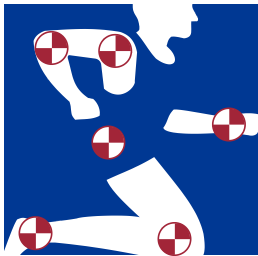


ACL Injury: Evaluation and Imaging

Craig C. McKirgan, DO
Orthopaedic Surgeon

Sunday 10 Nov. 2013



Center for
Orthopaedics
& Sports Medicine

OBJECTIVES

- Epidemiology of ACL injuries
- Anatomy
- Diagnosis of ACL Injuries
- Imaging for ACL injuries
- Treatment Options



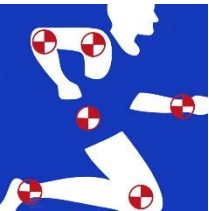
Facts & Epidemiology

- Substantial Physical & Psychological morbidity for athletes.
- Lost Playing Time
- Lost Productivity
- Possible Future Osteoarthritis (>50% at 10 yr.)
- 70% of injuries are Non-Contact

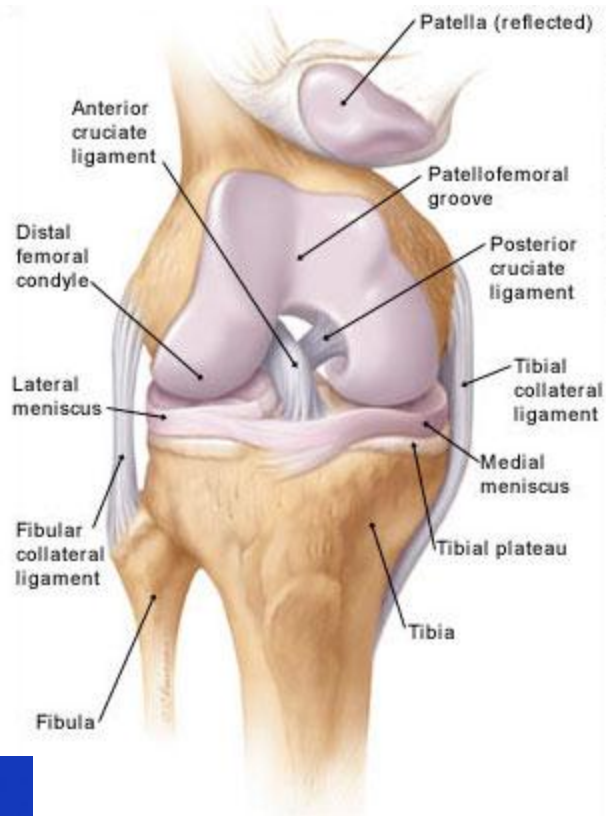


Facts & Epidemiology

- Females 4-6 x greater risk than males (Title IX)
- >50K Female Athletes (HS & College) tear their ACL/yr. in the USA
- \$17K/ACL Recon & Rehab
- Unusual in children <14 y/o



Anatomy Ligamentous

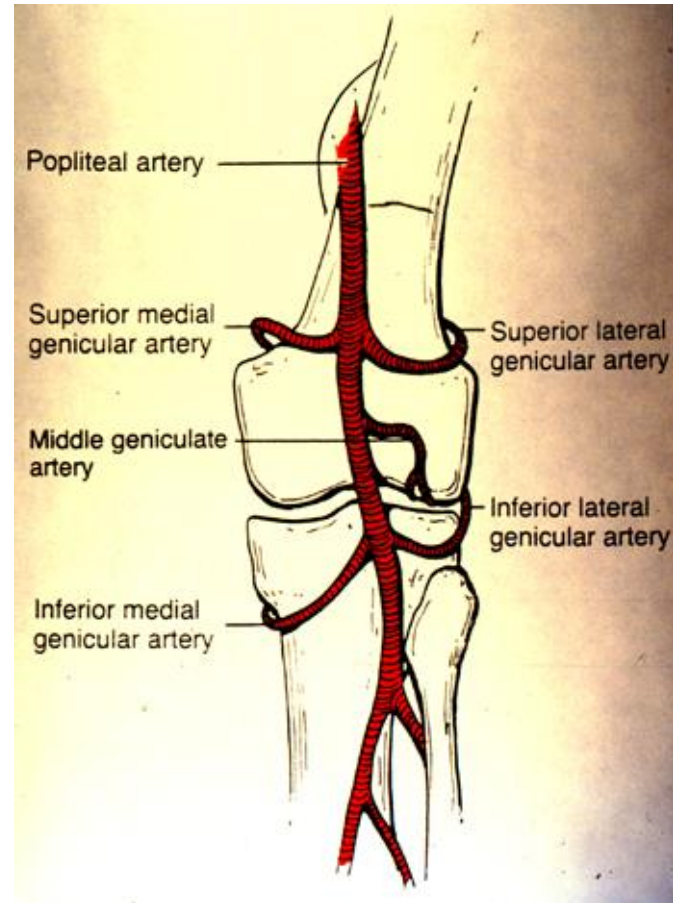


Anatomy Attachments



Anatomy

- Vascular Supply
 - Middle Geniculate Artery (Primary Source)
 - Perisynovial sheath and terminal elements of the tibia and femur.



