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MENISCAL TEARS

Kyle Schultz, DO/MBA

OBJECTIVES

- Meniscus function and anatomy
- Types of meniscal tears
- Treatment options
- Exposure to new techniques

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DISCLOSURES

- None

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INTRODUCTION

- Meniscal tears are the most common soft tissue injury of the knee
  - Up to 750,000 arthroscopies per year in the US
- Significant burden on not only the patient but the health care system as well
- Traumatic and degenerative tears
- Acute disfunction with long term degenerative consequences
- Identifying appropriate operative and non-operative care to promote short term recovery and limit long term consequences

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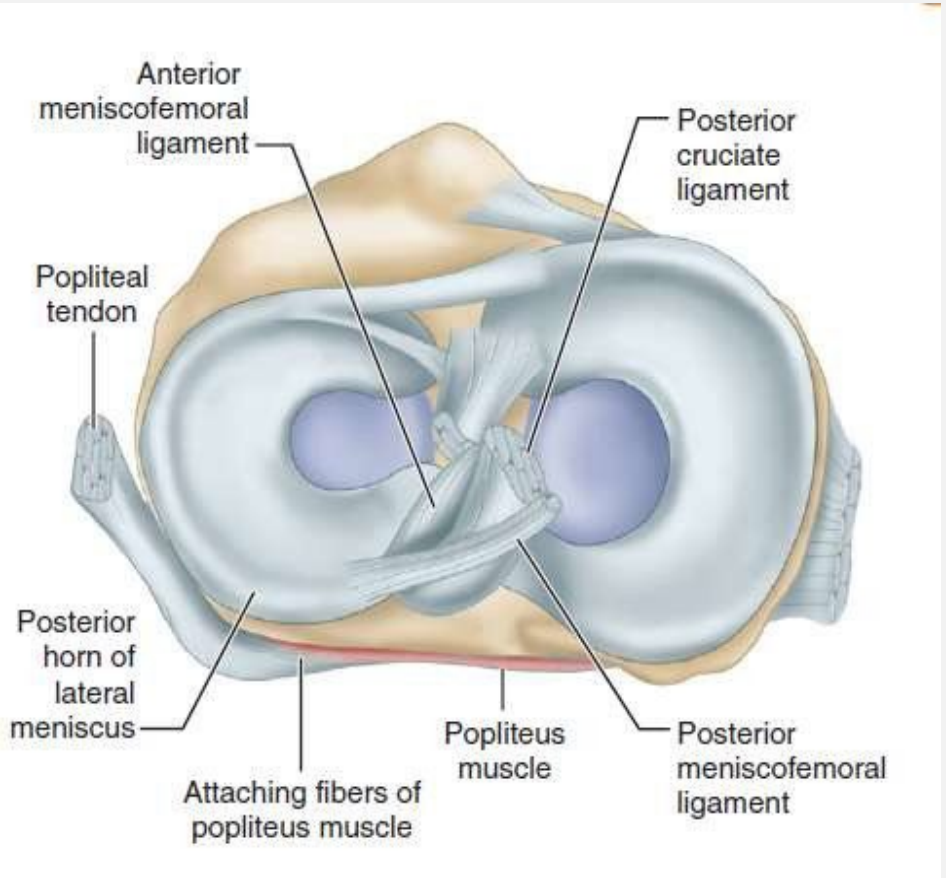
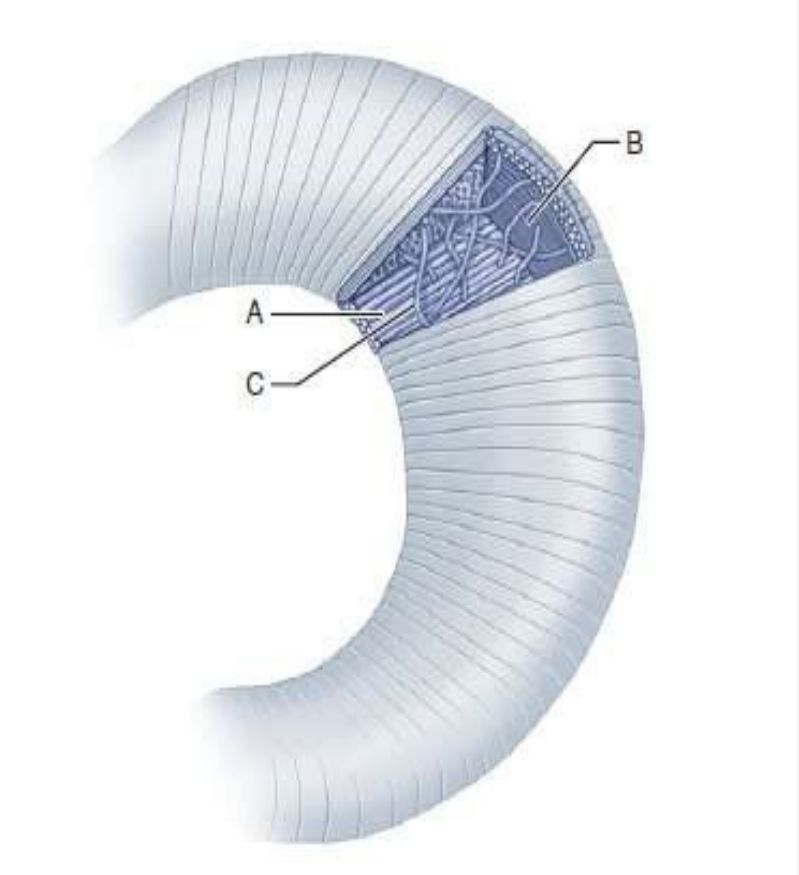
ANATOMY

- Fibrocartilage
- Medial meniscus
- Lateral meniscus
- Microscopy





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ANATOMY

- Blood supply
  - Birth
  - Adulthood
- Tear location
- Tear type

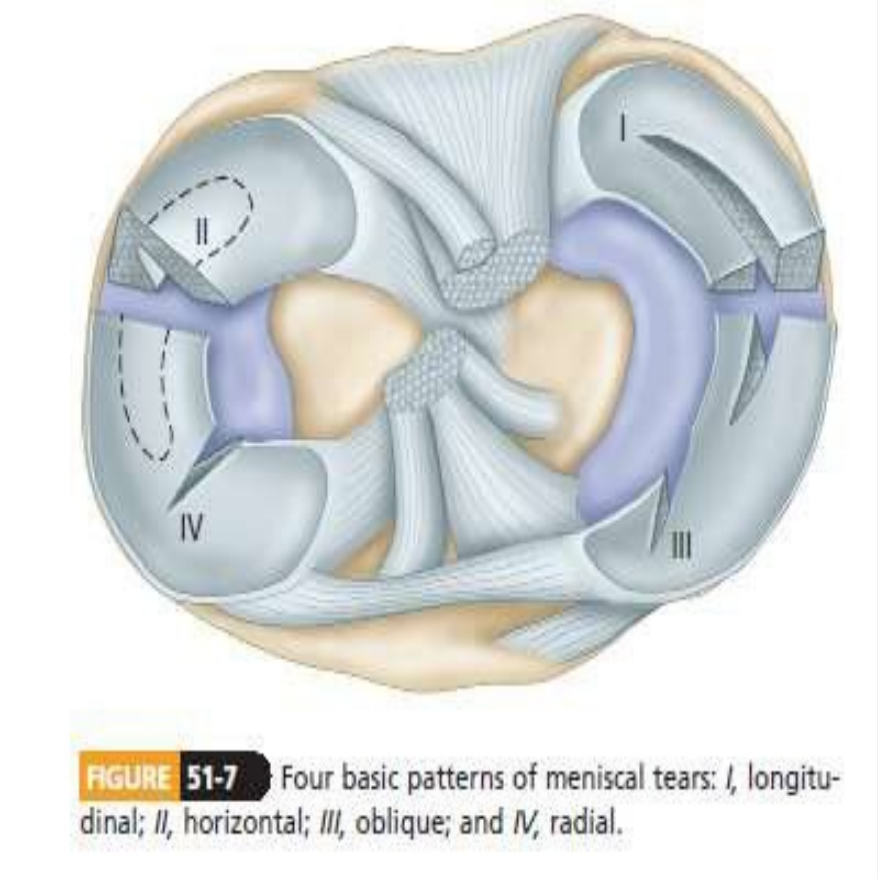
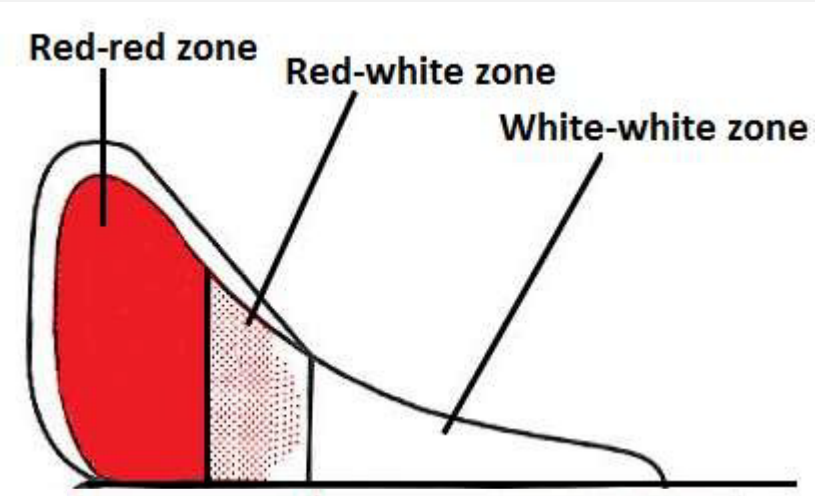
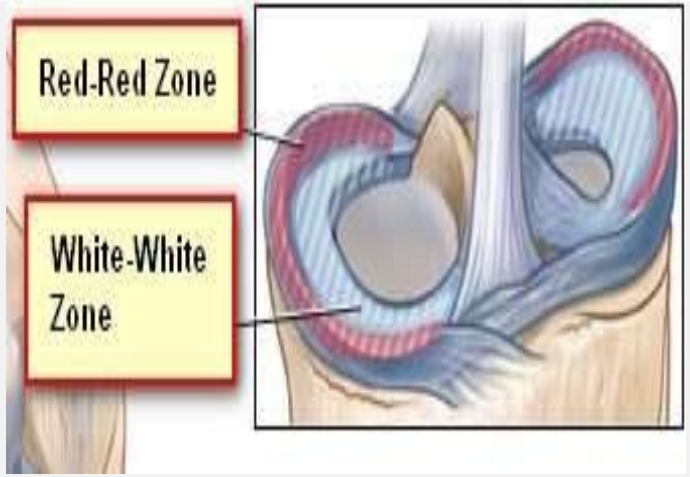


FIGURE 51-7 Four basic patterns of meniscal tears: *I*, longitudinal; *II*, horizontal; *III*, oblique; and *IV*, radial.





