Meniscal Preservation

Save the Meniscus!

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Disclosures

- Arthrex Consultant

Objectives

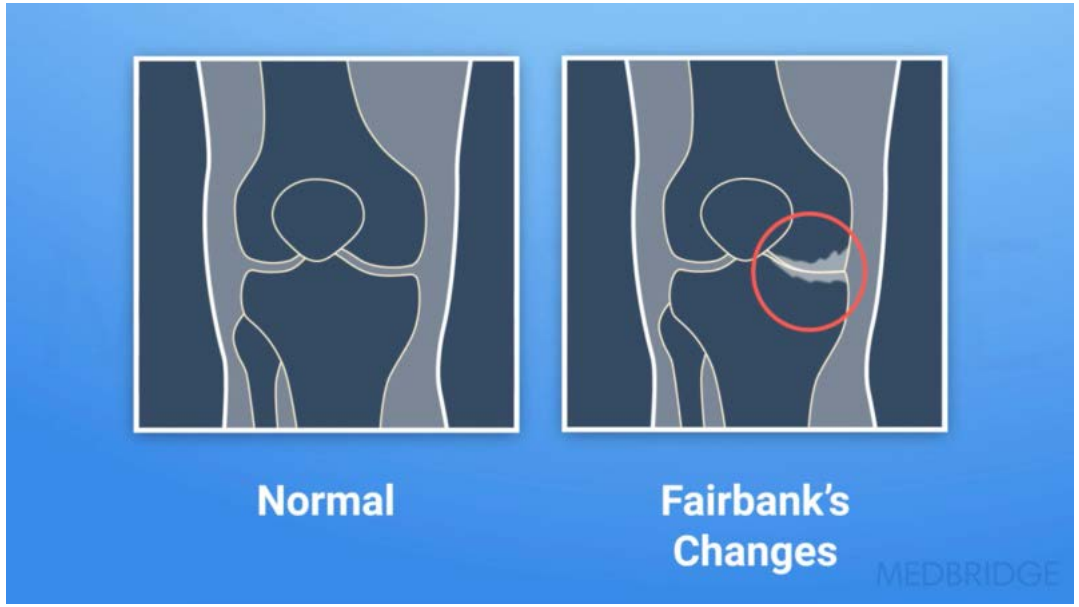
- Meniscal structure and function
- Meniscal repiar
- Indications/Contraindications of Meniscal Allograft Transplantation
- Outcomes of surgery

The Meniscus

- Bland-Sutton 1897
  - Vestigial tissue
  - “The functionless remnants of intra-articular leg muscles”
- Complete meniscectomies were common

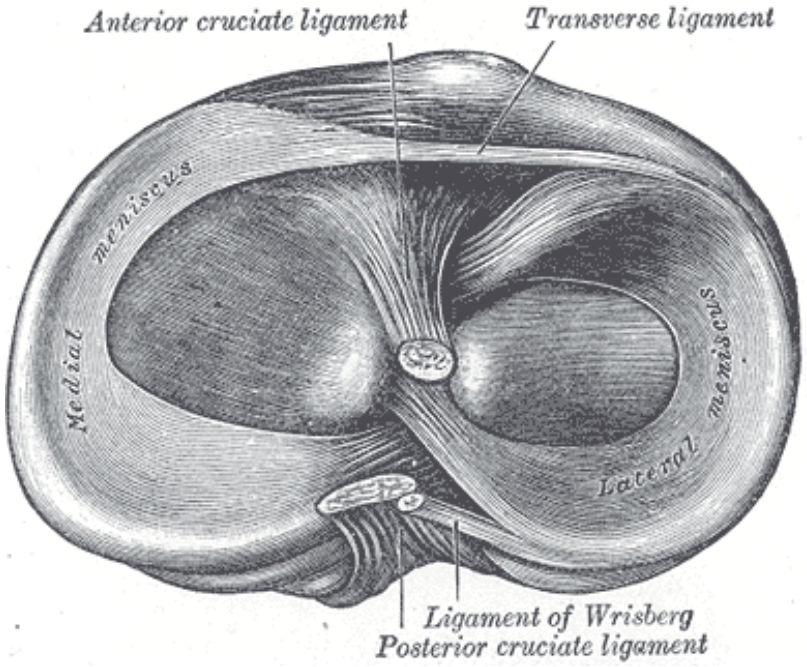
Natural History of Meniscus-Deficient Knee

- Fairbank in 1948 described the chondroprotective role of the meniscus
- Fairbank Changes
  - Formation of an anteroposterior ridge extending from the femoral condylar margin
  - Marginal flattening of the femoral articular surface
  - Joint space narrowing

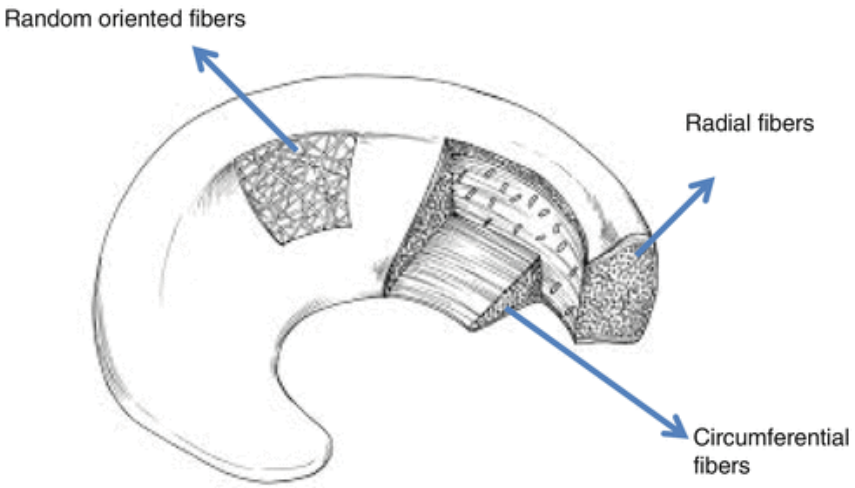


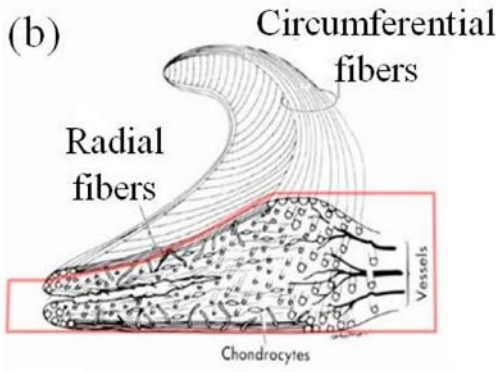
Meniscus Anatomy

- Medial
  - C-shaped
  - Covers 30% of medial plateau
- Lateral
  - Circular shaped
  - Covers 50% of the lateral plateau



Meniscus Anatomy

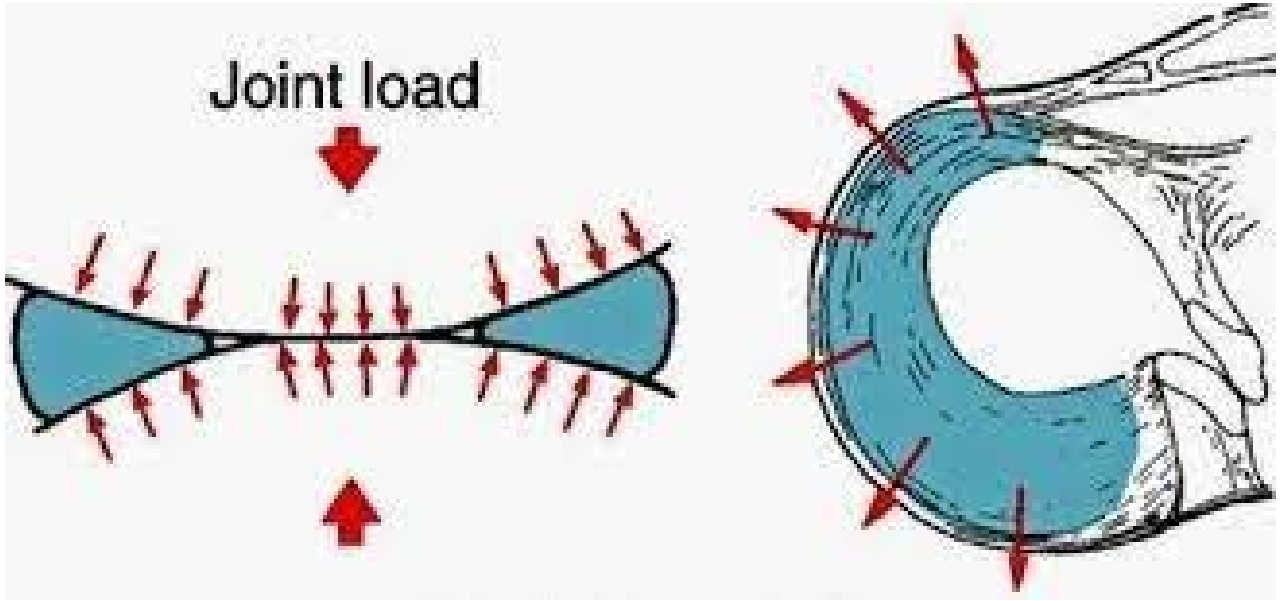


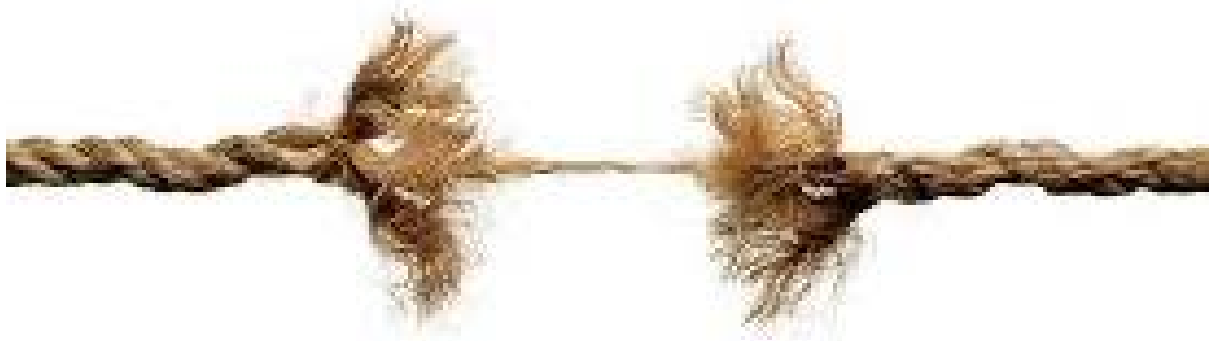


- Concave wedge shaped structure
- Collagen fibers
  - Primarily oriented in a circumferential manner
  - Radially oriented fibers function as ties

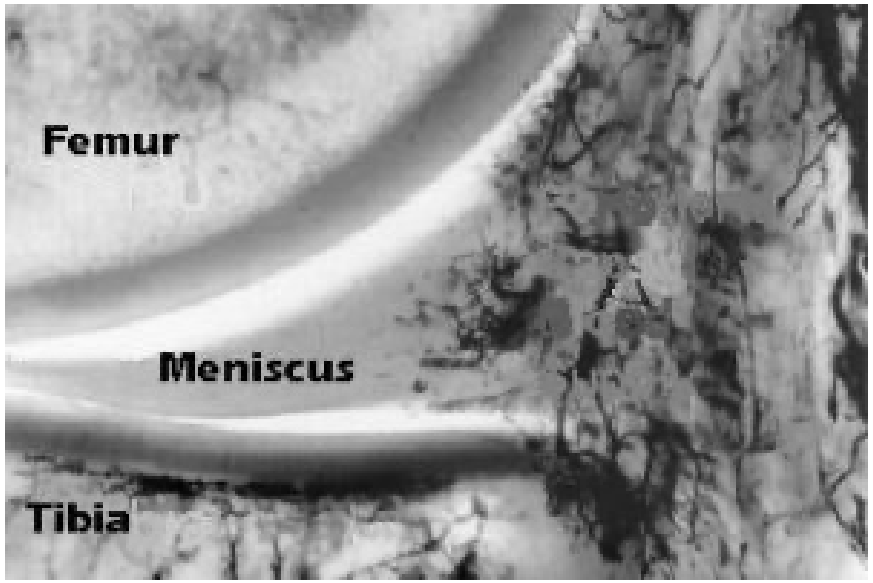
Hoop Stress

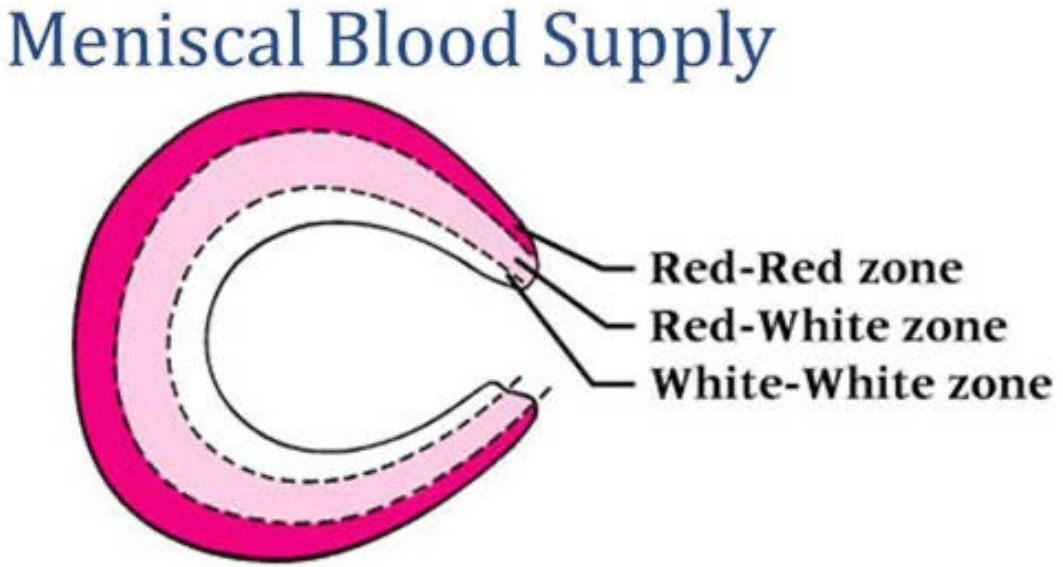
- Axial/compressive loads redistributed into tensile forces around its circumference
- Reduces contact stresses in the joint