Anatomy

- Nerve Supply
 - Posterior articular nerve (sub-synovial)



Function

- Prevent excessive anterior translation of the tibia on the femur
- Control normal kinematics
- Prevent Hyperextension
- Prevent excessive internal rotation of the tibia on the femur



Pathology

- Nontraumatic ACL Insufficiency
 - Physiologic joint laxity (bilat-exam)
 - Congenital absence of the ACL (rare)
 - Absence of tibial eminence
 - Absence of intercondylar notch
 - Developmental absence
 - Associated with
 - Proximal focal femoral deficiency
 - Congenital knee dislocation
 - Leg length discrepancy



Pathology

- Traumatic ACL Insufficiency
 - Location of Injury
 - Tibial or femoral avulsion fracture
 - Midsubstance
 - Time of Injury
 - Acute <3 weeks
 - Subacute 3 – 12 weeks
 - Chronic > 12 weeks



Pathology

- Traumatic ACL Insufficiency
 - Age of Patient
 - Chronologic
 - Physiologic
 - Tanner Stege
 - Bone Age
 - Natural History
 - Adult: ACL instability – degenerative disease
 - Children: Not well understood. Especially partial tears.



History

Acute (MOI)

Noncontact

(>50%)

Twisting/cutting
maneuver

- Rapid change of
direction

Contact



History

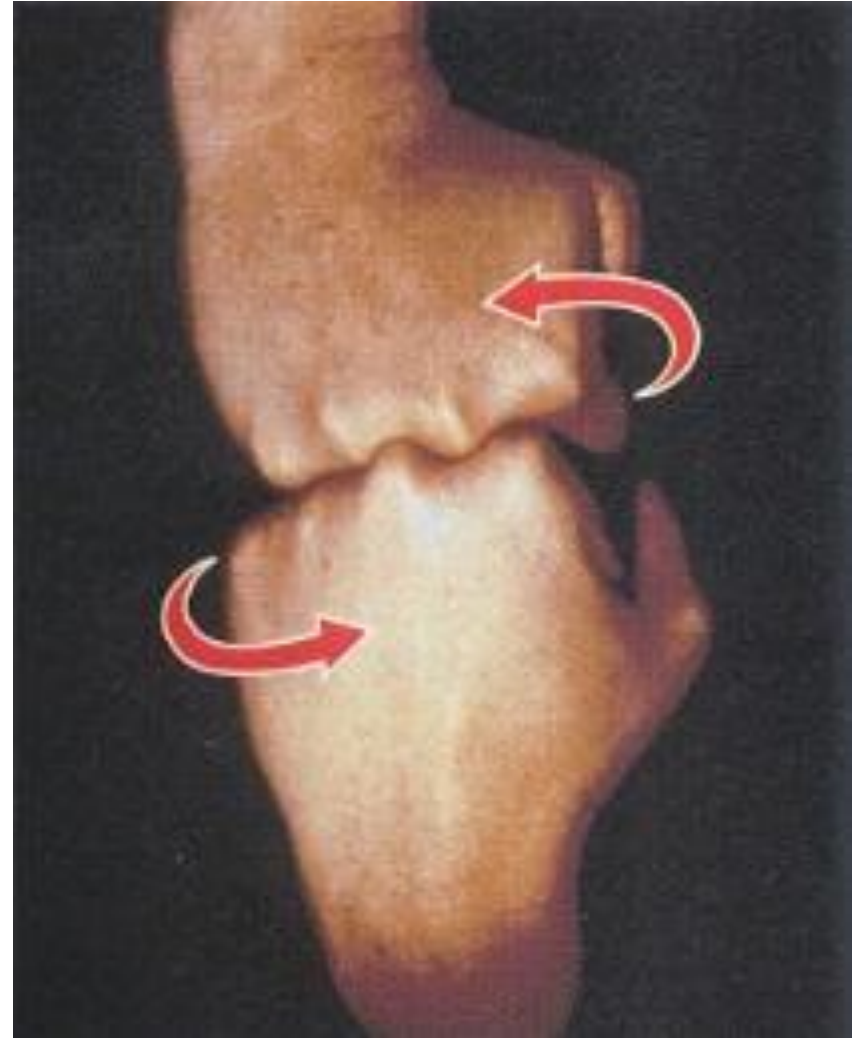
- History
 - Acute
 - “POP”
 - Unable to return to play
 - Effusion (hemarthrosis)



History

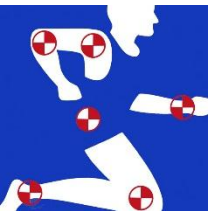
Chronic

- Instability/giving way/
“fist” sign
- Locking/catching
(meniscal)
- Recurrent effusions