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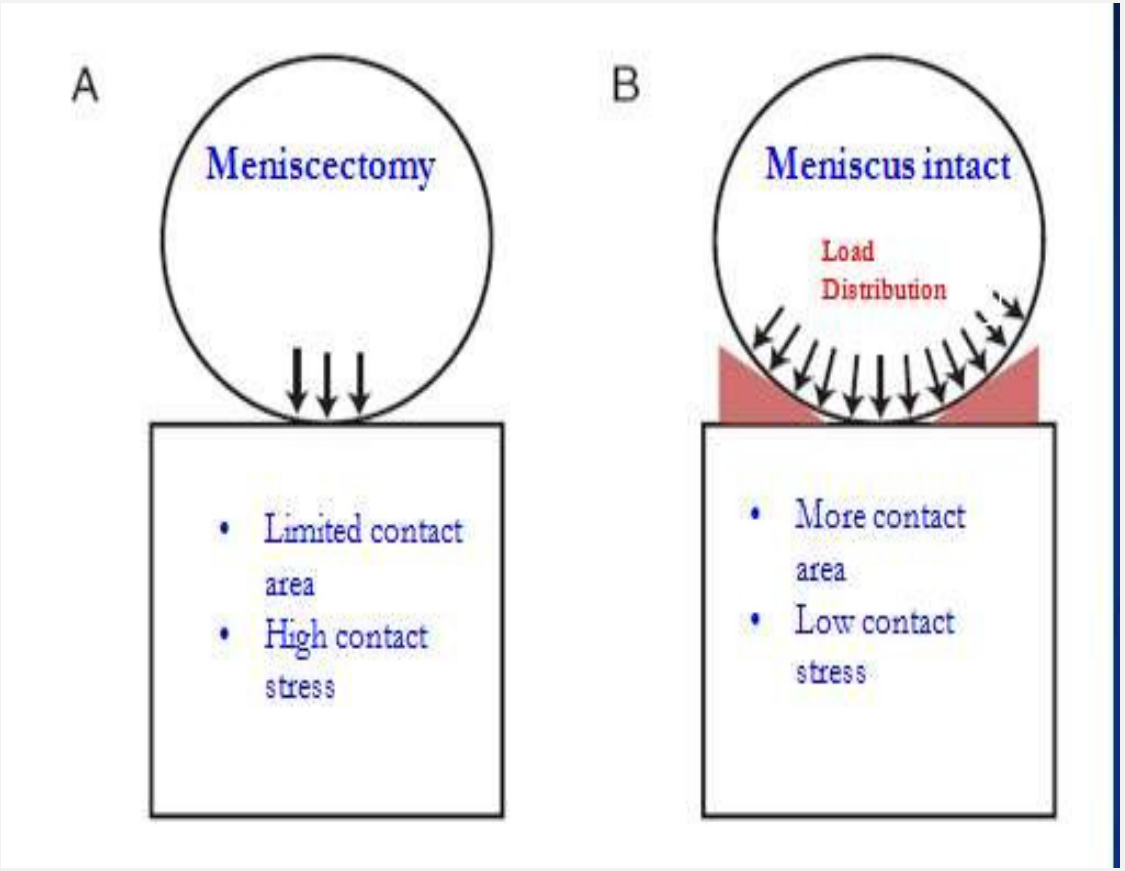
FUNCTION

- Share the load
- Improves congruity of articulation between femur and tibia
- Prevent impingement of capsule/synovium
- Distribute synovial fluid
- Secondary rotational stabilizers



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HISTORY AND CLINICAL FEATURES

- Mechanism
- Effusion
- Felt a "pop"
- Concomitant injuries
- Provocative exam
- **Loss of motion**

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EXAM

- Joint line tenderness
- McMurray
- Apley compression
- Steinmann
- Thessaly

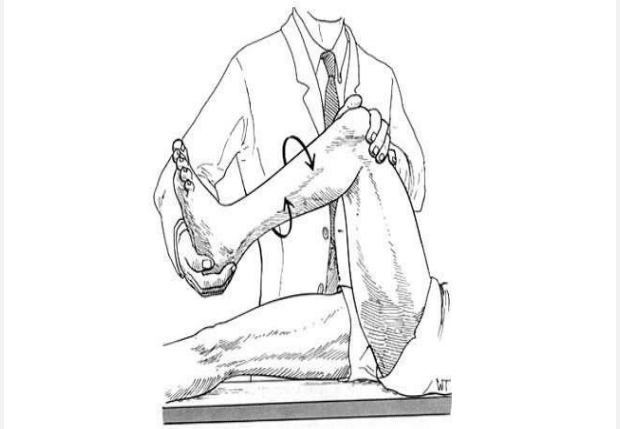
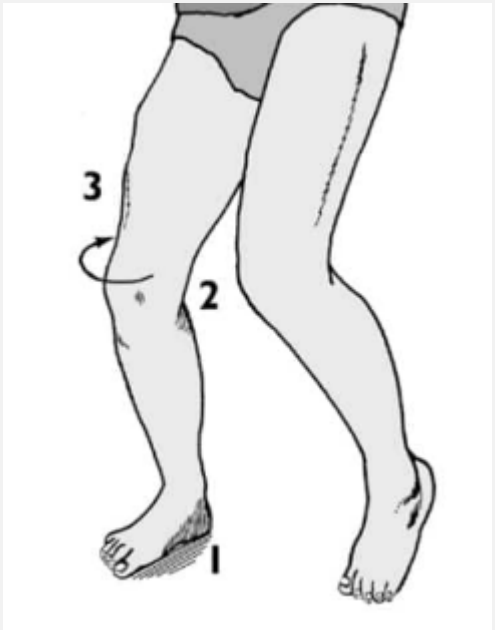


Figure 23. McMurray's Test for meniscal injury. (From Apley A The diagnosis of meniscus injuries. J Bone Joint Surg Am. 1947;29:78-84)



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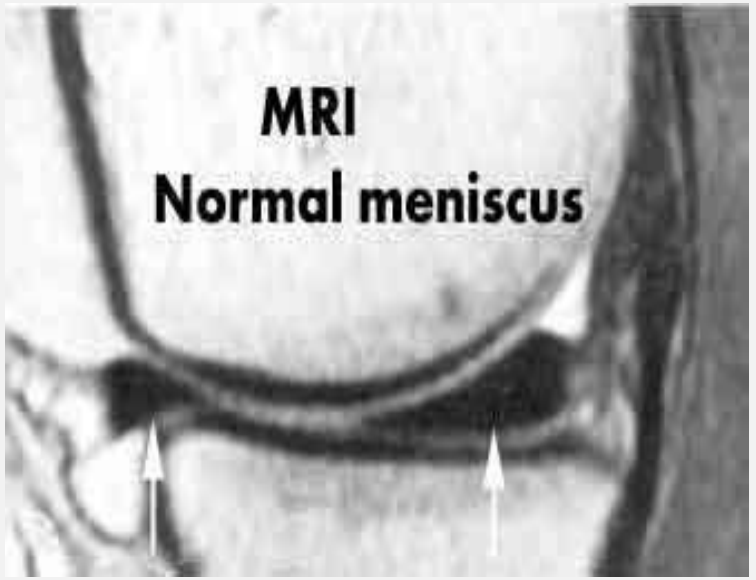
IMAGING

- X-rays
  - Osteochondral injuries
  - Loose bodies
  - Signs of concomitant injuries
- MRI
  - Great value for diagnostic accuracy
  - >90% accuracy in most reports



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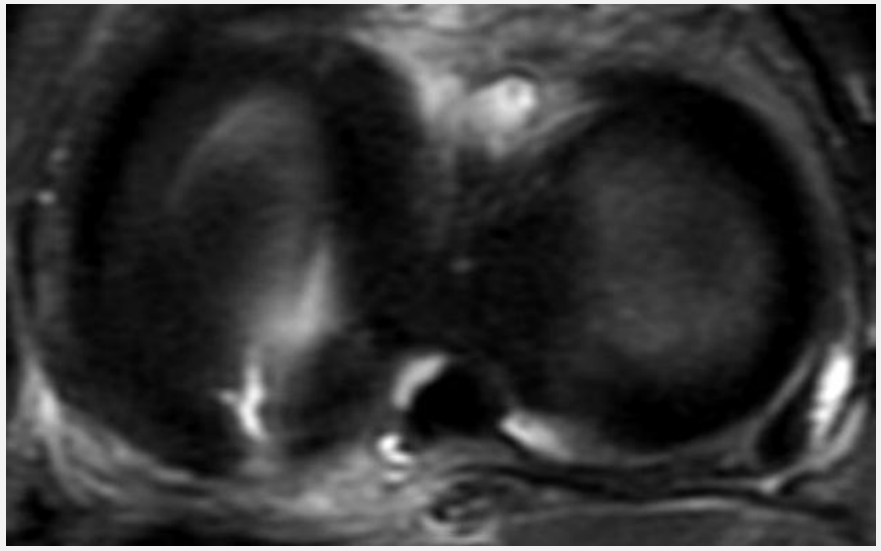
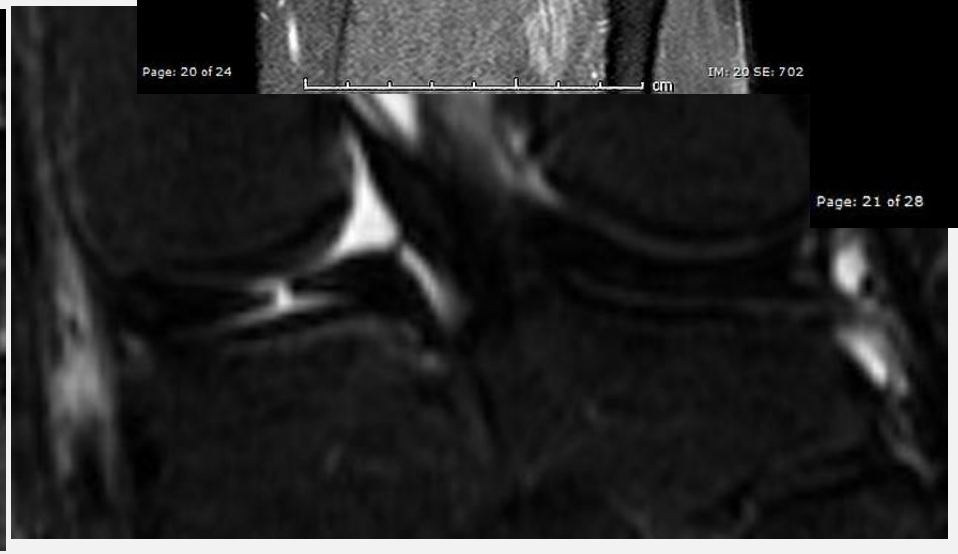
MRI

- Radial
- Horizontal





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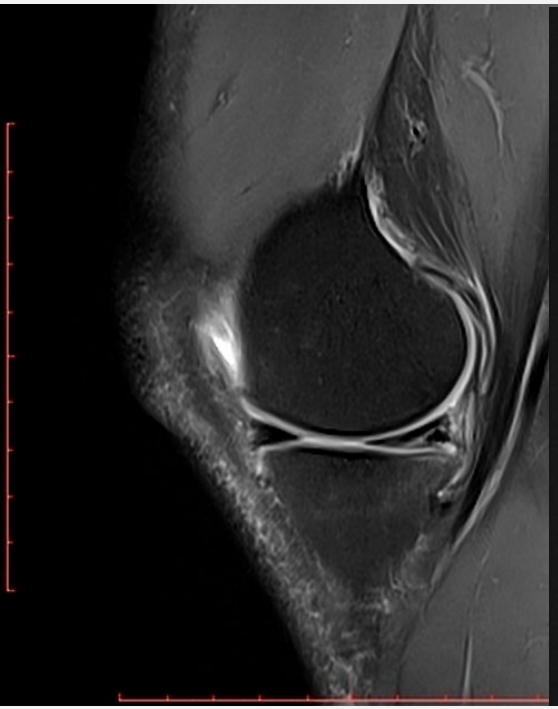
MRI

