Prevention of ACL Injuries

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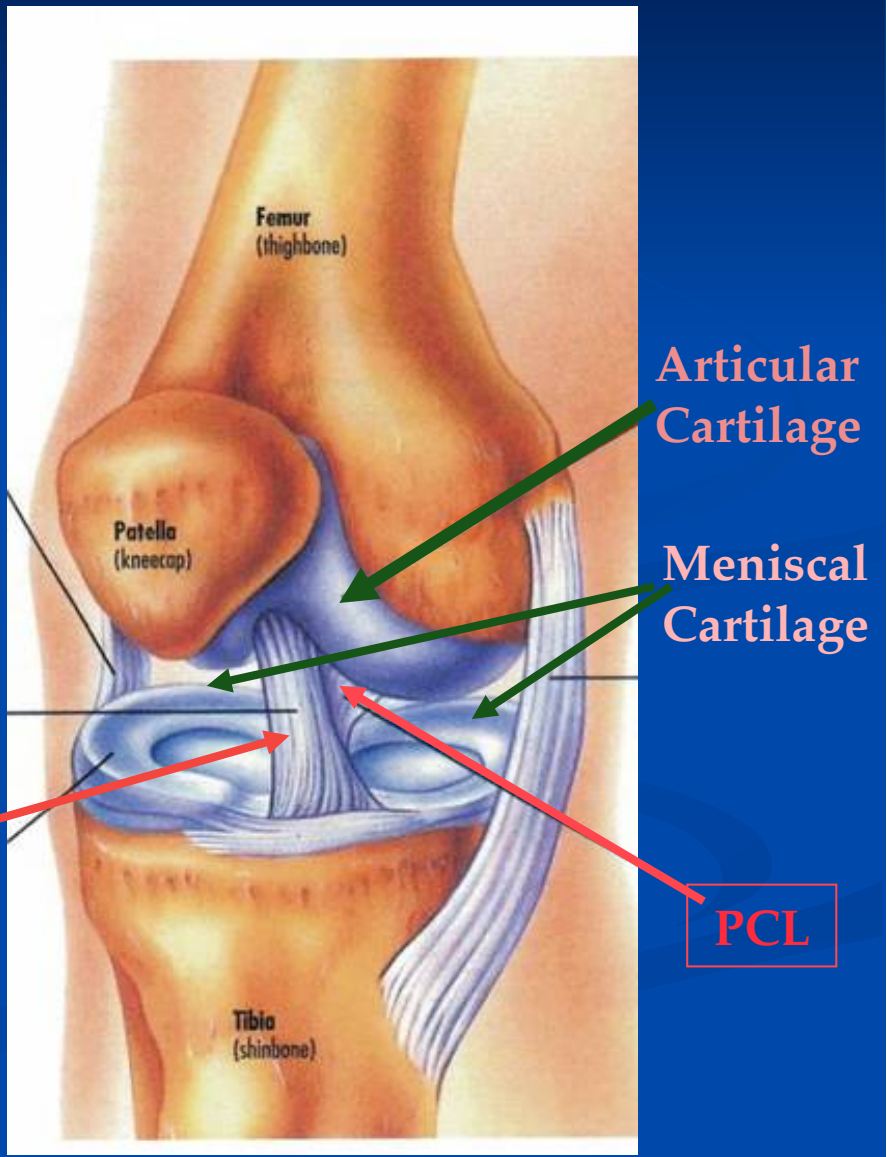
- Anterior Cruciate Ligament Injuries: “ACL”
- 100,000 ACL tears every year
- Majority in 15 to 25 year olds
- Cost to society 1.5 Billion dollars a year
- Short term, loss of participation and game time
- Long term, higher chance of arthritis in future

Prevention of ACL injuries

- Common problem in young athlete
- Girls more susceptible to injury
- Incidence 2 to 8 times higher in girls
- Why?
- Is there anything we can do to prevent it?

