

Meniscal Tears and Treatment



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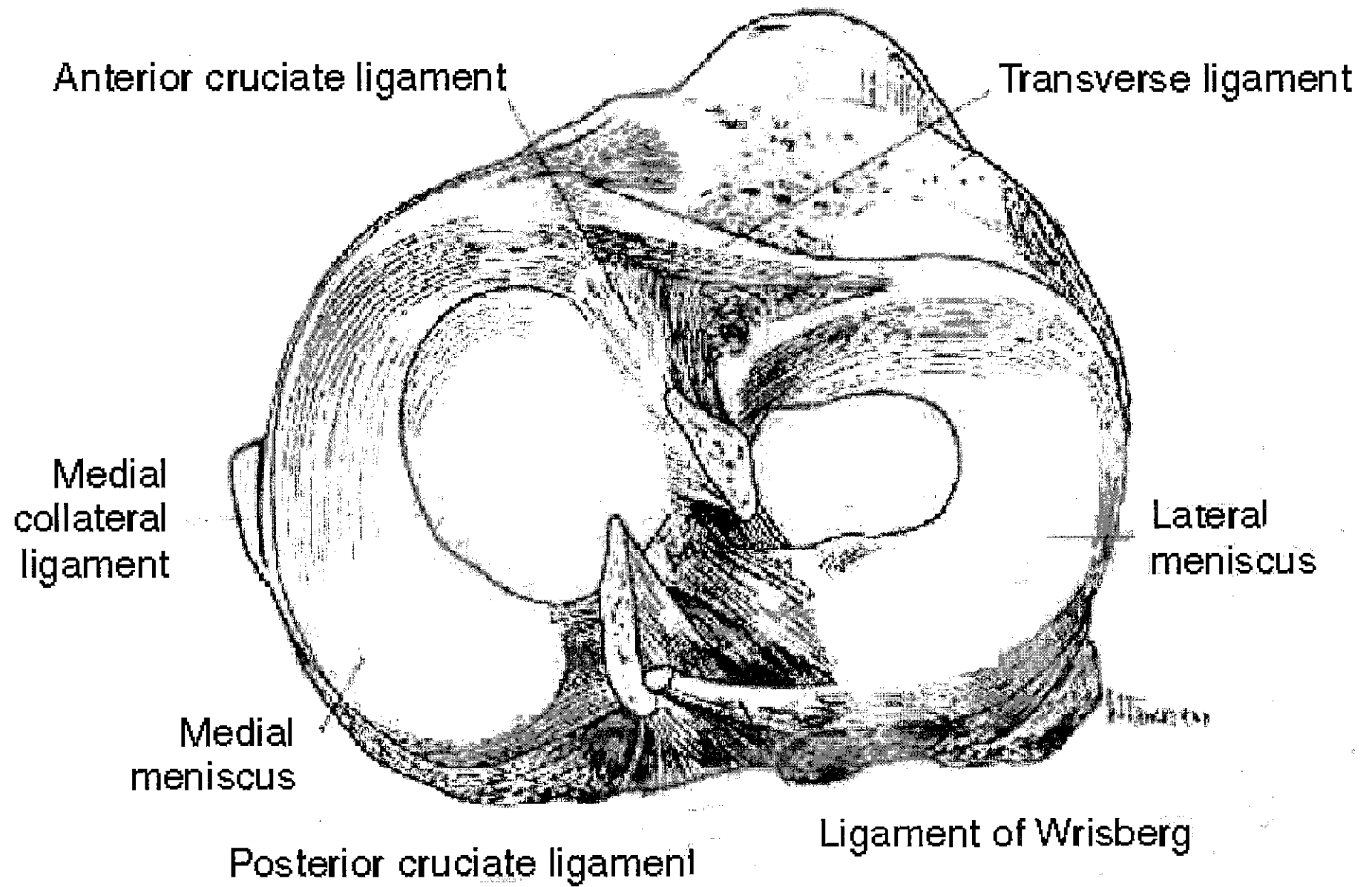
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Objectives

- Discuss important points in history, physical and testing that lead to a diagnosis of damaged meniscus
- Understand the short and long term outcomes of meniscectomy
- Discuss the benefits and implications of surgical vs. conservative management of meniscal tear

Epidemiology

- Overall incidence unknown, but surgical incidence is 60-70 per 100,000 per year
- Most common orthopedic surgical procedure
- 1/3 of meniscal tears are sports-related
- **2/3 MVA or work related**
- 1/3 of meniscal tears associated with ACL injury