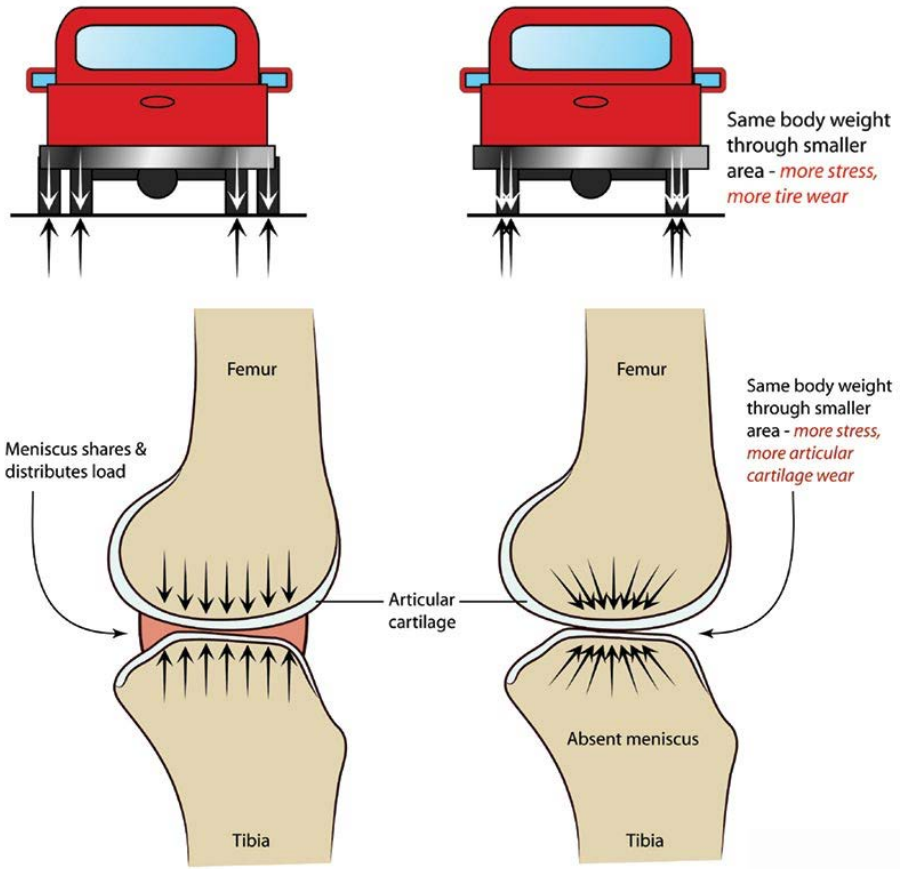
Meniscus Blood Supply



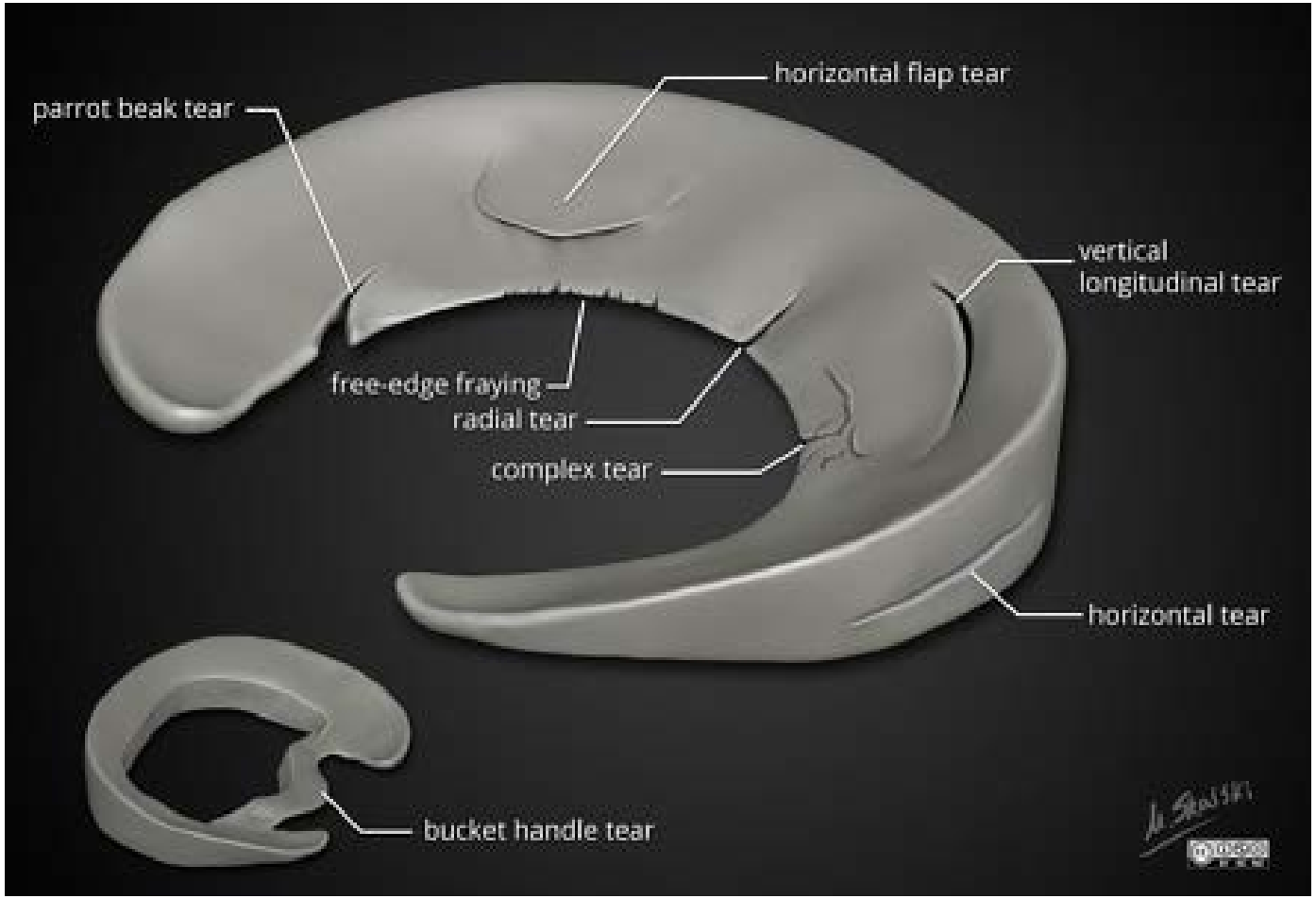


Meniscus Function

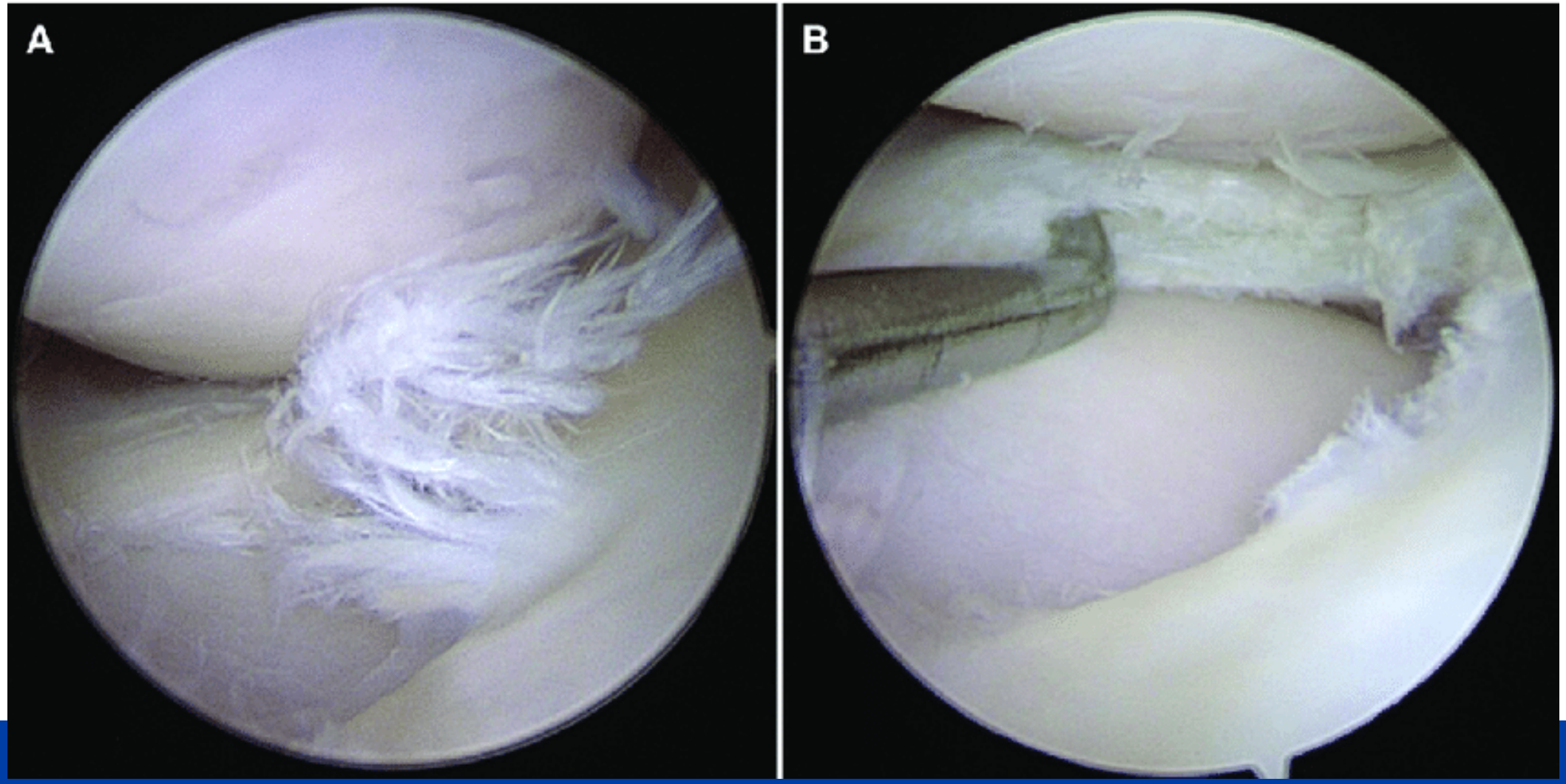
- Load bearing
- Shock absorption
- Joint stability
- Joint lubrication