Anatomy

- Patella, knee cap
- Femur, thigh bone
- Tibia, lower leg bone
- Fibula, small leg bone
- Articular Cartilage
- Meniscal Cartilage
- Major Ligaments
  ACL
  PCL

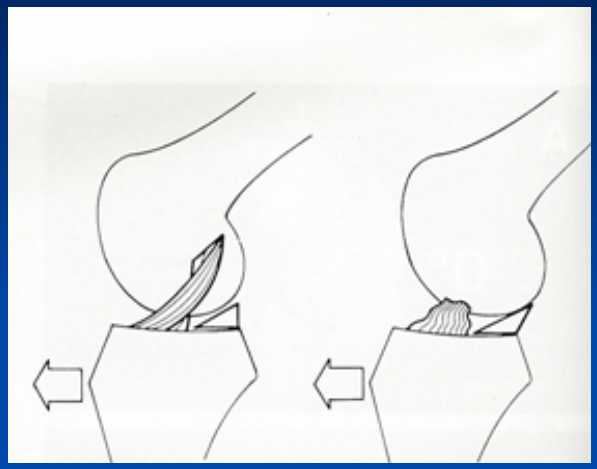


Function

- Load Bearing
  .articular cartilage
  .meniscal cartilage
- Ligaments
  .tightness of the knee
  .primary stabilizers
- Muscles
  .control of the knee .secondary stabilizers

Mechanism of Injury

- When the athlete plants his/her leg on the ground the ACL is engaged and the Knee is stable
- Major function = restrict tibia from moving to the front



Neuromuscular control and Proprioception

- A Complex array of nerves, muscles, bones, ligaments, and cartilages work together to optimize what we know as sports performance
- Neuromuscular Control: unconscious control of our movements and muscles by our brain stem
- Proprioception: our body's ability to know where our knees and ankles are in space

ACL Injury

- What happens in that one in a million times that the athlete pivots and the ligament tears?

What causes ACL tears

- 70% occur when there is no contact whatsoever
- Biomechanical factors
- Body position associated with increased risk of injury

Body Position

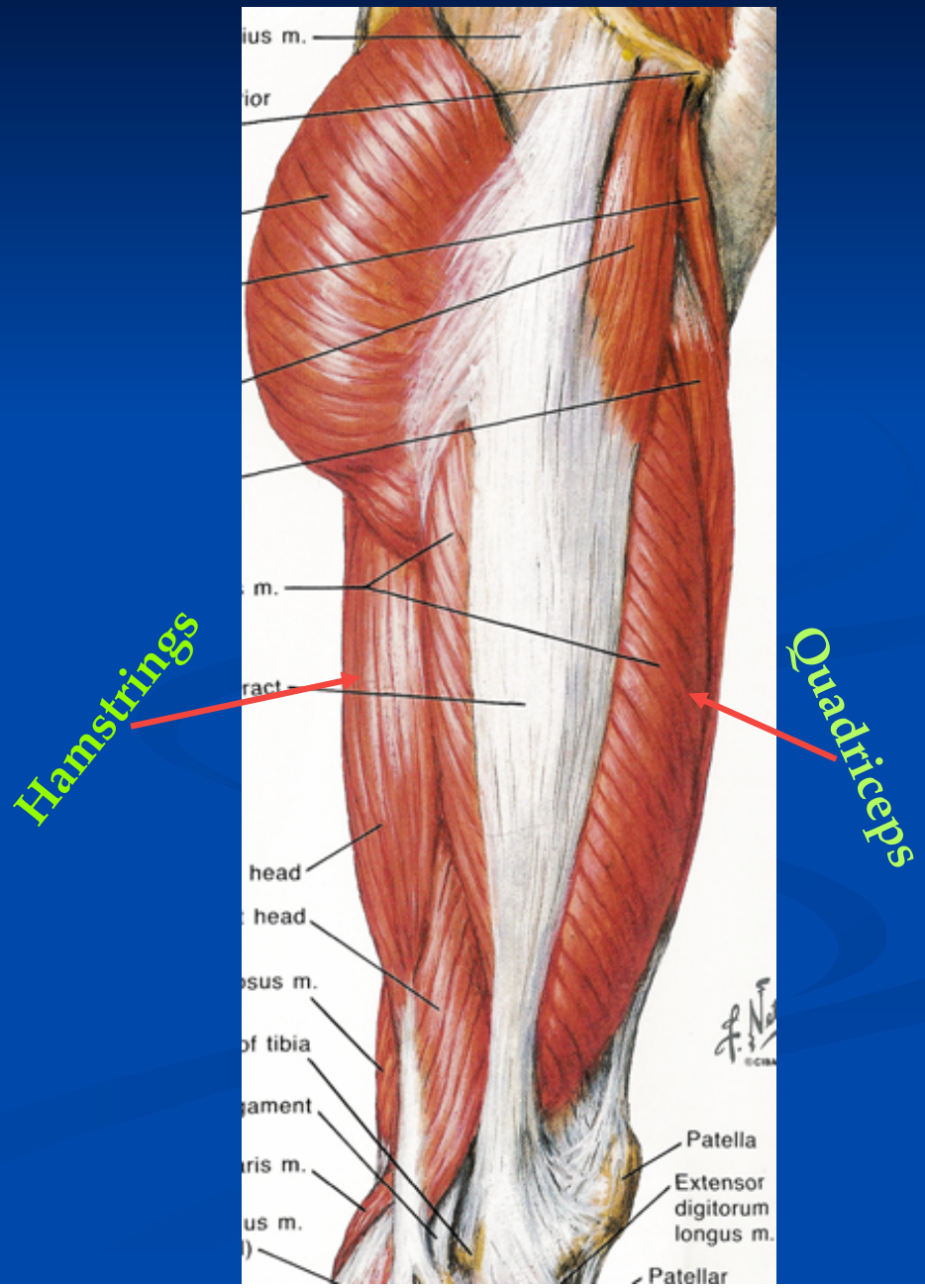
- **"Crouched position"**
  .hips and knees bent
  .center of gravity over feet
  .on their toes
- **"Upright position"**
  .center of gravity behind knee
  .flat footed
  .hips and knees straight