- Bucket handle

- Complex



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MENISCAL ROOT TEAR

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MRI – "BONE BRUISING"

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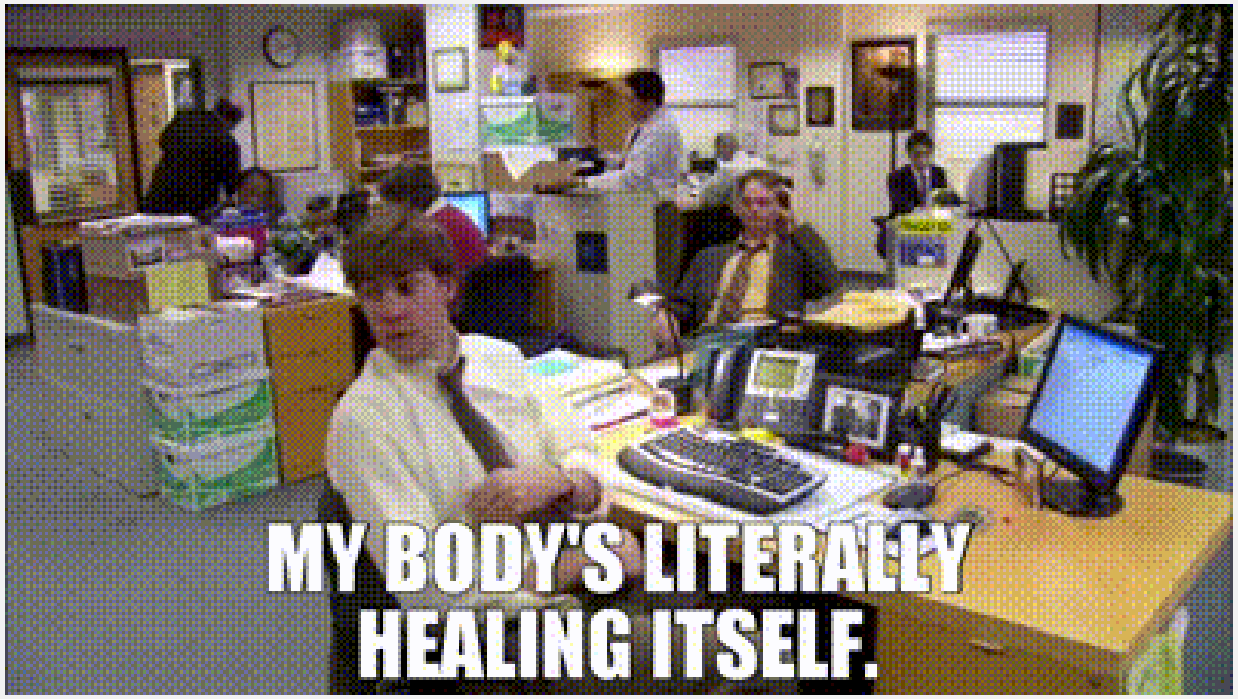
NON-OPERATIVE TREATMENT

- Indications
  - Incomplete or small non-displaced meniscus tear
  - Stable peripheral tear w/o other injury

- Therapies
  - RICE
  - WBAT +/- crutches, bracing
  - Anti-inflammatories
  - PT
  - +/- injections



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OPERATIVE INTERVENTION

- Repair vs resect
- How to repair
- How to improve healing potential

- Most interactions after meniscus talk at a conference

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WHY AND WHEN TO REPAIR?

- Maintain structural integrity
- Reduce stress = reduce arthritis
- Location, location, location…

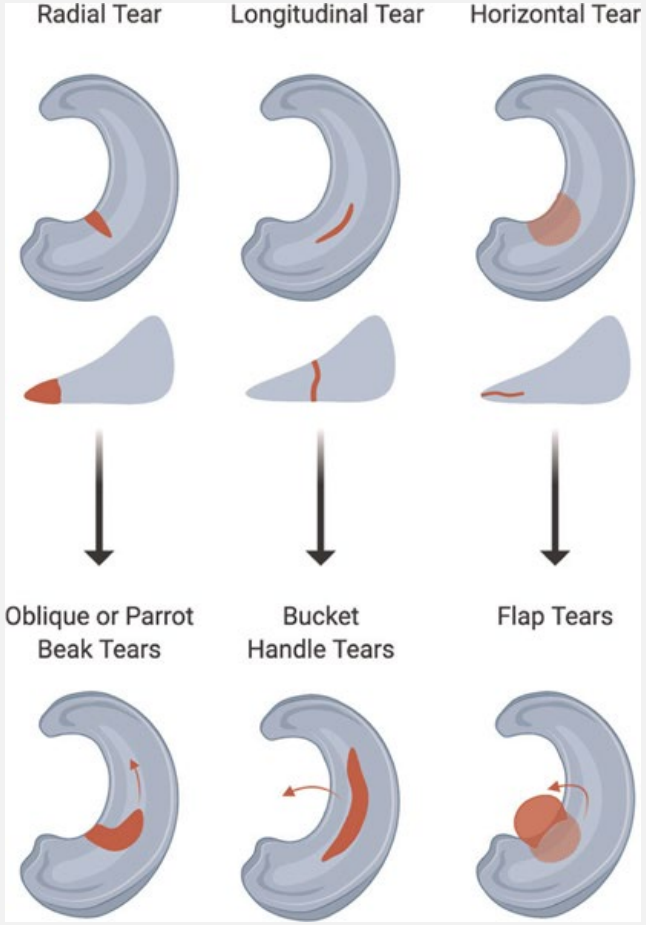

TABLE 45-1 Reparability of Meniscal Tears

ZONE	TEAR TYPE	CHRONICITY	SIZE (cm)	REPARABILITY
Red-red	Longitudinal	Acute	1.5-4.0	
Red-red	Longitudinal	Chronic	1.5-4.0	
Red-white	Longitudinal	Acute	1.5-4.0	
Red-white	Longitudinal	Chronic	1.5-4.0	
Red-white	Radial/flap	Acute	1.5-4.0	
Red-white	Radial/flap	Chronic	1.5-4.0	
Red-white	Radial/flap	Damaged	1.5-4.0	
Red-white	Radial/flap	Damaged	1.0-4.0	
White-white	Longitudinal	Acute	1.5-4.0	
White-white	Radial/flap	Acute	1.5-4.0	
White-white	Longitudinal	Chronic	1.5-4.0	
White-white	Radial/flap	Chronic	1.5-4.0	
White-white	Radial/flap	Damaged	1.5-4.0	

From Miller MD, Warner JJP, Harner CD: Meniscal repair. *In* Fu FH, Harner CD. Vince KG. editors: *Knee surgery.* Baltimore. 1994. Williams & Wilkins.

Bansal et al. Meniscal repair: The current state and recent advances in augmentation. *J Orthop Res.* 2021

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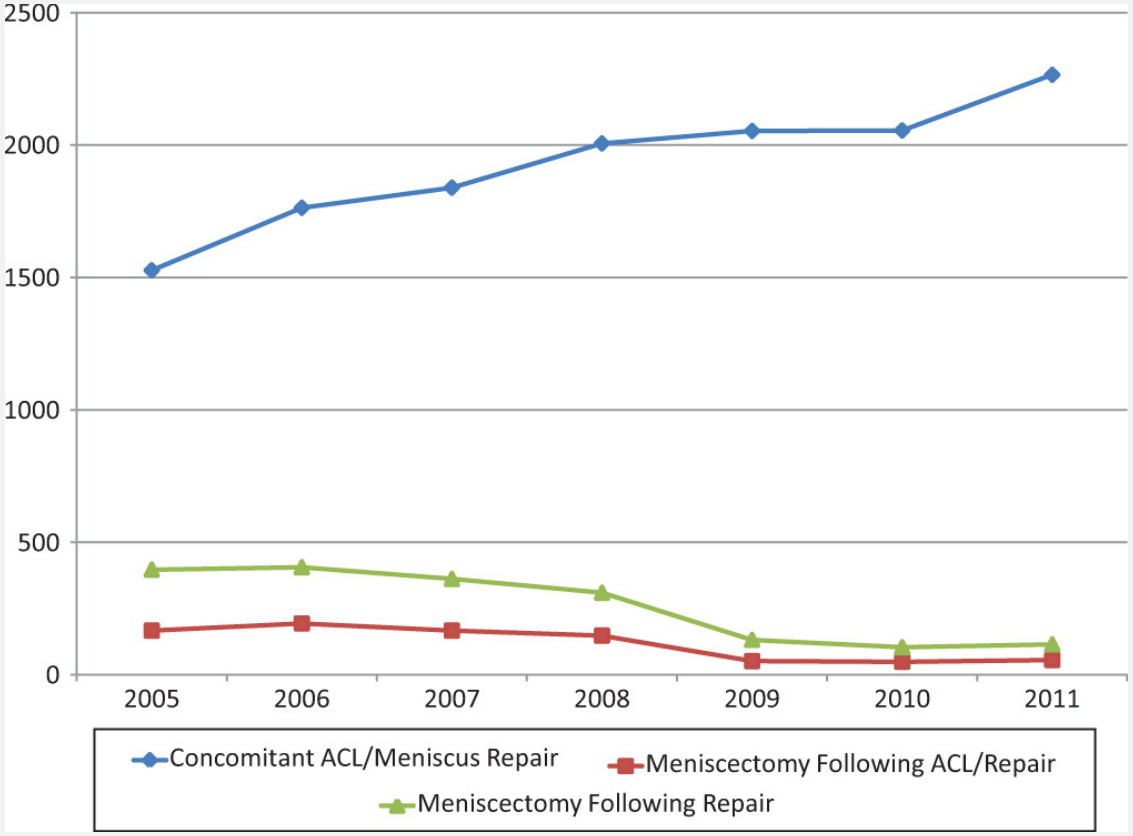
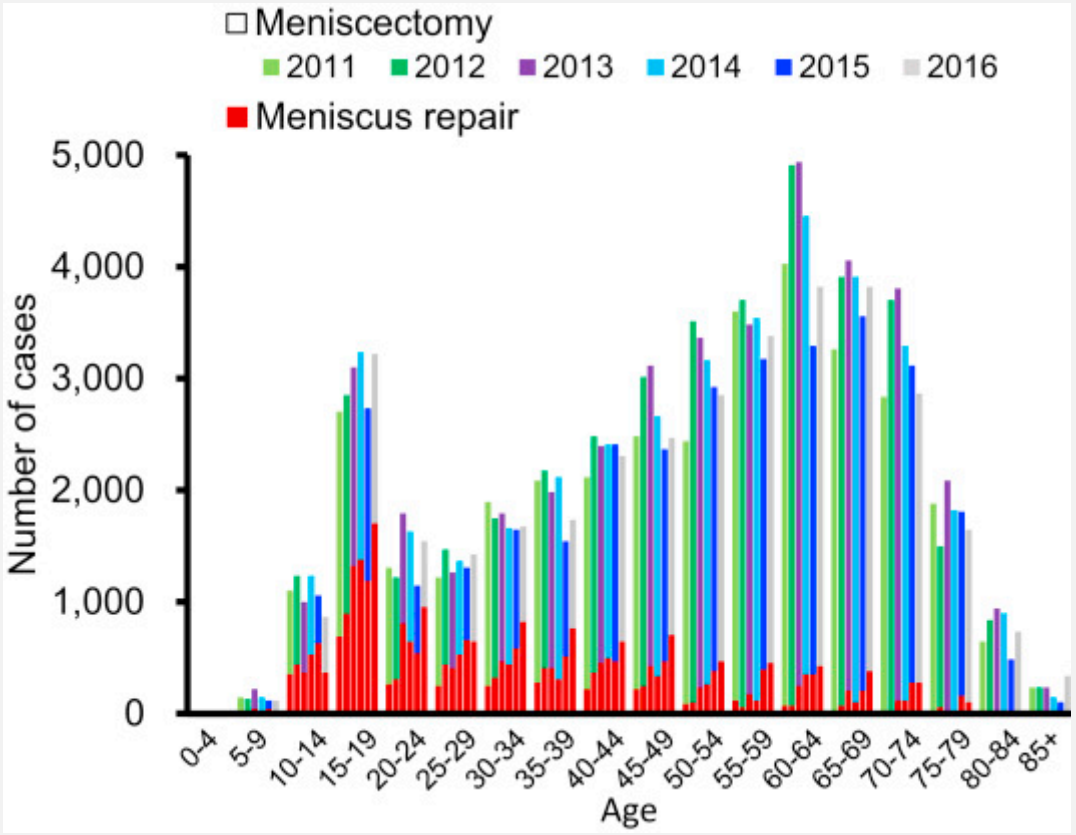
TRENDS IN MENISCAL SURGERY



