MENISCUS BASIC SCIENCE

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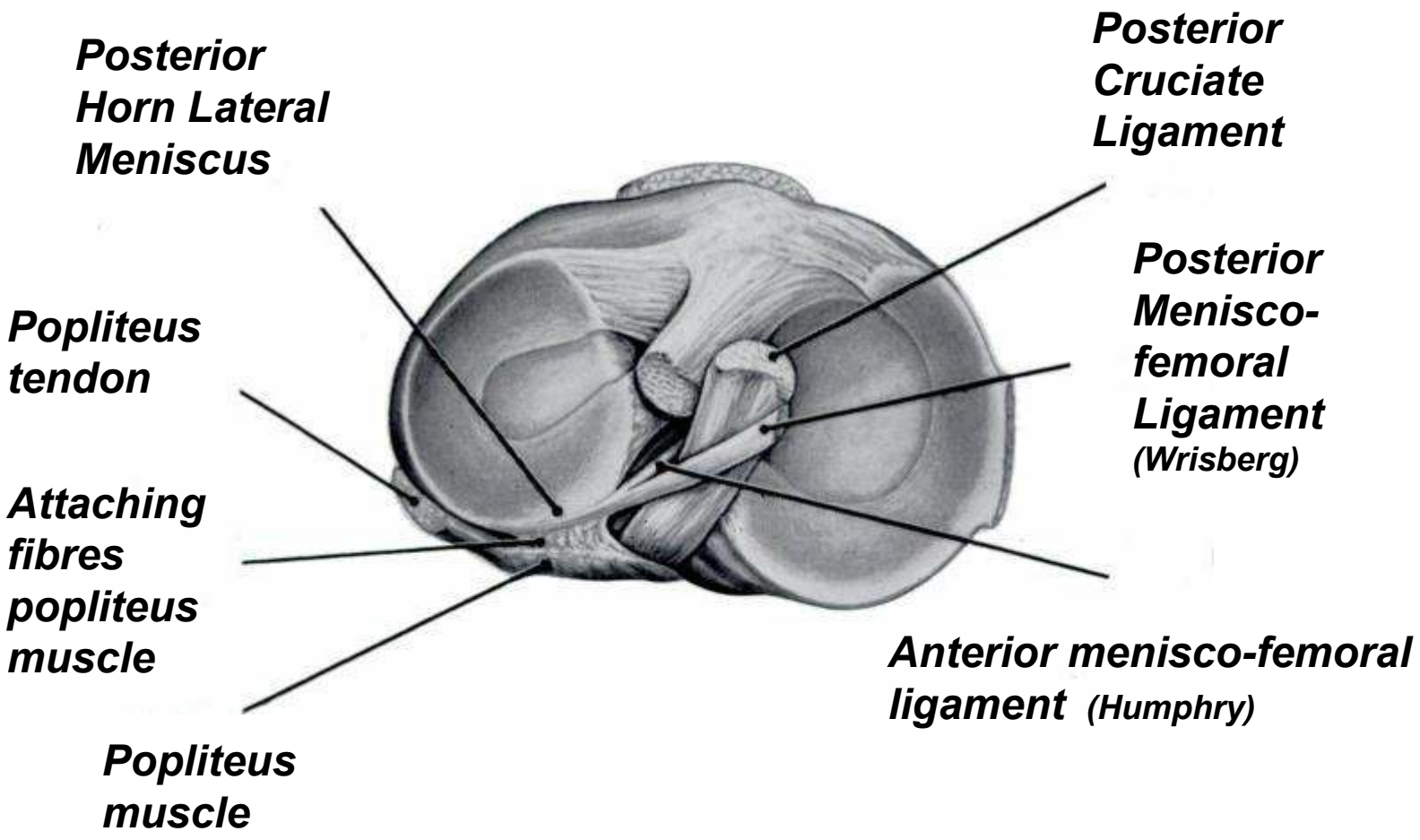
Introduction

- Anatomy
  - Macroscopic
  - Microscopic
- Function
- Healing and Repair
- Meniscal Tears
- Examination
- Investigation