Physical Examination

- Acute, sub-acute, chronic
- Bilateral extremity exam
- Hip exam



Physical Examination

- INSPECTION:
- Skin changes:
Ecchymosis or erythema
- Effusion



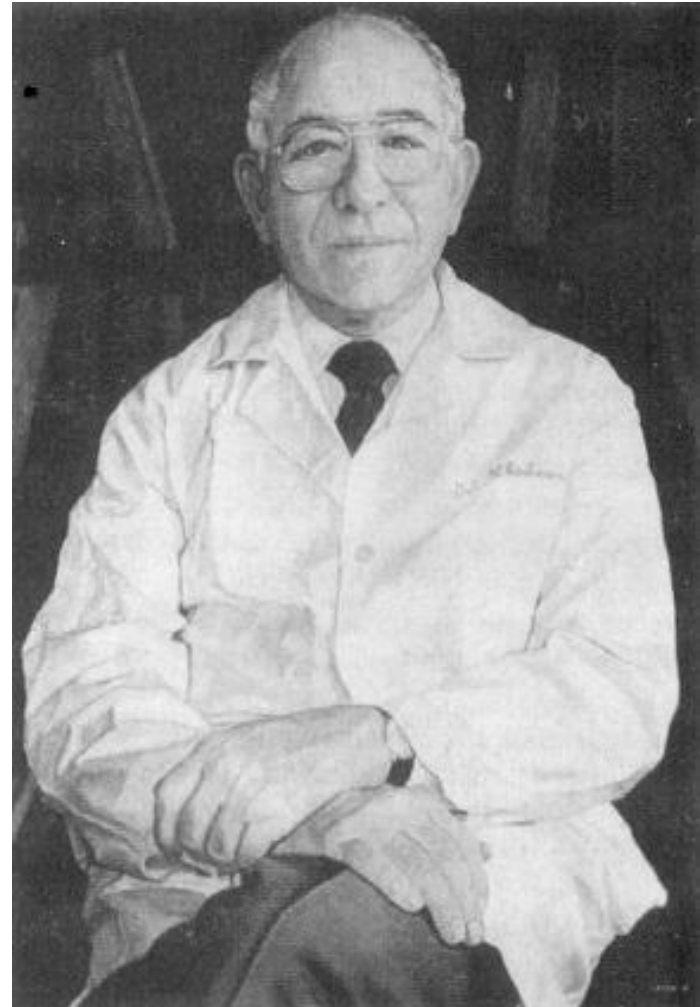
Physical Exam

- Meniscal exam
- Leg lengths
- Pulses
- Growth plate pain
- Valgus/varus stress (physis vs. collateral ligament)
- Patella Femoral Joint