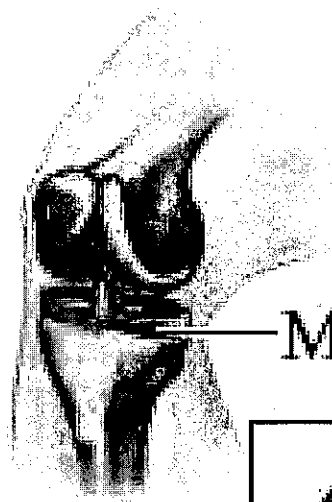


Structure of the Meniscus

- Medial - semicircular
 - Moves 2-5 mm through full ROM
 - Lack of motion may promote tears
 - Fibers from the deep medial collateral
- Lateral - almost complete circle
 - Moves ~1 cm through full ROM
- Both made of fibrocartilage
 - 75% circumferential type 1 collagen fibers
 - 25% radial fibers

Tears and Zones

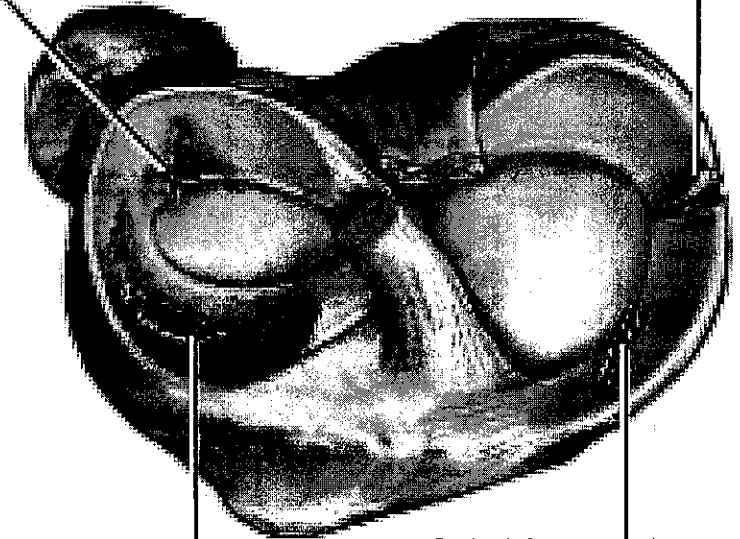
Right knee joint



Meniscus

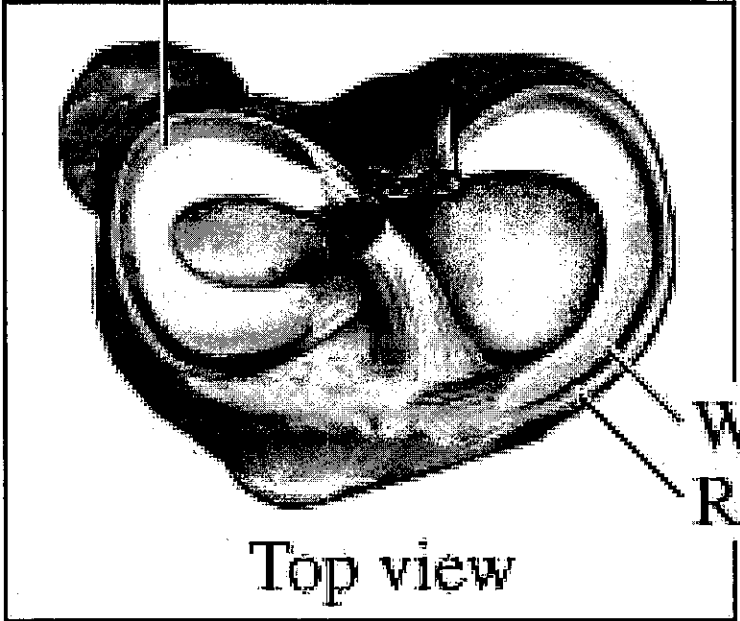
Radial tear

Horizontal tear



Longitudinal tear

Oblique tear



White zone

Red zone

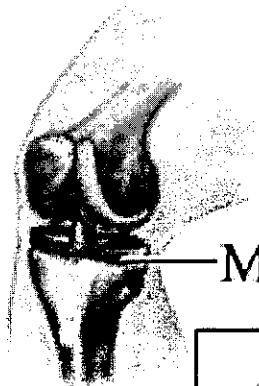
Top view

Structure of the Menisci

- Vascular supply good in the most peripheral 20% of the fibers
 - Supplied by the geniculate arteries
- Inner 1/3 of the ring is avascular
 - Relatively thin
 - Nourished through synovial fluid
- Middle 1/3 of the ring is combination