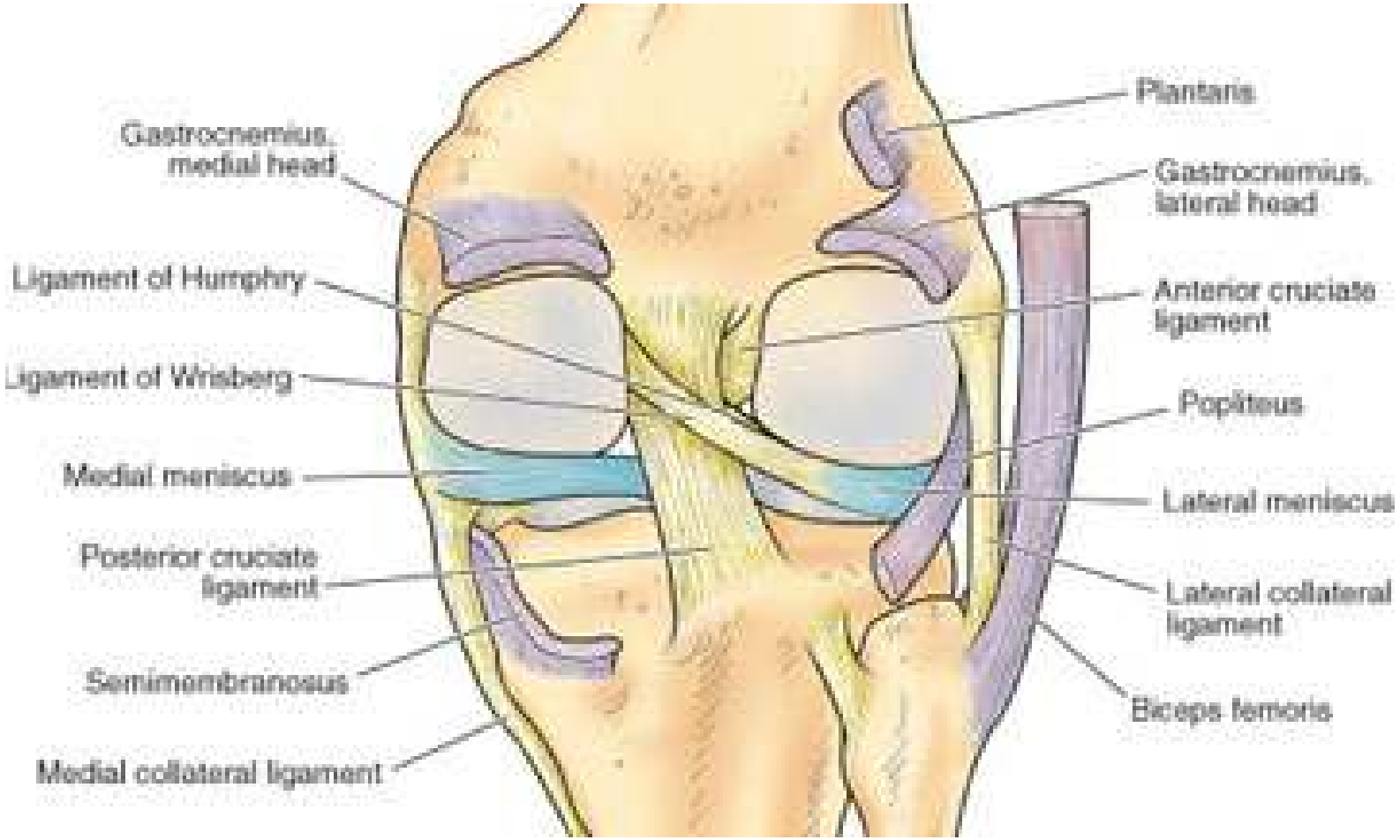
Anatomy

- Macroscopic Appearance
  - Crescents
  - Triangular cross section
  - Cover 50-66% of joint surface
  - Peripheral edges convex
  - Attached to inner surface of knee joint capsule
  - Coronary ligaments attach menisci to tibia