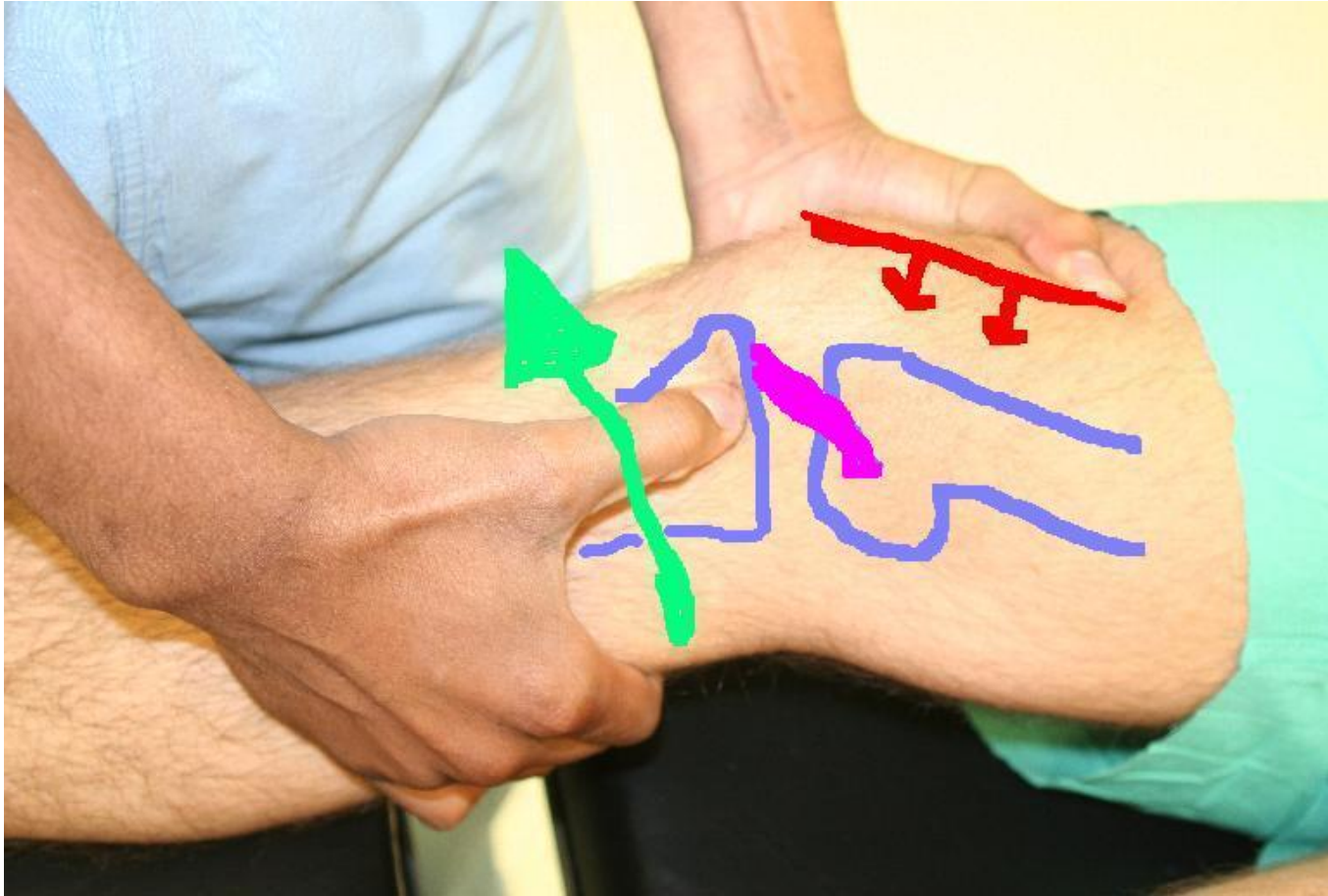


ACL Specific Exams

- Lachman Test
- Anterior drawer
- Pivot shift test
- Instrumented arthrometers (KT-1000)