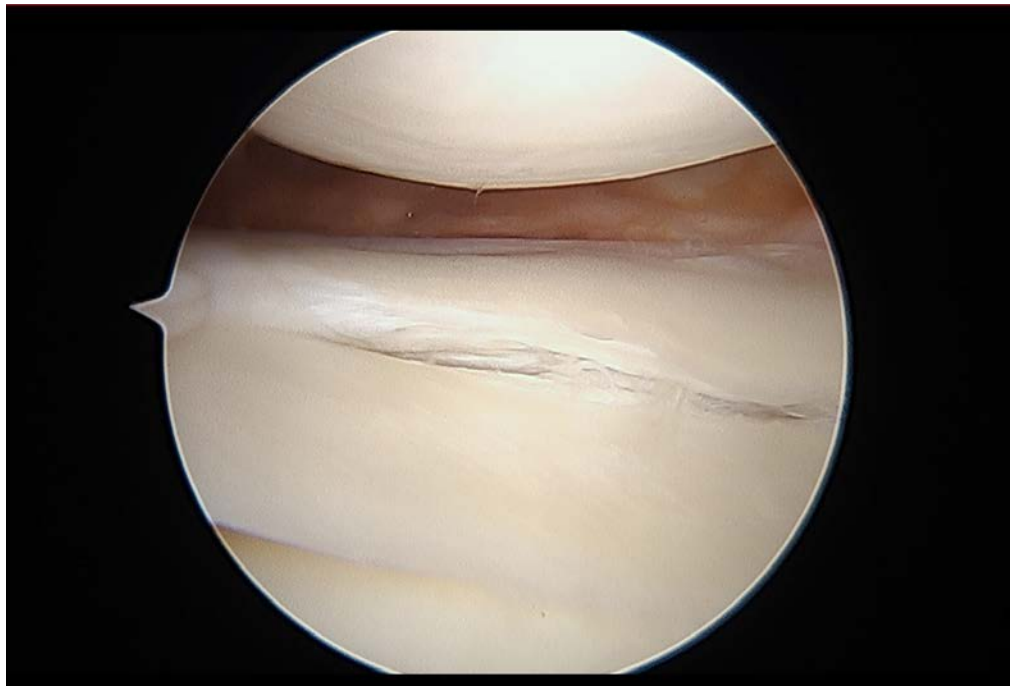
Types of Tears

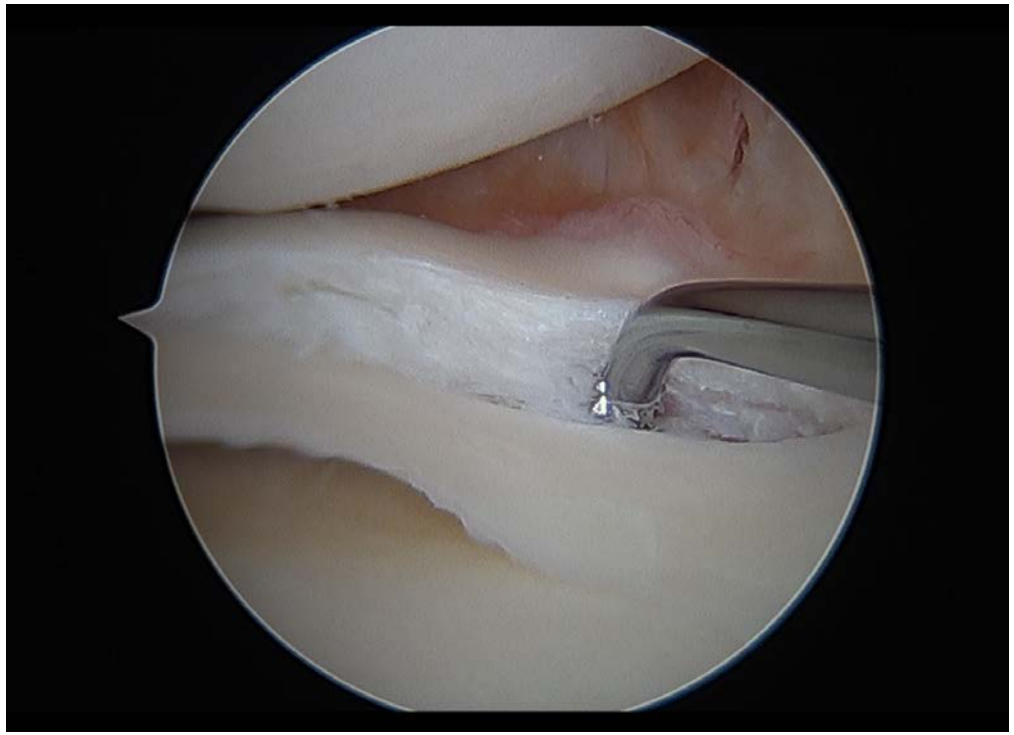


Complex Tear

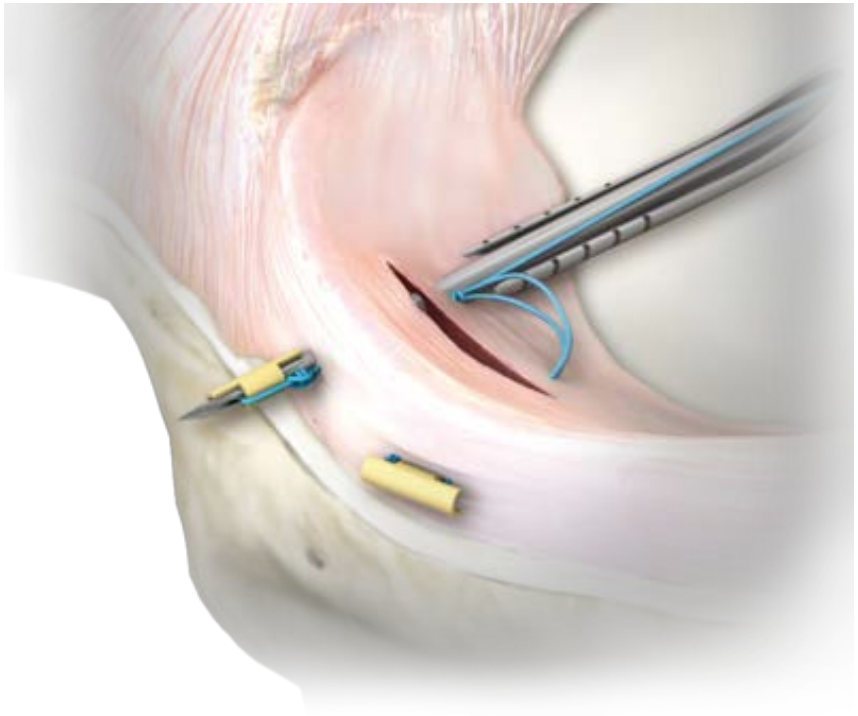


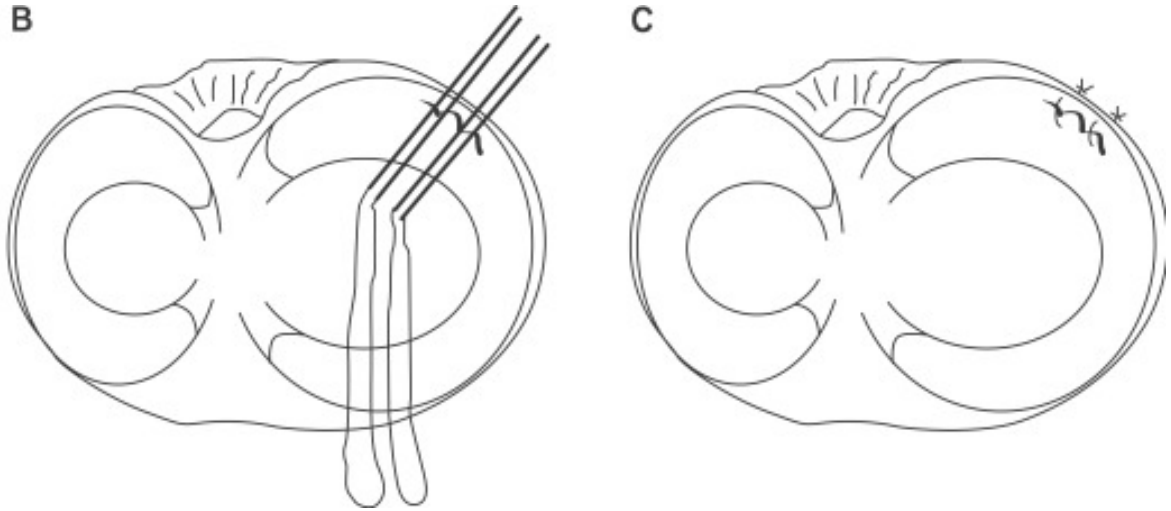
Vertical Tear





Meniscal Repair Techniques





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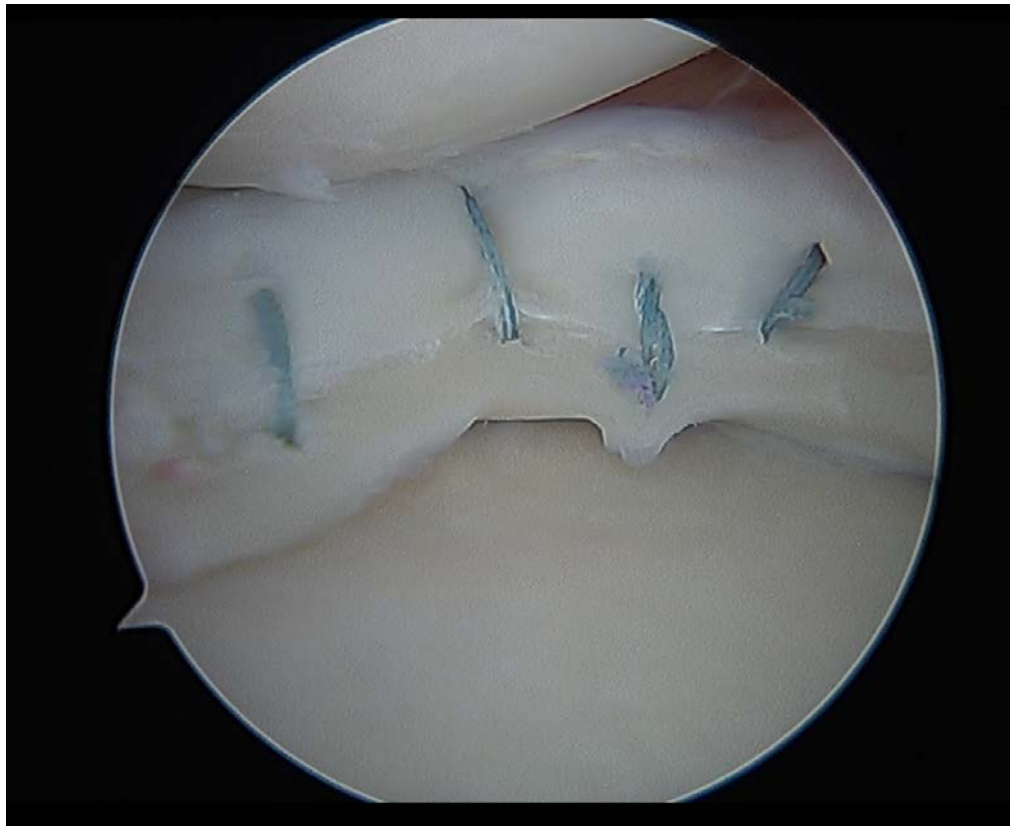
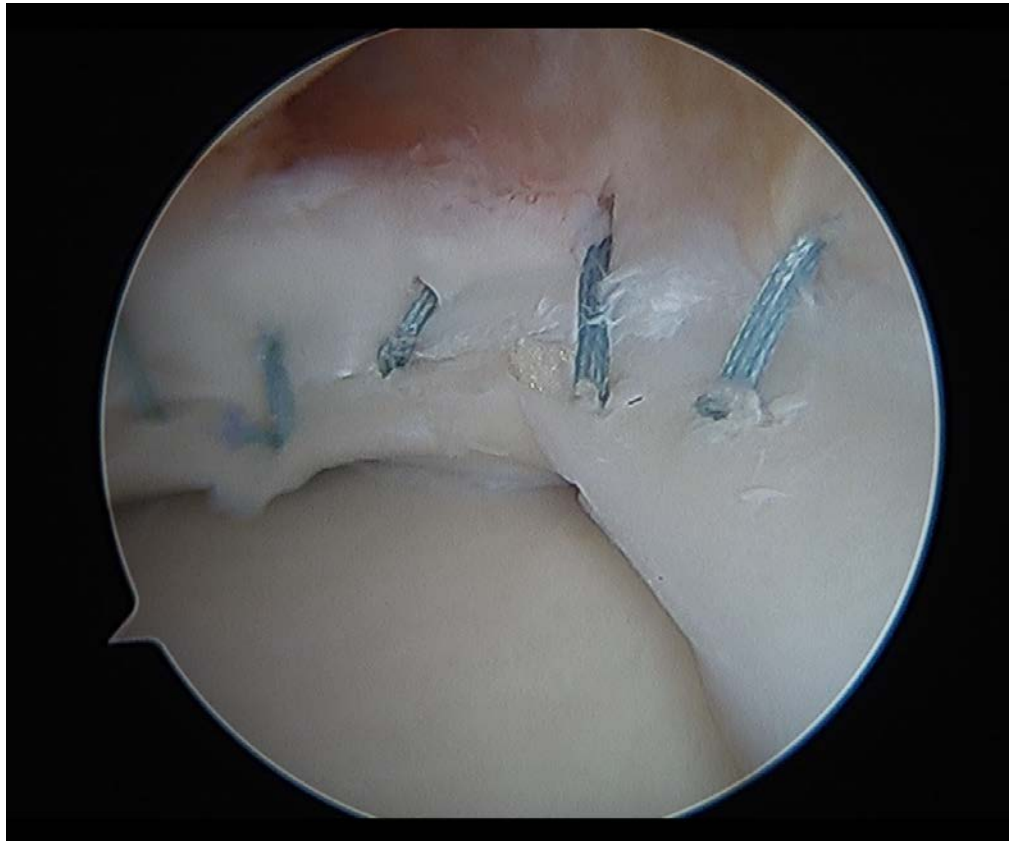
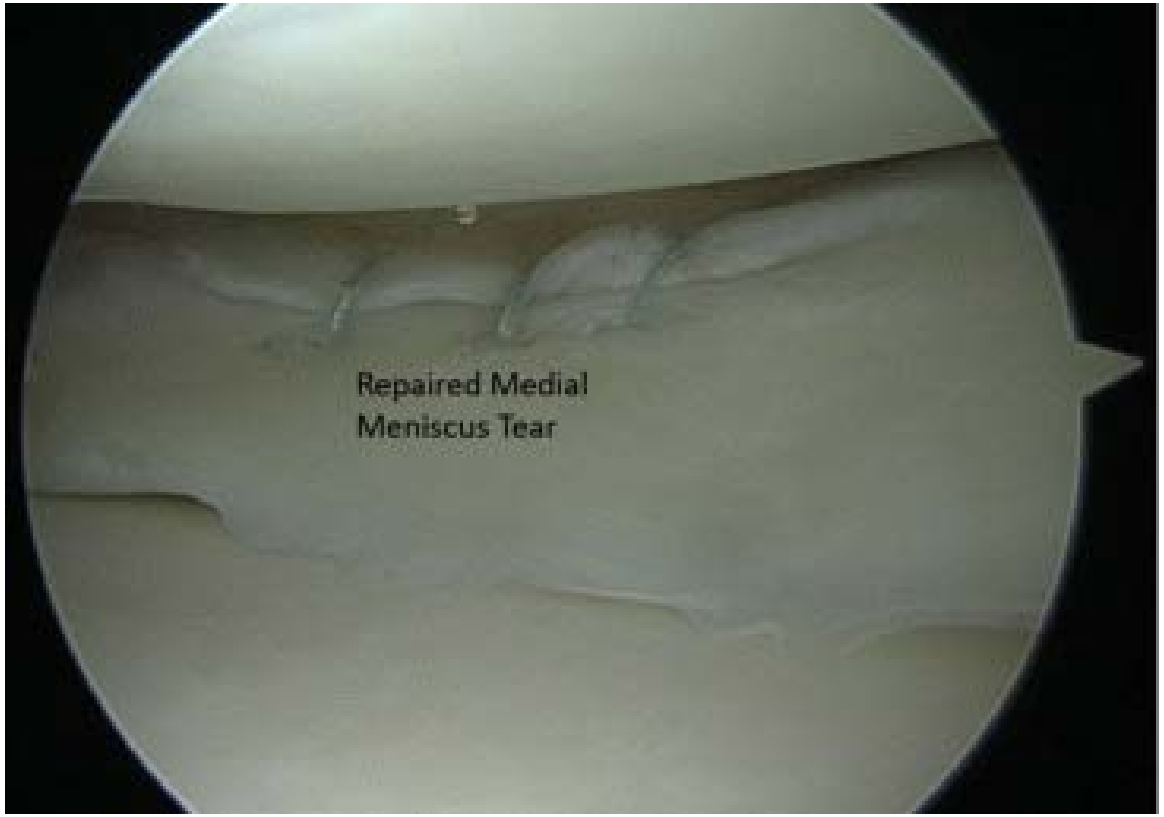