Meniscal Anatomy



Meniscal Attachments



Medial Meniscus

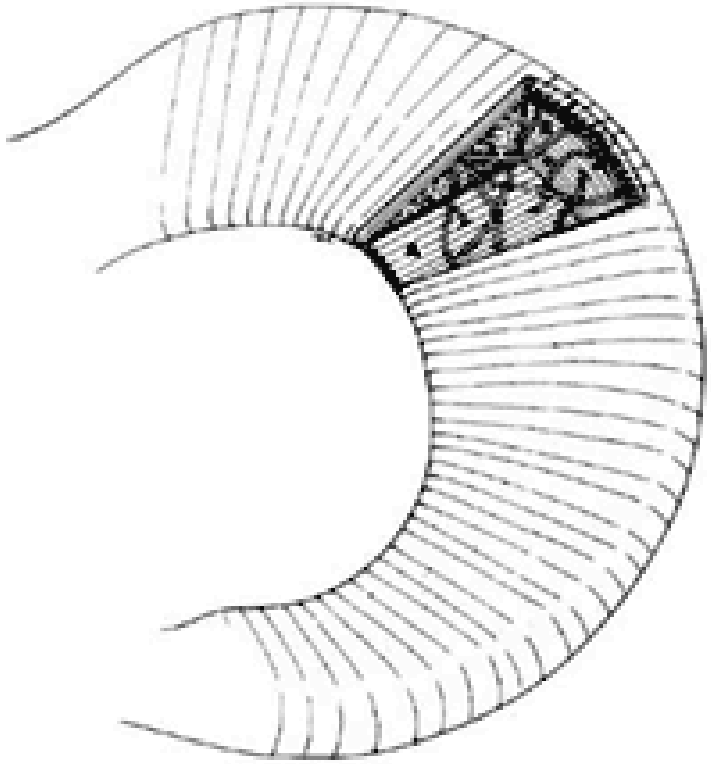
- C Shaped
- Covers 64% of tibial plateau
- Posterior horn wider than anterior horn
- Attached anteriorly to intercondylar eminence
- Posteriorly to intercondylar eminence anterior to attachment of PCL
- Firmly attached to medial capsule at deep medial collateral ligament
- Attached to tibia via coronary ligaments

Lateral Meniscus

- Circular
- Covers 84% of tibial plateau
- Smaller in diameter than medial meniscus
- Thicker peripherally
- More mobile
- Attached posteriorly to medial femoral condyle via meniscofemoral ligaments
  - Humphry anterior to PCL
  - Wrisberg posterior to PCL
- Attachment to capsule interrupted by popliteus

Microscopic Anatomy

- Tightly woven Type I collagen
  - fibrochondrocytes
- Fibres
  - Circumferential
  - Radial
  - perforating
- Strength lies in hoop forces



Vascularity

- Largely Avascular
- Blood supply from lateral and medial geniculate vessels both inferior and superior
- Perimeniscal capillary plexus

Arnoczky SP, Warren FR.Microvasculature of the Human Meniscus. Am J Sports Med 10;90-95, 1982

Anatomical Variants

- Anomolous attachments
  - Anterior horn ACL
- Hypoplasia or congenital absence
- Discoid Meniscus
  - Lateral
    - 4-15% incidence
    - ‘Snapping’
  - Medial
    - Rare 0.06-0.3%

Function

- Load Transmission
- Enhancement of articular conformity
- Distribution of joint fluid
- Nutrition of articular cartilage
- Prevention of soft tissue impingement during joint motion
- Stability of knee joint

Function – Load Transmission

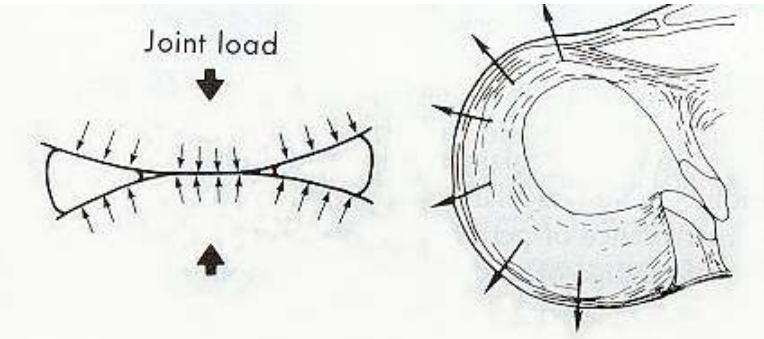
- Deepens articular surface
- Enlarges contact area by 2.5x
- 50% of load transmitted in extension and 85% in flexion
- Menisectomised knee increases contact pressures because of 50% reduction in contact area
- Partial menisectomy increases contact pressures by 350%