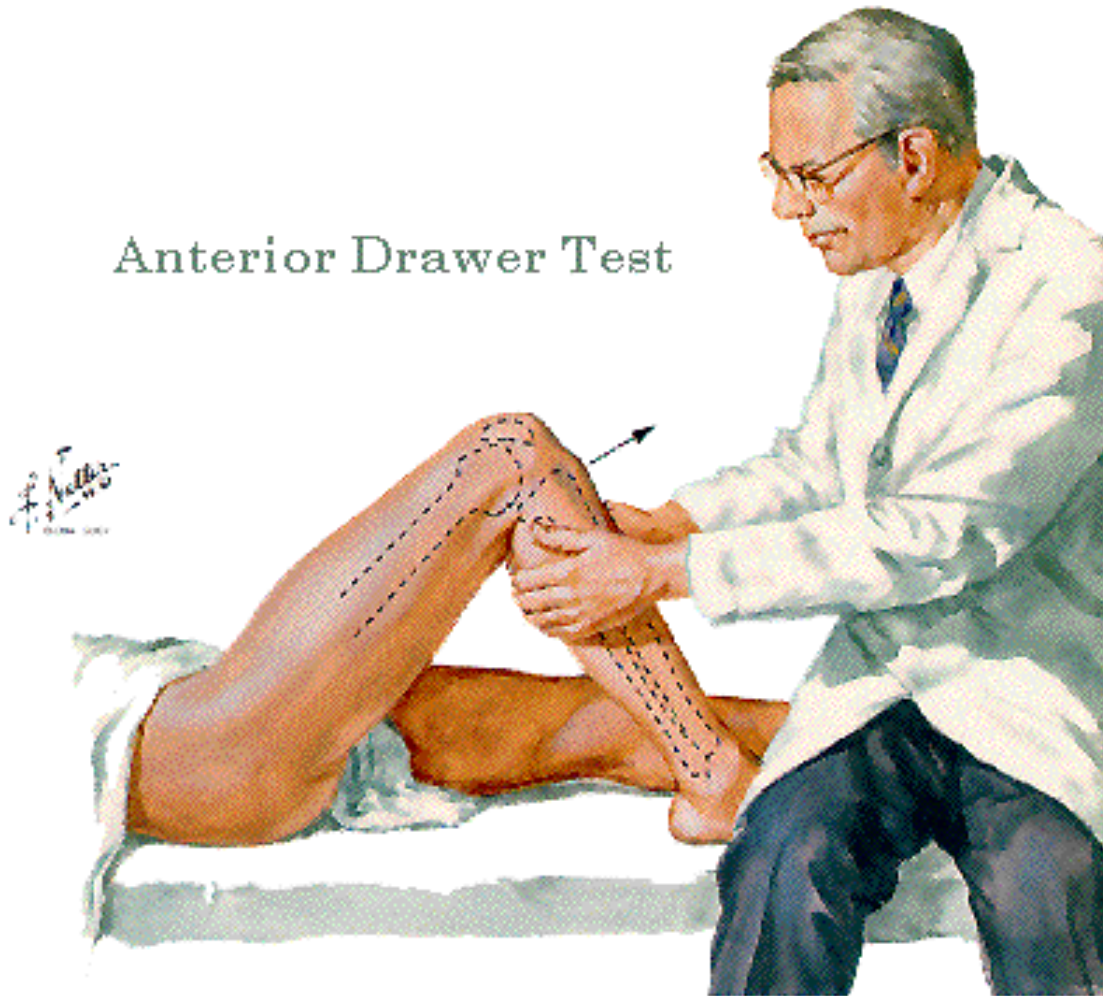
Physical Exam Lachman Test



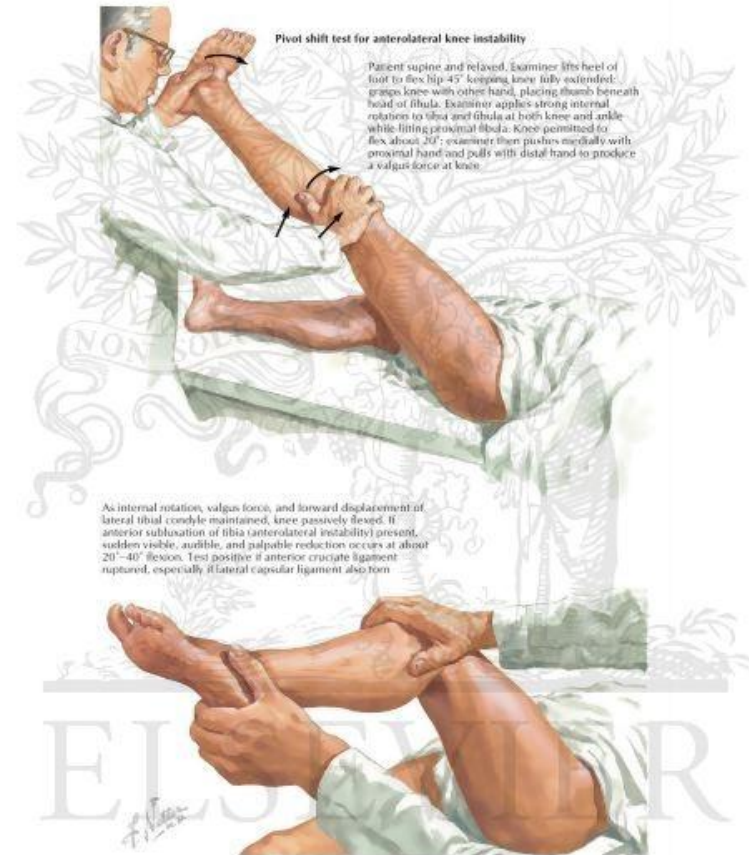
Physical Exam

Anterior Drawer

Anterior Drawer Test



Pivot Shift Maneuver



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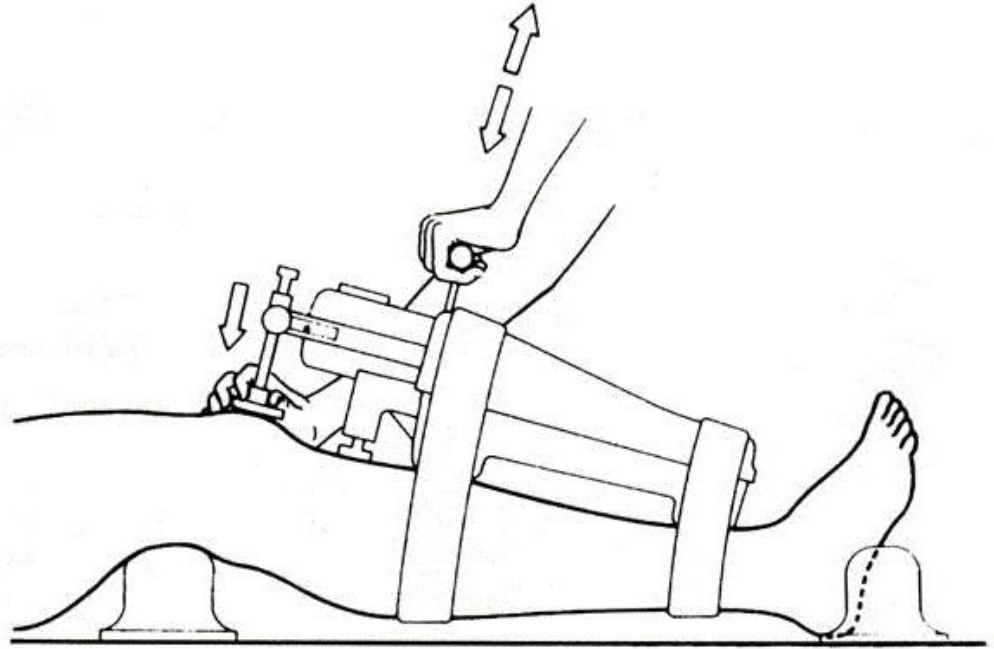
Physical Exam Video

Dr. Eric Janssen

- Lachman
 - Anterior drawer
 - Pivot shift test
- <http://www.youtube.com/watch?v=vEQw-G1Vr18>
 - 3:14



Instrumented Arthrometers (KT-1000)



Physical Exam

Knee Aspiration

- Hemarthrosis
 - Blood in the joint
 - ACL Tear
 - Meniscal Tear
 - Occult Fx (Fatty Droplets)



Imaging Studies

- X-rays
- MRI
- CT Scan
- Ultra sound



X-Rays

4 views. Ap, Lat, Notch, P-F

- Avulsions of bone (tibia, femur) Second fx
- Physeal maturity
- Physeal injury (stress views)
- Osteochondritis dissecans
- Hypoplasia of tibial eminence or femoral notch

