

ACL Injury Epidemiology and Risk Factors

Sports and MSK Symposium
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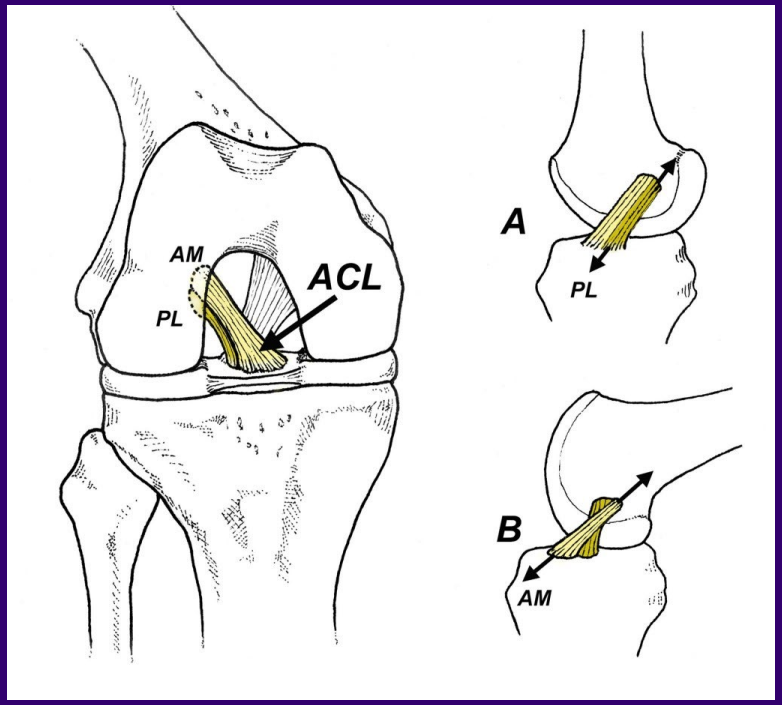
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Objectives

- Define the ACL and common mechanisms of injury
- Describe incidence of ACL injuries in various sports
- Identify modifiable and non-modifiable risk factors
- Review history and examination

What is the ACL?

- One of two cruciate ligaments that stabilize the knee
- Intercondylar notch of the tibial plateau to the lateral femoral condyle
- Comprised of two bundles
  - > Anteromedial bundle
  - > Posterolateral bundle
- Composed of type 1 and 3 collagen



Mechanism of Injury

- Non-contact
  - > Pivoting or cutting
  - > Improper landing
  - > Sudden deceleration
- Contact
  - > Direct blow to the lateral knee

Epidemiology: Incidence

- Annual incidence approximately 68.6 to 75.19 per 100,000 person-years
  - > 100,000 to 200,000 injuries annually in the US
- Peak in males aged 19-25 years and females aged 14-18 years
  - > Approximately 1.5 times greater risk of ACL injury in adolescent female athletes compared to male
- College athletes face 2.4 times higher risk than high school athletes after adjusted for sport and sex
- Competition settings carry 6-8 times higher risk than practice for both sexes
- High rate of ipsilateral knee surgery in NCAA who begin collegiate careers with prior knee surgery

Sports at Risk

- Football
- Soccer
- Basketball
- Gymnastics
- Skiing
- Fixed-object HIRL









Sport Specific Rates

- Football
  - > Among NCAA sports, football had highest ACL tear rate of 1.44 per 10,000 athlete-exposures (AE) for men's sports
  - > ACL injury incidence across years remained consistent across NFL
- Soccer
  - > Among NCAA women's sports, women's soccer had 3rd highest ACL tear rate of 2.6 per 10,000 AE vs 0.9 per 10,000 AE for men's
  - > US high school girls average annual rate of 13.3 per 100,000 AE
  - > Adolescent girls rate of 0.166 per 1000 AE
- Basketball
  - > Pooled rate of 0.091-0.110 per 1000 AE for female athletes vs 0.024-0.027 per 1000 AE for male athletes
  - > US high school girls - 2nd highest ACL injury rate of 12.2 per 100,000 AE
  - > Adolescent girls relative risk of 4.14 vs boys