Vascular zones

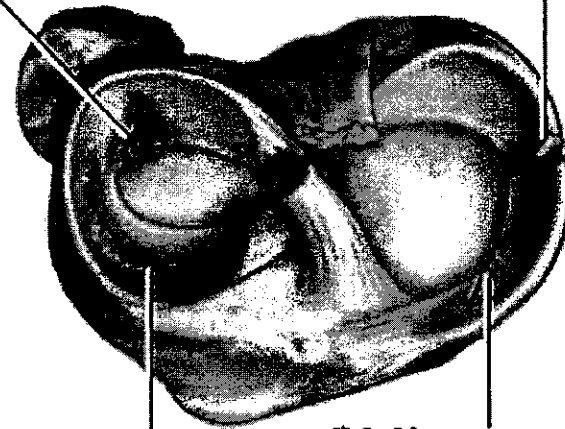
Right knee joint



Meniscus

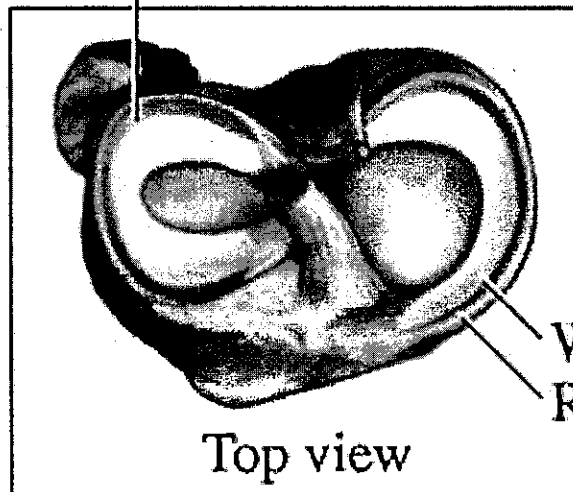
Radial tear

Horizontal tear



Oblique tear

Longitudinal tear



White zone

Red zone

Top view

Function of the Menisci

- Distribute load across the knee joint
 - 2-4x body weight during walking
 - 6-8x body weight during running
- Axial compression is converted to “hoop stress”, or circumferential elongation in the meniscus
- Lateral meniscus distributes more load than medial meniscus, which contributes to greater degeneration if disrupted
- Menisci deepen the socket of the tibial plateau, contributing to stability of knee

Function of the Menisci

- Wedge shape limits translation of femur on tibial plateau
- Menisci forced posteriorly in flexion, anteriorly in extension of the knee
- Menisci reduce stresses on the ACL
- Menisci force synovial fluid into articular cartilage (helping to nourish the white zone) during compression.

Pathophysiology

- In acute knee injuries with ACL intact, medial meniscal injury is 5 times more likely than lateral
- In acute knee injuries with ACL ruptured, lateral meniscus more likely to be involved
- If ACL is previously disrupted, lateral meniscal injury is more likely than medial
- **In repetitive deep squatting, medial meniscus most likely to be injured (20:1)**

History?



"It's an old work injury."

History: the Key to Diagnosis

- Twisting on planted foot
 - Inertial forces or external forces
- Acute effusion in acute injury
- Waxing and waning course with pain and effusion intermittently in chronic injury
- The older the patient, the less likely that history will be revealing
 - More likely to occur with trivial trauma
 - Difficult to distinguish from DJD

Physical Exam

Finding/Test	Sensitivity	Specificity
Joint Line Tenderness	71%	27%
McMurray	58.5%	93.4%
Apley	58%	80%
Thessaly 5°	66%Me, 81%La	96%Me, 91%La
Thessaly 20°	89%Me, 92%La	97%Me, 96%La
MRI	75-87%	87-93%

