Sports Injuries and Their Prevention

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Common Injuries

- Concussions
- ACL Tears

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Concussions

- Mild traumatic brain injuries caused by a blow to the head
- In US, 400,000 concussions occur yearly during high school athletic competition
- Most patients fully recover
- Some continue to experience cognitive dysfunction

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Immediate Concussive Symptoms

One or More of the Following

- Headache
- Nausea, vomiting
- Ringing in ears
- Vertigo
- Blurred vision
- Lightheadedness
- Difficulty concentrating
- Cognitive and memory dysfunction

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Questions for Discerning between Concussed and Nonconcussed Players

- At which field are we playing?
- Which team are we playing today?
- Which period is it?
- How far into the period is it?
- Which side scored most recently?
- Which team did we play last week?
- Did we win last week? Maddocks et al. Clin J Sports Med 1995

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Post-Concussion Syndrome

- Chronic headaches
- Fatigue
- Sleep difficulties
- Difficulty concentrating
- Personality change
- Sensitivity to light and noise

- Dizziness upon standing
- Short-term memory deficits
- Problem solving difficulties
- General academic difficulties

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Cumulative Effects

- Brain is more susceptible to another concussion while it is recovering
- Severity and number of concussive symptoms increases in patients who suffer second concussion prior to full recovery from previous one
- Younger athletes appear to be more vulnerable to cumulative effects

Collegiate Football Study

- Delayed onset of new symptoms occurred more frequently if the player returned to play in that game/practice (33% vs 12.6%)
- Players w/ h/o 3 or more concussions were 3x more likely to have another concussion vs those who had never suffered concussion

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Guskiewicz et al. JAMA 2003

Cumulative effects

- Of the 12 players with repeat same-season concussions, 11 occurred within 10 days of the initial injury and 9 occurred within 7 days of the initial injury
- 30% of those with 3 or more concussions had a prolonged recovery (>7 days) vs 7.4% of those who had not suffered a previous concussion (p=.03)

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Guskiewicz et al. JAMA 2003

Suffering additional concussions causes more severe symptoms

TABLE 1. On-field concussion severity markers by concussion history group[a]

Variable	No. of athletes	No previous concussions (%)	3 or more previous concussions (%)	χ^2	P	Odds ratio
Positive LOC	87	5.0%	25.9%	8.0	0.005	6.7
Retrograde amnesia	73	11.1%	21.1%	1.2	0.278	—
Anterograde amnesia	74	14.8%	40.0%	5.5	0.019	3.8
Confusion	60	44.2%	76.5%	5.1	0.024	4.1
5+ minutes mental status change[b]	72	9.4%	31.6%	5.3	0.021	4.4
3–4 abnormal markers	73	3.7%	26.3%	8.3	0.004	9.3

[a] Total study sample consisted of 88 athletes. Varying degrees of missing data were present. The number of athletes who had each marker coded ranged from 60 to 87. LOC, loss of consciousness; —, not significant.

[b] 5 or more minutes of retrograde amnesia, anterograde amnesia, or confusion.

Collins et al. Neurosurgery 2002

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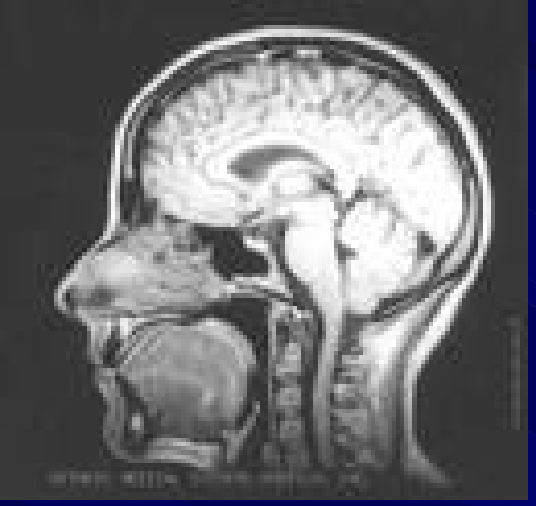
Lower GPA for multiple and recent concussions in high school athletes

TABLE 2. Demographic data for youth athlete participants

Variable	Range	Concussion history group[a]			
		None	1 previous	≥2 previous	Recent
Age (yr)	13 – 19	15.4 (1.2)	15.8 (1.3)	15.9 (1.3)	15.8 (1.3)
Grade (education)	9 – 13	10.1 (1.0)	10.4 (1.1)	10.5 (1.1)	10.5 (1.1)
Estimated verbal achievement percentile	40 – 99	86.7 (11.9)	85.6 (12.8)	81.5 (15.4)	81.9 (15.4)
Estimated math achievement percentile	40 – 99	90.0 (11.1)	87.7 (13.0)	84.5 (13.5)	87.5 (10.6)
Grade point average	2.0 – 4.0	3.54 (0.5)	3.35 (0.5)	3.21 (0.5)	3.26 (0.5)
Sports years	1 – 16	5.6 (3.5)	7.1 (3.6)	7.7 (3.3)	6.7 (3.5)

[a] Means ± standard deviation.
[b] ≥2 previous and Recent concussion groups < No concussion group.
[c] ≥2 previous concussion group > No concussion group.

