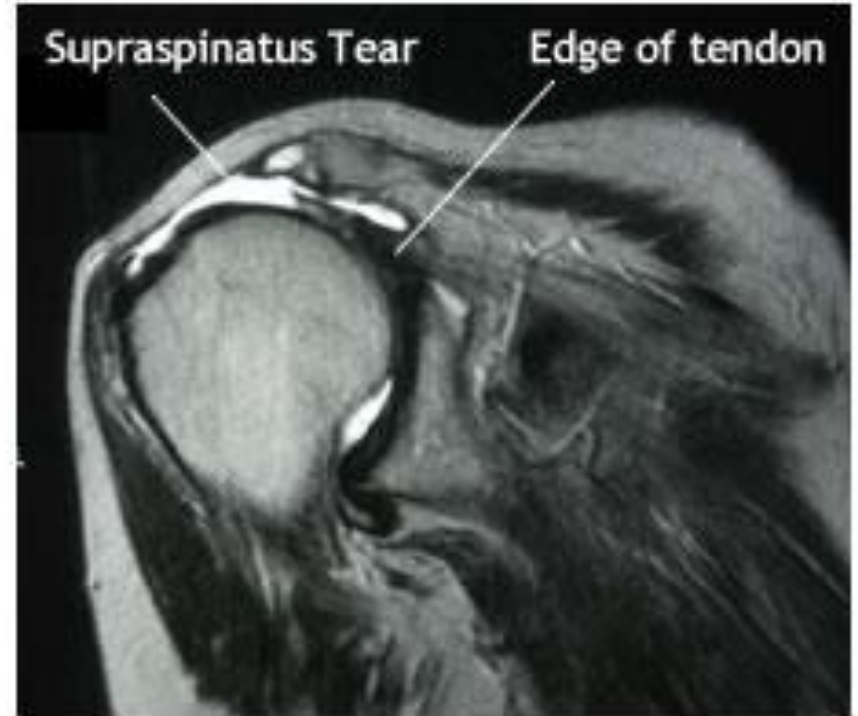
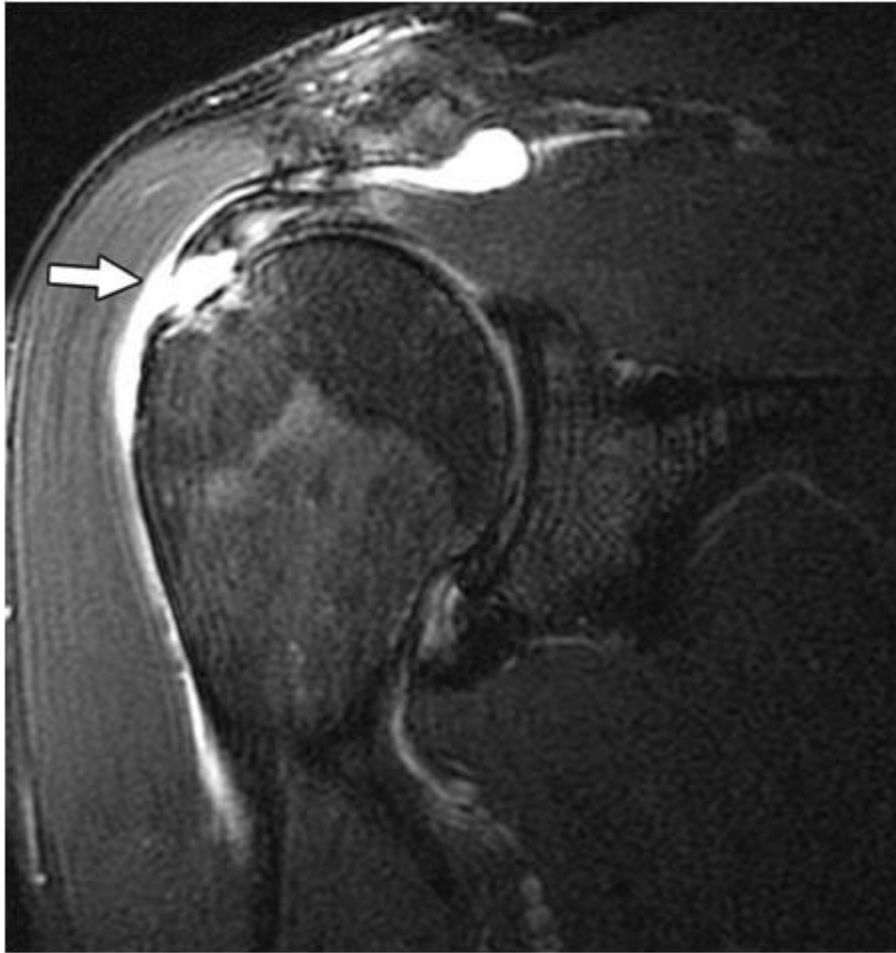
Partial tears not believed to heal / are progressive.

# Rotator Cuff Tear

- PE: Weakness in ER / Abd
- + impingement signs
- X-rays to assess acromion type
- MRI to ascertain cuff tear location, severity and acuity.



# Rotator Cuff Tear



# Rotator Cuff Tear

## Initial Treatment

- Nonoperative measures should be considered initially for **chronic cases.**, but dependent on degree of weakness / pain.
- NSAIDS, activity mods, RC strengthening / ROM.
- No evidence for corticosteroids in RCT<sup>16</sup>
- May require up to 12 -18 months of conservative measures to achieve max benefit in partial tears<sup>32</sup>

# Rotator Cuff Tear

## When to Scope

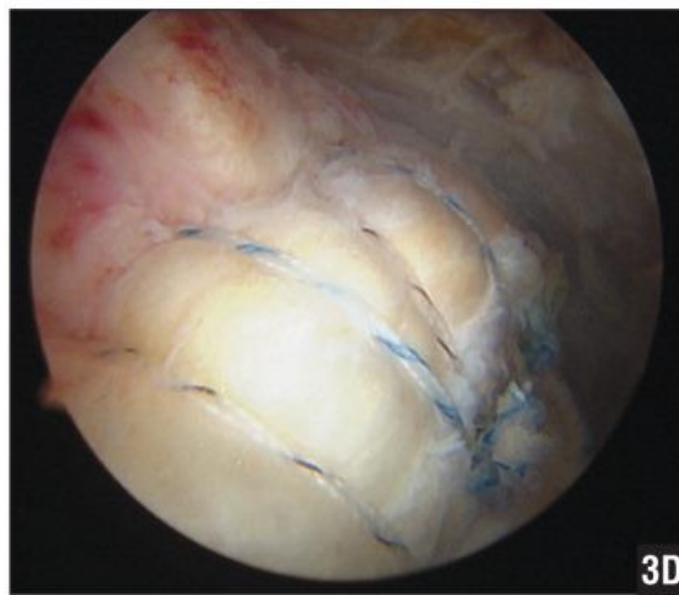
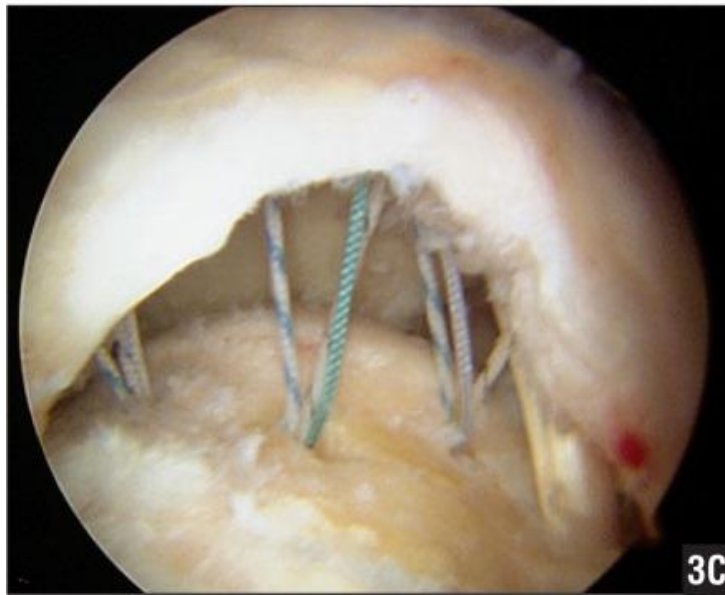
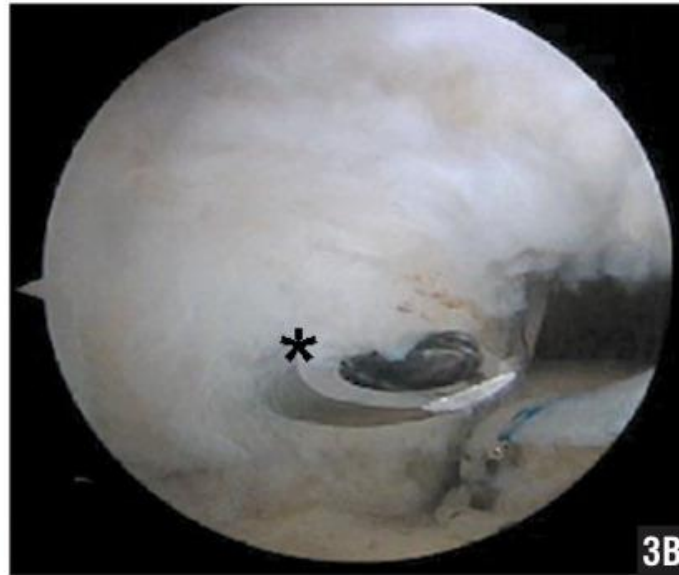
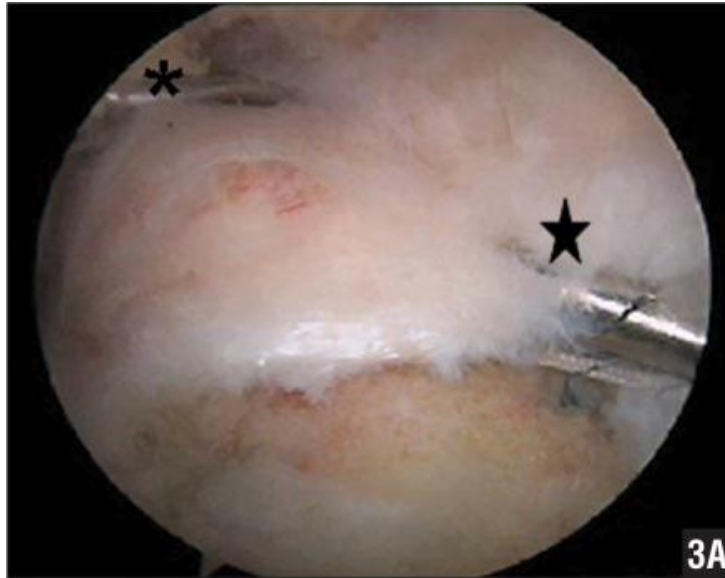
- Most full thickness RCT will have less response to non-operative measures.
- Significant objective weakness and functional limitation
- Tear can be arthroscopically debrided (<50% thickness), or completed and repaired using a variety of techniques, w/ or w/o SAD.