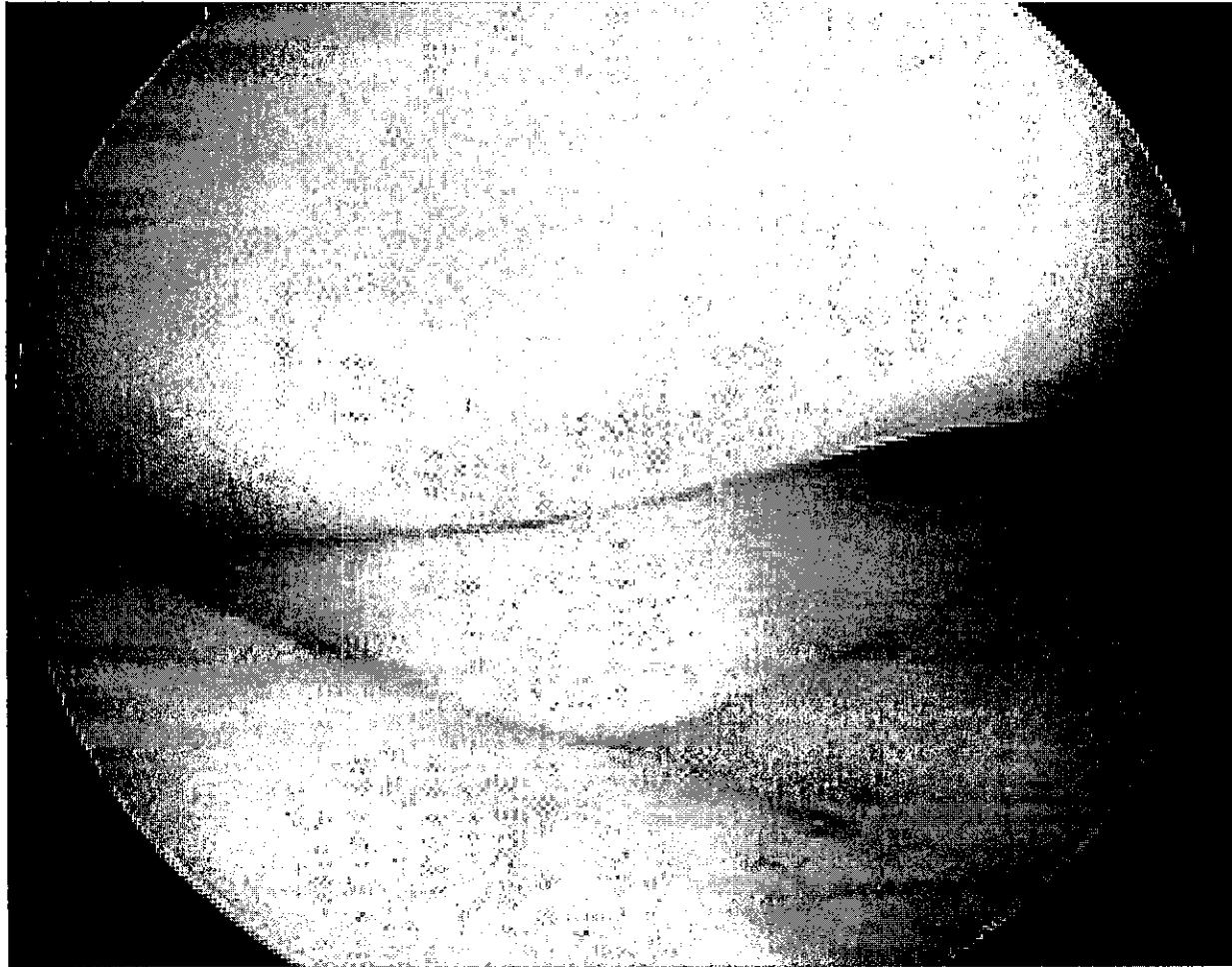
} 80% } 95%

*This test has not yet undergone external validation studies

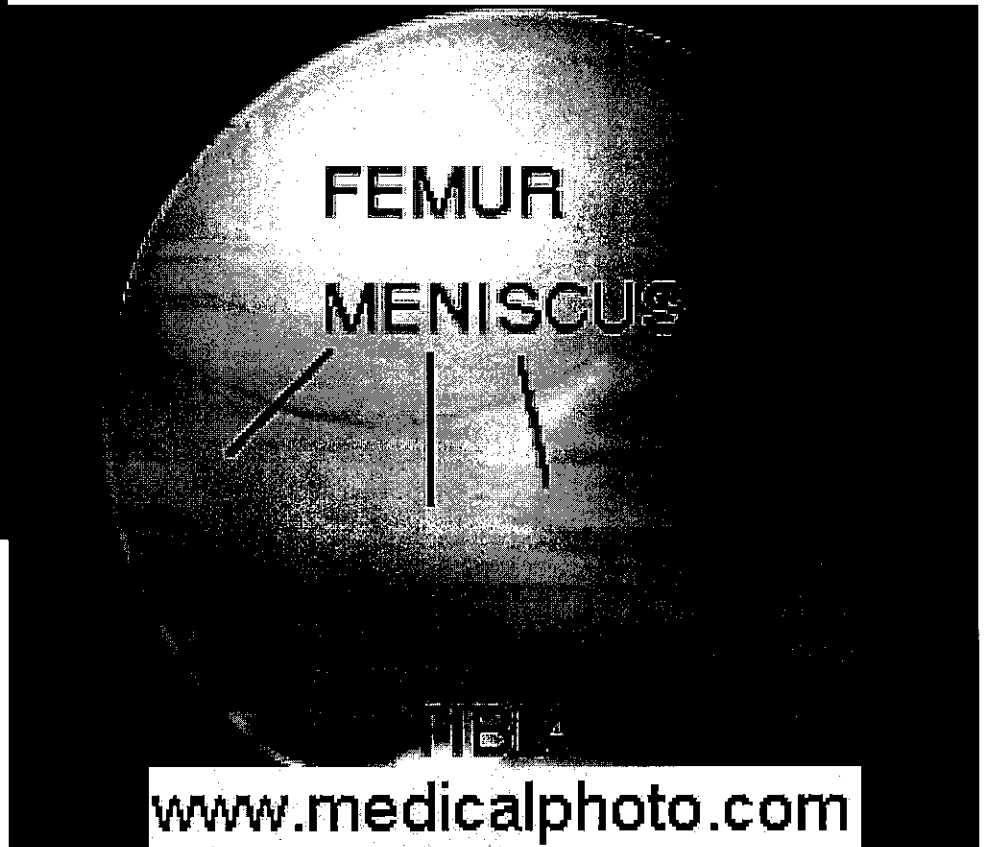
Value of MRI as Diagnostic Tool

- Studies do NOT prove it superior to composite clinical exam
- Many false positives appear
- MRI has high NEGATIVE predictive value
- Sensitivity and specificity keep getting better as technology improves
- How will MRI result change treatment?
 - No surgeon would touch a knee without one
 - Helps with planning procedure

Bucket Handle Tear



Oblique Tear



Treatment Options

- Total meniscectomy
- Partial meniscectomy
- Meniscal repair
 - Inside out
 - Outside in
 - All inside
- Conservative (No operative intervention)

Consequences of Meniscectomy

- As early as 1948 Fairbanks noted increased osteophyte formation and femoral cartilage deterioration in meniscectomized knees
- Total meniscectomy remained a common procedure until the 1980's
- In medial meniscectomy, load bearing surfaces are halved, doubling stress on tibial plateau
- If 15-30% of meniscus is removed, forces between tibia and femur increase up to 350%