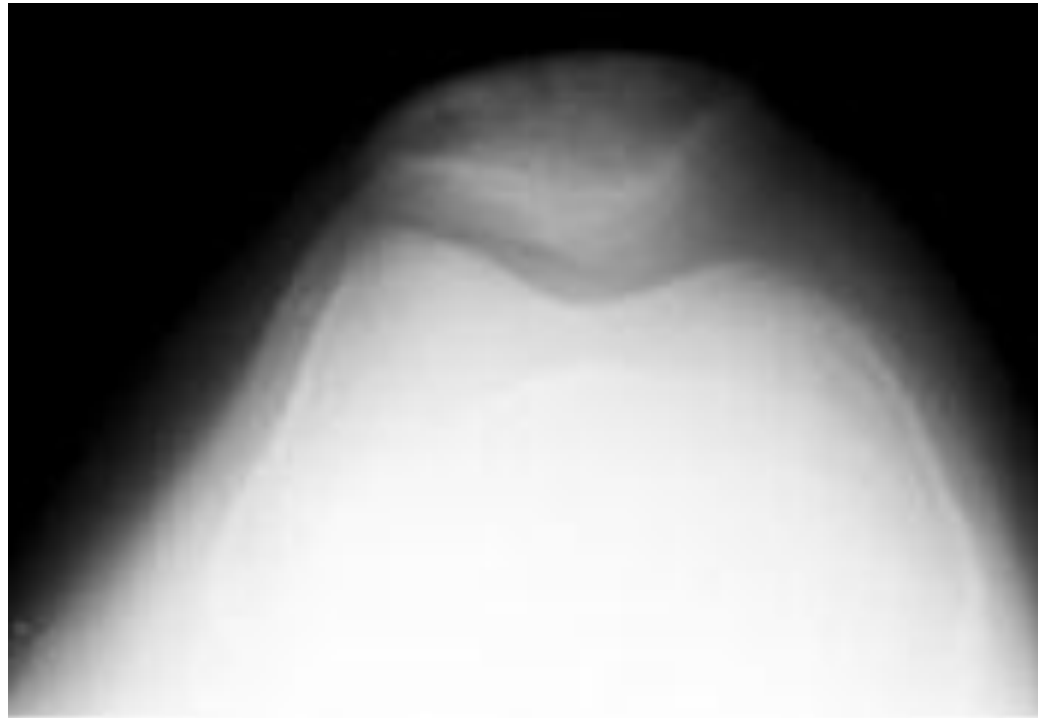


X-Rays

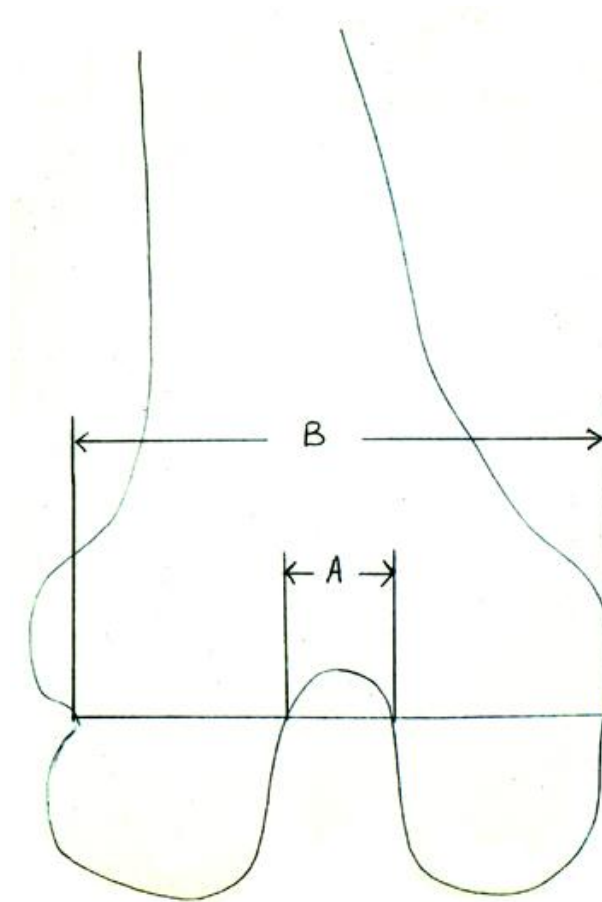
AP & Lateral



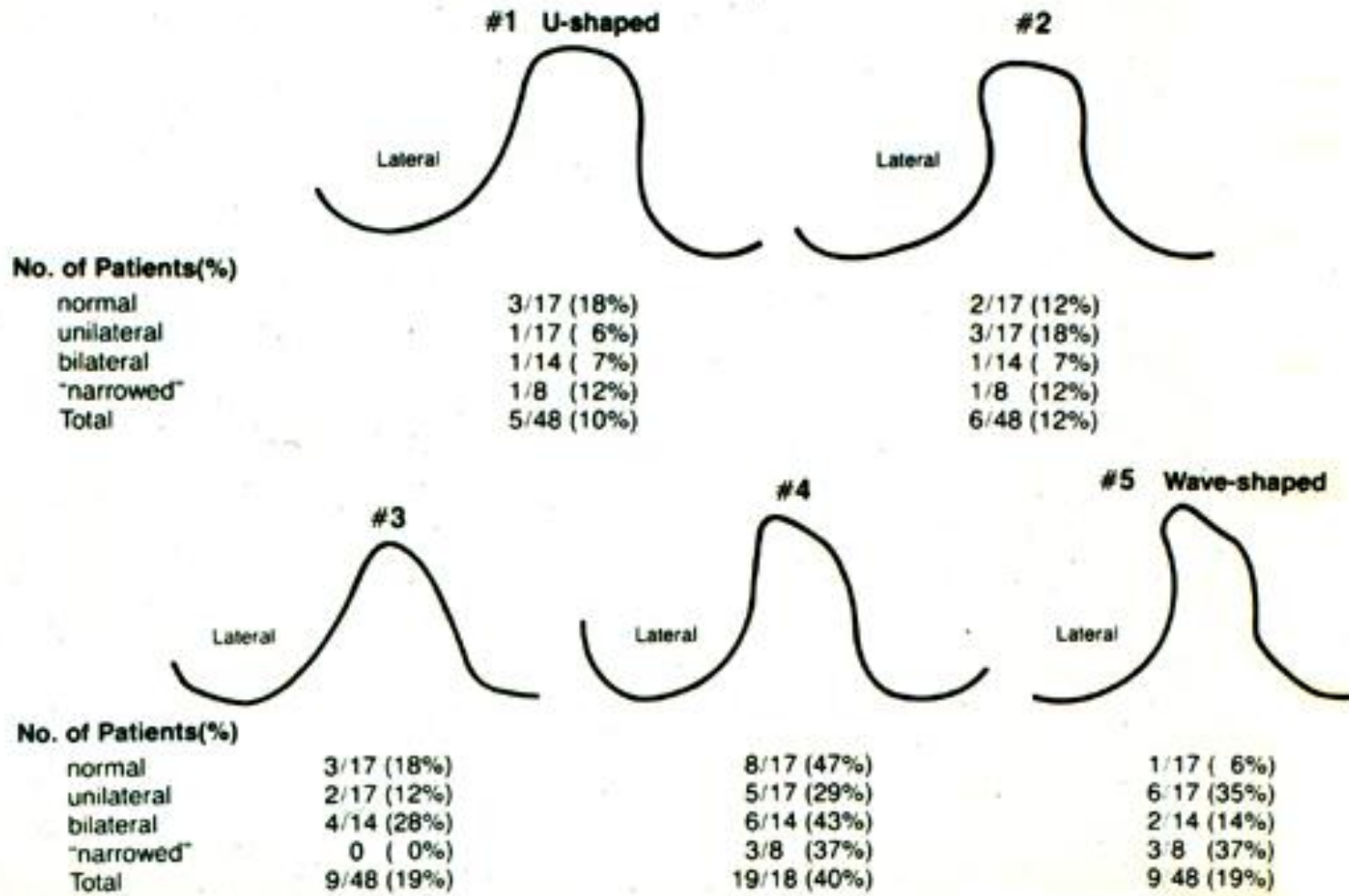
X-Rays Notch & Patella Views



Notch Ratio View



Notch Ratio