Function – Joint Stability

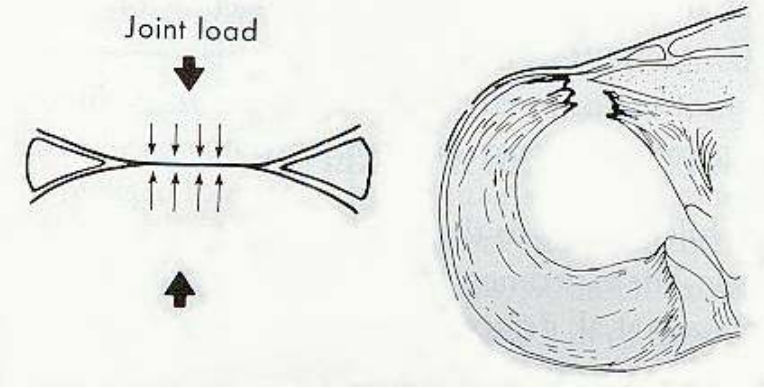
- AP stability effected by intact MM
- Depends upon intact ligaments
- Effect exaggerated if ACL disrupted
- Medial menisectomy has greater effect than lateral

Function –Shock Absorption

- Hoop tension keeps menisci between bones

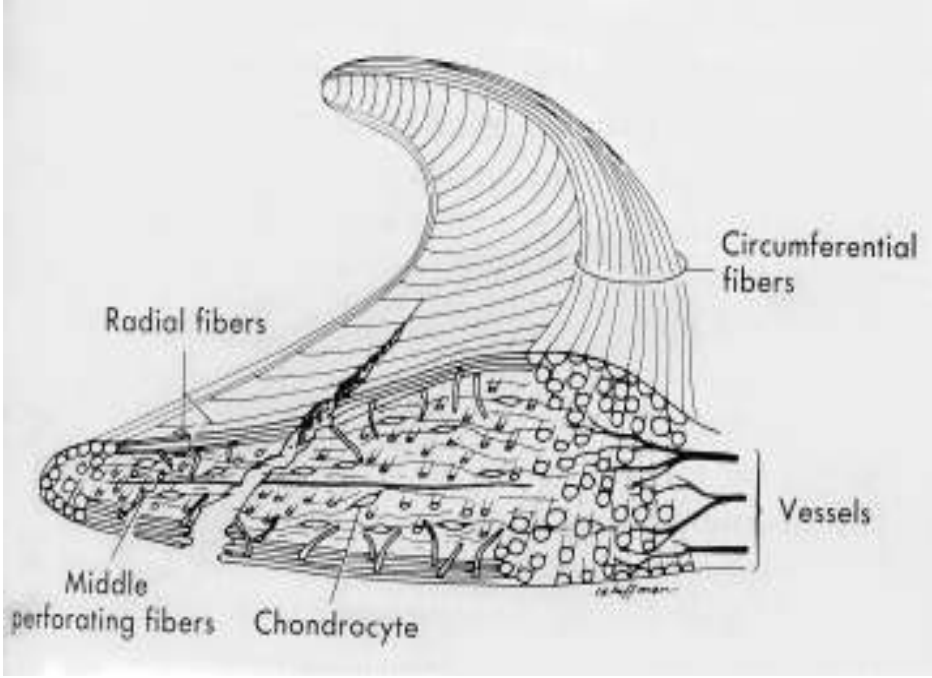


- Single complete radial cut eliminates hoop tension



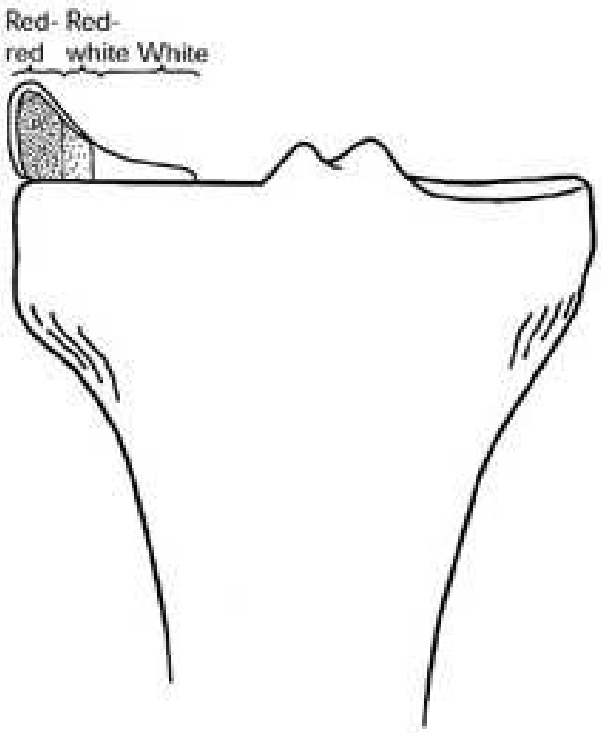
Meniscal Tears

- Most commonly caused by rotational force on a partially flexed knee