Total meniscectomy

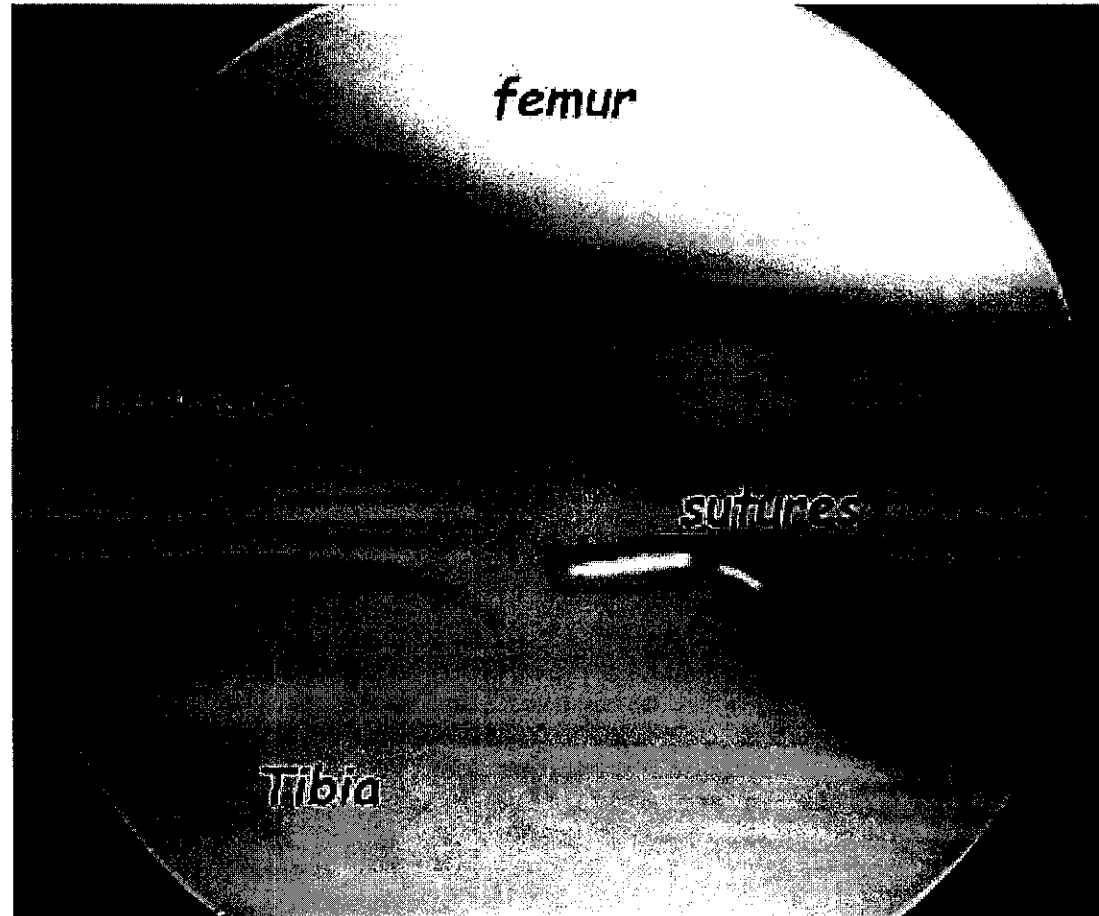


Meniscus Repair

- Used in longitudinal tears
- Many fixation devices, none better than sutures, though some are faster
- Outside in, inside out, and all inside technique

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Meniscus repair



Criteria for Meniscal Repair vs. Partial Meniscectomy

Criterion	Repair	Ptl. Meniscectomy
Distance from rim	<3mm	>3mm
Mobility of fragment	Stable	Mobile
Age of injury	Recent	Old
Ret. To Play	Later	Sooner
Age of patient	Younger	Older

Meniscus Repair--Recovery

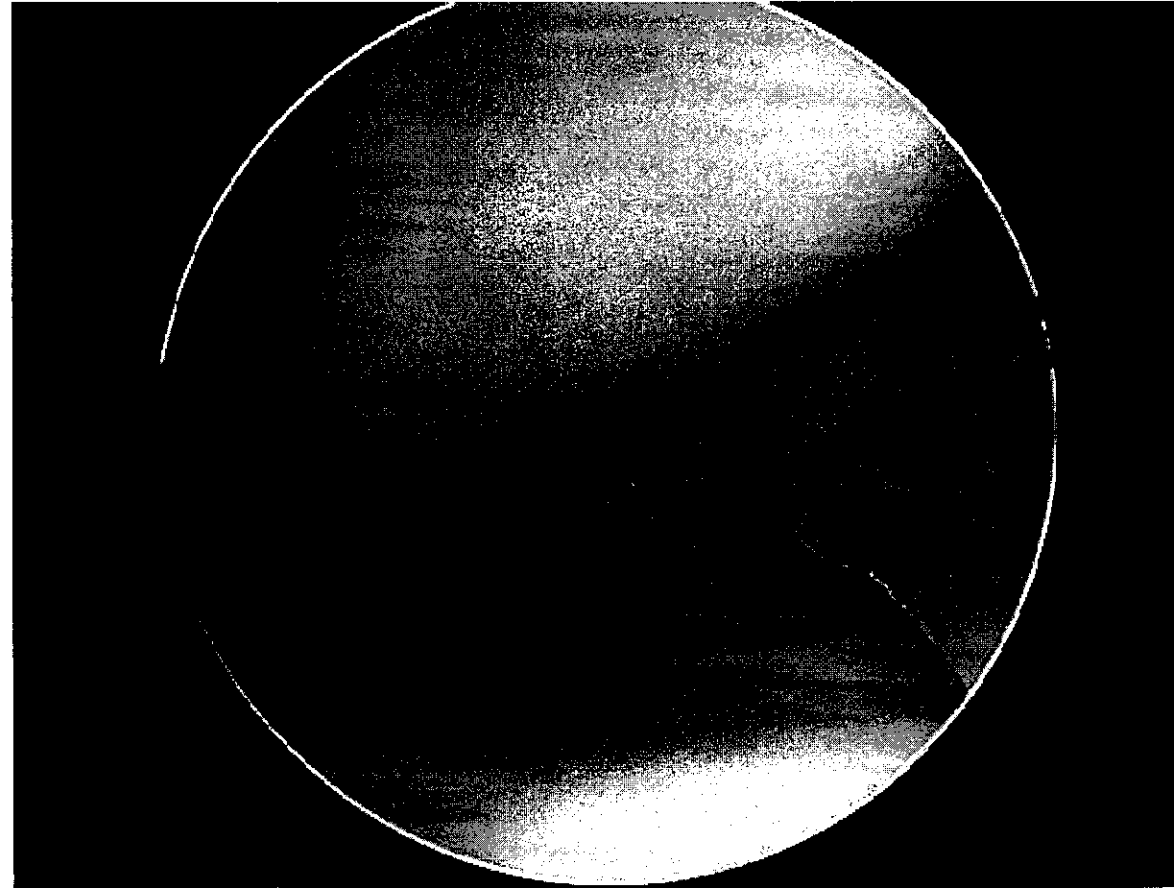
- Pts must wear brace with pwb for 2 weeks
- Sedentary workers back to work in 1 week
- Laborers back in 6-8 weeks
- Athletes back in 12-16 weeks
- 76% “excellent” results after 10 years*