X-Rays Segond Fracture

Paul F. Segond

Paris, France

1851-1912

High (>75%) Association with ACL
tears



X-Rays

Segond Fracture

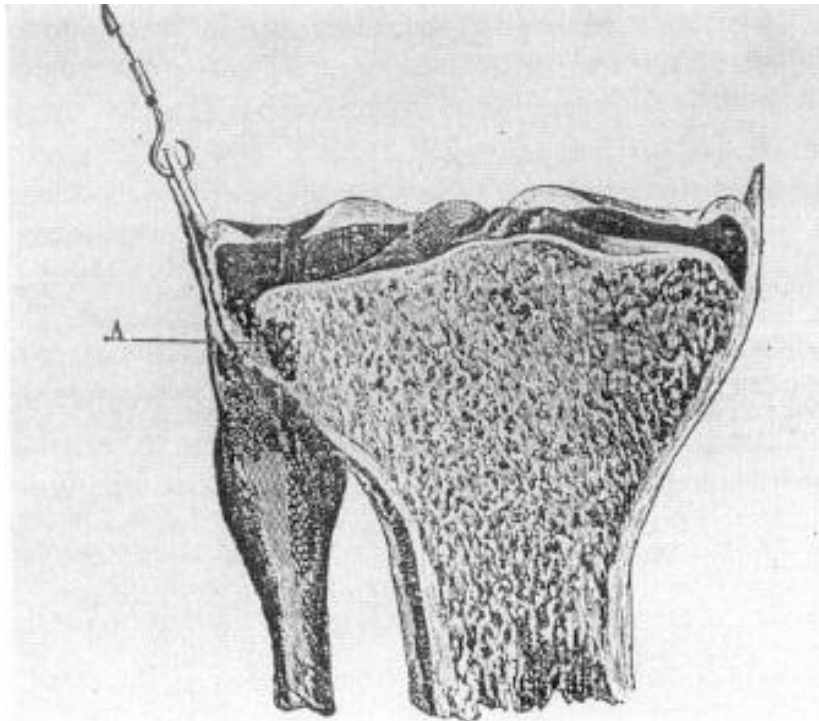
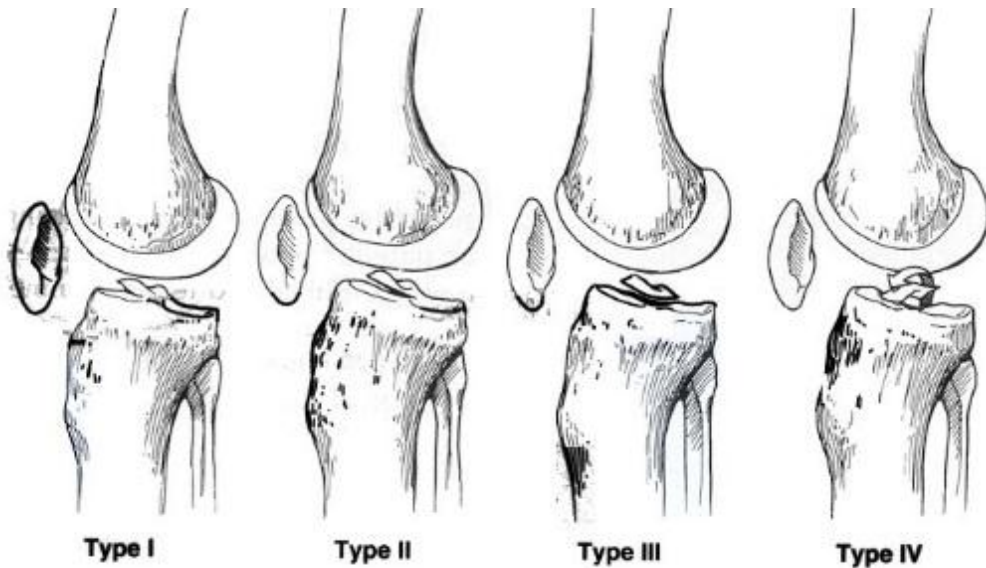