Meniscal Repair Outcomes

- Systematic Review
- 83% healing rate
  - 81% inside-out
  - 86% all-inside

Noyes et al. Arthroscopy 2014

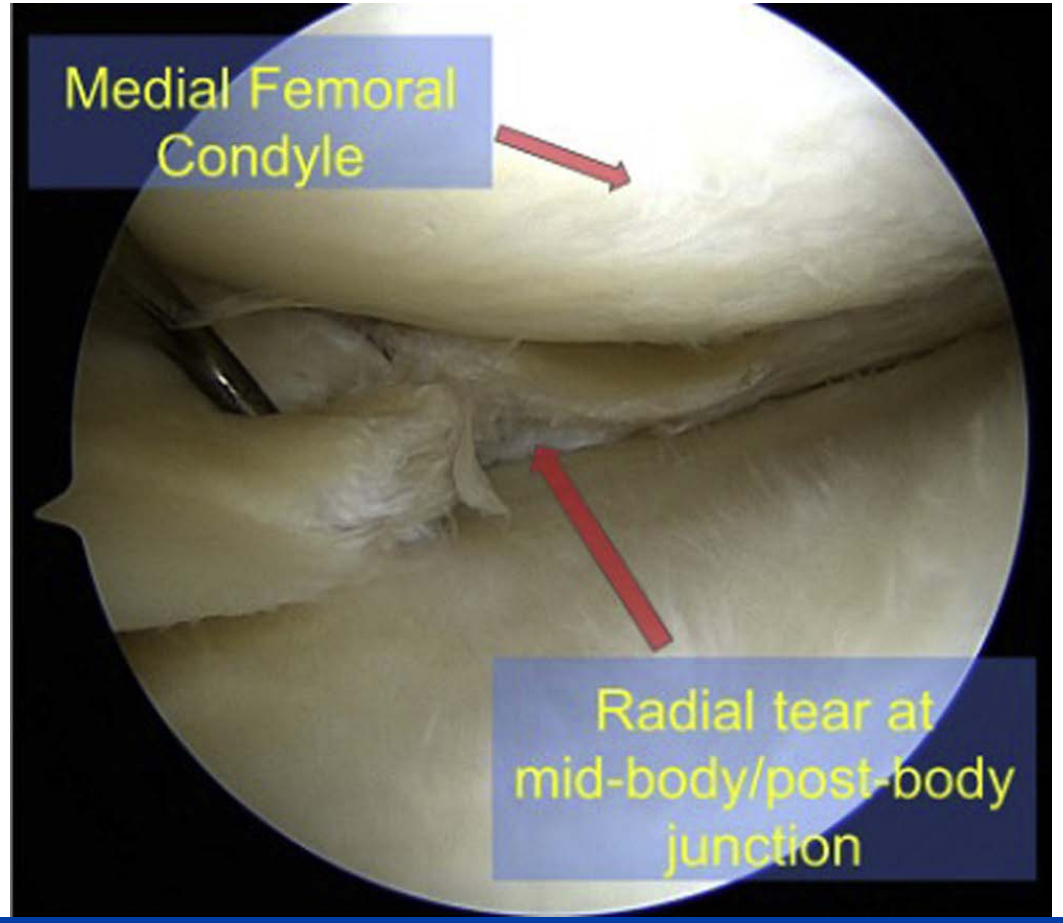


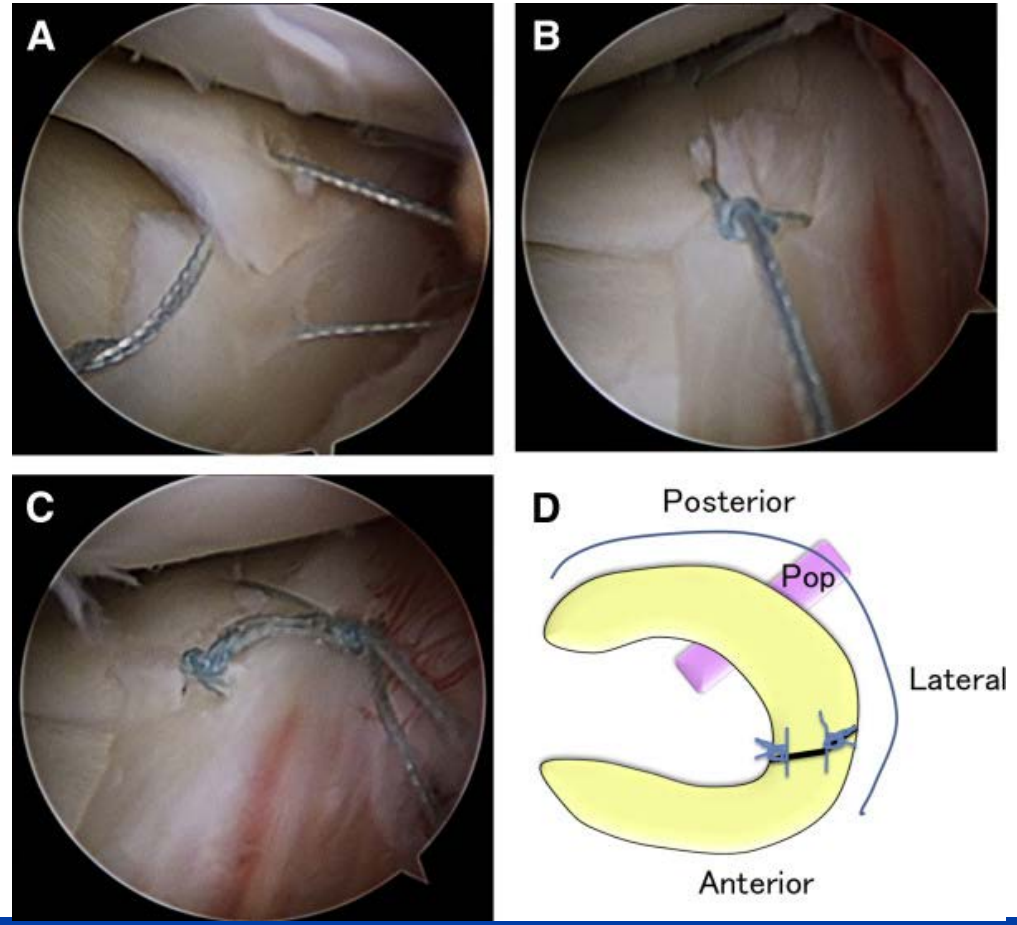
Meniscal Repair vs. Meniscectomy

- Systematic review
- Lower reoperation rate with meniscectomy (1.4% in short term vs 3.9% long term vs. meniscal repair (16.5% short and 20.7% long term)
- Higher healing rate when repair performed with ACL reconstruction
- Meniscal repair had improved PROs and lower progression of OA