Sport Specific Rates

- Gymnastics
  - > Among NCAA sports, highest ACL injury rate of 0.33 per 1000 AE
  - > Female and male gymnasts 2x higher incidence compared to female and male soccer players
- Skiing
  - > Recreational alpine skiing incidence of 0.23 per 1000 skier-days
  - > 14.9% of total injuries in skiing vs 3.1% in snowboarding
- Rugby
  - > Non-contact ACL injury incidence of 0.06 per 1000 player-hours
- Lacrosse
  - > US high school girls – 3rd highest ACL injury rate of 10.4 per 100,000 AE
- Volleyball
  - > US high school girls – lower ACL rate of 3.2 per 100,000 but growing in incidence rate

Non-Modifiable Risk Factors

- Sex, females > males
  - > Potential hormonal influence
- Anatomy
  - > Narrow intercondylar notch
  - > Increased posterior tibial slope
- Genetics
- History of ACL injury

Modifiable Risk Factors

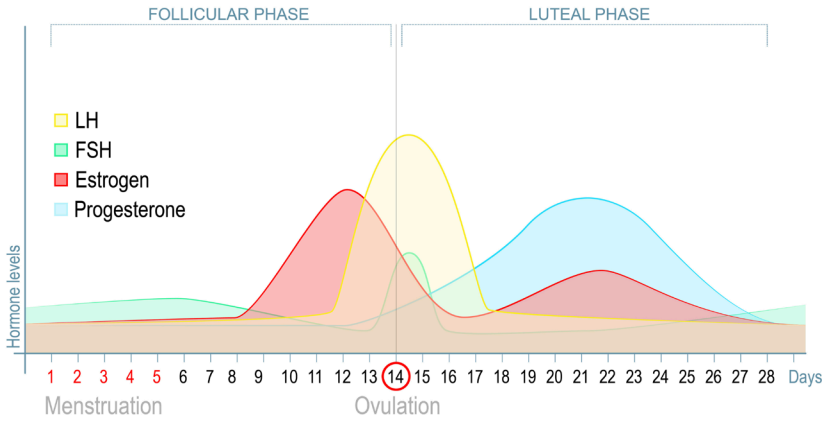
- Neuromuscular control
- Strength imbalances
- Landing mechanism





Hormonal and Other Factors

- Girls and women may be at higher risk of ligament and tendon injuries
- Controversial area needing further investigation
- Estrogen receptors on human ACL
  - > Increased collagen synthesis and degradation, decreased total collagen and protein content, fiber diameter and density
- Relaxin breaks down ligament's collagen
  - > Increases in second half of menstrual cycle
- Females on OCP's less affected



History

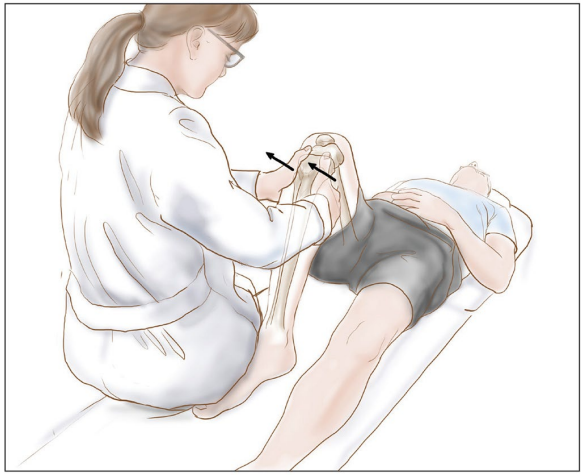
- Sport/mechanism of injury
- Ambulatory status
- Mechanical symptoms
- Hear/feel a “pop” associated with deep knee pain
- Immediate swelling

Examination

- Inspection
  - Gait
  - Swelling
- Palpation
  - Joint line tenderness
- Movement
  - ROM
  - Active knee extension
- Provocative maneuvers