Body Position

- Position of body during landing, cutting, pivoting
- Hips and Knees are straight
- Landing on flat feet
- This puts ACL at risk
- In contrast: when athlete has hips and knees bent, and lands on his/her toes, risk of ACL injury is minimized

Balance of Power

- Recruittment Pattern
- Quadriceps muscles antagonist-**stress ACL**
- Hamstring muscles agonist-**protect ACL**
- Weak hamstrings and strong quadriceps puts ACL at risk
- Female Quad. dominant
- Male Hamstring dominant
- Hamstrings 60% to 80% as strong as Quadriceps

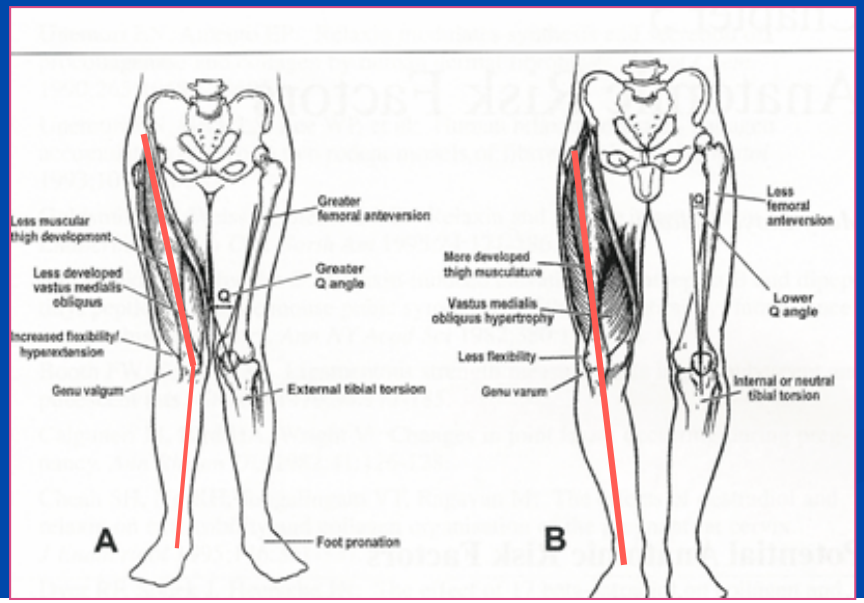