# Rotator Cuff Tear

## When to Scope

- Prognosis guarded w/ sx's greater than 1 year, full thickness tears, objective weakness and functional limitation at presentation.
- Best outcomes achieved in surgically treated full thickness tears within three months of injury!!!
- SO...surgical evaluation and intervention indicated sooner for best outcomes.

# Arthroscopic view



# Adhesive Capsulitis (Frozen Shoulder)

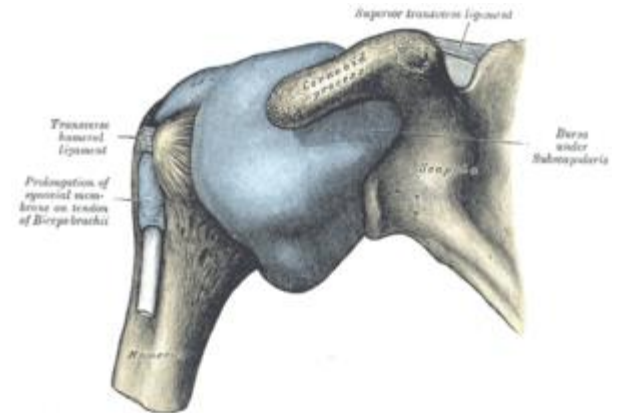
- Pain, loss or AROM & PROM
- Assoc. w/ DM, trauma, thyroid dz.

## 3 phases:

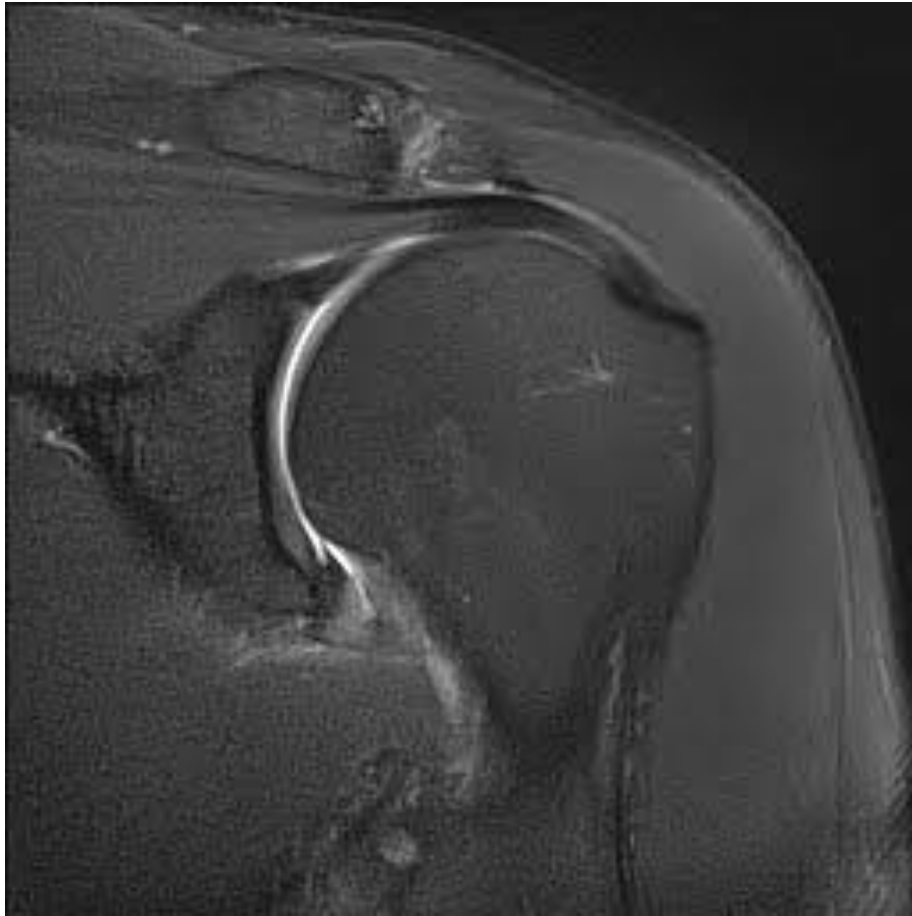
- Freezing
- Frozen
- Thawed

Conservative management: First line,  
PT, steroid injections, (U/S - guided), NSAIDS, time.

**Surgery: MUA / arthroscopic capsulotomy / lysis of adhesions if limited ROM after 6-9 mos. of conservative management.**

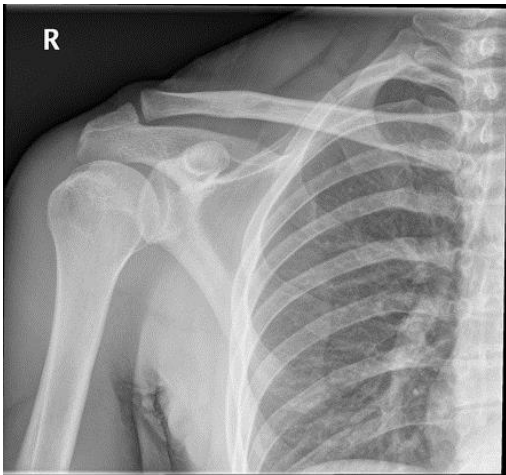


# Adhesive Capsulitis



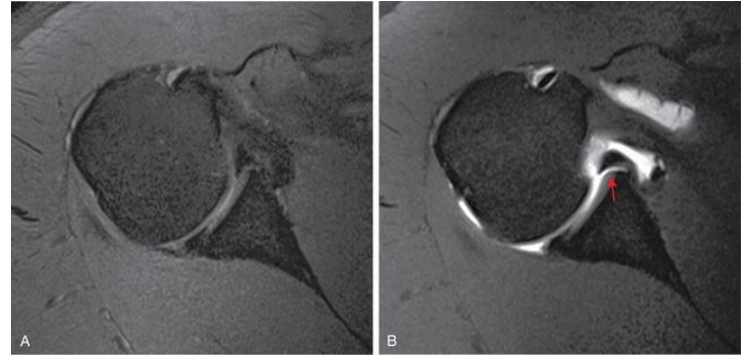
# Final Thoughts on the Shoulder...

- Obtain standard 4 views first: AP, true AP (Grashey : 30-45 deg), Scapular Y and axillary views. (can modify w/ additional views as needed)



# Final Thoughts on the Shoulder...

If an MRI is indicated:

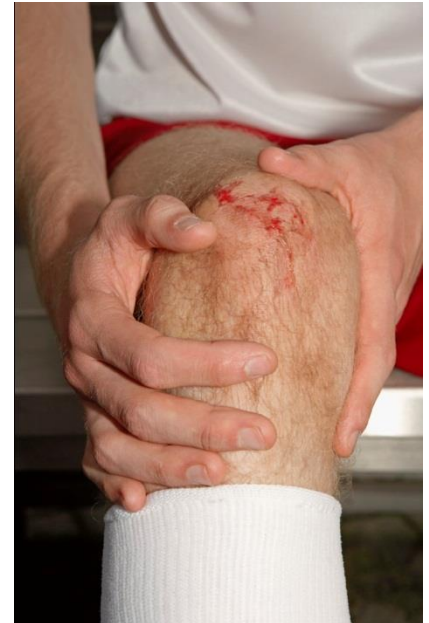


1. Does it need to be an MR arthrogram? (intra-articular pathology vs. cuff tear, age of patient, prior surgery, etc.)
2. 1.5 vs. 3T MRI. U/S gaining in popularity (user-dependent)
3. The wrong diagnostic study could delay / hinder diagnosis and surgical plan / intervention.

# Athletic Injuries

## Knee

- Acute knee injury
  - MCL, LCL, ACL, PCL, meniscus tear, OCD
- Chronic knee pain
  - PFS, chondromalacia, OA.



# Acute Knee Injury

## MCL

Hx: Valgus moment to knee

PE: Prox tears more common than distal. Valgus stress at 30 deg.