Abrams et al. Trends in meniscsus repair and meniscetomy in the United States, 2005-2011 *AJSM*. 2013



Katano et al. Trends in isolated meniscus repair and meniscectomy in Japan 2011-2016. *Journal of Orthopedic Science*. 2018

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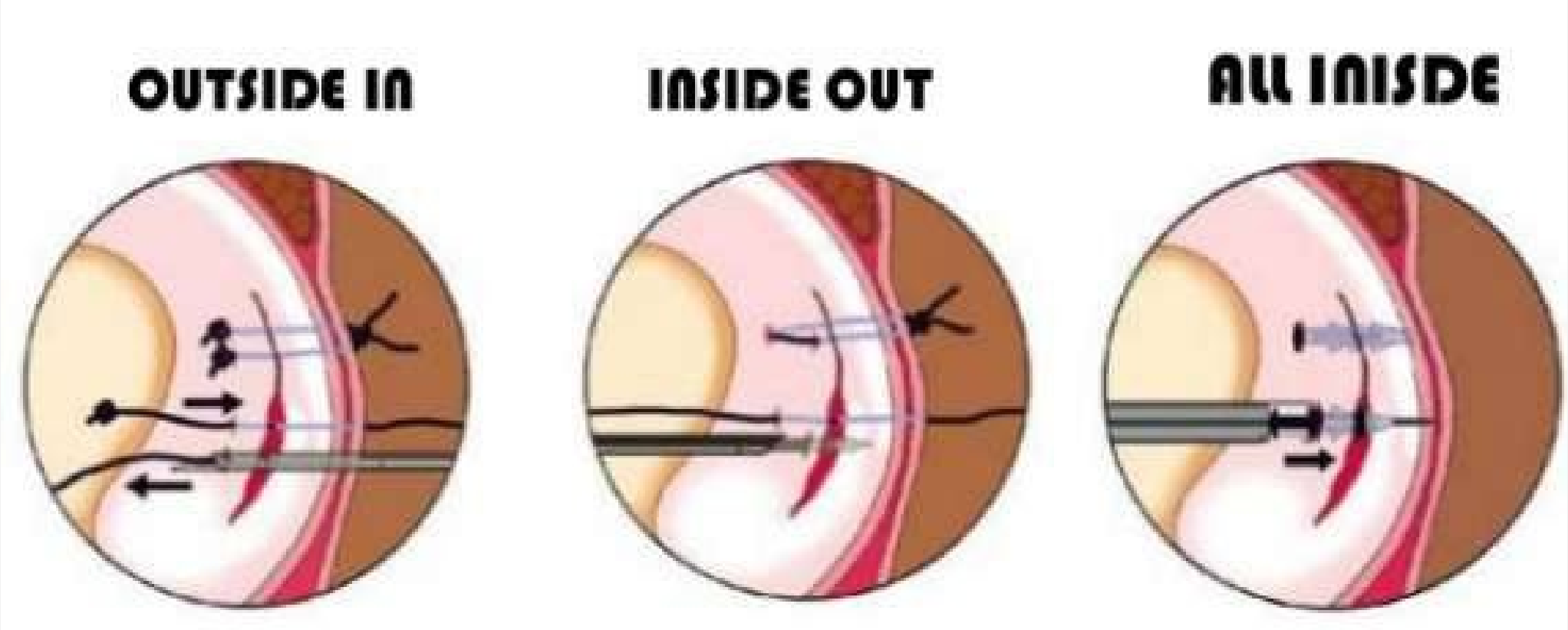
REPAIR TECHNIQUES



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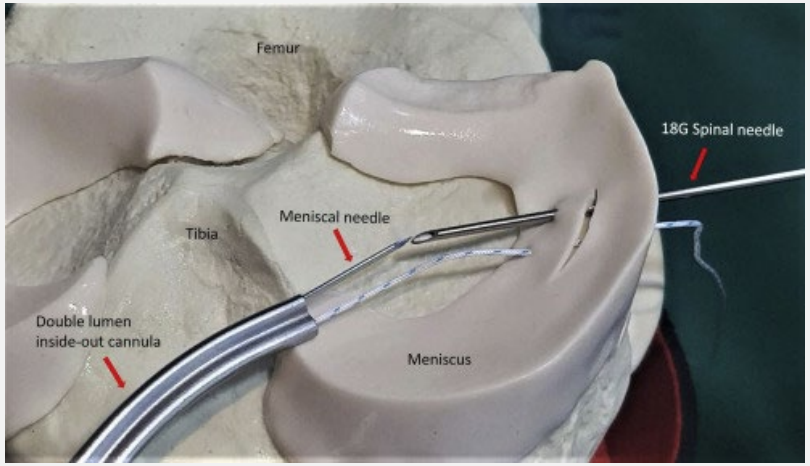
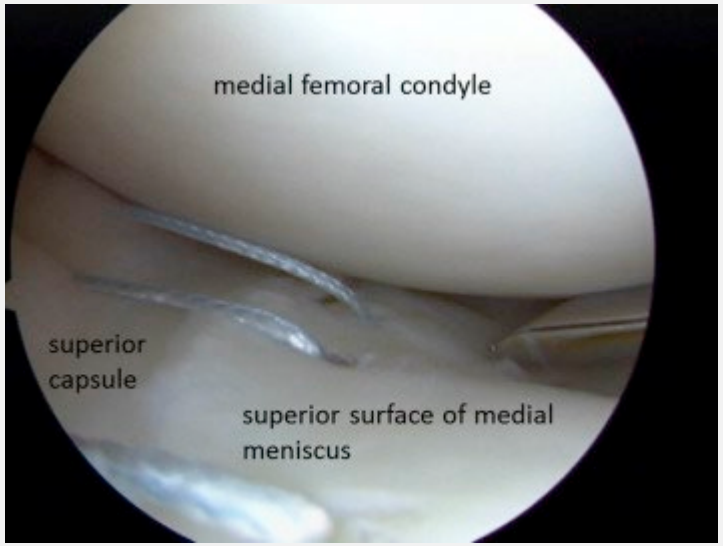
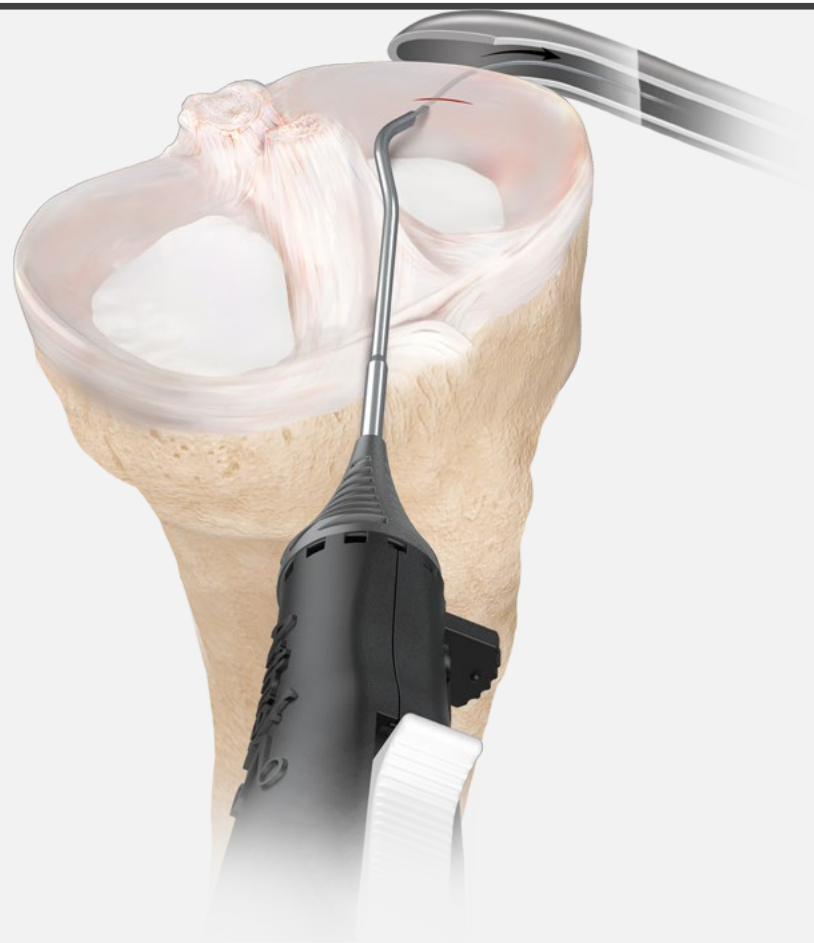
INSIDE – OUT REPAIR

- "Gold standard"
- Versatile for:
  - Tear location
  - Tear type
- Multiple configurations
- Requires open approach