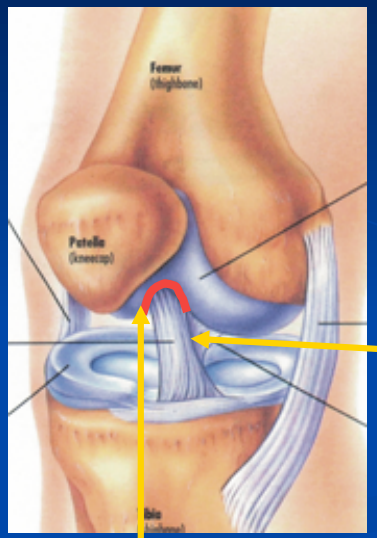
Other Risk Factors

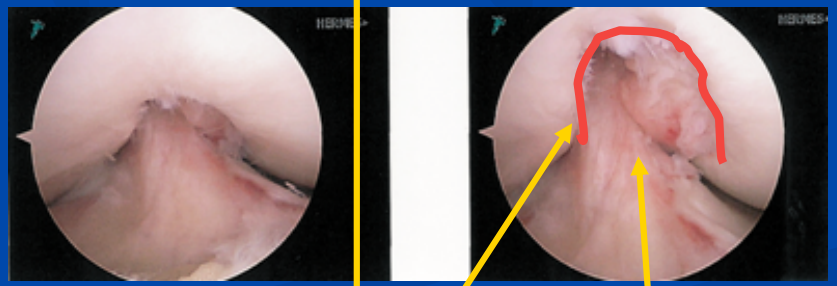
- Anatomic
- Environmental
- Hormonal

Anatomic Factors

- Intercondylar Notch
- Small notch
- Small Ligament size
- Alignment of lower leg







ACL

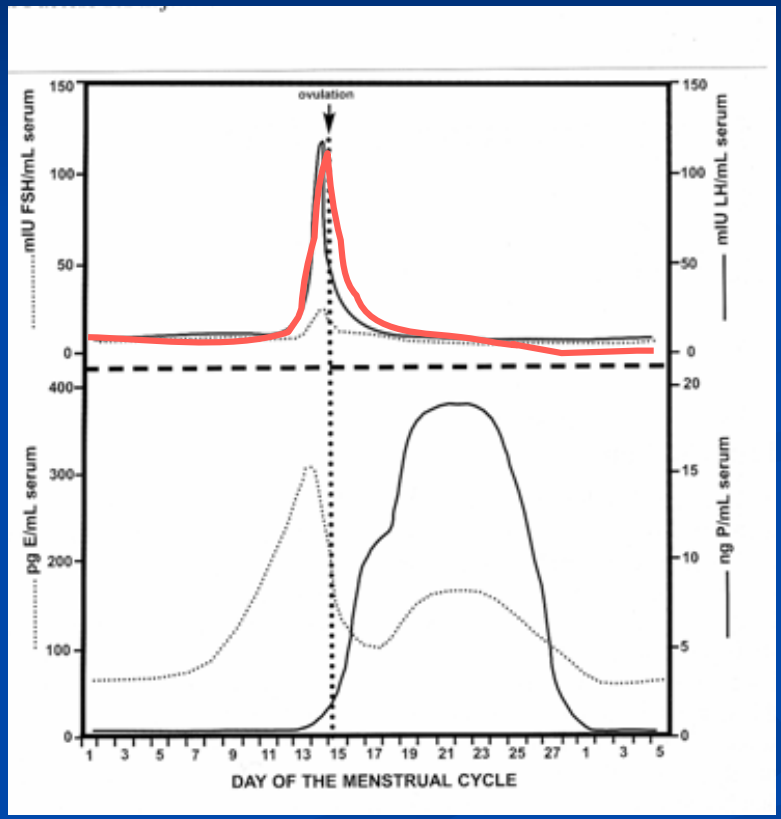
Intercondylar notch

Environmental Factors

- Fields
- Cleat Design

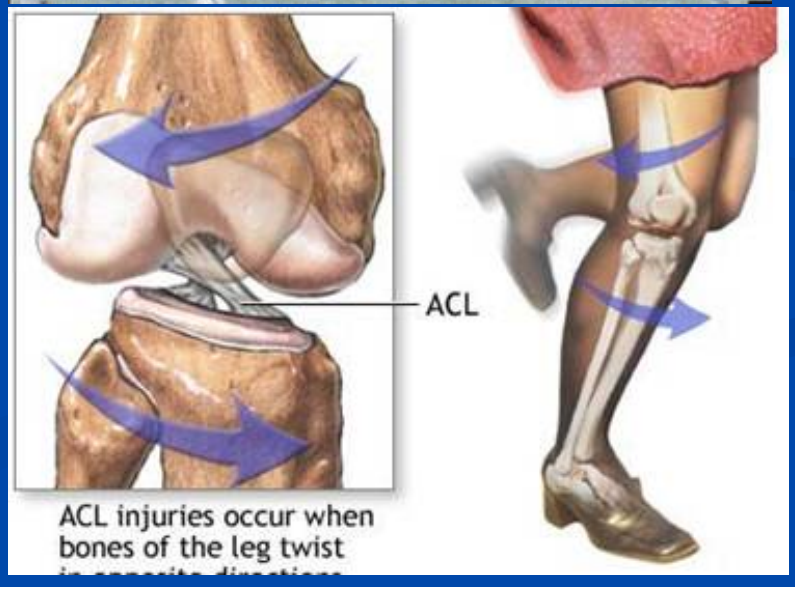
Hormonal Factors

- Estrogen and Relaxin
- Relax and soft tissues
- Does this predispose female athlete to ACL injury?
- Increased incidence of ACL tears during ovulatory phase?