Grade I: No significant gapping, (1-5 mm)

Grade II: 6-10 mm gapping

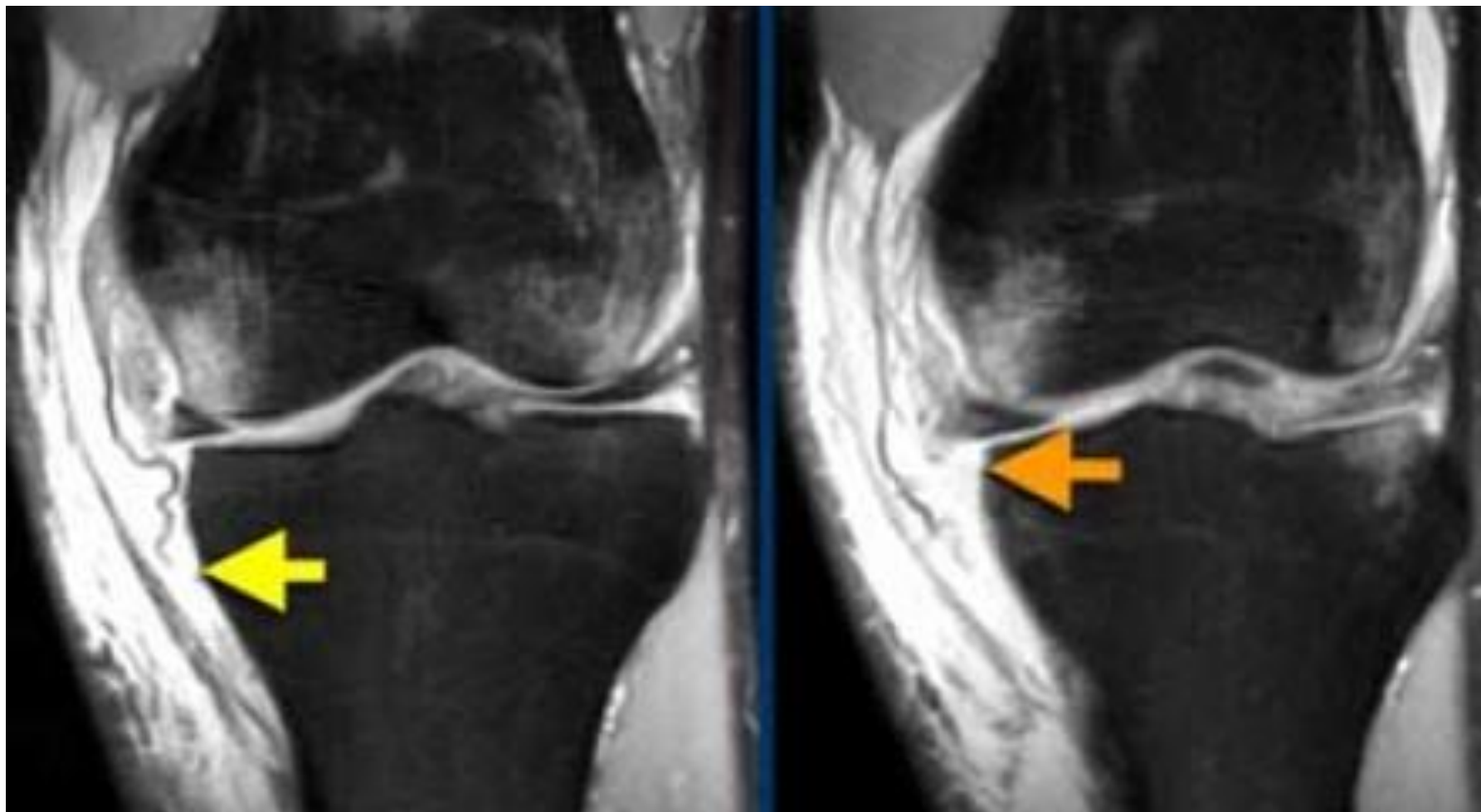
Grade III: >10 mm gapping / instability. Often less painful than grade II.

X-ray: (R/O fx / avulsion), MRI better, (not necessary in mild cases in absence of effusion), U/S gaining popularity.

# Pellegrini-Stieda Lesion



# MCL Injury MRI



# Acute Knee Injury

## MCL

### Non-Operative



- Grade I & II: Hinged knee brace.
- Return to full activities within 1.5 – 3 weeks depending on sx's.
- Isolated grade III: Rehab following resolution of edema and use of hinged knee brace. Usually RTP 6-8 wks if no instability.

# Acute Knee Injury

## MCL

### Operative Indications

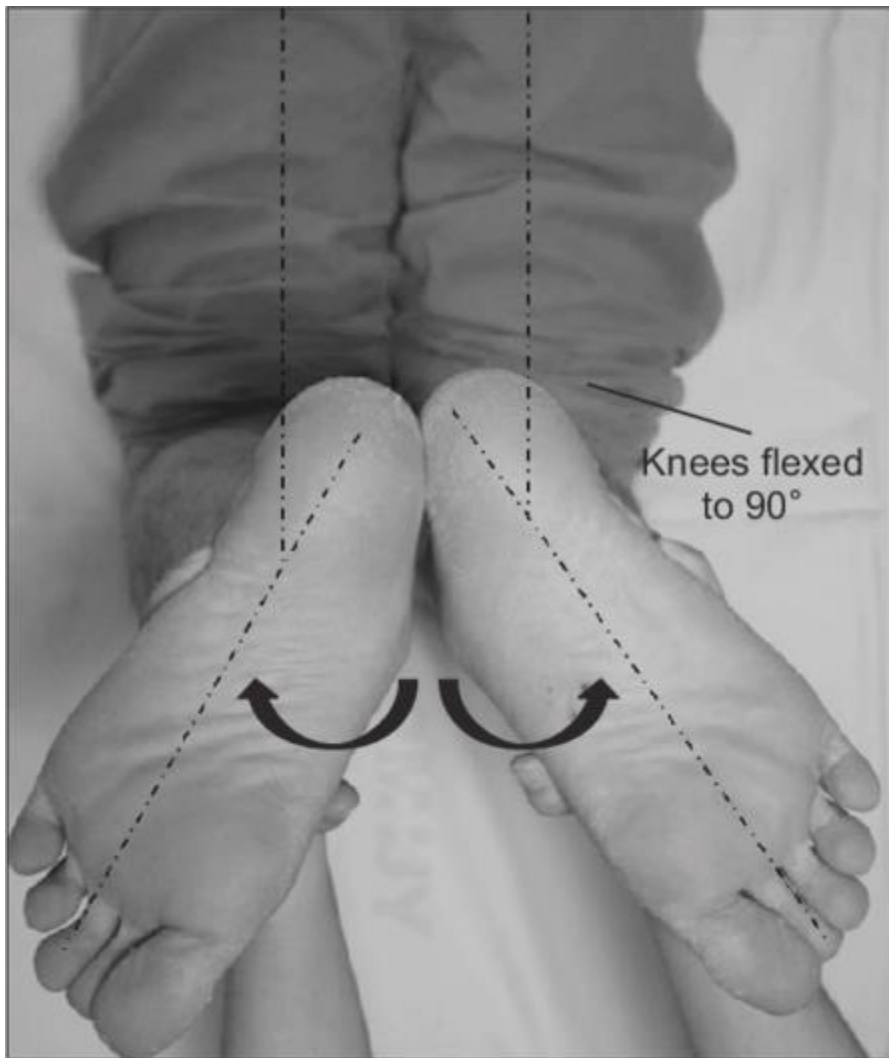


- **Controversial**
- Arthroscopy indicated w/ concomitant intra-articular injuries: (ACL, meniscus, osteochondral injury).
- Trend towards bracing for grade III MCL, before /after reconstruction of ACL / meniscus repair.
- Gross instability may warrant repair / reconstruction.
- **NOTE: Beware of concomitant LJT ---may indicate tibial plateau fx.**

# Acute Knee Injury

## Lateral Injuries

- Hx: Hyperextension / varus moment / twisting. Sudden deceleration w/ fixed / rotated LE. Direct posterolateral directed blow to medial knee.
- Pain at lateral knee, possible motor / sensory peroneal n. involvement.
- PE: Possible varus malalignment, hyperextension. Test LCL at full extension and 30 flex. Compared to contralateral knee.
- Dial Test: Tibial ER at 30 / 90 deg – PLC (30), PLC and PCL at 30 & 90 deg.



# Acute Knee Injury

## Lateral Injuries

### Nonoperative Treatment



- Depending on level of instability. Immob 2 – 4 wks, followed by rehab / quad strengthening.
- Early degenerative changes problematic.
- Believed to be underdiagnosed / under-reported.

# Acute Knee Injury

## Lateral Injuries

### Operative Treatment

- Symptomatic instability / functional loss
- Knee malalignment (need for osteotomy?) should be addressed at time of PLC intervention.
- Surgical repair, if indicated, should be performed within 2 weeks.
- PLC injuries need urgent referral to orthopedics. Beware of combined ACL's / PCL's...

# Acute Knee Injury

## Lateral Injuries

### Final Thoughts

- PLC injuries left untreated may lead to early / progressive DJD.
- Minor, isolated PLC injuries may be appropriate for conservative tx. 2- 4 wks immob, w/ return to full activities at 6-8 weeks.
- Post-op: Aggressive / prolonged PT up to 1 year prior to return.
- Most severe injuries preclude return to pre-injury level, even after surgical treatment.
- **Consider early ortho referral for lateral-sided knee injuries.**

# Acute Knee Injury

## Meniscus Tears

- Can occur as solitary lesion or be combined w/ other injuries.
- Rotation, hyperflexion event.
- Mechanical symptoms (locking, popping, giving out, swelling).
- PE: JLT, (most accurate PE finding), McMurray, (less accurate), Thessaly's (better), effusion.

# Acute Knee Injury

## Meniscus Tears



- Standard X-Rays: AP, lat, merchant and 45 deg PA wbing (Rosenberg). R/O fx's and assess early DJD.
- MRI: 90-95% accurate in detecting meniscal pathology<sup>21</sup>
- Gold Standard: Direct visualization via arthroscopy.



# Acute Knee Injury

## Meniscus Tears



Complete longitudinal    Bucket handle    Displaced bucket handle



Parrot beak    Flap    Displaced flap



Radial    Double flap    Incomplete longitudinal

# Acute Knee Injury

## Meniscus Tears

### Conservative Management

- Not all meniscus tears need surgical intervention, (especially incidental findings in setting of DJD). Some may be asymptomatic.

- Stable vertical tears (<10 mm)
- Stable partial thickness tears
- Small radial tears (<3 mm )



These may be tx. non-operatively, (degenerative tears), but if found in symptomatic pt. ---warrants orthopedic referral.