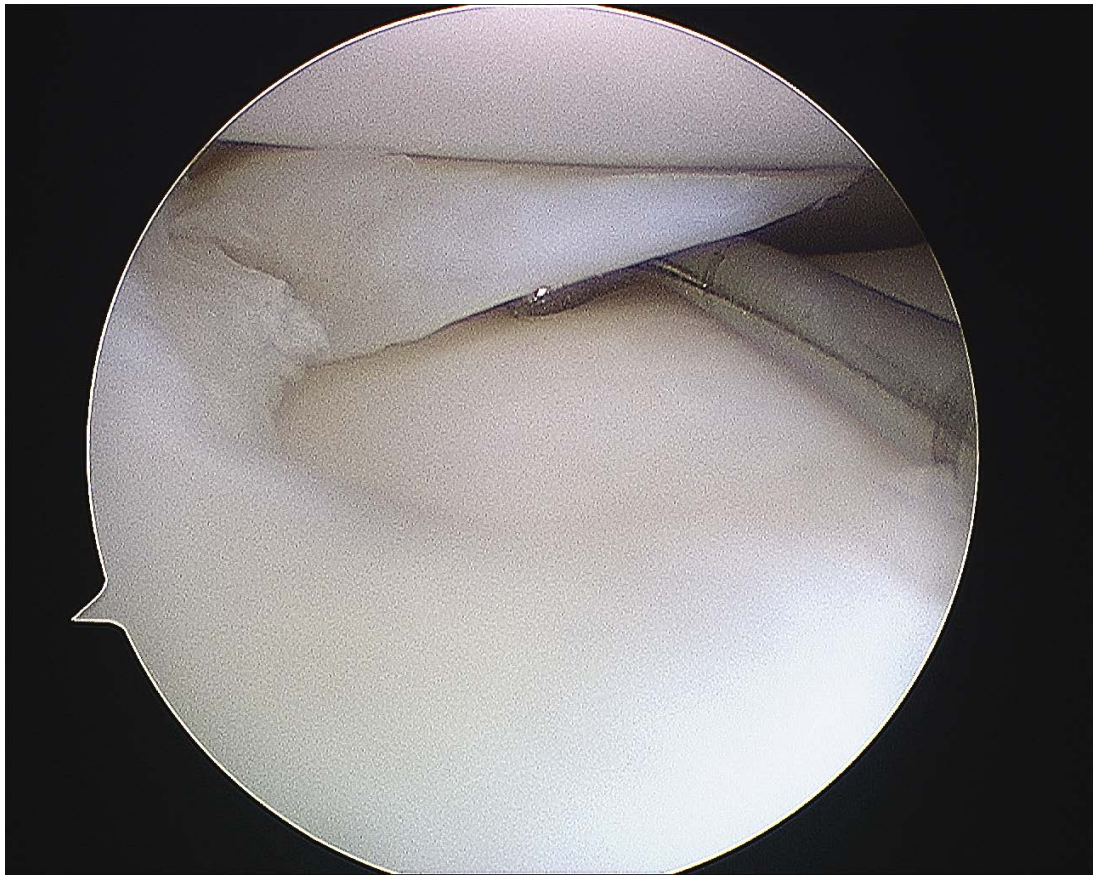
Brophy et al. Arthroscopy 2011

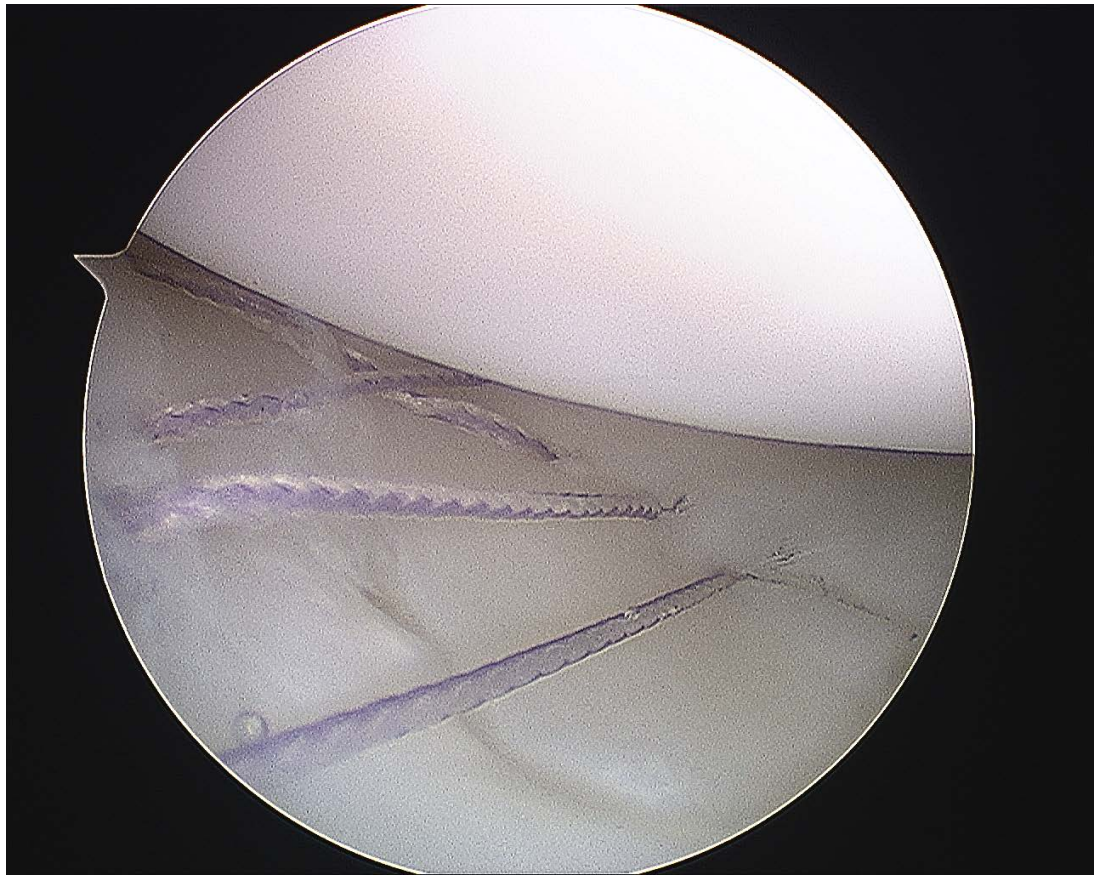
Radial Tear





Radial Tear





Repair of Radial Tear vs. Repair of Bucket Handle Tear

18 radial tear repair vs 18 bucket handle repairs

- 2 year follow up
  - 11.1% re-tear of radial repair
  - 5.6% re-tear of bucket handle tear

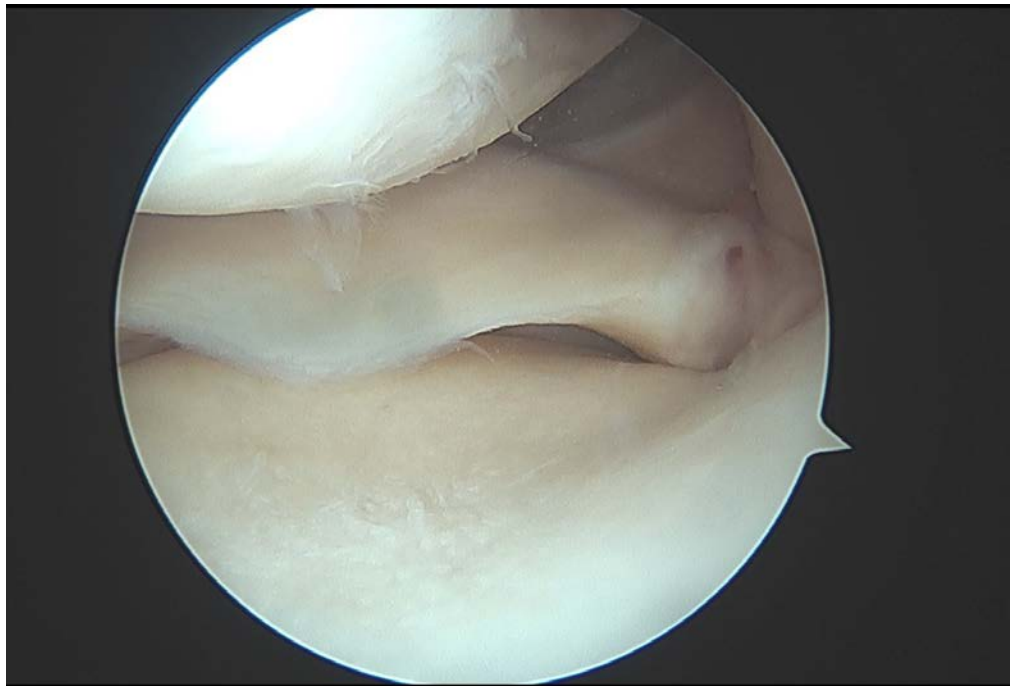
Wu et al. AJSM 2018

Radial Tear Repair

- Systematic review
- 243 radial tears in 241 patients
- Second-look arthroscopy or repeat MRI
  - 62% complete healing
  - 30% partial healing
  - 8% failure to heal

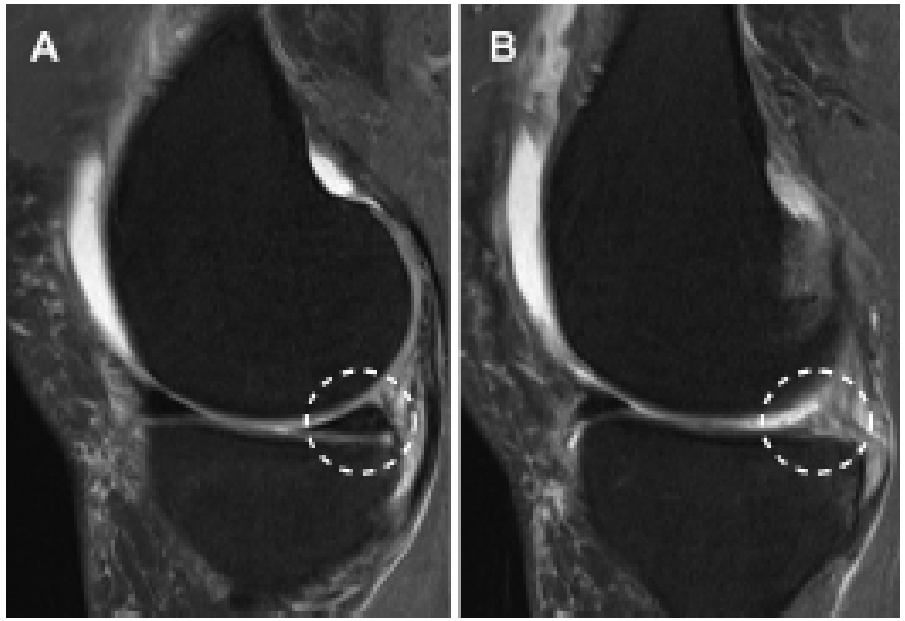
Milliron et al. Arthrosc Sport Med Rehab 2021

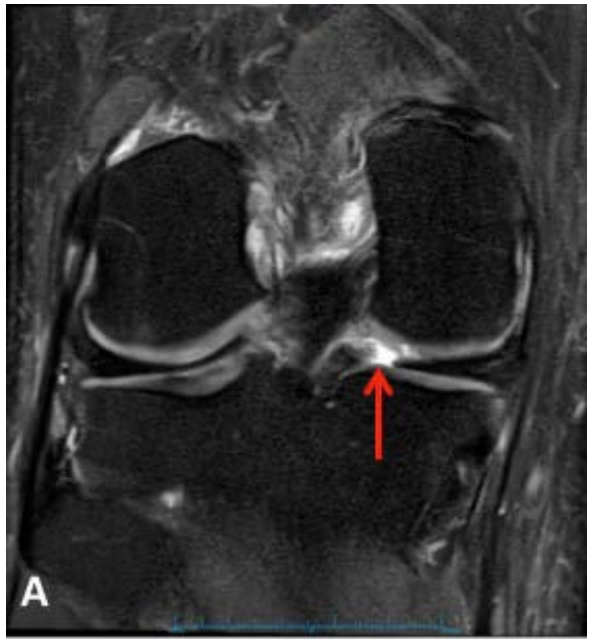
Meniscal Root Tear



- Loss of “hoop” stresses
- Increased peak tibiofemoral contact pressure
- Increase in tibiofemoral contact area
- Acceleration of degenerative changers