Figure 4. Segond fracture. (From *Prog Méd* 16: 1879.)



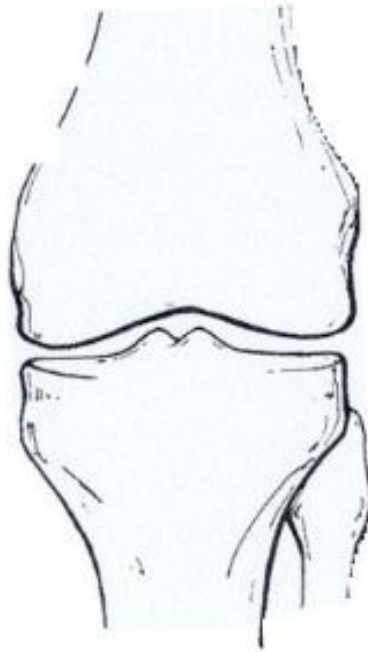
X-Rays

Tibial Eminence Fractures

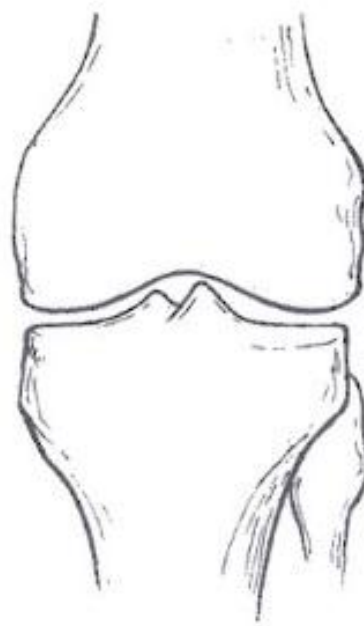


X-Rays

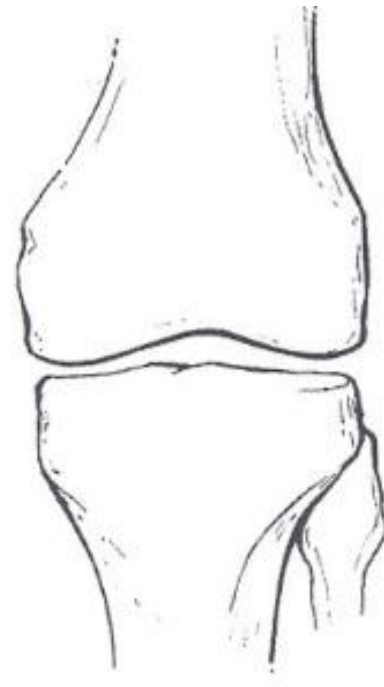
Hypoplastic Tibial Eminence or Femoral Notch



Normal



Total hyperplasia



Aplasia



X-Rays Physeal Injury



Magnetic Resonance Imaging (MRI)

- Coronal, SAGITTAL, axial views
- Area of ACL injury
- Chondral injury
- Meniscal injury
- Physeal maturity



Magnetic Resonance Imaging (MRI)



Treatment



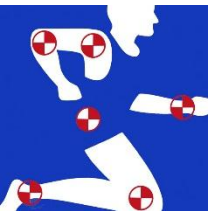
"Igor, quick! Run over to the cemetery, dig up a corpse, and bring me an anterior cruciate ligament."



Treatment

- Objectives

- Return to as near normal function as possible
- Eliminate/decrease episodes of instability and further injury



Treatment

- Non-Operative
 - Rehab
 - Bracing
 - Avoidance of High Risk Activities



Treatment

- Operative
 - Unable to “repair”
 - Must “Reconstruct” ACL



Summary

- Epidemiology of ACL injuries
- Anatomy
- Diagnosis of ACL Injuries
 - HISTORY
 - Physical Exam
- Imaging for ACL injuries
 - X-rays
 - MRI
- Treatment Options
 - Non-Operative
 - Operative



Questions?



Thank You