# Acute Knee Injury

## Meniscus Tears

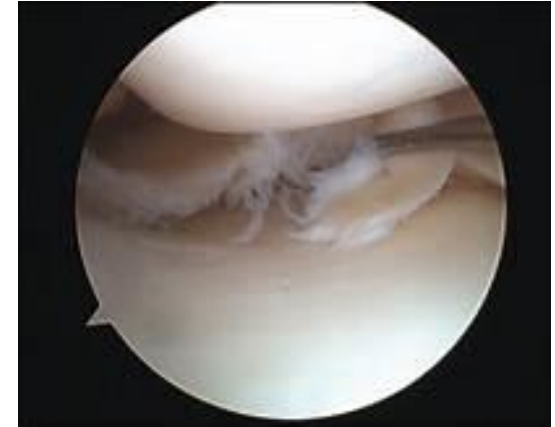
### When to Scope

- Symptomatic tears
- PE findings c/w tear – JLT, effusion, Decreased ROM, + McMurray's, + squatting pain.
- Failed conservative management (NSAIDS, PT)
- Absence of other identifiable causes of symptoms, (DJD, RA, etc).
- **Incidental finding related to DJD – not an indication for arthroscopy**

# Acute Knee Injury

## Meniscus Tears

### When to Scope

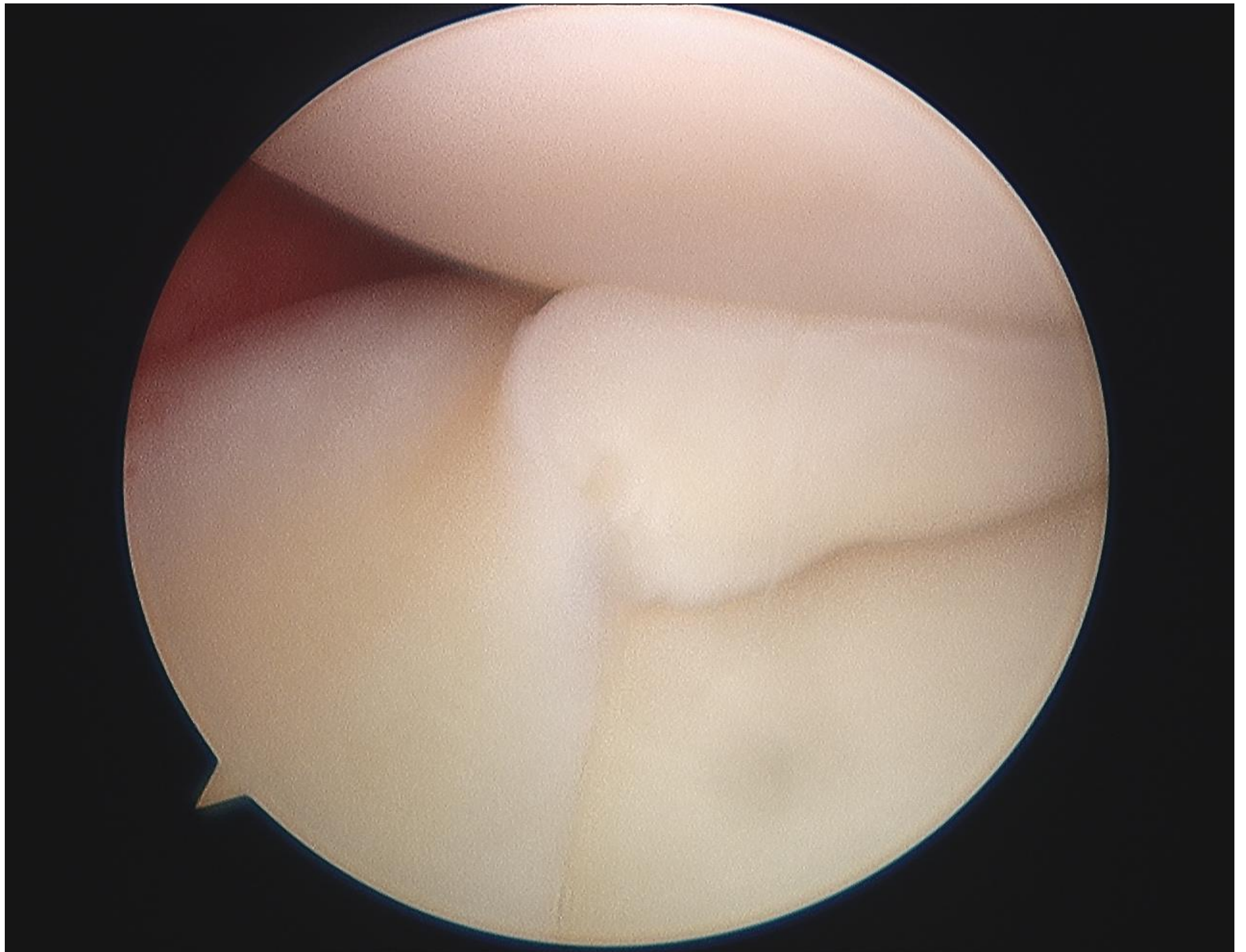


- Repair vs. Debridement

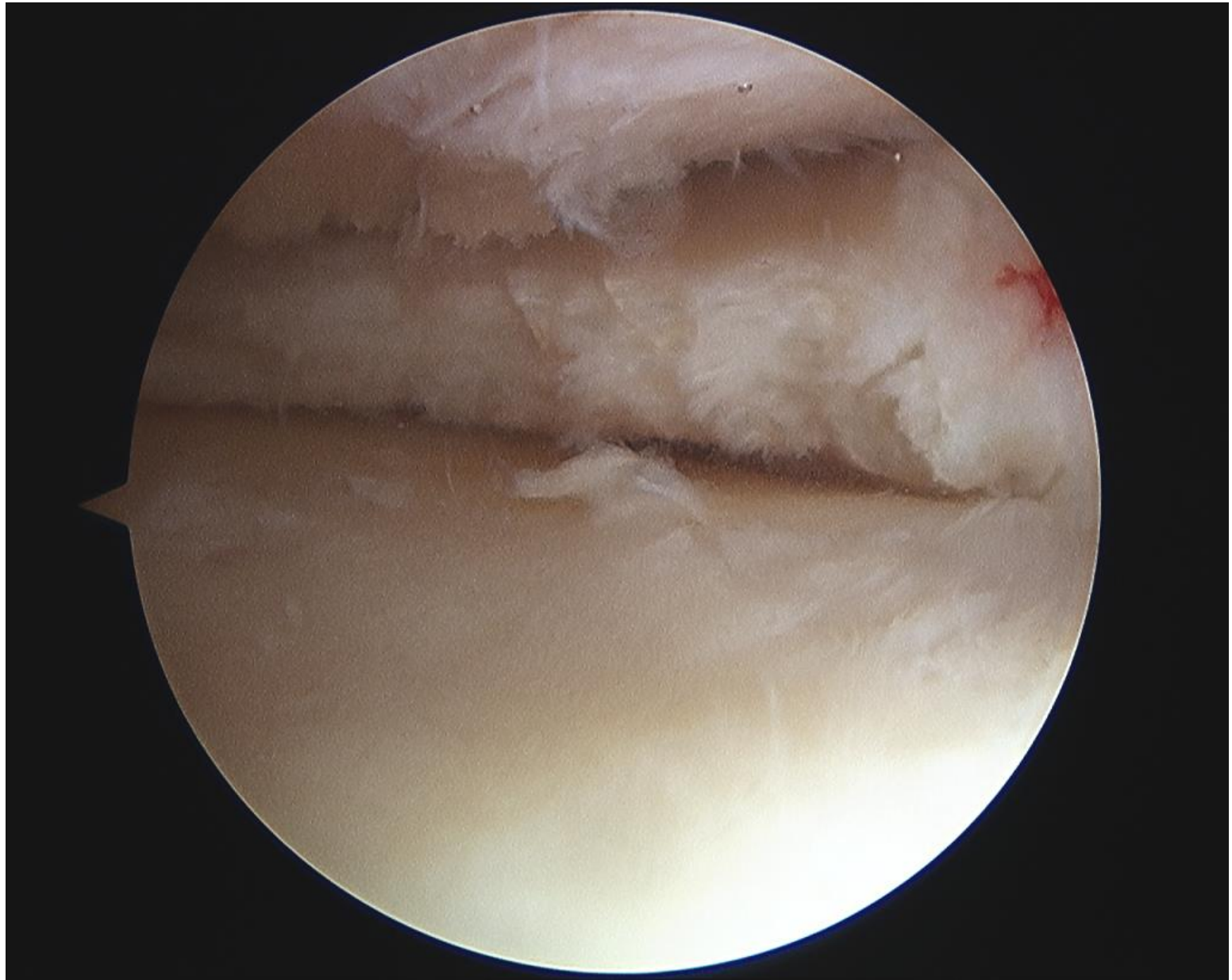
**Repairs appear to be most successful in tears that are:**

- Longitudinal and  $> 10$  mm in length
- Located in the red-white or red zone, (within 3-4 mm of capsular junction)
- Young, active pt. w/o degenerative changes.
- During concomitant ACL reconstruction.

**NOTE: Important to get early orthopedic consultation to limit resultant degenerative changes / speed up return to activity.**







# Acute Knee Injury

## Meniscus Tears When to Scope



- Return to activities dependant upon ROM, strength and pain-free state, sport-specific demands.
- Partial meniscectomy / debridement – possibly faster return.
- Meniscal repair – prolonged return to full activities (3 - 4 mos.)

# Acute Knee Injury

## Osteochondritis Dissecans

- Etiology still not fully understand.  
(Subchondral blood compromise = fracture to cartilage and underlying subchondral bone.)
- Adult vs. Juvenile form (state of physis)
- Adult form - ? Unrecognized juvenile form?
- Hx: Vague knee pain. Intermittent swelling, following increased activity.
- Locking, popping, catching, giving out may be present.

# Acute Knee Injury

## Osteochondritis Dissecans

- X-rays: Standard 4 view, to include notch view, (pediatric)
- Most common location – **lateral aspect of MFC.**
- MRI: (T2). Characterizes lesion's stability by assessing fluid behind cartilage.