FIGURE 1

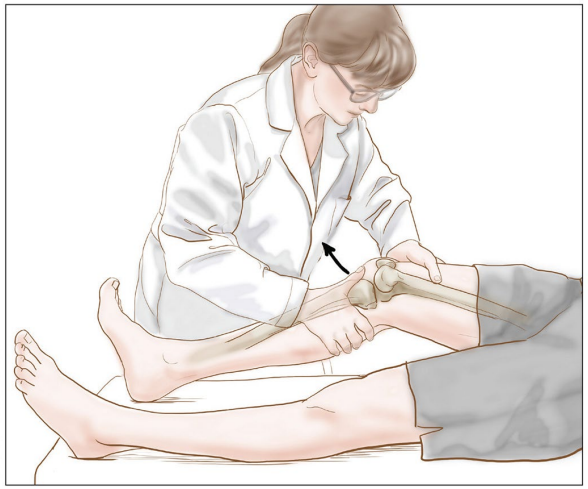
Anterior drawer test[5]



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FIGURE 2

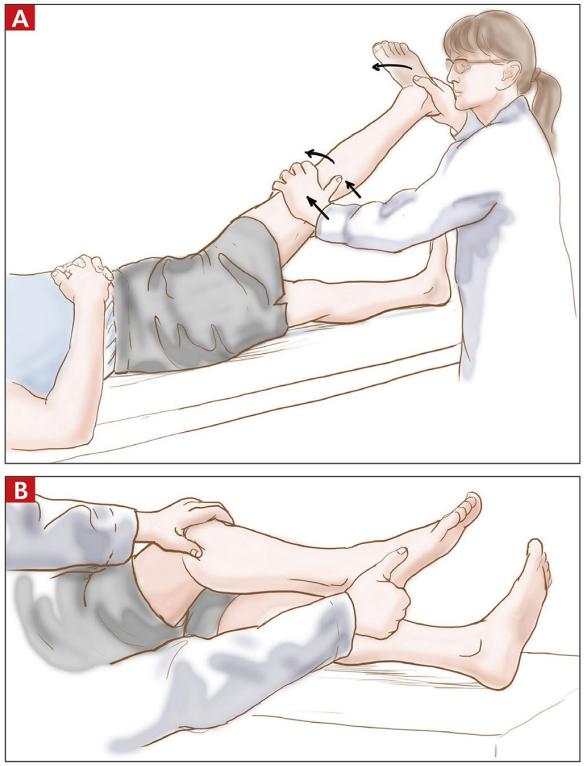
Lachman test[5]



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FIGURE 3

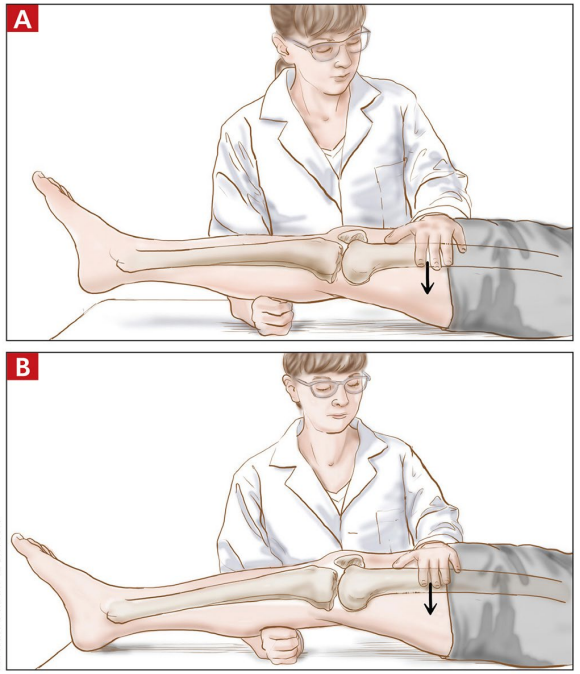
Pivot shift test[5]



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FIGURE 4

Lever sign test[20]



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Questions? Thank you!

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