Johnson MJ, Lucas GL, Dusek JK, Henning CE. Isolated arthroscopic meniscal repair: a long term outcome study (more than ten years). *Am J Sports Med.* 1999;27:44-49.

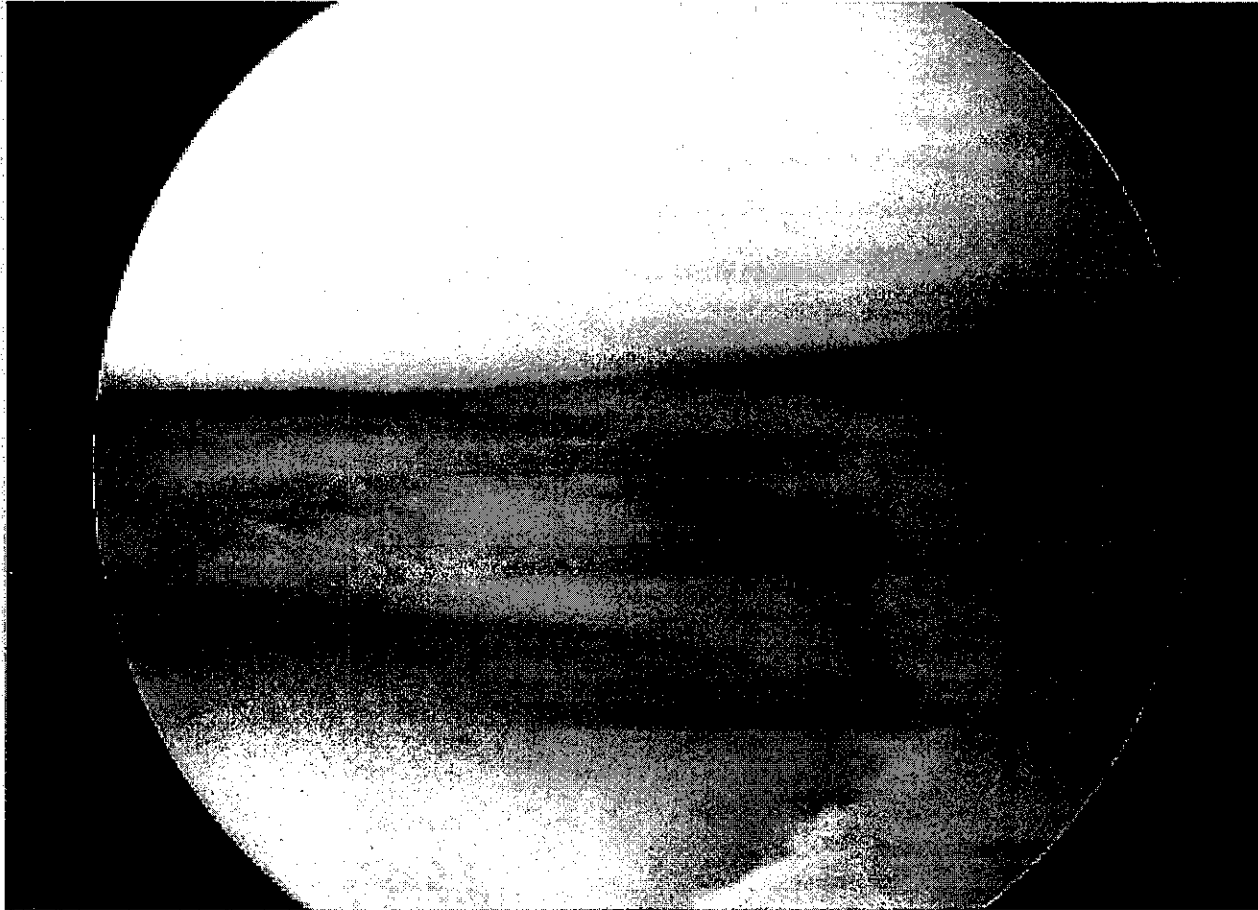
Partial Meniscectomy

- Done when tear involves interior 70%
- May be done when athlete wants to resume activity ASAP
- Done with mobile fragments
- 10-35 minute arthroscopic procedure under regional or general anesthetic
 - Mobile areas removed
 - Edges contoured to “prevent further tears”
- Immediate partial weight bearing allowed
- Crutches for 1-2 days