### Unstable Fragment

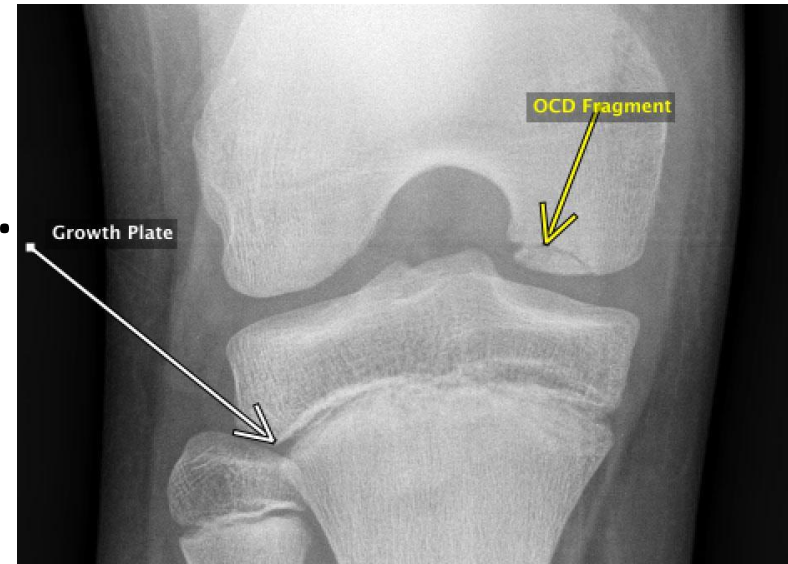
1. Uptake >5 mm in diameter behind defect.
2. Increased signal intensity through subchondral plate through lesion.
3. Cartilage lesion > 5 mm in size.

# Acute Knee Injury

## Osteochondritis Dissecans

### Treatment

- Promote healing and prevent displacement / progression.
- Stable – Non-op tx. w/ Non-wbing for up to 3 mos.
- NSAIDS
- Non-wbing ROM exercises.
- Consider bracing.



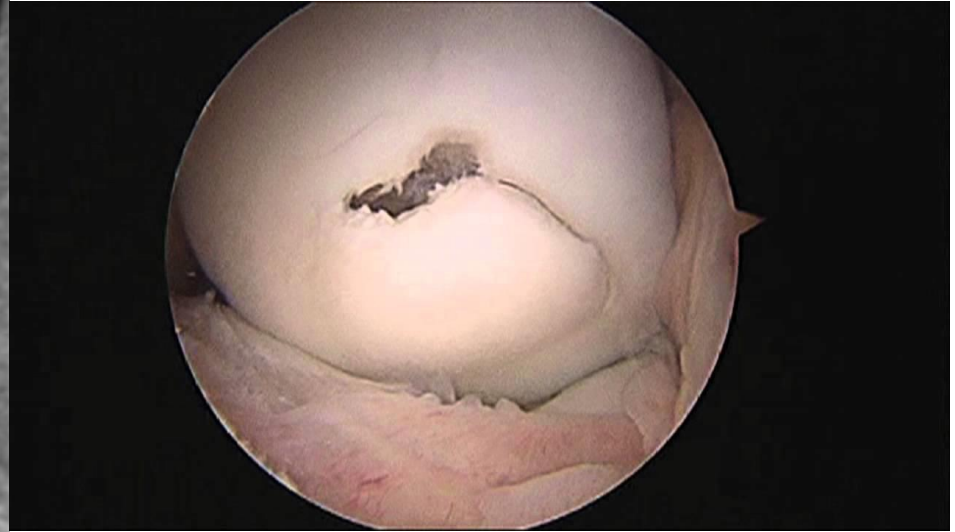
# Acute Knee Injury

## Osteochondritis Dissecans

### When to Scope

- Lesions that are progressive / unstable should be considered for arthroscopic intervention.
- ACI, microfracture, OATS....
- Newly diagnosed OCD's should be referred to orthopedist for assessment of stability and operative consideration.

# Osteochondritis Desiccans



# Acute Knee Injury

## ACL Tear

- Hx: Non-contact pivot injury, “pop”, w/ immediate effusion.
- PE: Lachman, (most sensitive – 93% and specific – 99%), ant drawer, pivot-shift, effusion, decreased ROM<sup>29</sup>
- X-Ray: 4 view – tibial spine avulsion fx, (notch / lat views), lat tibial plateau avulsion, (segond fx).
- MRI: Accuracy – 95%. Bone bruising about LFC and posterolateral tibial plateau.



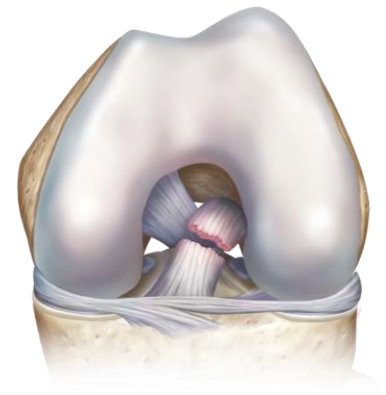


# Acute Knee Injury

## ACL Tear

### Conservative Treatment

- Consider for older pt.s w/ lower demands.
- Strengthening / ROM
- Bracing
- Modification of activities
- Sports w/o significant knee pivoting



# Acute Knee Injury

## ACL Tear

### When to Scope



- Younger / active pts. w/ instability.
- Earlier intervention may be beneficial to prevent degenerative changes. (???)
- Typically undergo “pre-hab” to regain strength, ROM prior to arthroscopic reconstruction.
- Multiple techniques w/ various pros / cons.
- Post-op rehab programs vary, but typically strength training by 6 weeks.

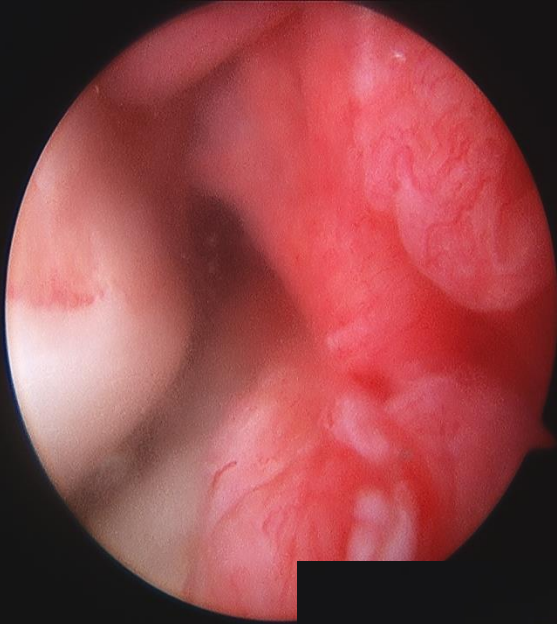
# Acute Knee Injury

## ACL Tear

### When to Scope

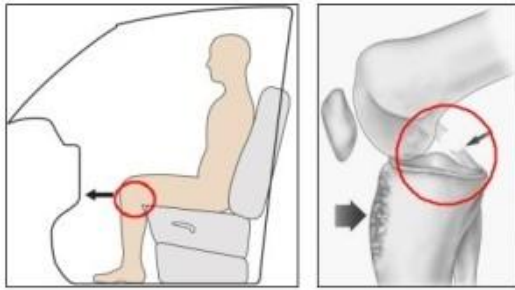
- Varied long-term results regarding development of DJD and RTP.
- Elite athletes – 6 – 9 mos. min to RTP.
- Conservative: May require 6+ mos. of rehab / strengthening, w/o ever regaining full pre-injury level.
- **Bottom line: Early referral to orthopedist following eval/x-ray/MRI most beneficial.**

# ACL Reconstruction



# Acute Knee Injury

## PCL Tear



Dashboard injury

- Hx: “**Dashboard mechanism**” – forceful posterior translation of tibia w/ knee at 90 deg. Plantarflexed foot w/ another player falling into ant. Tibia also can be a cause.
- Less pain / effusion than ACL.
- PE: Effusion, pain, decreased ROM, ant. tibial bruising, + post drawer, + post sag.
- **Distinguish from combined PLC injury w/ dial test. PCL injuries seldom in isolation.**

# Acute Knee Injury

## PCL Tear



- X-rays: Demonstrate post. attitude of tibia related to femur, and R/O assoc. fx.
- MRI: Typically diagnostic for PCL tear.

# PCL MRI



**intact pcl**



**torn pcl**

# Acute Knee Injury

## PCL Tear

### Treatment



- Low grade tears can be managed conservatively.
- Bracing acutely (2-4 wks) w/ rehab focusing on ROM / strengthening of quads, w/ hamstring stretching.
- Higher grade tears may warrant surgical intervention, depending upon patient's demands, instability, limitations.