- Posterior horn
- Longitudinal



Meniscal Healing

- Vascularity determines repair
  - Perimeniscal capillary plexus supplies outer 10-25%
- Classification Miller,Warner,Harner
  - Red – fully within the vascular area
  - Red-white – at the border of the vascular area
  - White – within the avascular area



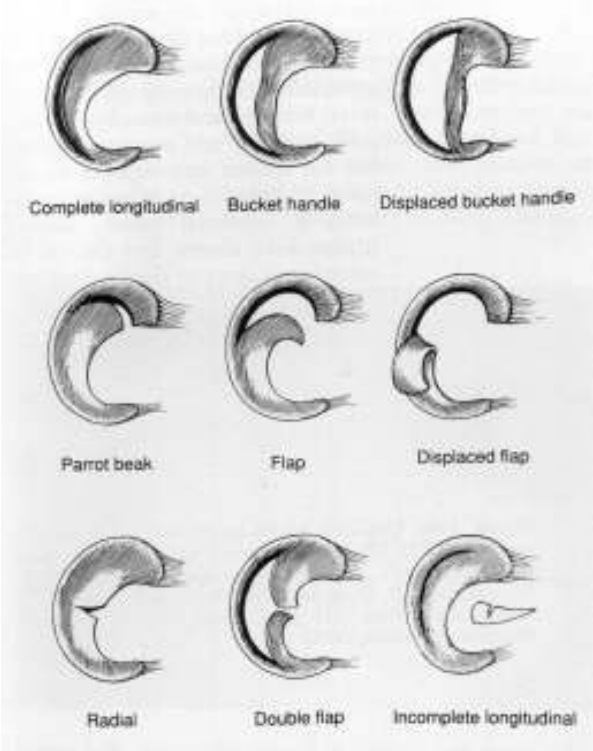
Classification of Meniscal Tears

- Defined by location related to blood supply or tear pattern
- Traumatic vs degenerative tears
  - Vertical
  - Horizontal
  - Complex