Meniscal Root Diagnosis





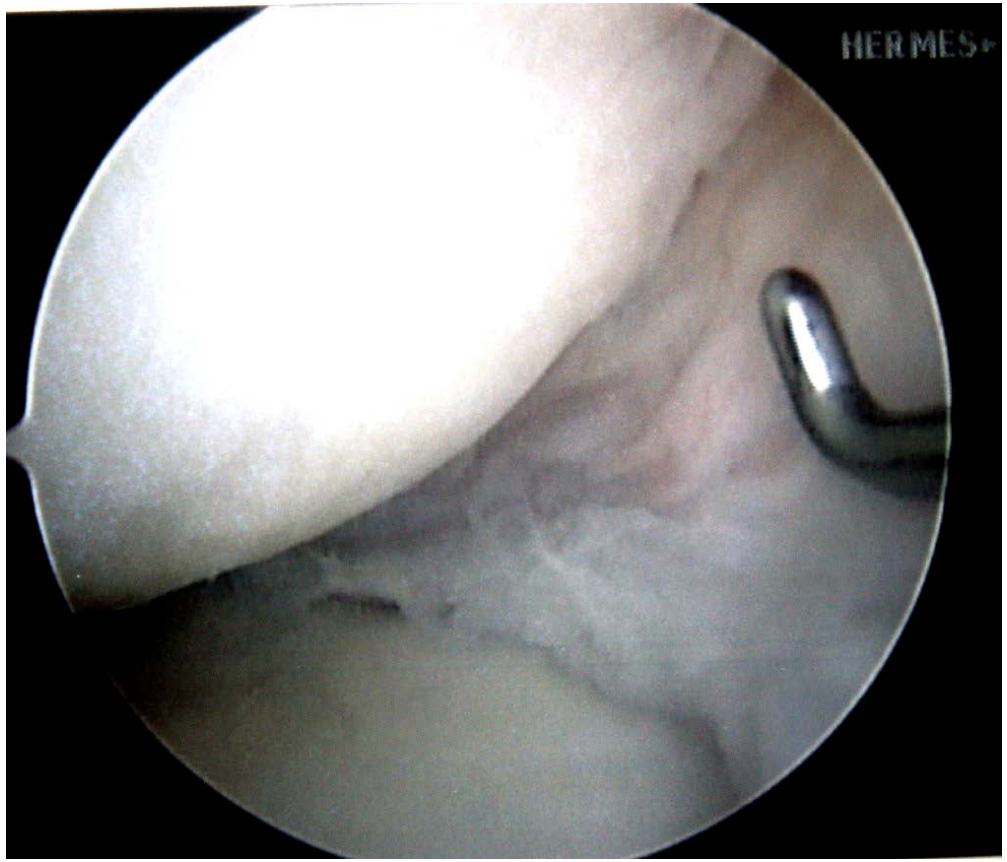
Meniscal Root Tear Repair

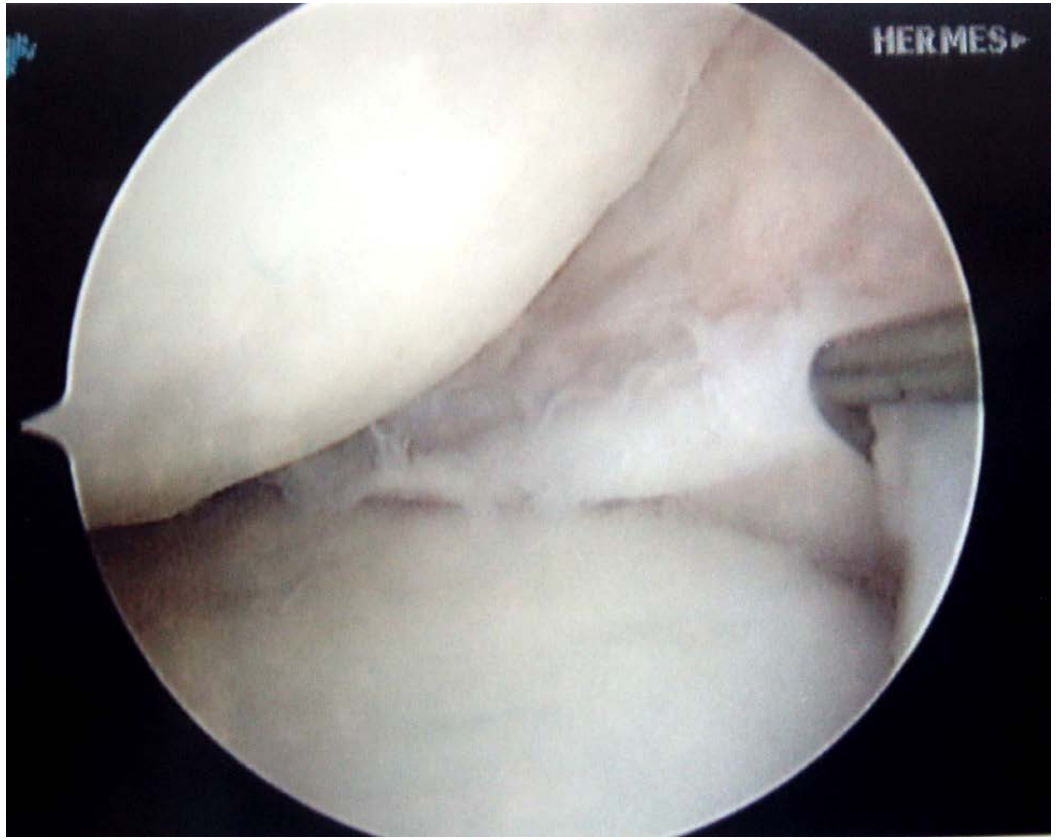
Meniscal Root Repair Outcomes

- 45 patients with medial meniscal root tear
  - 15 treated non-op
  - 15 treated with partial meniscectomy
  - 15 treated with meniscal root repair
- Progression to Arthroplasty at 74 months (6.2 years)
  - Non-op 4/15 (26.7%)
  - Meniscectomy 9/15 (60%)
  - Meniscal root repair 0/15 (0%)

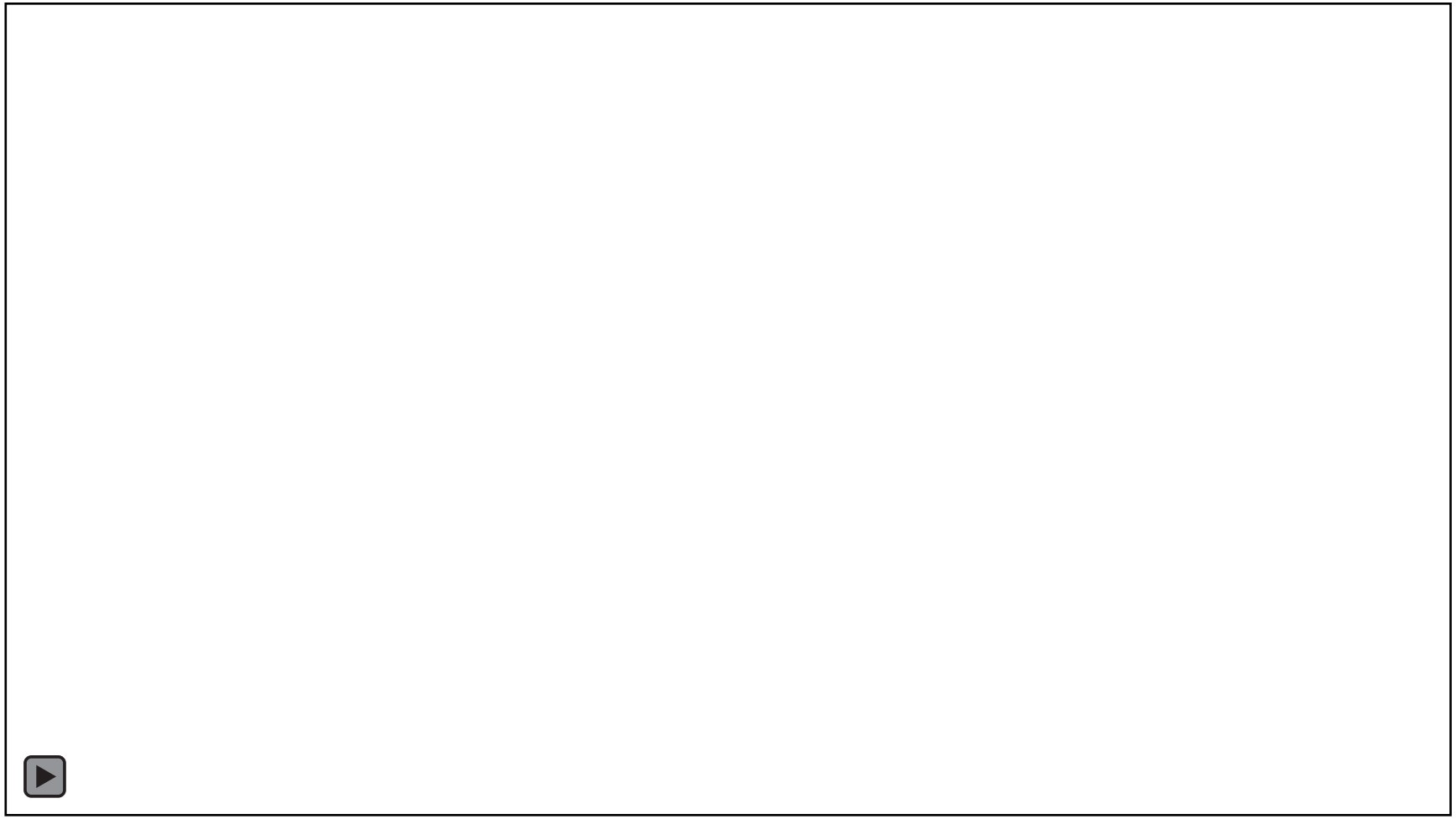
Krych et al. AJSM 2020

Total Meniscectomy



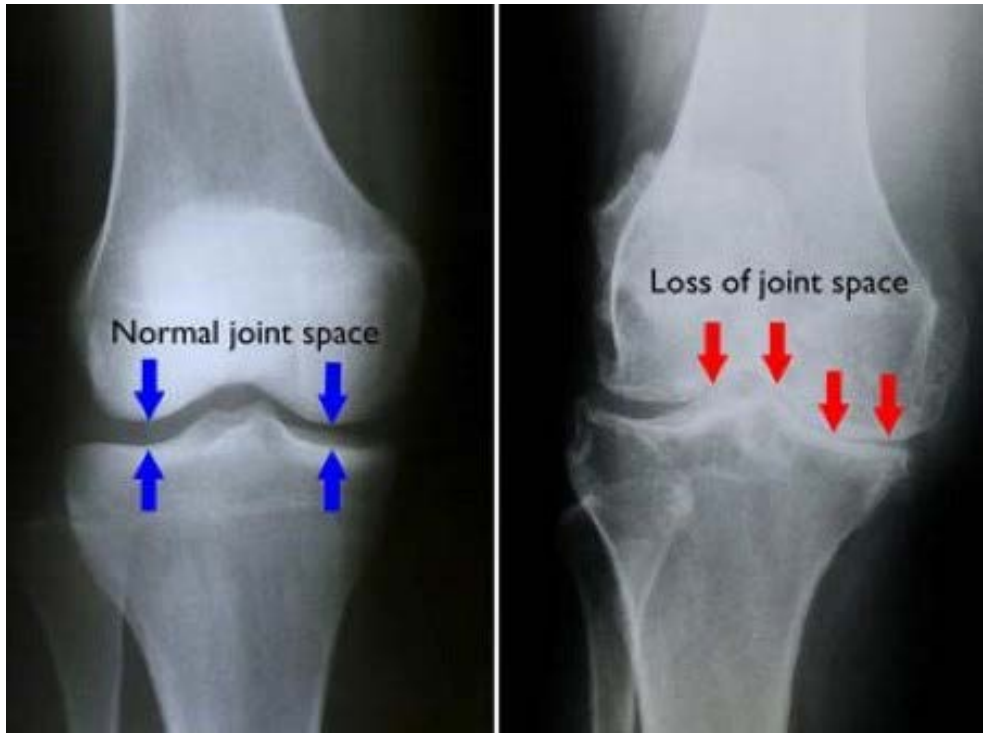


Total Meniscectomy



Natural History of Meniscus-Deficient Knee

- Partial meniscectomy
  - Less degenerative changes
  - Degree of degeneration directly related to amount of meniscus removed
- Total meniscectomy
  - Quick progression of cartilage loss
- Early radiographic findings of OA in 62% of patients with total vs 36% of patients with partial meniscectomy

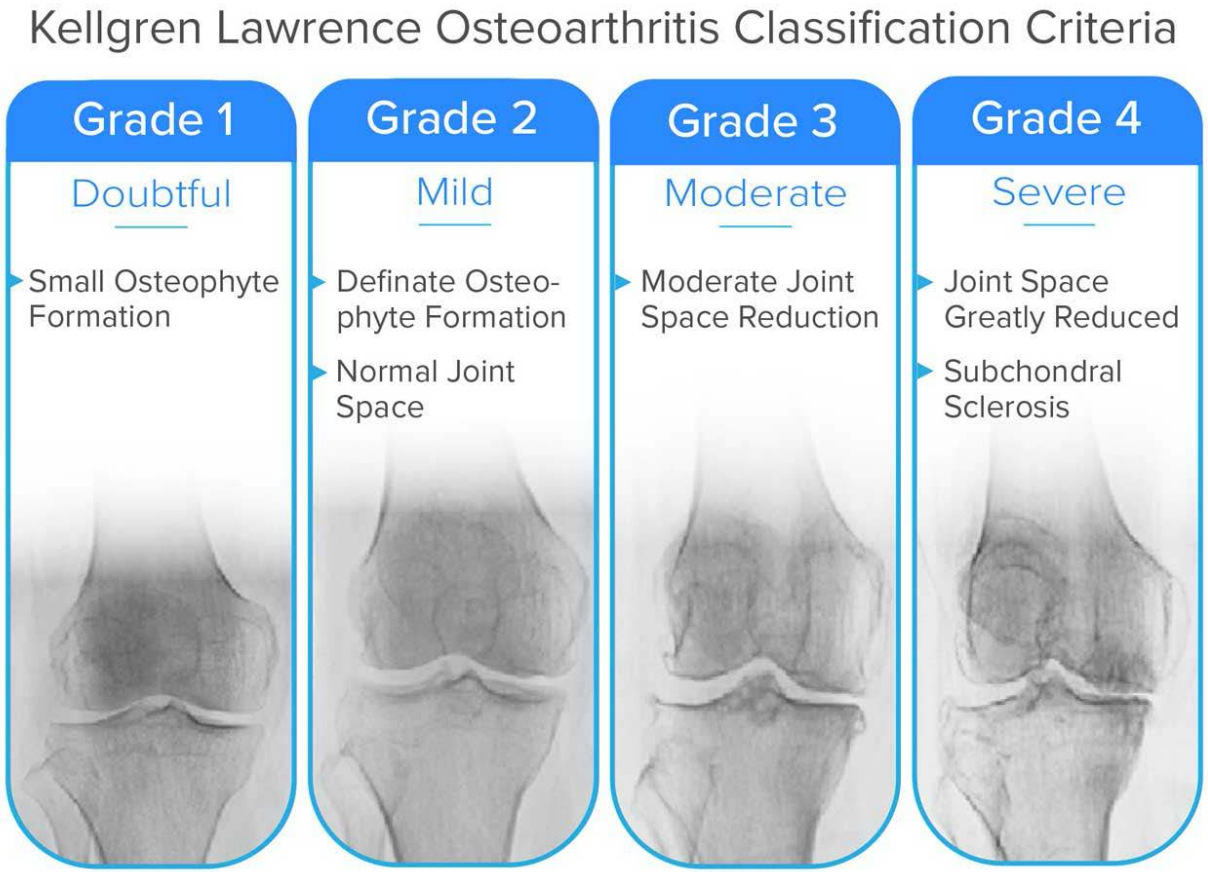


Meniscal Allograft Transplantation

Indications for Meniscal Transplant

- Less than 55 years old
- Meniscus deficient
- Unicompartmental pain at the joint line
- Functional limitations
- Pain is predominant symptom
- No significant OA (Kellgren-Lawrence grade 1-2)