# Acute Knee Injury

## PCL Tear

### When to Scope

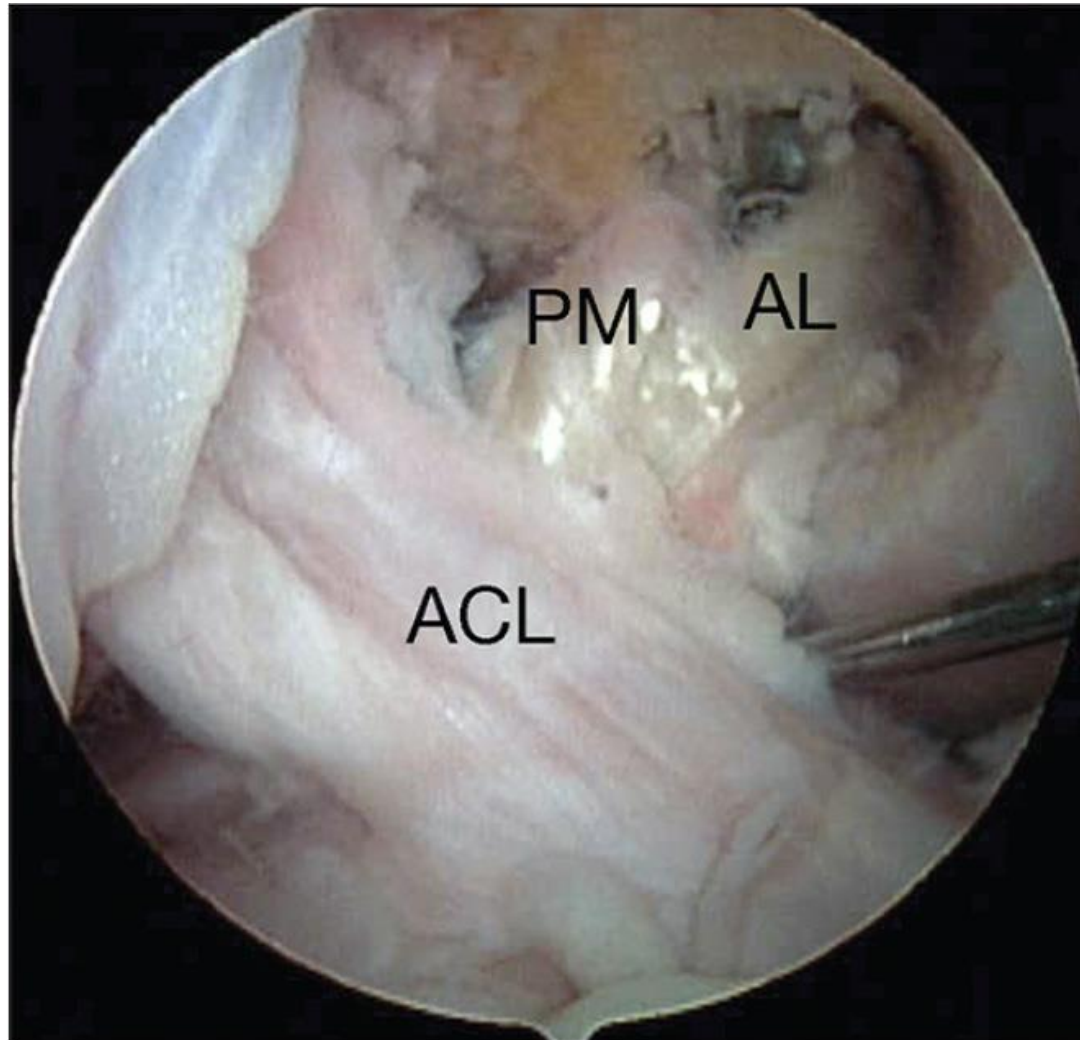


- Severe, high-grade injuries in high-demand athletes may warrant arthroscopic intervention.
- Various surgical approaches.
- Multi-ligamentous injuries / instability.
- Prevent future DJD (medial / patellofemoral compartments)

-Better overall RTP / pre-injury level than ACL injuries for low-grade, isolated PCL tears.

Referral to orthopedist for high grade / unstable injuries / concomitant injuries, or those unresponsive to conservative measures.

# Arthroscopic view of PCL



# Chronic Knee Injury

## Patellofemoral Disorders

### Chondromalacia and PFS

Chondromalacia Patella: Softening / fissuring of patella cartilage.

Hx: Typically no h/o trauma, theater sign, pain traversing stairs. H/O tibial malalignment, foot pronation.

PE: + Patella grind. Pain at medial and/or lateral patella border.

X-Rays: 4 view: (Merchant view).

MRI: Thinning, fissuring of cartilage.



# Chronic Knee Injury Chondromalacia Management

- Conservative measures are the cornerstone of tx. PT for stretching / VMO strengthening
- McConnell taping
- NSAIDS
- Activity mods
- Bracing

Surgical intervention rarely indicated.  
Arthroscopic debridement of limited value.  
Lateral release no longer routinely indicated

# Chronic Knee Injury

## Patellofemoral Syndrome

- Very common in runners.
- No changes to articular surface of patella.
- Most common in female athletes / runners.
- Felt to be related to lateral patella tracking, high Q angle, weak VMO.
- Hx: & PE: Similar to chondromalacia patella.
- Merchant view to assess lateral tracking, R/O DJD. MRI if unresponsive to conservative measures or to R/O other etiologies.

# Chronic Knee Injury

## Patellofemoral Syndrome

### Treatment



- Again, conservative measures are the staple of treatment. Quad stretching, VMO strengthening, modalities.
- Indications for arthroscopic intervention even less common than isolated patella chondromalacia.

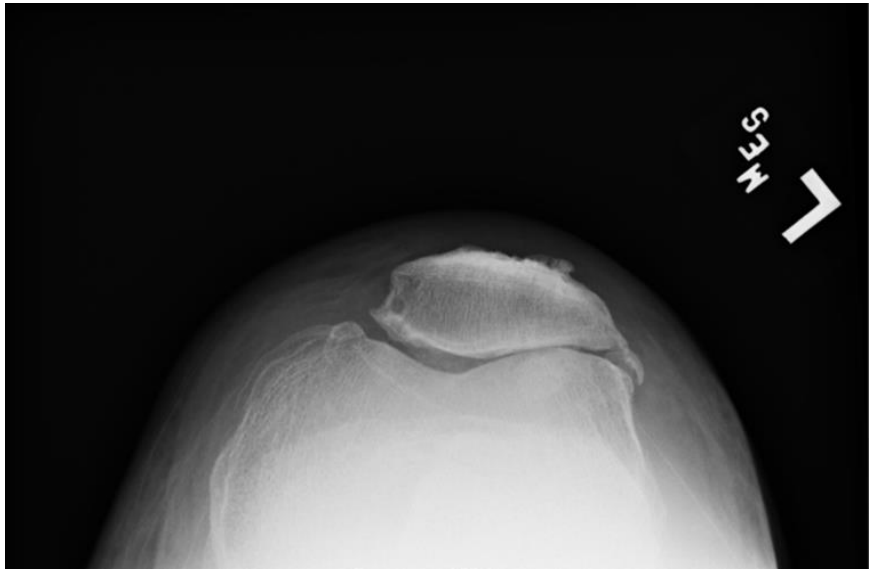
### When to Scope / Surgical Intervention

- Rarely, patella realignment procedures may be necessary. Surgical intervention typically not considered before failing 6 + mos. conservative therapy.

# Chronic Knee Pain

## Osteoarthritis

- Very common in running athletes, particularly those over 40.
- Multitude of causative factors, including trauma, family hx., obesity.
- Hx: Possible h/o trauma. Location of pain correlates w/ location / extent of dz. Decreased ROM, intermittent effusion.
- X-Rays (wbing 4 view) most important imaging study. MRI only obtained if dx. unclear or associated soft tissue conditions felt to be more symptomatic, or new / recent injury w/ mechanical symptoms.



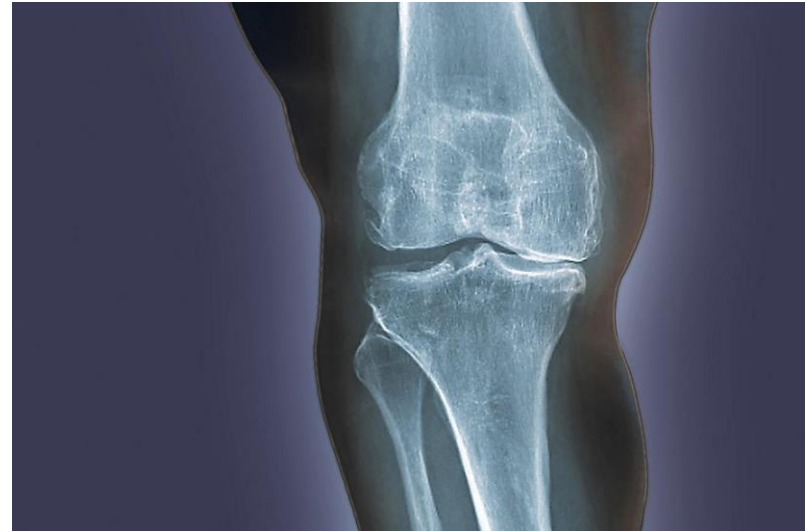
# Osteoarthritis

## When to Scope

- Again, conservative measures most effective.
- Relatively limited role for arthroscopy in isolated DJD. Arthroscopic debridement controversial, but research indicates no role in DJD.
- In setting of “new” mechanical symptoms following injury, can consider arthroscopy.
- No role for arthroscopy in setting of incidental / degenerative meniscus tears.

# Knee Osteoarthritis

- Symptoms:
  - Function-limiting knee pain
  - Effect on walking distances
  - Pain at night or rest
  - Activity induced swelling
  - Stiffness
  - Mechanical symptoms (chronic)
    - Instability, locking, catching?



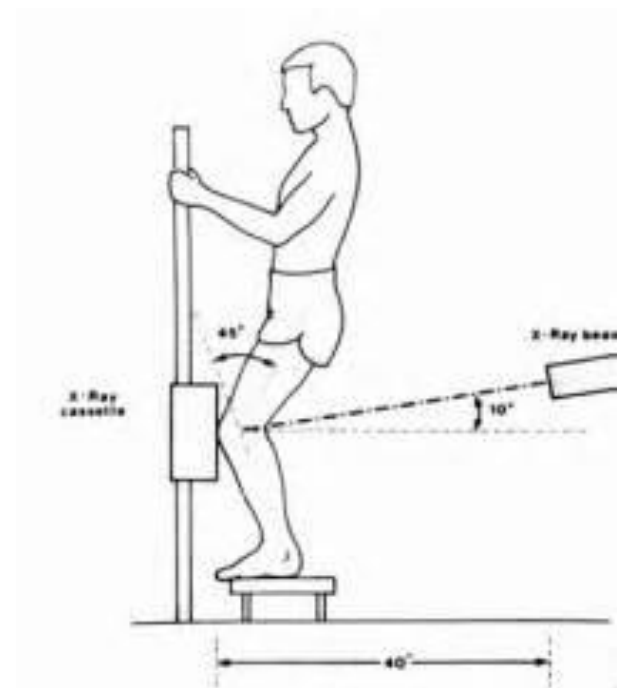
# Knee Osteoarthritis

- Physical exam
  - Body habitus
  - Gait
  - Limb alignment
  - Effusion
  - Skin (scars – prior surgery?)
  - Range of motion
    - Lack of full extension/flexion
  - Ligament integrity