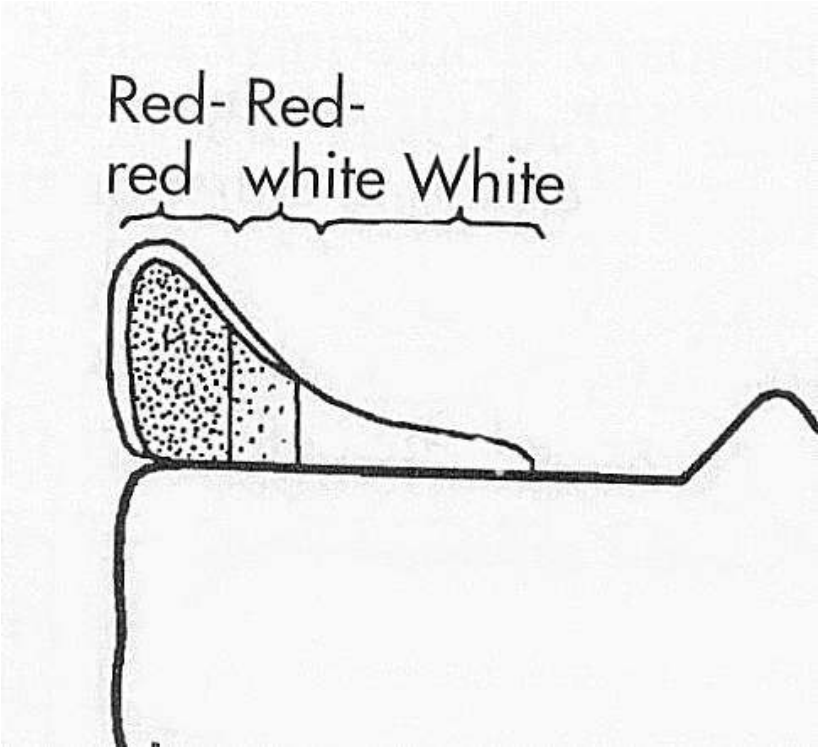


Classification

Morphology

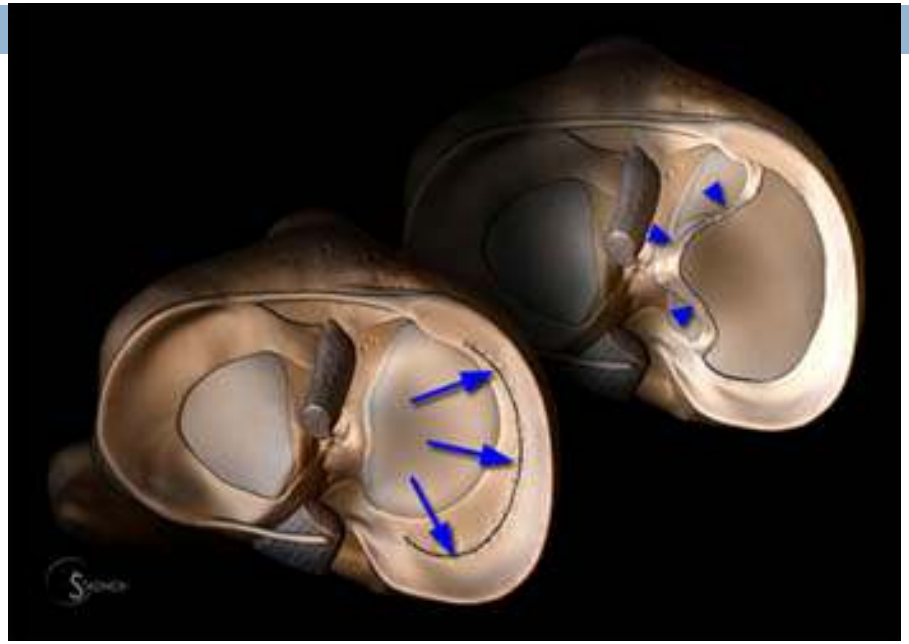


Location related to blood supply



Bucket handle Tear

- Extensive longtitudinal tears
- Subluxation of free edge between the articular surfaces



Diagnosis

- History
  - Mechanism of injury
  - Pain
  - Intermittent swelling
  - Clicking, locking, giving way
  - Pain on squatting or deep flexion
- Focussed Examination
  - Locked knee
  - Quads wasting
  - Effusion
  - Joint Line tenderness
  - McMurrays Test