Moser et al. Neurosurgery 2005



Second-Impact Syndrome

- The brain is in a vulnerable biochemical state for a variable period of time after a concussion
- If a second concussion is suffered during this recovery period, patients may suffer permanent brain damage or even death
- 40 deaths reported during past decade: majority High School athletes

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Critical for athletes to be clear of all symptoms for one week before resuming sports

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Prevention

- Appropriate headgear for those who have suffered concussions
- International conference of neuropsychologists and sports medicine physicians in Vienna called neurocognitive testing the “cornerstone” of proper concussion management

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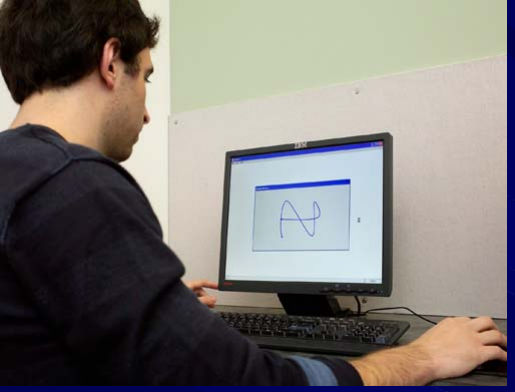

ImPACT Testing

- Immediate Post-Concussive and Cognitive Testing
- Validated tool for assessing cognitive recovery after concussion
- 20 minute test that is computer-driven
- Baseline established pre-season for all athletes
- Given to concussed athletes at various intervals after trauma

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NJ High Schools That Use ImPACT

- Baldwinsville Central
- Bergen Catholic
- Bernards
- Blair Academy
- Boonton
- Bridgewater-Raritan
- Cedar Grove
- Central Regional
- Chatham
- Cherry Hill West
- Christian Brothers Academy
- Cinnaminson
- Colts Neck
- Columbia
- Cranford
- **Delaware Valley**
- Delbarton
- Don Bosco Prepatory
- East Brunswick
- Eastern
- Ewing
- Fort Collins
- Franklin
- Freehold Borough
- Freehold Township
- Gill St. Bernard's
- Glen Ridge
- Glen Rock
- Governor Livingston
- Haddon Township
- Haddonfield School District
- Hanover Park
- Hillsborough
- Hopewell Valley
- Howell
- **Hunterdon Central**
- Immaculata
- Kent Place
- Kinnelon
- Lakeland Regional
- Lawrence
- Lawrenceville
- Lenape Valley
- Linden
- Lyndhurst
- Madison
- Mahwah
- Manalapan
- Manasquan
- Manchester Township
- Marlboro
- Millburn
- Monroe Township
- Montclair
- Montgomery
- Montville Township
- Moorestown
- Newark Academy
- Newton
- North Bergen
- North Brunswick
- **North Hunterdon**
- Northern Burlington
- Northern Highlands
- Northern Valley Demar.
- Notre Dame
- Nutley
- Paramus Catholic
- Park Ridge
- Parsippany Hills
- Pascack Valley
- Pemberton
- Pequannock
- Pinelands
- Pingry
- Piscataway
- **Phillipsburg**
- Princeton Day
- Princeton Regional
- Ramapo
- Raritan
- **Ridge**
- Ridgewood
- River Dell
- Robbinsville
- Roxbury
- Salem
- Sayreville
- Seneca
- South Brunswick
- Sparta
- St. Joseph's
- St. Rose
- Summit
- Tenafly
- The Peddie School
- The Pennington School
- Triton Regional
- **Voorhees**
- Wall
- **Warren Hills**
- Washington – Lee
- Watchung Hills
- West Milford
- West Morris Central
- West Morris Mendham
- West Orange
- West Windsor-North
- West Windsor-South
- Whippany Park

Professional Teams and Universities That Use ImPACT

- NY Jets
- NY Giants
- Philadelphia Eagles
- NY Mets
- NY Yankees
- Philadelphia Phillies
- NY Rangers
- NJ Devils
- Philadelphia Flyers

- Princeton University
- Harvard University
- Rutgers University
- US Military Academy
- UCLA
- University of Florida
- University of Michigan
- University of Miami
- Duke University

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Safe Return to Play

- NJSIAA requires that players exhibiting signs or symptoms of a concussion be removed from rest of that game/practice
- NJSIAA requires athlete to be free of symptoms for 7 days before return to play
- Combining Clinical Exam with ImPACT results improves ability to predict safe return to play