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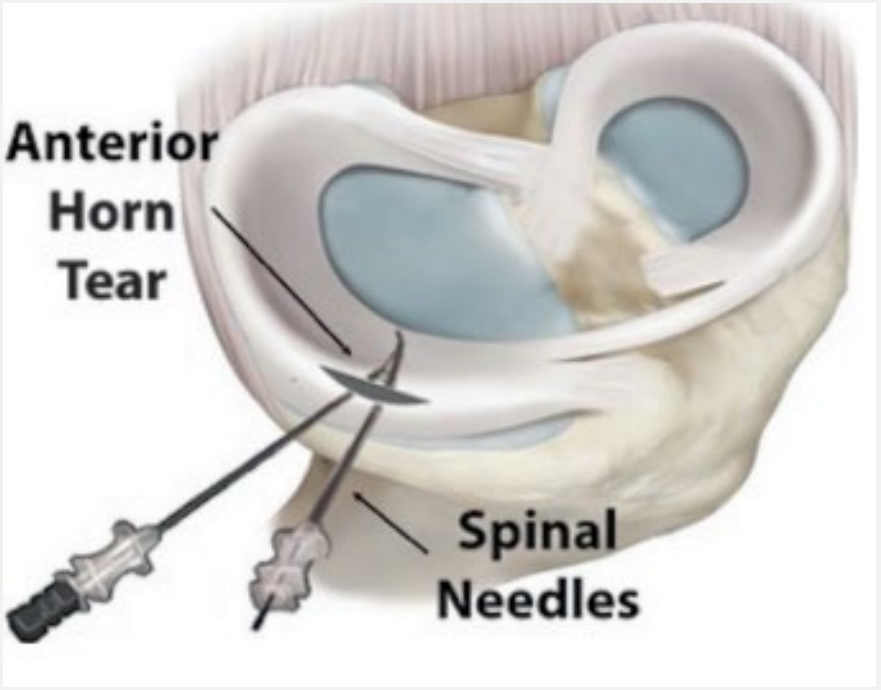
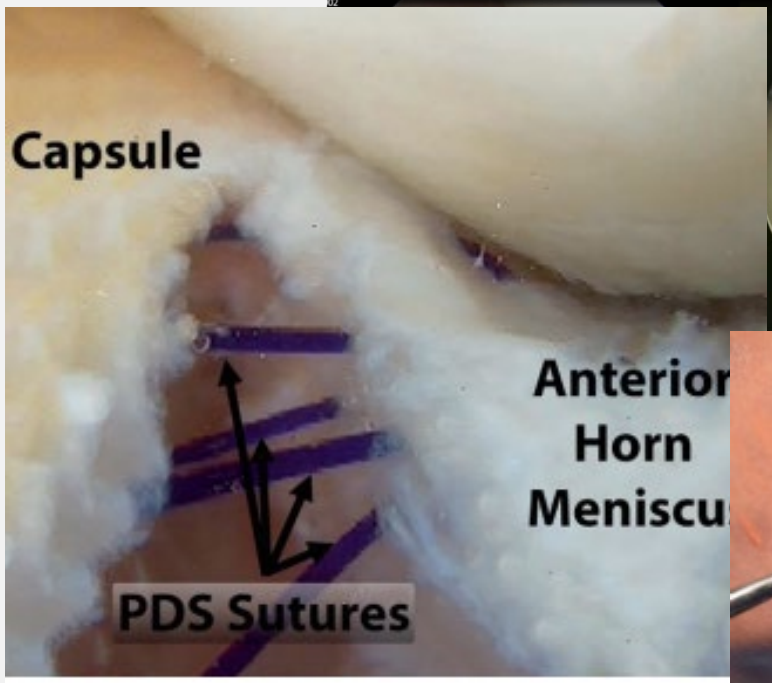
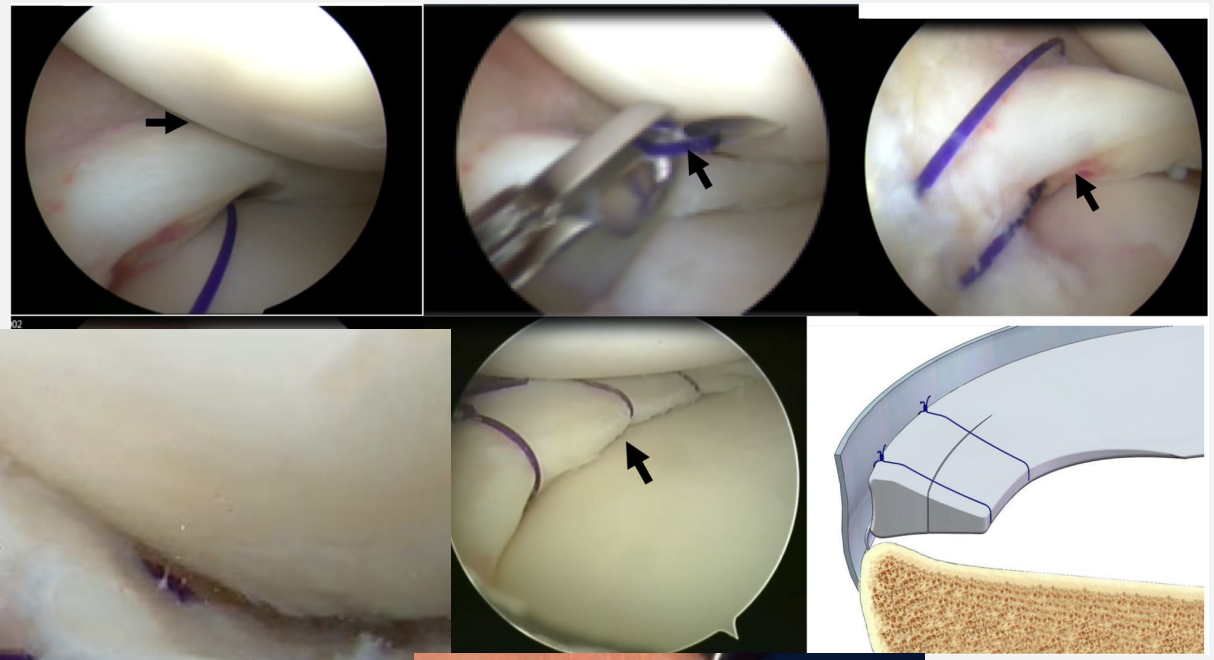
OUTSIDE – IN REPAIR

- Helpful for anterior horn tears







Chala J, et al. *Chapter 12, Outside-in meniscal repair: techniques and outcomes*. LaPrade. 2017. *The Menisci*

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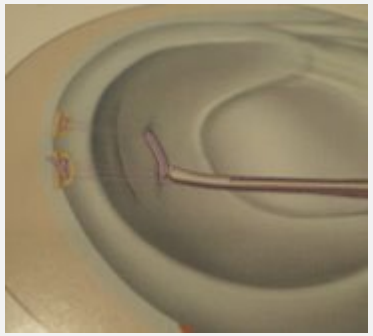
ALL INSIDE REPAIR

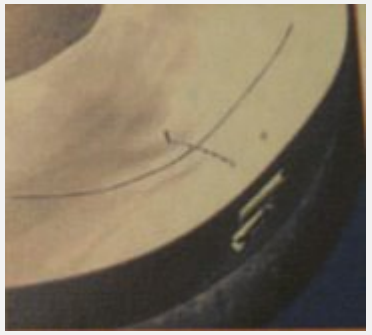
- 1st Generation




Darts/Barbs Screws Staples

- 2nd Generation
  - Clinching Devices
    - Rigid backstops



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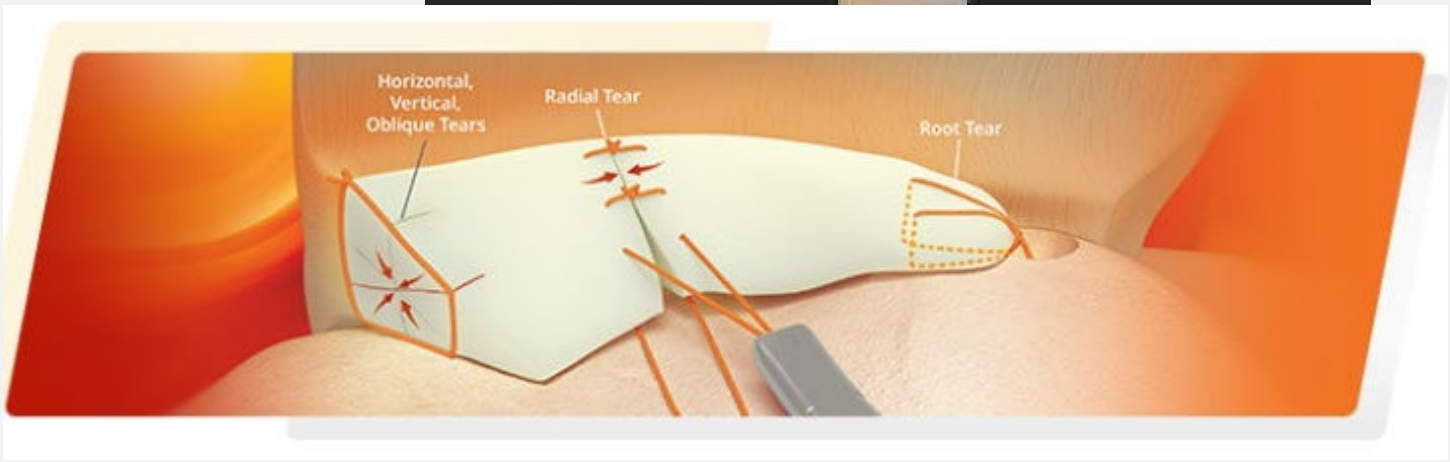
ALL INSIDE REPAIR



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ALL INSIDE REPAIR

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ALL INSIDE REPAIR

- Newer devices have:
  - All suture options
  - Multiple depth options to help avoid NV injury
  - Various configurations possible
  - Adjustable or varying angles of needles
  - Improved biomechanical properties

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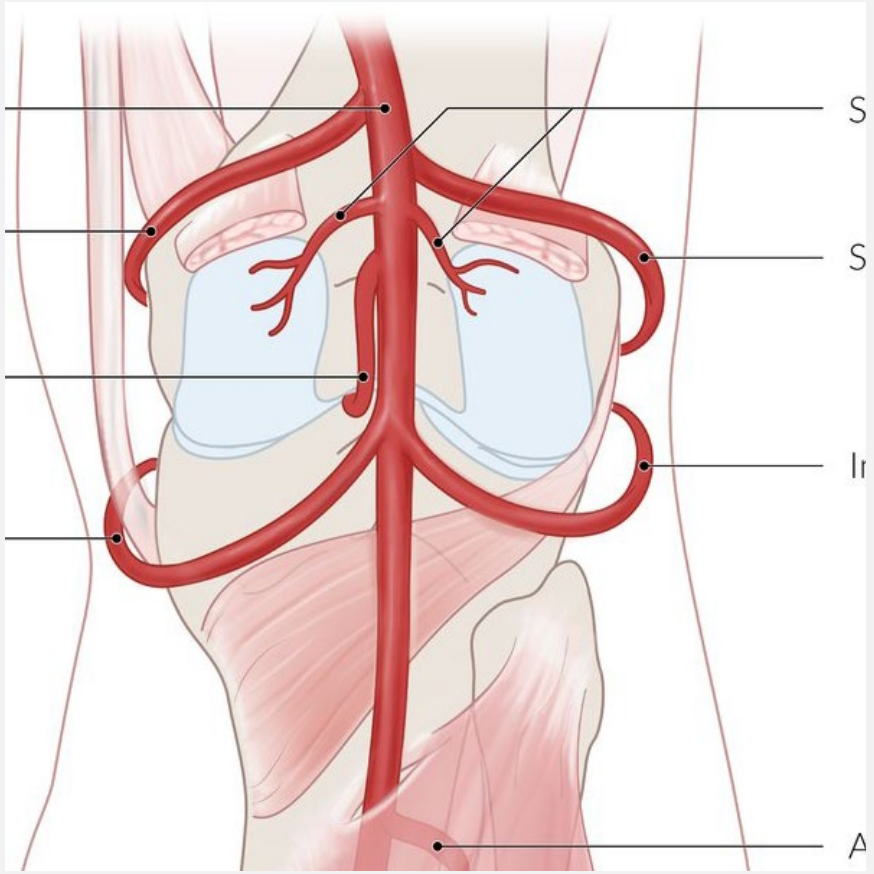
SO WHY NOT USE IT EVERYWHERE?