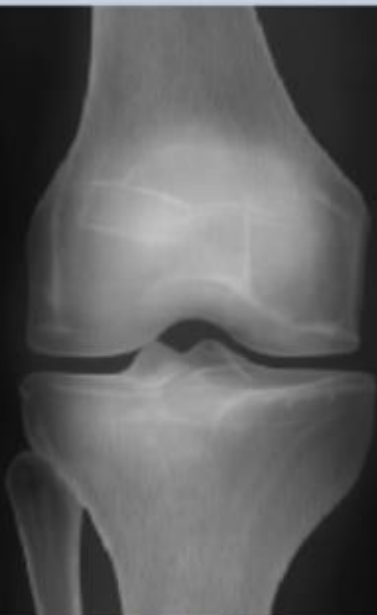
# Knee Osteoarthritis Imaging

- **Weight-bearing PA views (Rosenberg)**
- pattern of arthritic involvement
  - Medial/lateral tibiofemoral, patellofemoral
- Characteristics
  - Joint space narrowing
  - Osteophytes
  - Eburnation of bone
  - Subchondral sclerosis
  - Subchondral cysts

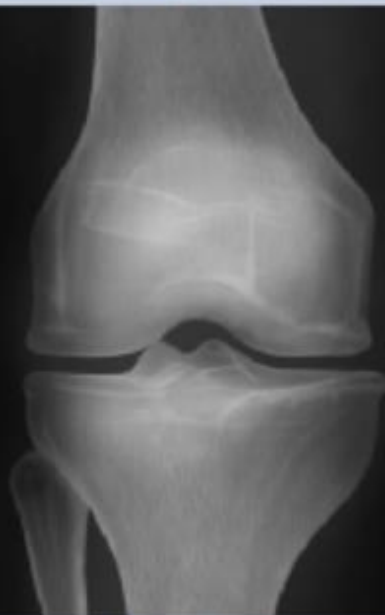




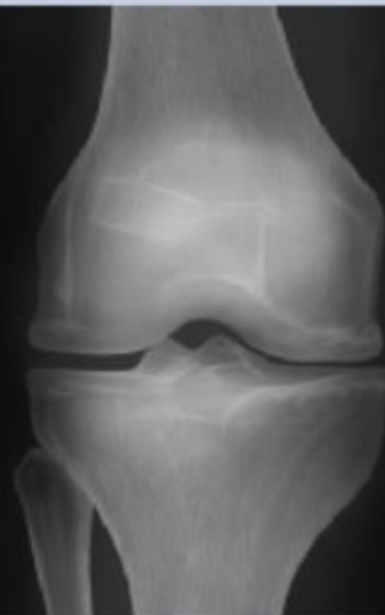
## Kellgren-Lawrence (KL) grading scale



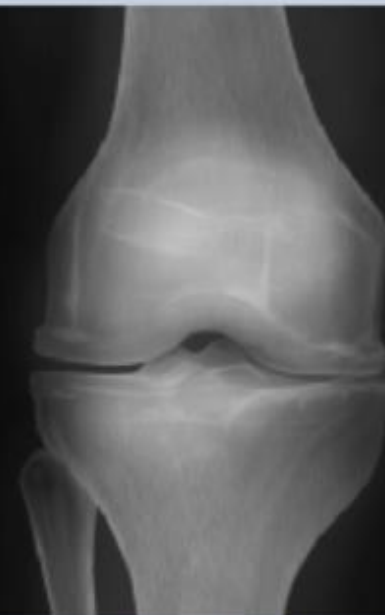
**Grade 1**



**Grade 2**



**Grade 3**



**Grade 4**

CLASSIFICATION	Normal	Doubtful	Mild	Moderate	Severe
DESCRIPTION	No features of OA	Minute osteophyte: doubtful significance	Definite osteophyte: normal joint space	Moderate joint space reduction	Joint space greatly reduced: subchondral sclerosis

# Knee Osteoarthritis First Line Management



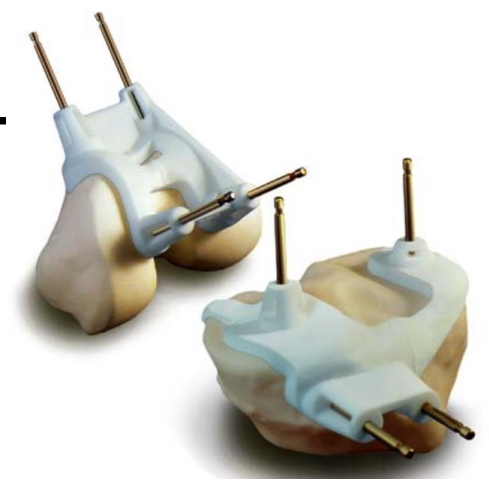
- Nonoperative:
  - NSAIDs; first line treatment
  - Rehabilitation, education and wellness activity
  - Weight loss program
  - Intra-articular steroid injections (consider long-acting steroid)
  - Acupuncture: AAOS strong evidence against
  - Viscoelastic joint injections: strong evidence against.
  - Needle lavage: moderate evidence against
  - Lateral wedge insoles: moderate evidence against

# When to Consider Arthroplasty



- Once conservative management has failed - consider total knee arthroplasty
- **TKA**
  - Symptomatic knee osteoarthritis
  - Failed non-operative treatments
  - CR vs. PS / AS implants show no difference in outcomes
  - Patellar resurfacing: Should be individualized. No difference in pain or function with or w/o patella resurfacing

# PSI and Navigation - Robotic TKA



- Patient specific instrumentation
- Will require CT or MRI (company-dependent)
- Customized cutting blocks 3-D printed from pre-operative three-dimensional models
- Improves accuracy
- May require intra-op navigation assist

# ½ a Knee Replacement?

- Aka Unicompartmental knee arthroplasty
- Can be medial or lateral joint
- Patellofemoral joint replacement
- Same indications



# Uni-compartmental Joint Replacement

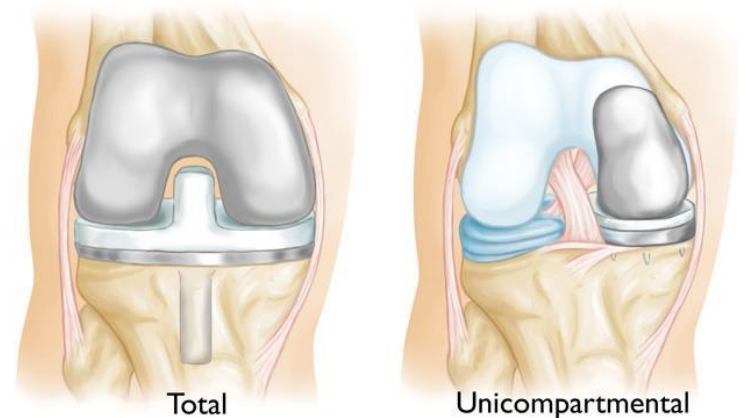
- **Contraindications**

- Inflammatory arthritis
- ACL deficiency
- Fixed varus deformity  $> 10$  degrees
- Fixed valgus deformity  $> 5$  degrees
- Restricted arc of motion  $< 90$  degrees
- Flexion contracture  $>10$  degrees
- Prior meniscectomy in contralateral compartment
- Tricompartamental arthritis
- Anterior knee pain?



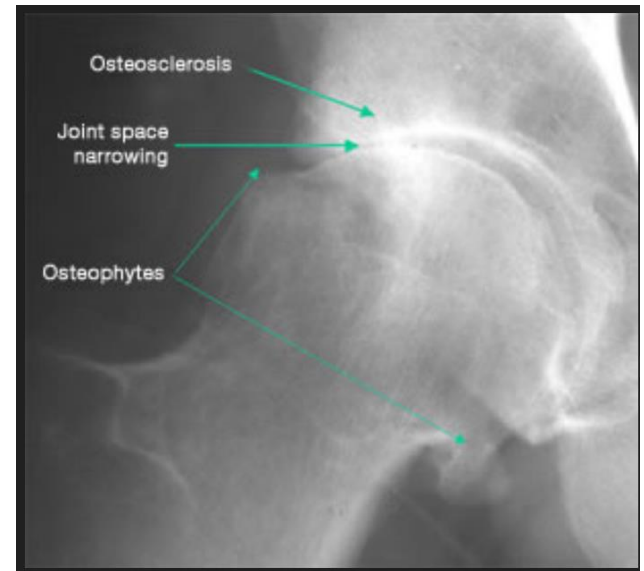
# Uni-compartmental Joint Replacement

- **Advantages compared to TKA**
  - Faster rehabilitation and quicker recovery
  - Less blood loss
  - Less morbidity
  - Less expensive
  - Preservation or normal kinematics
  - Smaller incision



# Hip Osteoarthritis

- Follow similar approach to knee replacement
- Utilize non-operative methods first
- Once pain is no longer functional then proceed with hip replacement
- Imaging shows
  - Osteosclerosis
  - Joint space narrowing
  - Osteophytes



## TONNIS CLASSIFICATION OF HIP OSTEOARTHRITIS; 1999

Grade	Radiographic features
0	- No signs of osteoarthritis
1	- Slight narrowing of joint space - Slight lipping at joint margin - Slight sclerosis of the femoral head or acetabulum
2	- Small cysts in the femoral head or acetabulum - Increasing narrowing of joint space - Moderate loss of sphericity of the femoral head
3	- Large cysts - Severe narrowing or obliteration of joint space - Severe deformity of the femoral head - Avascular necrosis



Kovalenko, B., Bremjit, P., & Fernando, N. (2018). Classifications in Brief: Tönnis Classification of Hip Osteoarthritis. *Clinical Orthopaedics and Related Research* 476(8), 1680-1684.

von Bernstorff, M., Feierabend, M., Jordan, M., Glatzel, C., Ipach, I., & Hofmann, U. K. (2017). Radiographic hip or knee osteoarthritis and the ability to drive. *Orthopaedics* 40(11) e82-e89

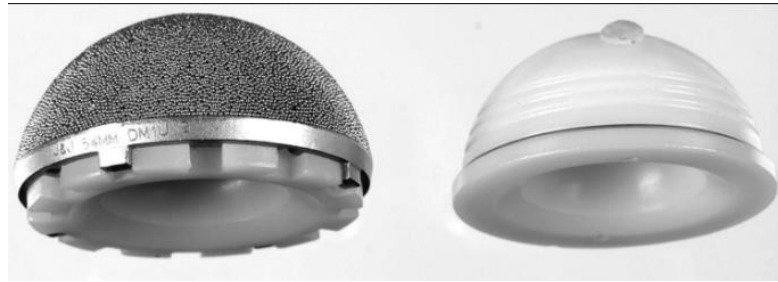
# Total Hip Arthroplasty Design

- Biomechanics depend on
  - Prosthesis design
  - Bearing surface and lubrication characteristics
  - Fixation method
  - Designs include
    - Femoral component
      - Cemented
      - Press fit
        - » Tapered stems
        - » Porous coated stems
        - » Modular stems