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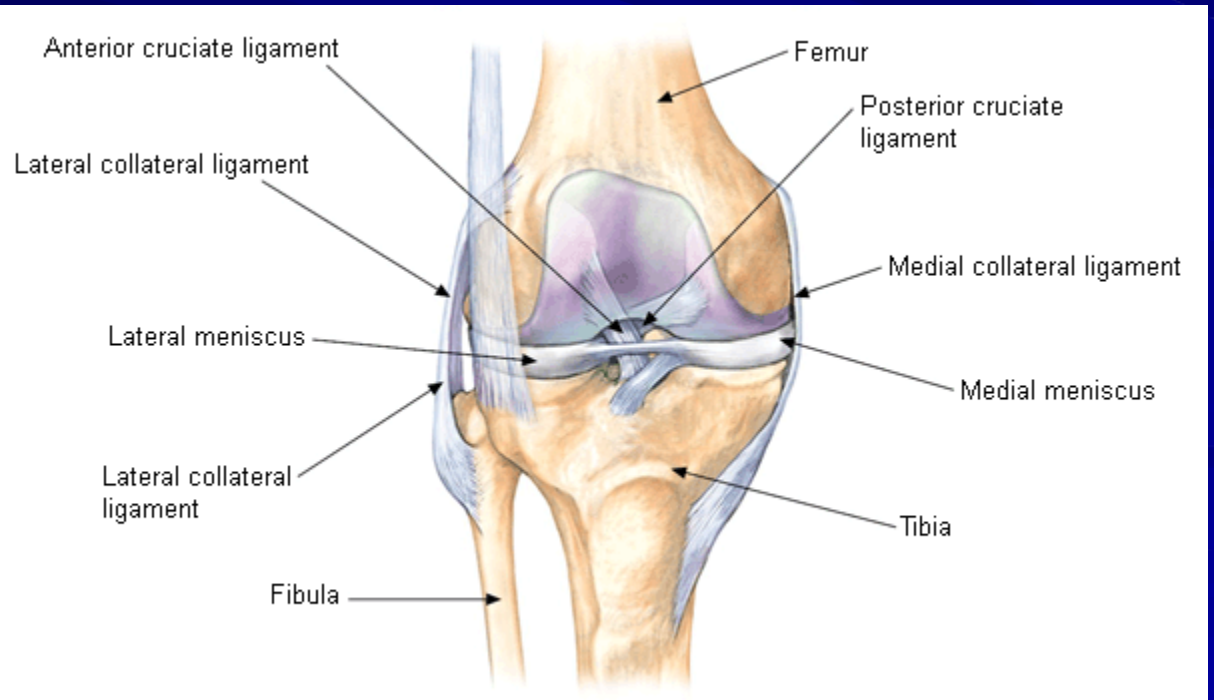
ACL Injuries

What is an ACL?

- Ligament in the center of the knee that provides stability for twisting, cutting, and pivoting maneuvers