- Difficult in tight compartment
- Iatrogenic meniscus damage
  - Multiple passes
  - Larger needle than other techniques
- Misfires
- NV injury
- Complex configurations



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HELP THE MENISCUS HEAL

- Improved healing with ACL-R
  - Girolamo et al. 2015
- Microfracture
- Fibrin clot
- Biologic scaffolds

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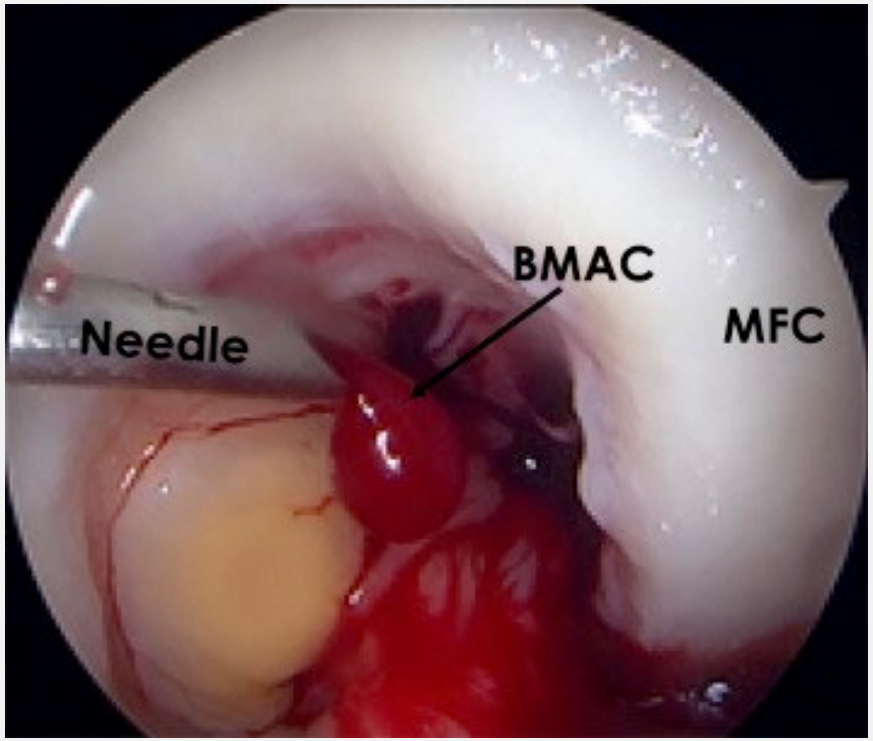
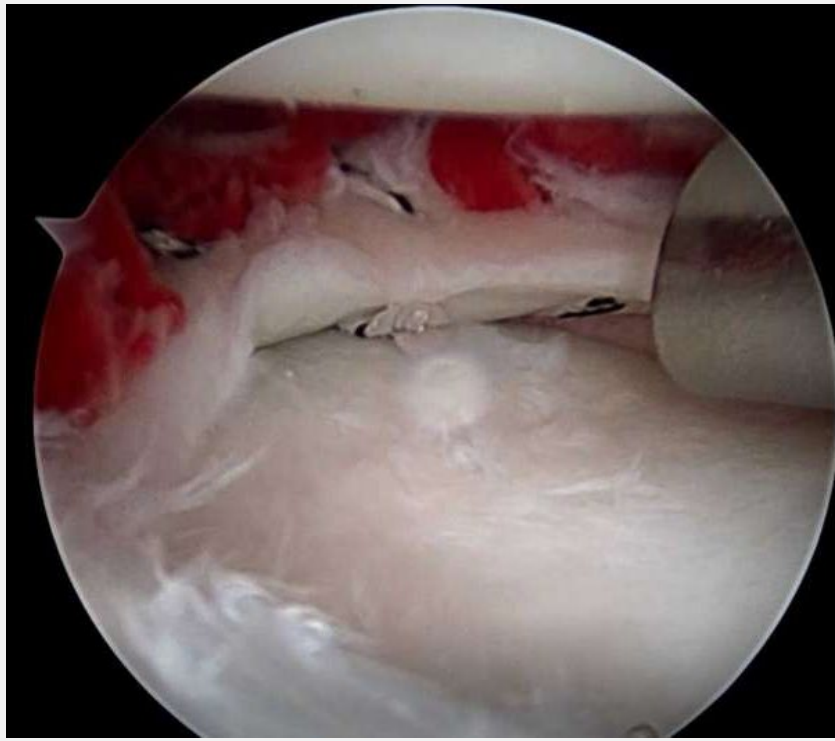
HELP THE MENISCUS HEAL





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PARTIAL MENISCECTOMY

- Failure of non-operative management
- Loose, unstable fragments (W/W or R/W)
- Patient decision
- Irreparable
- Partial is always preferable to subtotal or total meniscectomy
- ***aim to avoid in setting of advanced arthritis***

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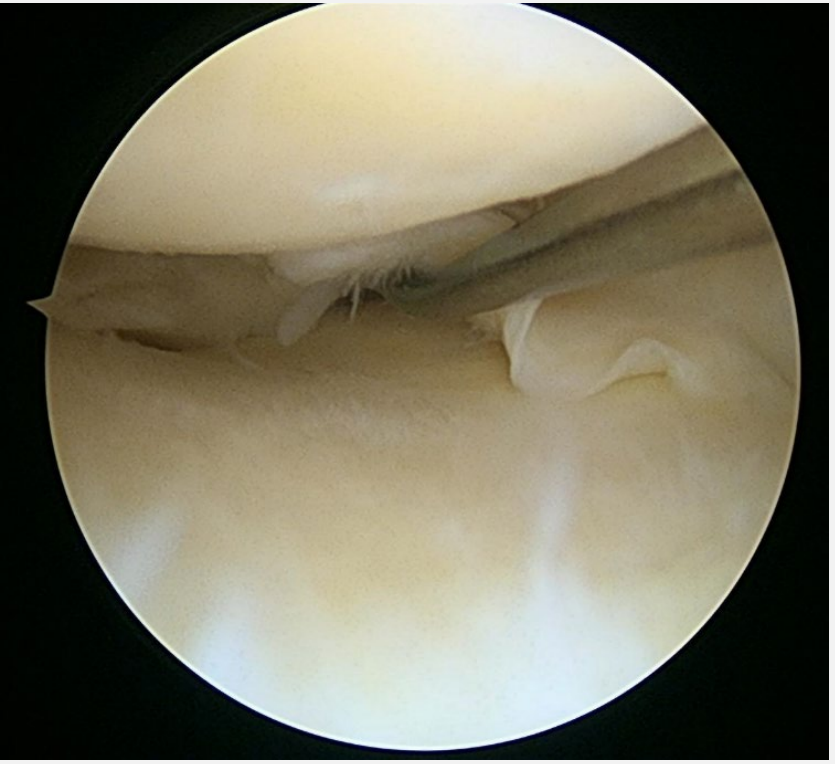
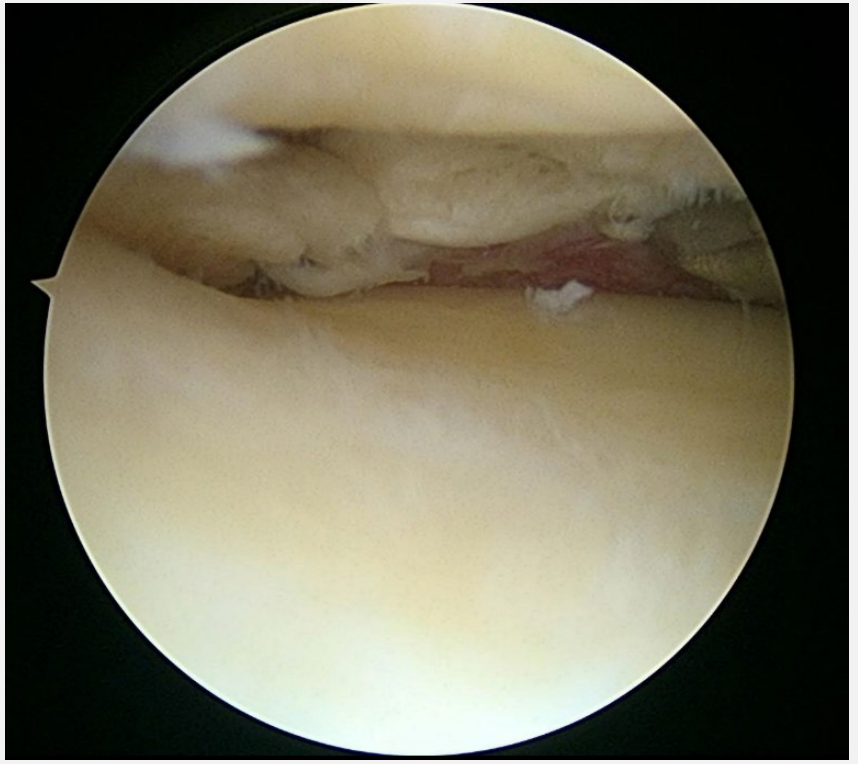
PARTIAL MENISCECTOMY





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- 154 symptomatic OA, 49 asymptomatic OA controlled match
- Meniscus tears were more common in pts with symptomatic OA (91%) than those without (76%)
- No significant difference in VAS pain or WOMAC score for those with symptomatic OA with or without a meniscus tear

The Clinical Importance of Meniscal Tears Demonstrated by Magnetic Resonance Imaging in Osteoarthritis of the Knee*

Bhattacharyya, Timothy MD; Gale, Daniel MD; Dewire, Peter MD; Totterman, Saara MD; Gale, M. Elon MD; McLaughlin, Sara MPH; Einhorn, Thomas A. MD; Felson, David T. MD, MPH

JB&JS

- 991 patients
- 19-56% of patients had tears
- Arthritis
  - 63% tears w/ symptoms
  - 60% tears w/o symptoms
- No arthritis
  - 32% tears w/symptoms
  - 23% tears w/o symptoms

Incidental Meniscal Findings on Knee MRI in Middle-Aged and Elderly Persons

Martin Englund, M.D., Ph.D., Ali Guermazi, M.D., Daniel Gale, M.D., David J. Hunter, M.B.,B.S., Ph.D., Piran Aliabadi, M.D., Margaret Clancy, M.P.H., and David T. Felson, M.D., M.P.H.