Kellgren-Lawrence Grading System

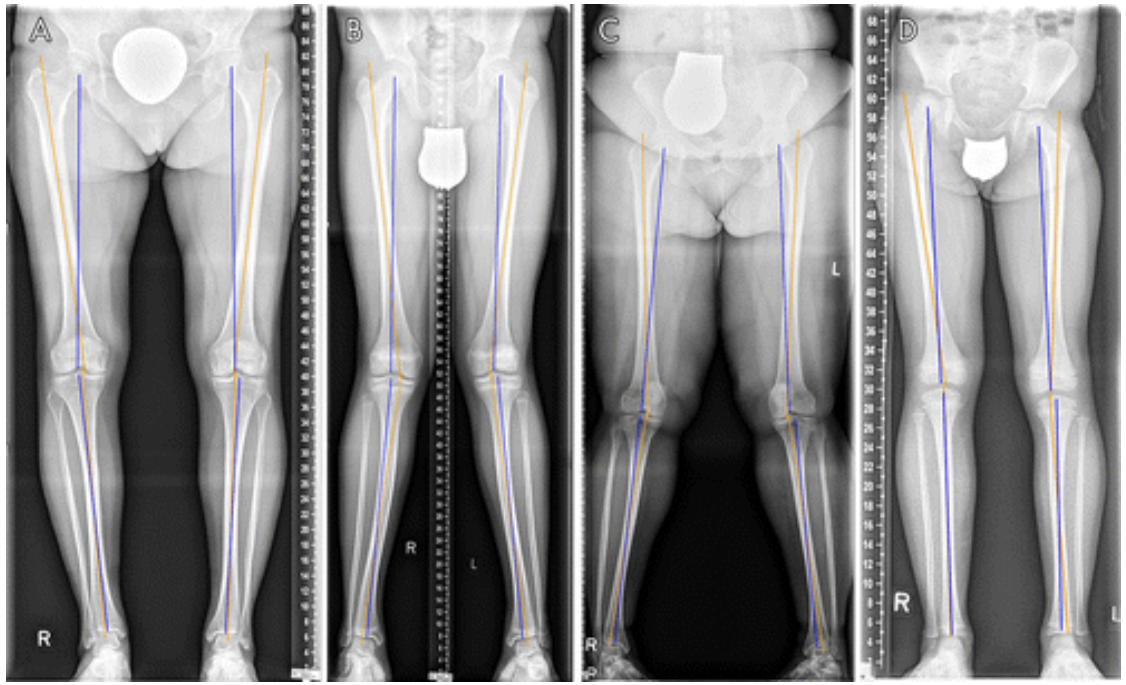


Contraindications to Meniscal Transplant

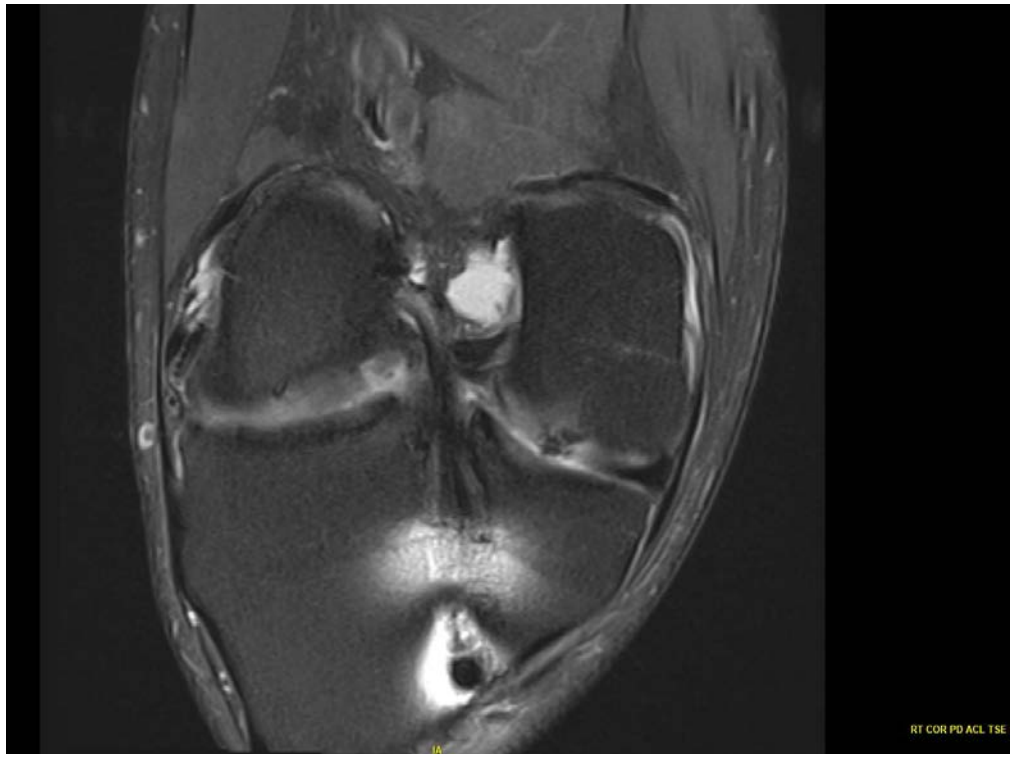
- Diffuse arthritic changes
- Inflammatory arthritis
- Synovial disease
- Skeletal immaturity
- Joint infection
- Marked obesity
- Asymptomatic patients

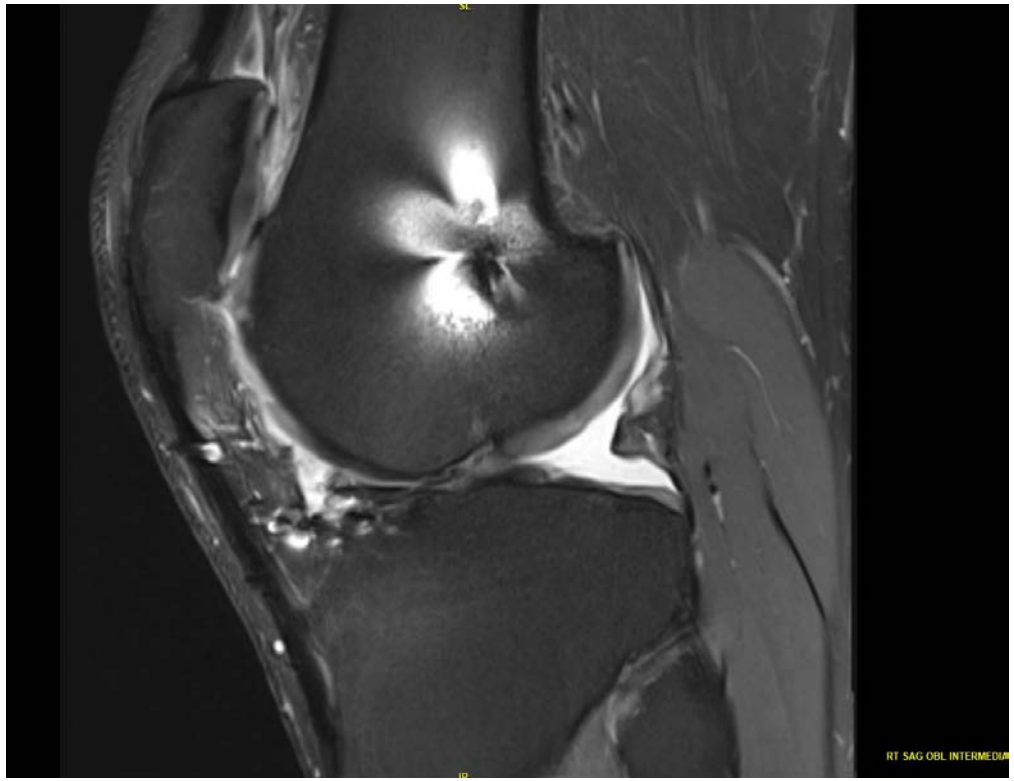
Work Up

- Standing plain imaging
- Long leg standing alignment films
- MRI
- Diagnostic arthroscopy

