Knee Internal Derangement in a 19-Year-Old Collegiate Football Player: A Case Study

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The knee consists of the following anatomical structures... 

What is Knee Internal Derangement (KID)? 
KID is a mechanical disorder of the knee that is due to a torn, ruptured, or deranged meniscus, or a partial or complete cruciate ligament rupture, with potential for synovial capsule involvement. Typical symptoms include pain, instability, and abnormal movement patterns.

Anatomy
The knee consists of the following anatomical structures...

**MUSCLE/TENDON**
- Sartorius
- Rectus Femoris
- Vastus Lateralis, Medialis, and Intermedialis
- Biceps Femoris
- Semitendinosus
- Popliteus
- Gastrocnemius
- Plantaris
- Gracilis

**LIGAMENTOUS/CARTILAGINOUS**
- Anterior Cruciate
- Posterior Cruciate
- Lateral Collateral
- Medial Collateral
- Lateral and Medial Menisci

**BONE**
- Tibia
- Femur
- Patella

**HYPEREXTENSION MECHANISM OF INJURY**

VARIATIONS
- Pure Hyperextension
- Hyperextension with varus force
- Hyperextension with valgus force
- Direct vs. Indirect Trauma

Main Restraints and Knee Stabilizers

ANTERIOR
- Quadriceps Musculature
- Patella/Patellar Tendon

POSTERIOR
- Posterior Synovial Capsule
- Gastrocnemius
- Posterior Cruciate

LATERAL
- Iliotibial Band
- Medial Collateral
- Lateral Collateral
- Lateral Joint Capsule

MEDIAL
- Superficial and Deep Median Collateral
- Medial Synovial Capsule
- Medial Retinaculum

POSTEROMEDIAL
- Semimembranosus
- Semitendinosus
- Posterolateral Corner
- Posterior Oblique Ligament

POSTEROLATERAL
- Popliteus
- Arcuate Ligament

Arthrokineamtics vs. Osteokinematics
Rolling, Gliding, Spinning vs. Flexion and Extension

Abstract
Epidemiologic research illustrates that knee internal derangement is one of the most common injuries in football that requires extensive rehabilitation, with knee injuries consisting of 16.4% of all football-related injuries in the NCAA. Knee internal derangement can present in a variety of football positions and is correlated with multiple mechanisms of injury. The Hope College Athletic Training Staff managed a case of Knee Internal Derangement due to a hyperextension mechanism in a 19 year old collegiate football linebacker. The anatomical structures involved in this incident include the PCL, MCL, medial and lateral menisci, tibial plateau, and femoral condyles.

Further, the case highlights the role of athletic trainers in diagnosis, how to properly triage care, and the body’s ability to heal naturally by primary intention.

Case Specifics
PRESENTATION
- Athletic described a MOI in which his knee was forced into hyperextension after disengaging from a block on a kickoff return.
- Able to walk off under own power, but complains of swelling, stiffness, and pain described as inside the knee.
- Ligamentous stress testing suggests possible PCL attenuation/tear, ACL sprain, and meniscal involvement.

DIAGNOSTIC IMAGING
- X-Ray—No evidence of fracture or dislocation, small suprapatellar effusion
- MRI—PCL partial thickness tear near femoral attachment
- Grade-I MCL sprain
- Tear of posterior horn of medial meniscus
- Possible tear of anterior horn of lateral meniscus
- Bone contusion to femoral condyles
- Non-displaced, compression fracture of lateral tibial plateau
- Traumatic synovitis

SURGERY/POST-SURGICAL
- All structures healed by primary intention after 6 week period to allow lateral tibial plateau fracture to heal
- Functional progression to allow for RTP (Wolff’s Law)
- Focus on Quadriceps muscle group to limit stress on PCL
- Establish strong core to aid with center of gravity and base of support training
- Multi-dimensional.

References