Partial meniscectomy



Partial meniscectomy



Partial Meniscectomy--Recovery

- Sedentary workers back to work in 1 week
- Laborers back in 2-4 weeks
- Athletes back in 2-6 weeks
- 88% “excellent” results at 15 years*

*Burks RT, Metcalf MW, Metcalf RW; 15 yr f/u of arthroscopic partial meniscectomy; Arthroscopy 1997; 13:673-9.

Conservative Therapy

- Not an option if knee locked, fragment not reduced
- Symptom relief with post-exercise RICE
- Symptom relief with NSAIDS, immobilization
- Physical therapy focusing on closed chain exercise of quadriceps and hamstrings
- Failure includes recurrent effusion, recurrent locking or pain that interferes with ADLs
- No randomized trials

Conservative Study Result

- Retrospective review of 3612 arthroscopies
- Identified 80 “stable” tears (<3mm movement) for whom nothing was done
- 70 were longitudinal, 10 were radial
- Only 6 needed subsequent surgery, 4 of which had had additional trauma
- 32 patients had “second look” surgery
- 17/22 longit. tears, 0/6 radial tears healed completely

Weiss CB, Lundberg M, DeHaven KD, Gillquist J; Non-operative treatment of meniscal tears. JBJS 1989 71-A(6):811-22.

Cochrane Review 2002

- No evidence for comparing surgery to no treatment*
- Partial is better than total meniscectomy:
 - Less operative time
 - Enhanced recovery rate
 - Improved long term stability
- Arthroscopic is better than open meniscectomy
 - Less operative time
 - **Quicker recovery post-op**

Summary: What We Know

- The meniscus, torn or intact, helps to stabilize and dissipate axial force in the knee
- Degenerative changes develop more frequently in meniscectomized (total or partial) than in normal knees (Williams, others)
- When meniscal repairs fail, pts are often engaging in the same activity as initial injury
- Longitudinal tears heal more readily than radial tears and simple or bucket handle tears heal more readily than complex ones

Summary: What We Know

- Peripheral tears (in the vascularized area) heal more readily than central tears (Noyes, Krych)
- Meniscal tears are accompanied by ligament tears in many cases
- Repairing both meniscus and ligaments (when both injured) improves outcomes (Noyes)
- Ligamentous pathology with meniscal tears makes degenerative changes more likely

What We Know

- Younger pts do better with meniscal repair than older patients (Mintzer)
- Less surgery is better than more surgery
 - Arthroscopy better than open
 - Partial better than complete meniscectomy (Cochrane)

What We Don't Know

- Whether no surgery is better than less surgery
 - Whether operating on stable radial tears improves outcomes
 - How to tell without surgery that conservative treatment is a reasonable option
- Whether and how long to immobilize the acute tear
- If a repair is undertaken, what timing and type of repair has the best outcomes
- If no repair is done, whether and when to do a “second look”

??Questions??

Thank
You

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Conservative Study Results

- “Stable” tears at ACL reconstruction left to heal and 2nd look removing ACL hardware
- Lateral: 74% healed, 6% incompletely healed, 14% unhealed
- Medial: 56% healed, 6% incompletely healed, 24% unhealed
- Healing rate was “length dependent”

Conservative Study Results

- 32 patients
- 30 lateral and 10 medial meniscal tears along with 25 ACL tears and 7 PCL tears
- Arthroscoped initially with repeat at 3 mo.
- Lateral meniscus: 69% completely healed and 18% incompletely healed
- Medial meniscus: 58% completely healed and 0% incompletely healed

Ihara H, Miwa M, Takayanagi K, Nakayama A.
Clin Orthop Relat Res. 1994 Oct;(307):146-54.

Ihara: Results Without Surgery

Injury	Results at 2 nd Look
Lat Meniscus	69% healed completely, 18% healed partially
Medial Meniscus	58% healed completely 0% healed partially
Ant. Cruc. Ligament	80% healed “satisfactorily”
Post Cruc. Ligament	3/7 (40%) healed “satisfactorily”

Thessaly Test?

- Done with pt standing, first on normal leg
- Flex knee 5 degrees, rotate body on fixed leg back and forth 3 times, holding examiner's hands for stability
- Flex further to 20 degrees and repeat
- Repeat on affected leg
- Positive is pain at joint line or feeling of locking or catching

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