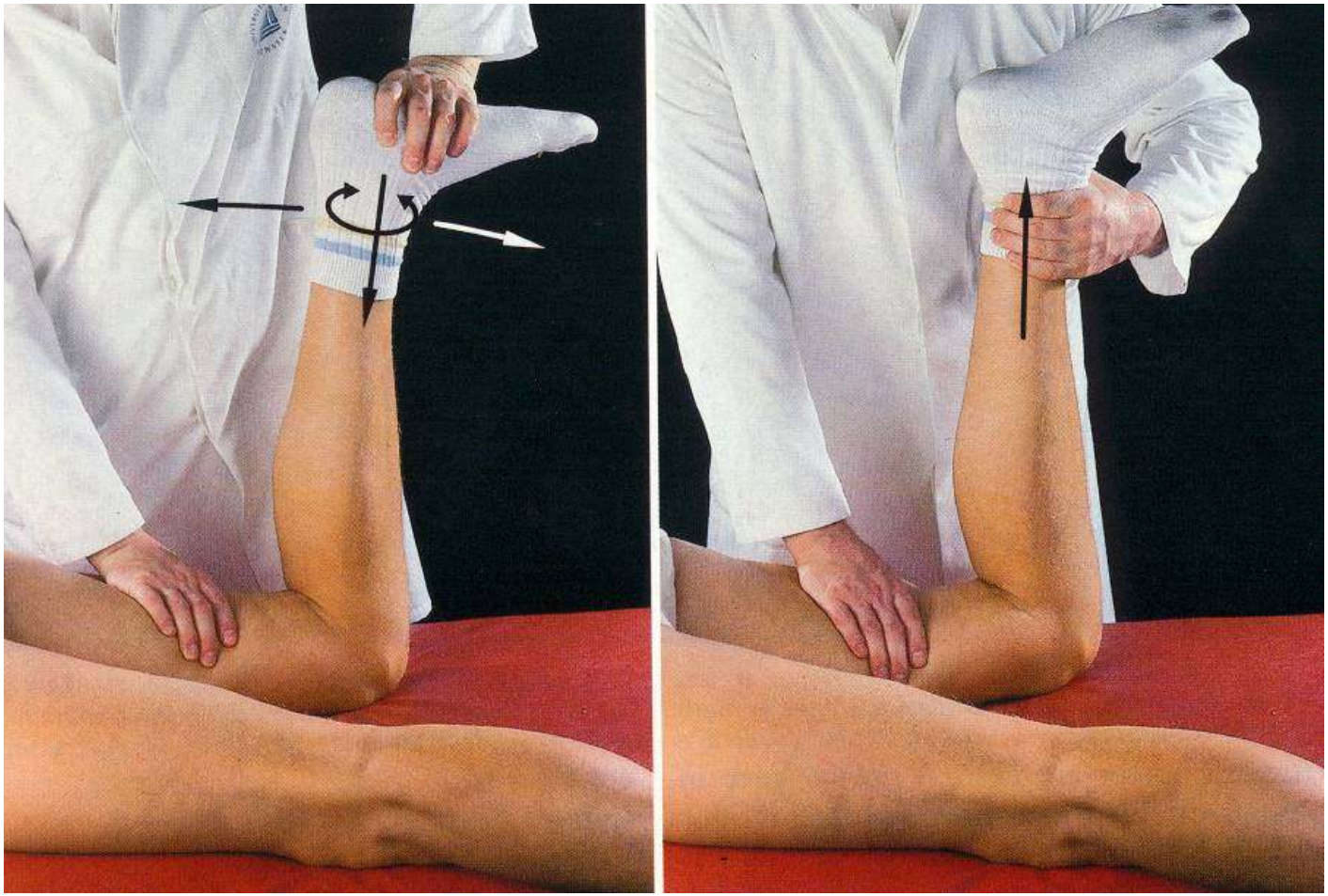
- Diagnostic Composite
  - History of catching or locking
  - Pain with forced hyperextension
  - Pain with maximum flexion
  - Pain with audible click with mcMurrays Test
  - Joint line tenderness on palpation

92%PPV in the absence of ACL injuries

Lowery,Steadman et al

McMurray's Test

Apley's Grind Test



Meniscal Provocation Tests

- Joint line tenderness 74%
- Apley test 46%
- McMurrays test 35%

Meniscal Tear - MRI

Summary

- Menisci important in biomechanics of knee
- Medial meniscus less mobile and more likely to sustain damage
- Healing related to blood supply

MCQ

- Which of the following structures always pass anterior to the PCL?
  A. The insertion of the posterior horn of the lateral meniscus
  B. The ligament of Wrisburg
  C. The popliteus origin
  D. The posterior oblique ligament
  E. The ligament of Humphry

Result

- Which of the following structures always pass anterior to the PCL?
  A. The insertion of the posterior horn of the lateral meniscus
  B. The ligament of Wrisburg
  C. The popliteus origin
  D. The posterior oblique ligament
  E. The ligament of Humphry