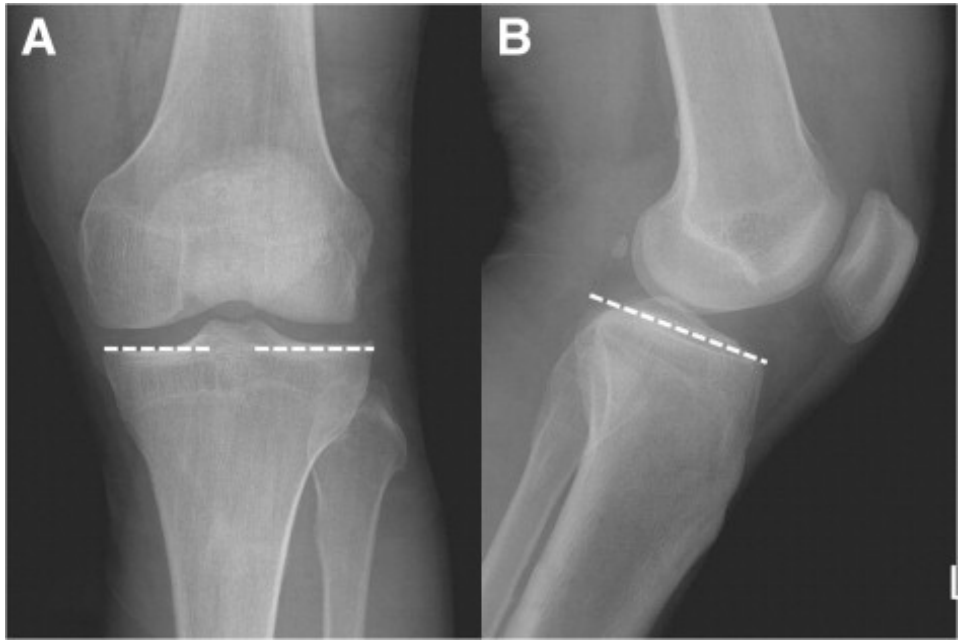


MRI

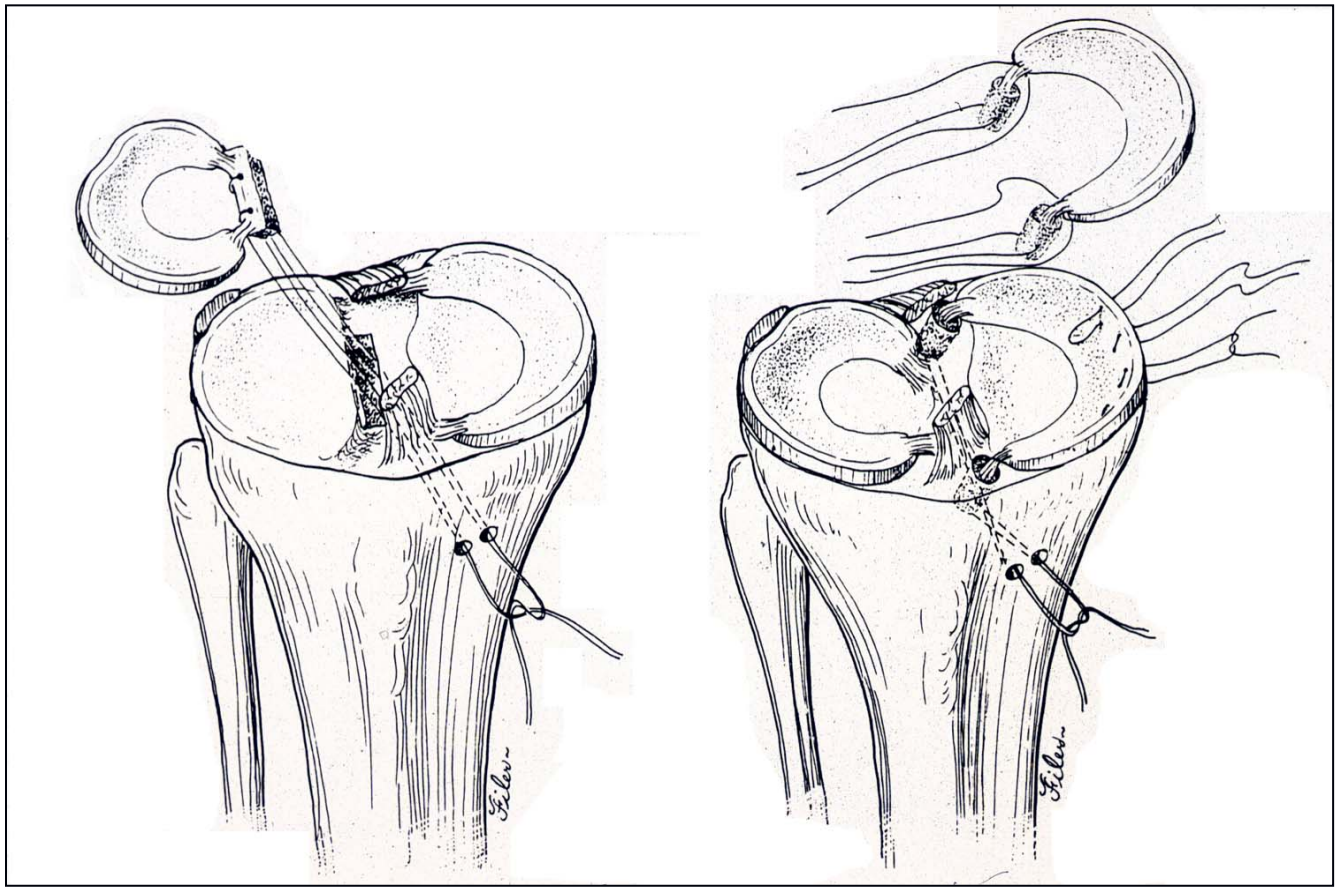




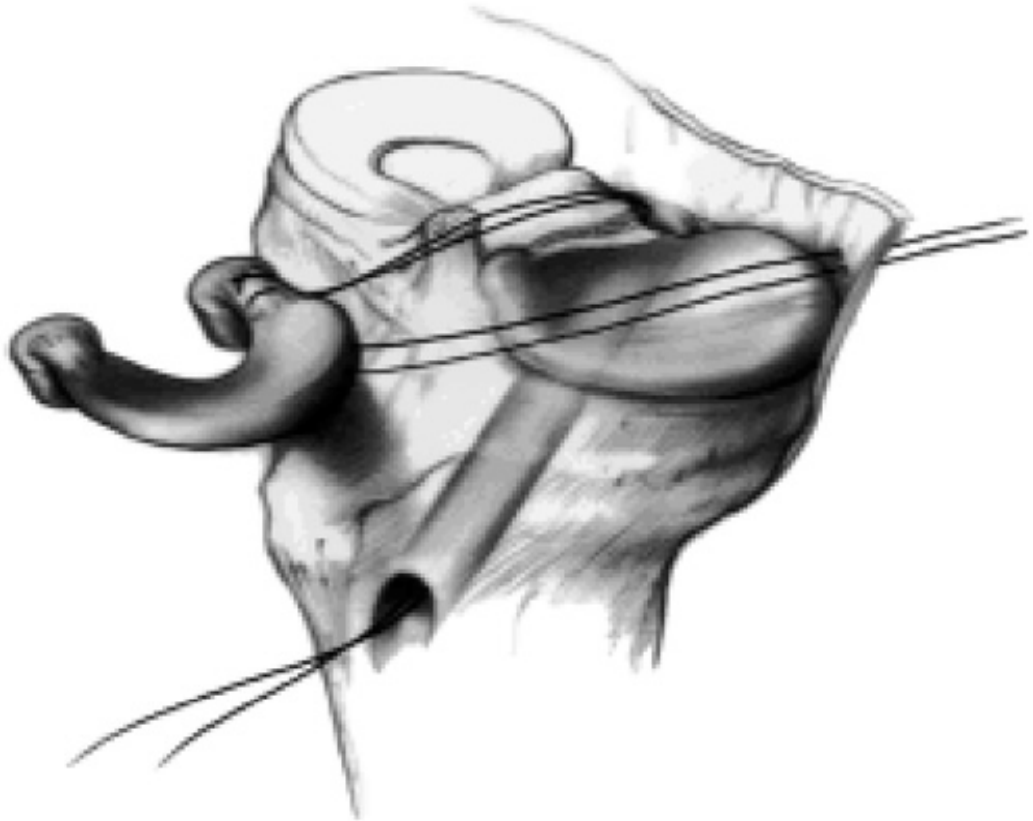
Graft Sizing

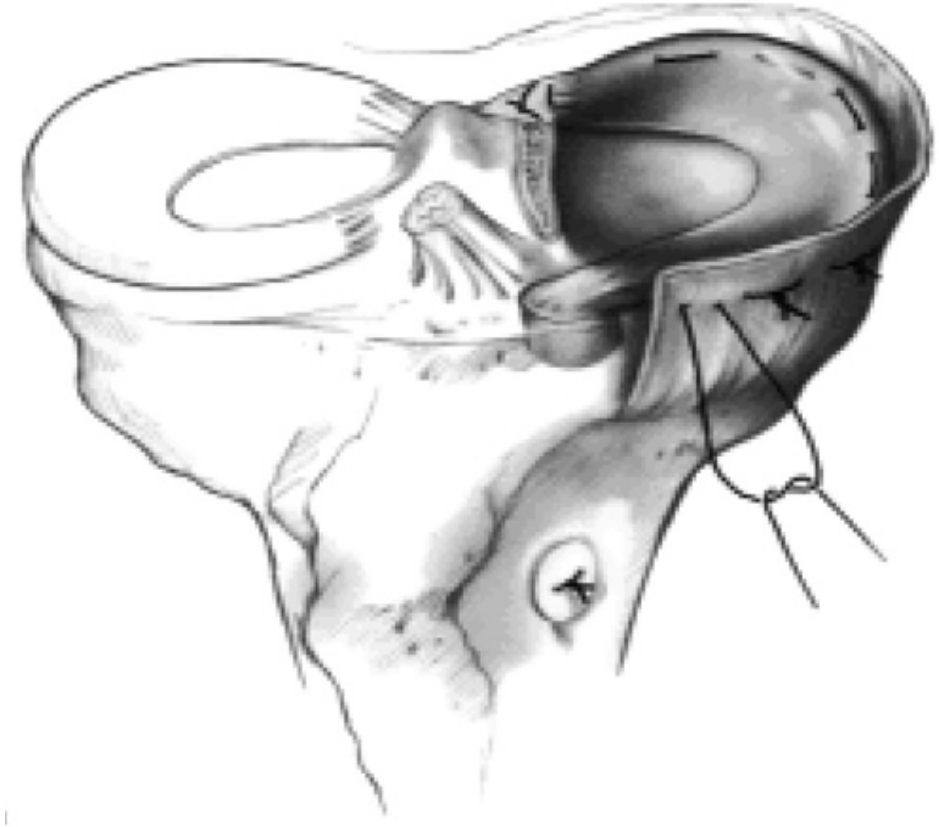


Surgical Technique

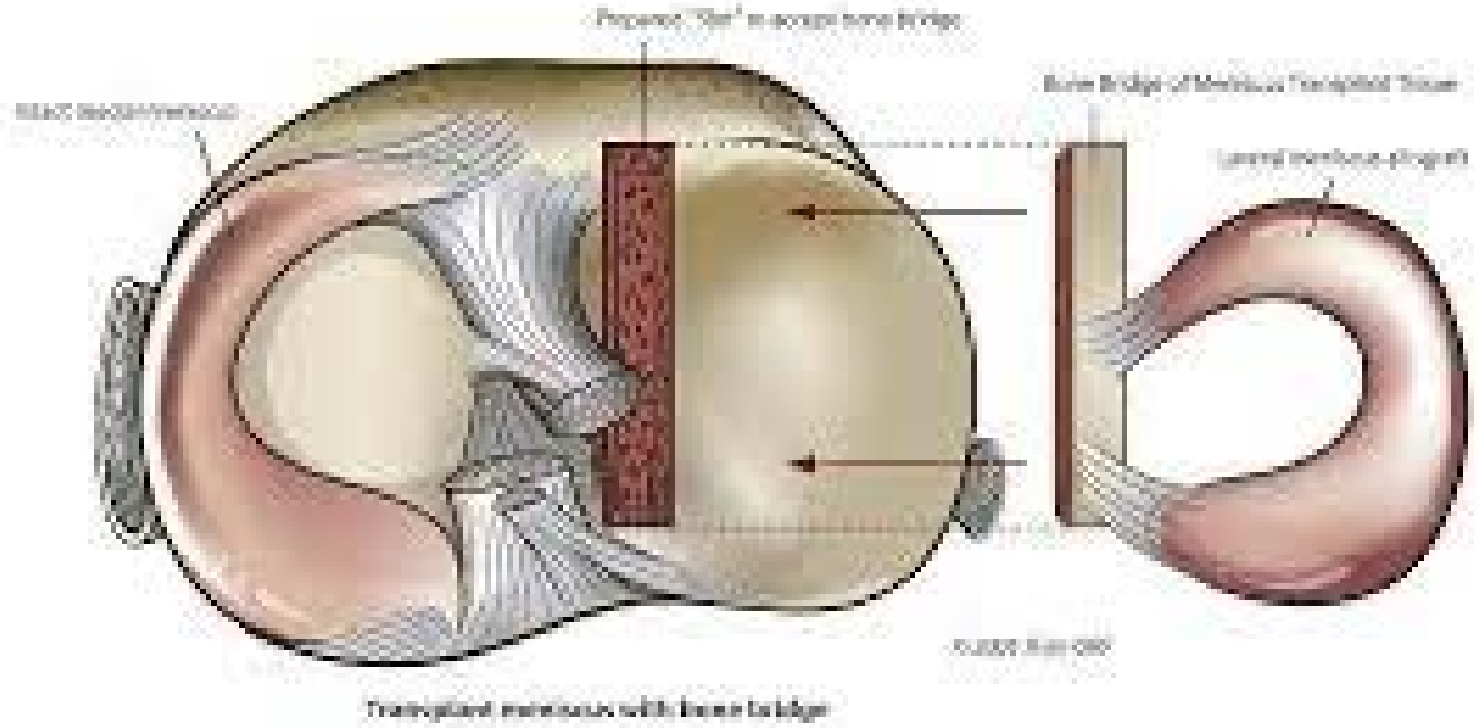


Medial Technique





Lateral Meniscus Technique



Results

- 172 consecutive MAT with 2-year follow-up
- 2-year survival rate 95%
- Patients without subsequent surgery, survival rate was 98%
- Patients with subsequent surgery, survival was 88%
- Failure rate (revision or conversion to TKA) was 4.7%

McCormick et al. AJSM 2014

Long Term Results

- Meta-analysis
- 73.5% survival at 10 years
- 60.3% at 15 years
- Mean time to failure for medial side 8.2 years
- Mean time to failure for lateral side 7.6 years
- Reoperation rate 32% (meniscal re-tear)

Cole et al. Arthroscopy 2020

MAT in the Young

- 32 patients aged 13-16
- Follow up of 7.2 years
- Significant improvement in PROs
- 6% reoperation rate
- No revision MAT or documented failures

Riboh et al. Arthroscopy 2016

MAT in Athletes

- 12 professional soccer players
- 92% returned to soccer at a mean of 10.5 months
- At 1-year, 67% playing at pre-injury levels
- 3-year follow-up, 75% playing professionally and 17% playing semi-professionally

Marcacci et al. AJSM 2014

MAT in Athletes

- 13 high-school level athletes
- 3.3 year follow-up
- 77% returned to pre-level play
- RTP at previous athletic level 16.5 months

Chalmers et al Arthroscopy 2013

Complications

- Reported at 10 to 50%
- Graft tearing is most common
  - 8.2-25% of patients develop tears
- Infection and immune reactions uncommon
- No reported cases of HIV
- Other
  - Loss of graft fixation
  - Hemarthrosis
  - Synovitis
  - Arthrofibrosis

Post-Operative Rehab

- 50% weight bearing and brace for 6 weeks
- Flexion limited to 90 degrees for 4 weeks
- Rehab therapy protocol similar to meniscal repair

Conclusions

- Save the meniscus at all costs
- MAT is a viable option in the right patient
- Outcomes are generally good
- Return to sport is possible
- Last ditch effort

Questions?