The NEW ENGLAND JOURNAL of MEDICINE

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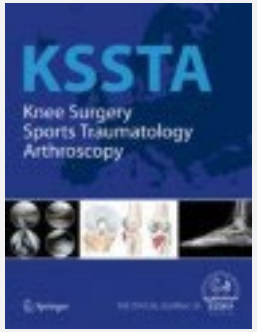
A Comparative Study of Meniscectomy and Nonoperative Treatment for Degenerative Horizontal Tears of the Medial Meniscus

Ji-Hyeon Yim, MD, Jong-Keun Seon, MD, PhD‡, Eun-Kyoo Song, MD, PhD, Jun-Ik Choi, MD, Min-Cheol Kim, MD, Keun-Bae Lee, MD, PhD, Hyoung-Yeon Seo, MD, PhD

Show less

Is arthroscopic surgery beneficial in treating non-traumatic, degenerative medial meniscal tears? A five year follow-up



Surgery versus Physical Therapy for a Meniscal Tear and Osteoarthritis

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Exercise therapy versus arthroscopic partial meniscectomy for degenerative meniscal tear in middle aged patients: randomised controlled trial with two year follow-up

thebmj

In Patients with Nonobstructive Meniscal Tears, Physiotherapy Was Noninferior to Arthroscopic Partial Meniscectomy for Knee Function Over a 24-Month Period

JB&JS

Surgery versus Physical Therapy for a Meniscal Tear and Osteoarthritis

The NEW ENGLAND JOURNAL of MEDICINE

- Multicenter, RCT
- 351 patients → 45+ yo, meniscal tear + mild-moderate OA
- Surgery + post-op PT versus PT alone
- WOMAC scores → 6 months
  - 20.9 improvement with surgery + PT
  - 18.5 improvement with PT alone
- **No significant difference functionally between groups at 6 months**

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In Patients with Nonobstructive Meniscal Tears, Physiotherapy Was Noninferior to Arthroscopic Partial Meniscectomy for Knee Function Over a 24-Month Period

JB&JS

- 321 patients
- 45-70 yo
- Randomized
  - 159 Arthroscopic partial meniscectomy
  - 162 PT
    - 16 sessions, 8 weeks → coordination, closed chain program

- **Non obstructive tears → PT was non-inferior to partial meniscectomy at 24 months**

- **Conclusion → PT should be considered as an alternative or initial therapy for non-obstructive meniscal tears**

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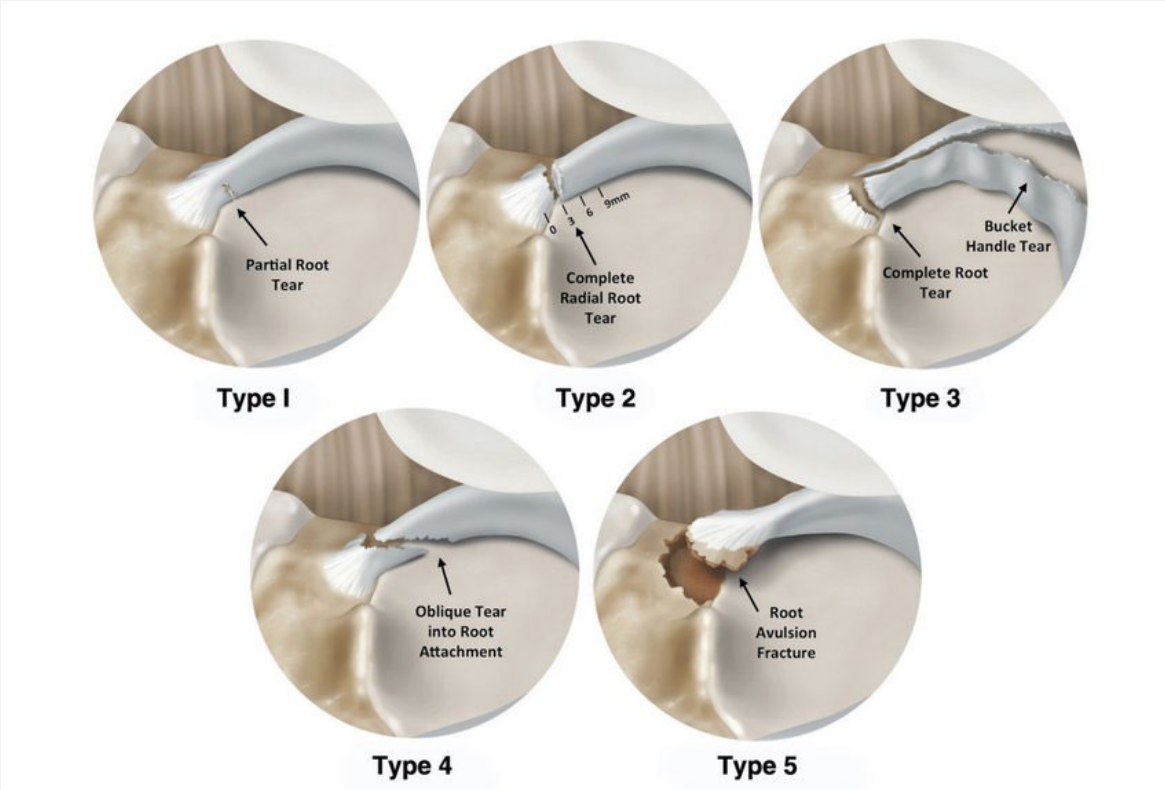
ROOT REPAIR

- Root plays an important role in biomechanics
  - Functional status of meniscus
  - Secondary stabilizer to translation/rotation

- Contraindications
  - Old age, advanced arthritis
  - Obesity
  - Mal-alignment (in isolation)

- Suture anchor or transtibial



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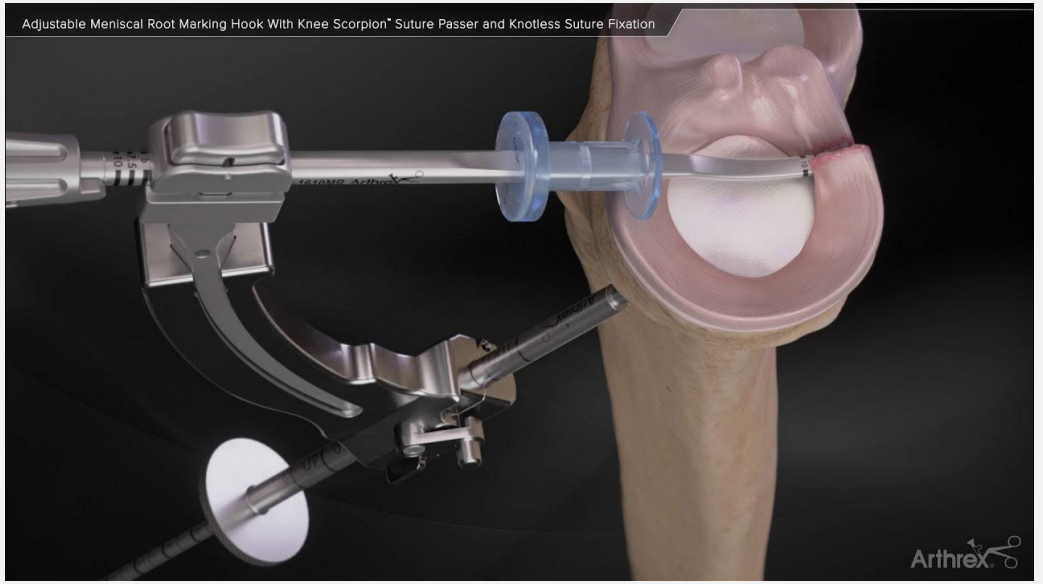
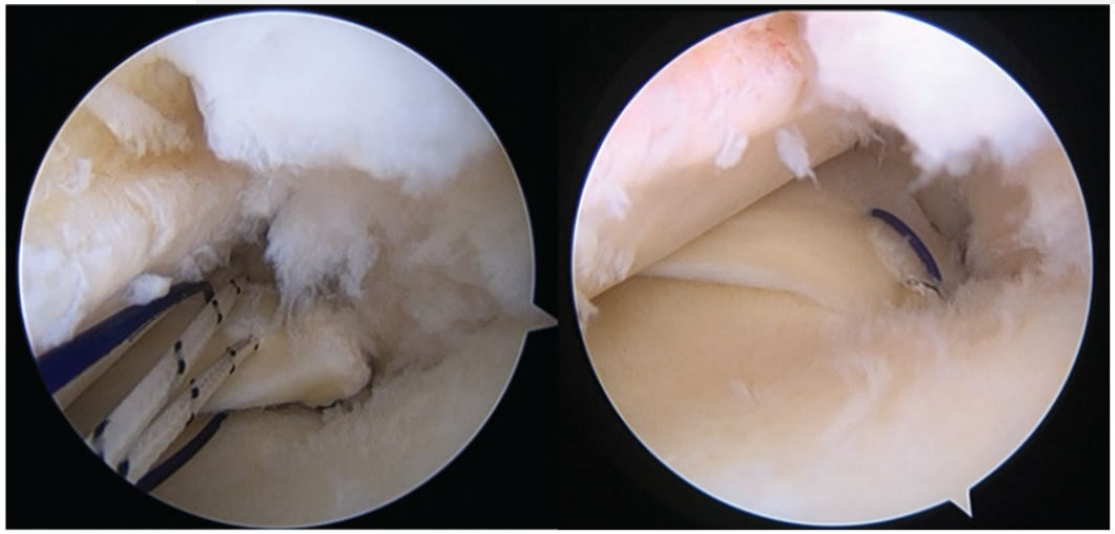
ROOT REPAIR





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ROOT REPAIR - REHAB

- Strict NWB for minimum 6 weeks
- 0-90 passive motion for 2 weeks
- >90 degrees passive after 2 weeks
- Deep squats greater than 70-80 degrees for typically 4 months

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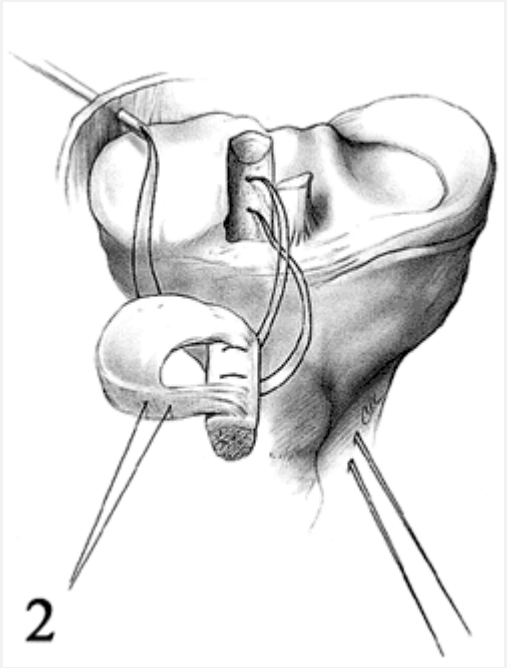
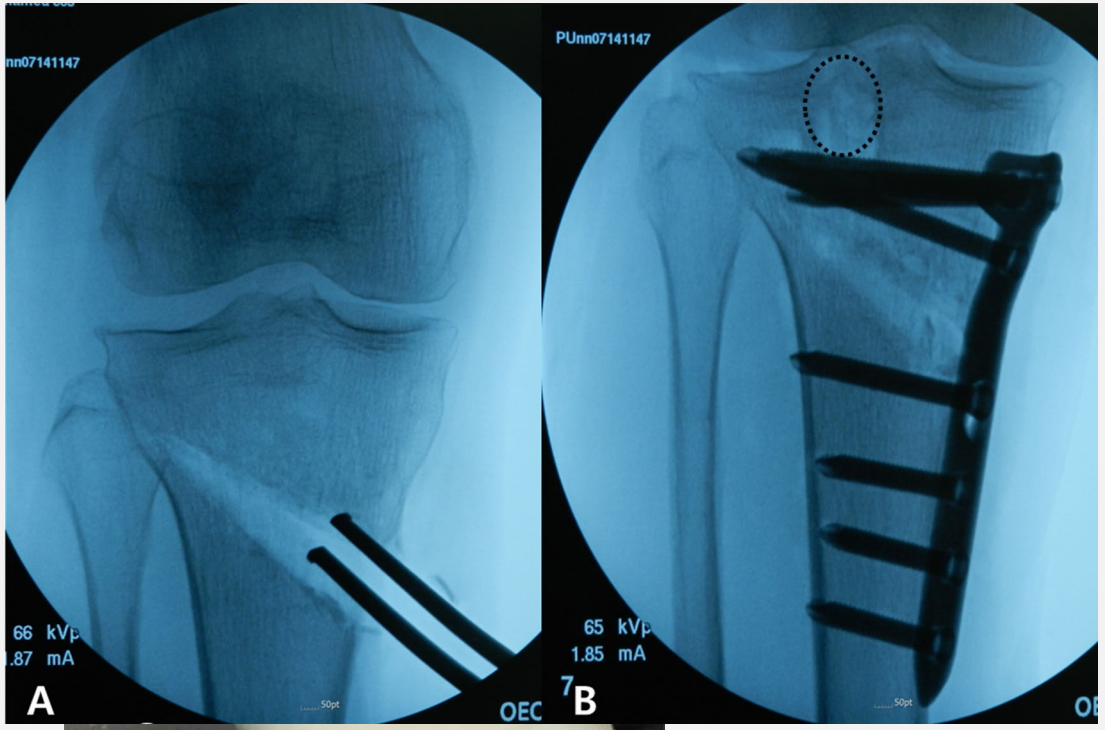
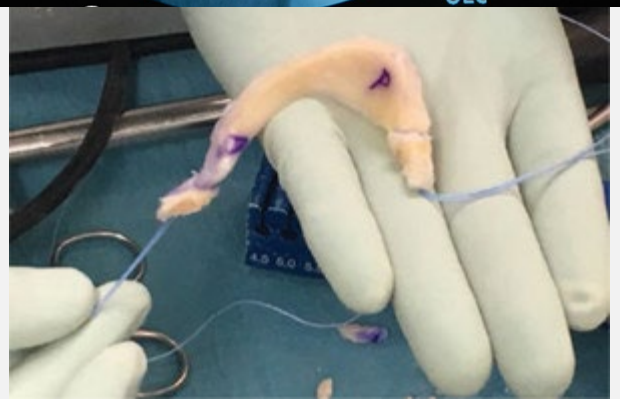
CAN'T YOU JUST REPLACE THE MENISCSUS