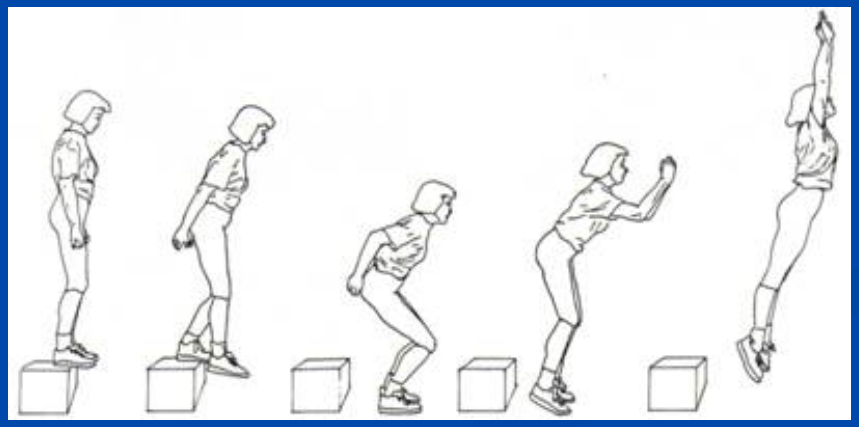
Moment of Injury

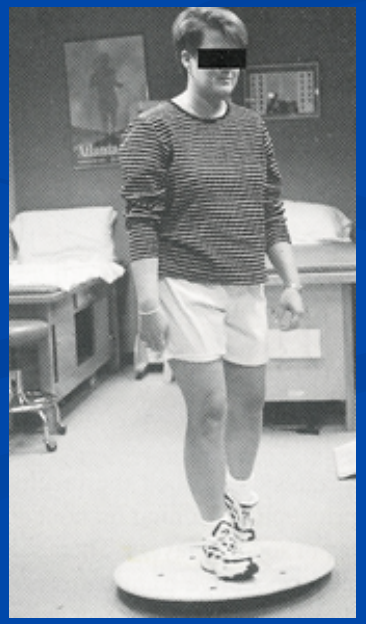
- Loud Pop
- Tibia subluxes forward and pops back in
- Pain
- Lie on turf, get comfortable
- Wait for coaches and trainers



ACL Injuries

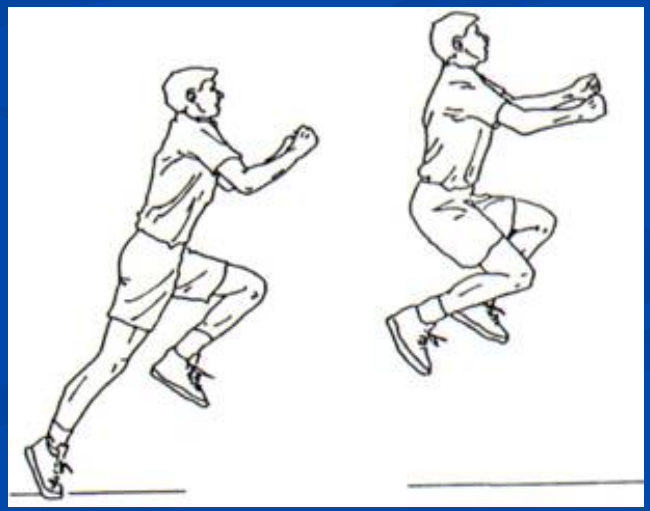
- Prevention--Biomechanical Factors critical
- Neuromuscular/Proprioceptive programs
- Dramatic reduction in ACL tears
- Plyometric/jump training and Balance drills
- Retrain mind on body position





Major Studies

- Mandelbaum, PEP program, 80% reduction of ACL injuires over 2 year in girls playing soccer ages 14 to 18
- Carraffa, Balance drills
- Hewett, Jumping drills
- Significant reduction of ACL tears in those who received Neuromuscular training



PEP program

- Prevent injury Enhance Performance
- Simple, no major equipment, soccer ball and cone
- 2 to 3 times a week
- Incorporate into practice sessions
- Retrain your body positioning in space
- It is all about prevention, more time playing and less time on the bench

PEP PROGRAM