# Total Hip Arthroplasty Designs

- Designs include
  - Acetabular components
    - Cemented
      - Polyethylene
      - Metal
    - Press fit
      - Metal



- Bearing surfaces
  - Polyethylene
  - Metal
  - Ceramic



Metal on Polyethylene



Metal on Metal



Ceramic on Ceramic

# Total Hip Arthroplasty



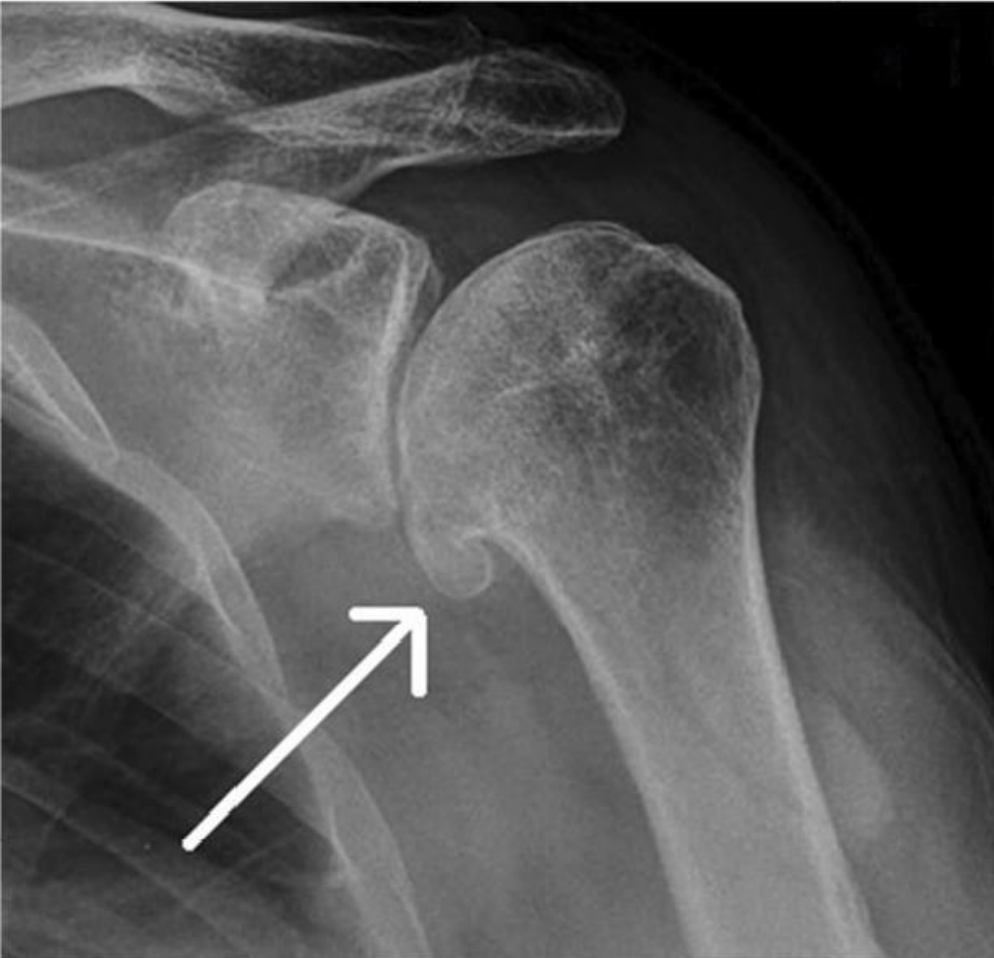
# A little on Shoulder Arthroplasty

- Total shoulder arthroplasty
  - Failed conservative management.
  - Replacement of humeral head and glenoid resurfacing
  - Greater ROM
  - Factors required for success of TSA
    - Rotator cuff intact and functional
    - Glenoid bone stock and version



# Shoulder Osteoarthritis

A



B



# TSA Outcomes

- Pain relief most predictive benefit
- Reliable ROM
- 93% survival rate at 10 yrs
- Good longevity with cemented and press-fit humeral components

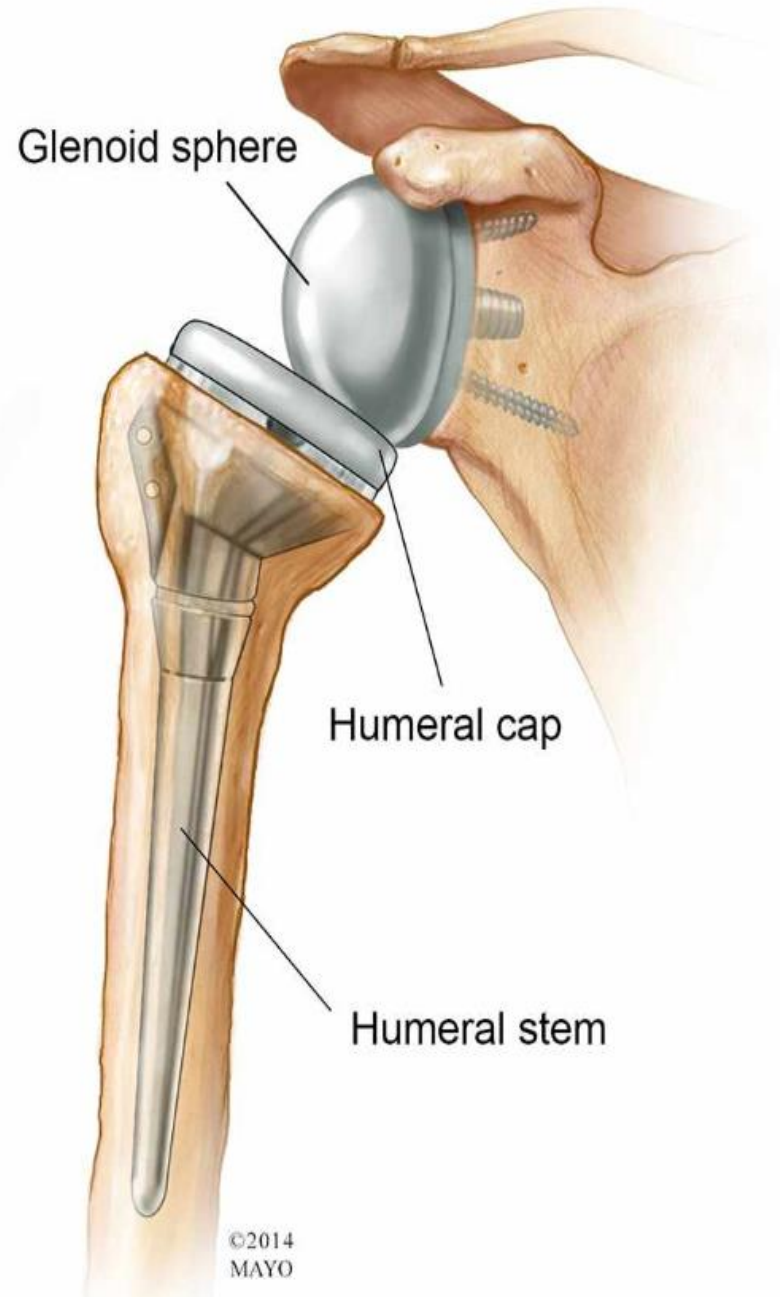


# Reverse Total Shoulder Arthroplasty

- Uses a convex glenoid and concave humerus to reconstruct the GH joint
- Center of rotation is moved inferiorly and medial
- Allows deltoid to act on a longer fulcrum
  - Increases mechanical advantage
  - Deltoid must be functional (check axillary n. function)
- This is the option for shoulder replacement in the setting of an irreparable rotator cuff tear, (cuff tear arthropathy)

# RSA

- Indications
  - Cuff tear arthropathy
  - Pseudoparalysis
  - Antero-superior escape
  - Acute 3 or 4-part proximal humerus fractures
  - Rotator cuff insufficiency equivalent
  - Failed arthroplasty
  - Rheumatoid arthritis



# Arthroplasty Post-Op

- Post-op considerations
  - Weight-bearing status
  - DVT ppx (lower extremity arthroplasty)
    - ASA 81mg BID vs ASA 325mg BID PO
    - Lovenox
    - Xarelto
    - Coumadin
    - Must consider kidney function
  - Continuation of post-surgical abx (24hr)
  - Pain control (multimodal)
  - Up and moving the night of/following morning
  - Select patients 23 hr. observation then home / same day increasing in popularity.

# Knee Issues

## The Bottom Line

- What can wait? What doesn't need to be surgerized right away?
  - Chondromalacia / PFS
  - Osteoarthritis
  - Bursitis
  - Isolated collateral lig injuries
  - Asymptomatic (incidental) discoid meniscus



# Knee Issues

## The Bottom Line



- Consider further evaluation and referral to orthopedics for possible surgical intervention:
  - Acute Injury w/ Effusion: Infection? Trauma? ACL / PCL? Peds / adolescent –SH Fx?
  - New MJLT / LJLT (w/ mech symptoms and hx)
  - Instability
  - Unresponsive to conservative measures

# Before making that referral...

- Obtain appropriate x-rays.
- MRI if indicated. **(X-rays first)**
- Determine if this can be treated conservatively or may require arthroscopy / surgical intervention.
- **If in doubt...make the referral.**
- **Sooner is better than later for the patient.**



# Conclusion

- This presentation was just one approach to this arena.
- Different physicians will approach musculoskeletal injuries & disease differently, depending upon their own clinical experience, comfort, region, referral network, etc.
- We're all in this together...as a TEAM.  
We all bring different things to the table.



# Questions?





# Contact Information

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# Thank You



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