- Strict indications
  - Appropriate or correctable alignment and stability
  - No or correctable cartilage lesions
  - BMI <35
  - <50yo
- Technically demanding
- Require size matching
- High re-operation rate







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BUT WHAT ABOUT THAT BONE BRUISE AGAIN?

- Subchondral insufficiency **fracture**
- NWB/PWB
- Unloader/Off-loader brace
- Like most non-displaced fractures, most will heal with protection and time

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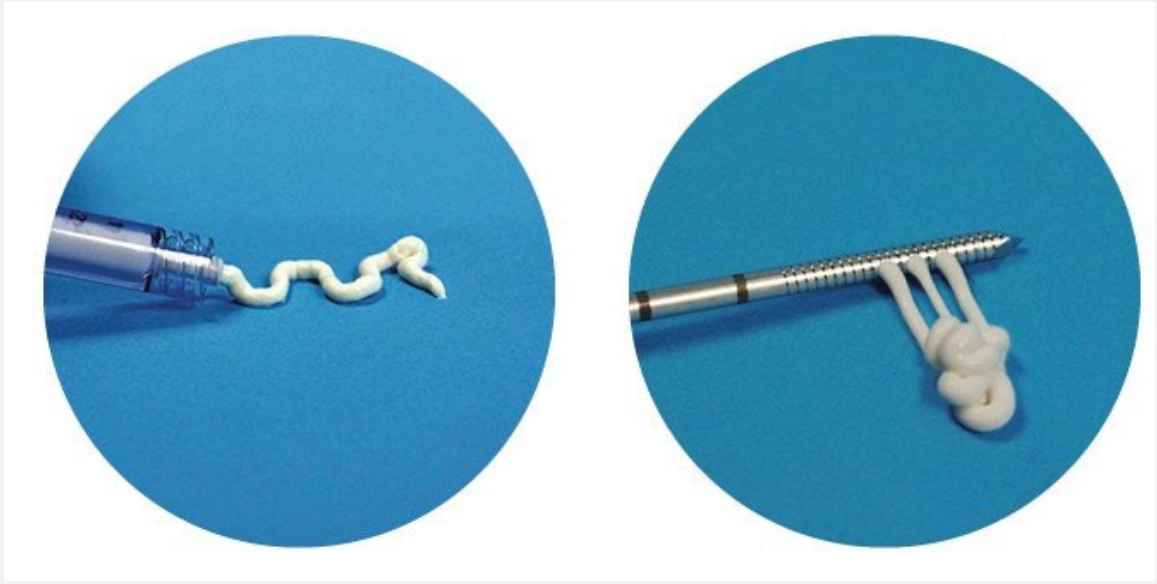
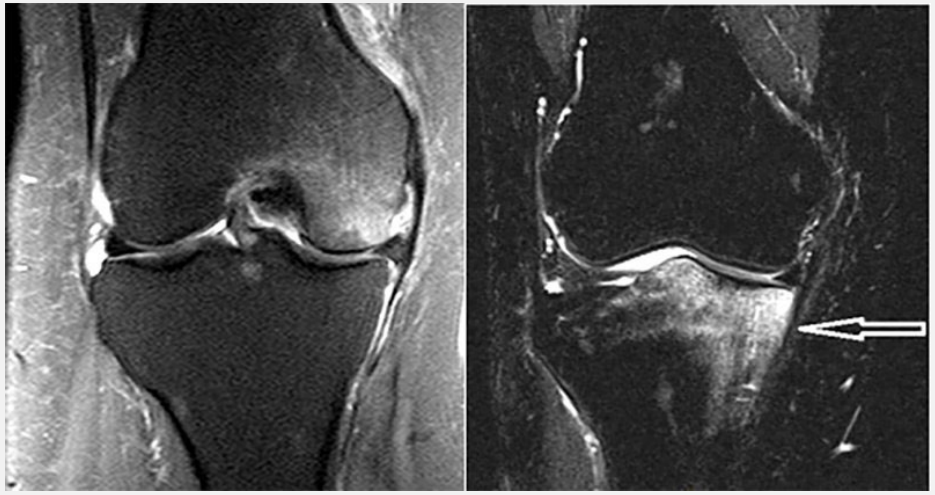
BUT WHAT ABOUT THAT BONE BRUISE AGAIN?

- Subchondroplasty
  - Stabilizes with calcium phosphate
  - Non-biologic
  - Complications with potential intra-articular extravasation
  - Studies have shown revision to TKA as high as 30% at 2 years





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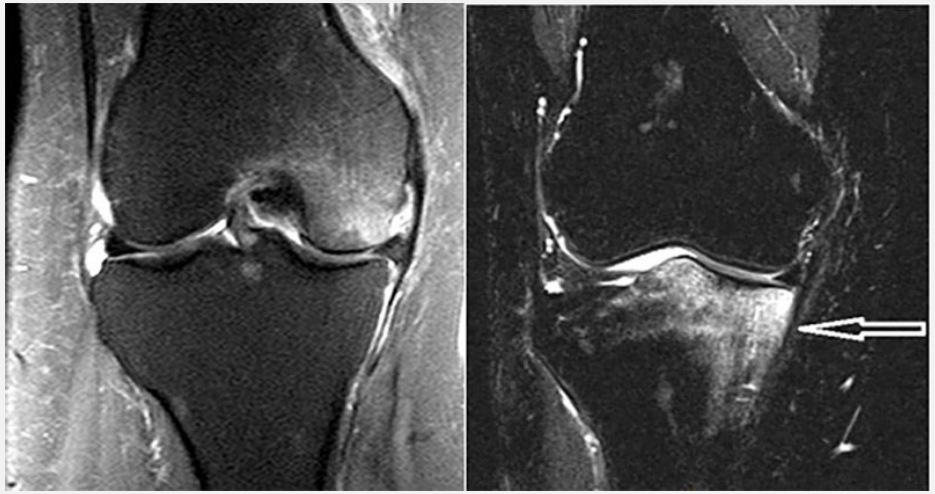
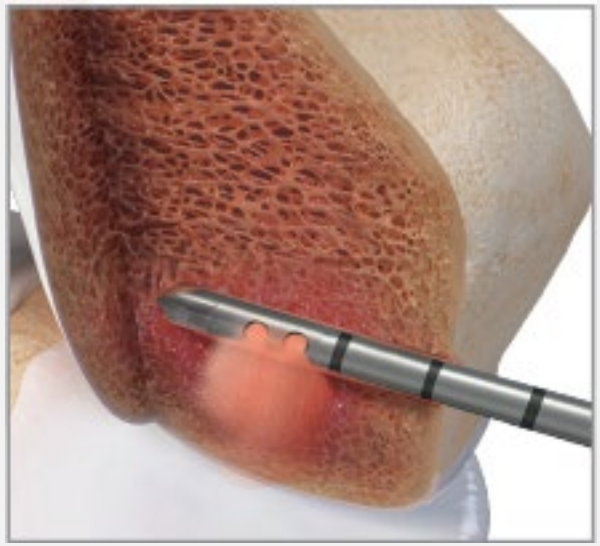
BUT WHAT ABOUT THAT BONE BRUISE AGAIN?

- Intraosseous Bioplasty
  - Structural and biologic
    - Demineralized bone matrix + PRP or BMAC
  - Similar technique to subchondroplasty
  - Less concern for potential extravasation into joint





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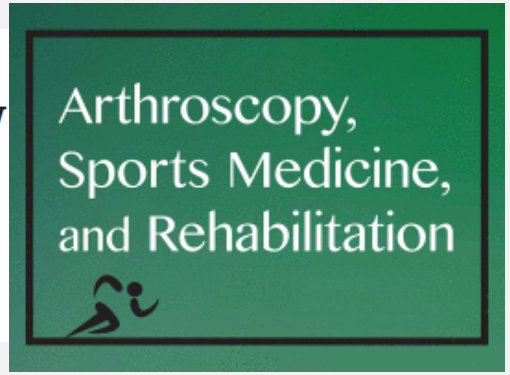
OUTCOMES

- 20 patients – 18-65yo
- 14.5 month f/u
- Improved VAS (7 → 1.3)
- IKDC improved (29.2 – 66.1)
- 93% survival at 1 year

Short-Term Outcomes for the Biologic Treatment of Bone Marrow Edema of the Knee Using Bone Marrow Aspirate Concentrate and Injectable Demineralized Bone Matrix

Connor S Kasik [1], Stephen Martinkovich [1], Brian Mosier [2], Sam Akhavan [1]



- Multiple centers have prospective research investigating continued utilization of IOBP

- Takeaway: short term appears promising. Expanding upon the benefits found with subchondroplasty with the addition of biology

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POST-OPERATIVE REHAB

- Repair
  - Surgeon dependent
  - Root vs body
- Control edema
- Re-establish ROM
- Re-establish LE and core strength
  - This is rarely an isolated problem

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SUMMARY

- Meniscus has many essential functions to health and stability of the knee
- Meniscus has a tenuous blood supply making "healing" difficult
- Non-operative management plays a role for a large subset of patients
  - Especially as an initial treatment option
- Repair is recommended, if possible and indicated
- Treatment options are numerous, must be patient focused

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