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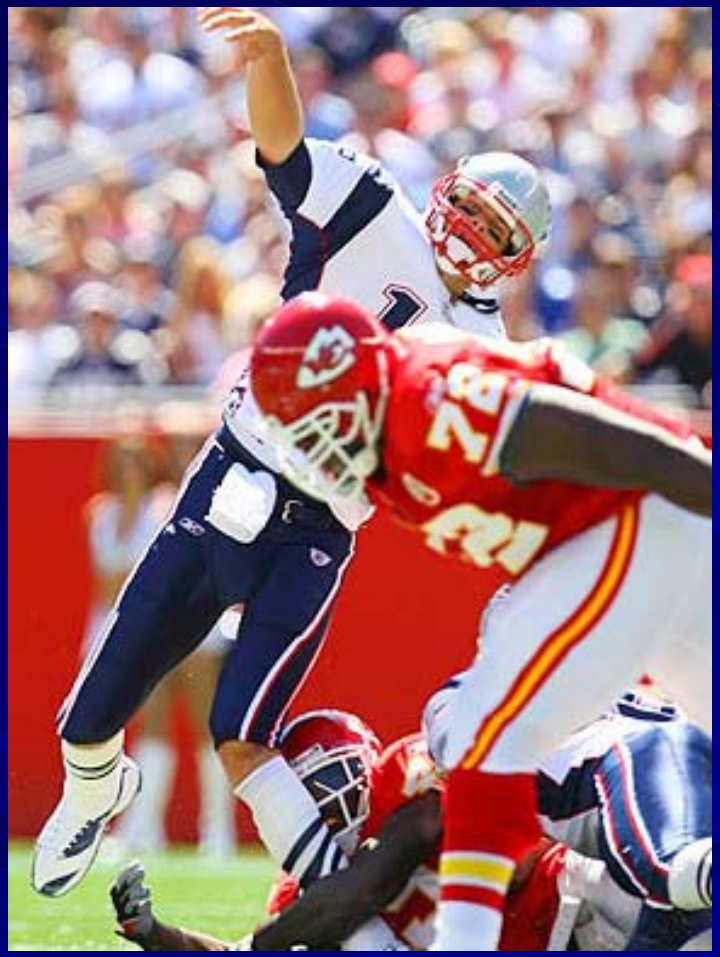
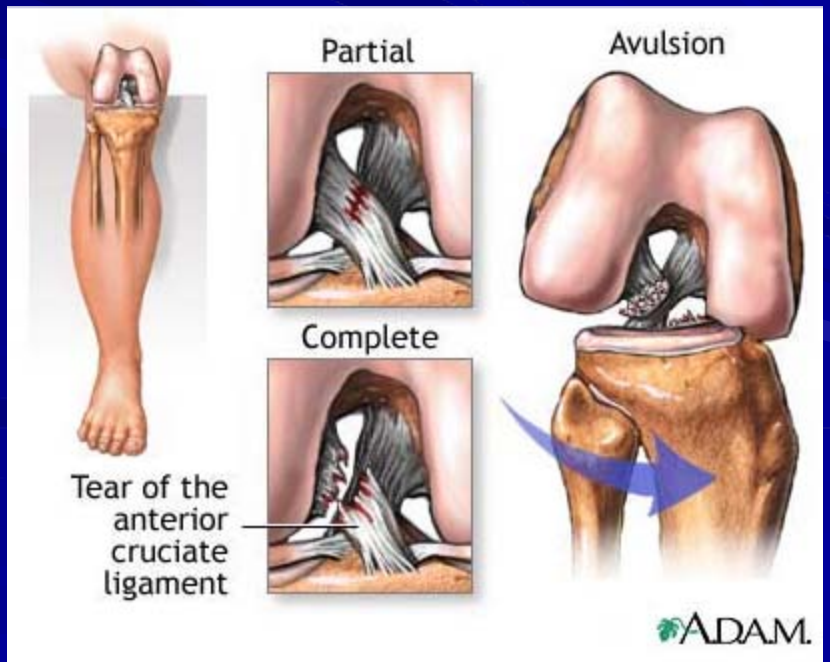
How is an ACL Injured?



- Hyperextension or twisting on planted foot
- “pop”, inability to continue, swelling



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Why do we care about ACL injuries?

- 31% of patients with moderate to severe disability in walking activities
- 44% of patients with moderate to severe disability in ADLs
- 77% of patients with moderate to severe disability in sports activities

Noyes et al. 1983

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Long-term effects of ACL tears

- Two thirds of ACL-deficient patients suffer from chronic knee instability and cartilage damage
- If left alone, the vast majority of these patients will develop osteoarthritis

Yu et al. 2002

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At risk group

- Female collegiate basketball players are approximately 8 times more likely to tear their ACLs than their male counterparts *Malone et al. 1993*
- Arendt et al. found the rate of ACL injuries among female collegiate basketball and soccer players to be 3 times higher than their male counterparts *Arendt et al. 1995*

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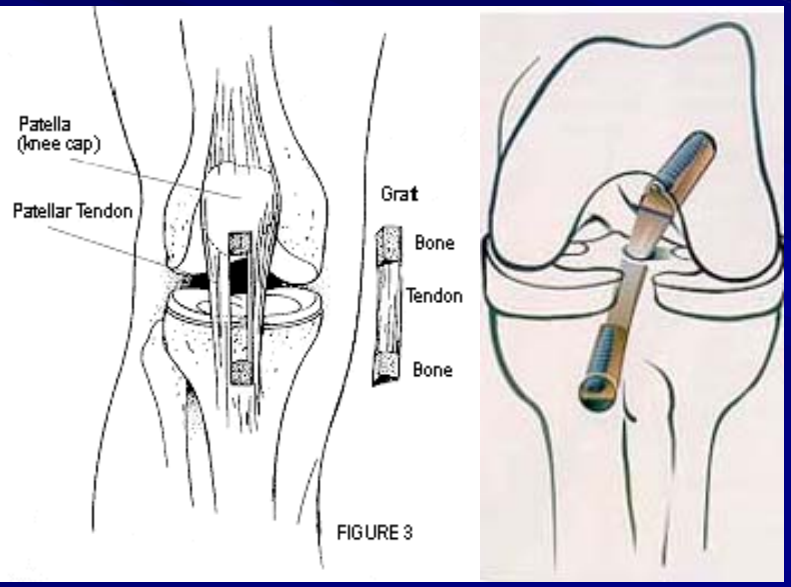
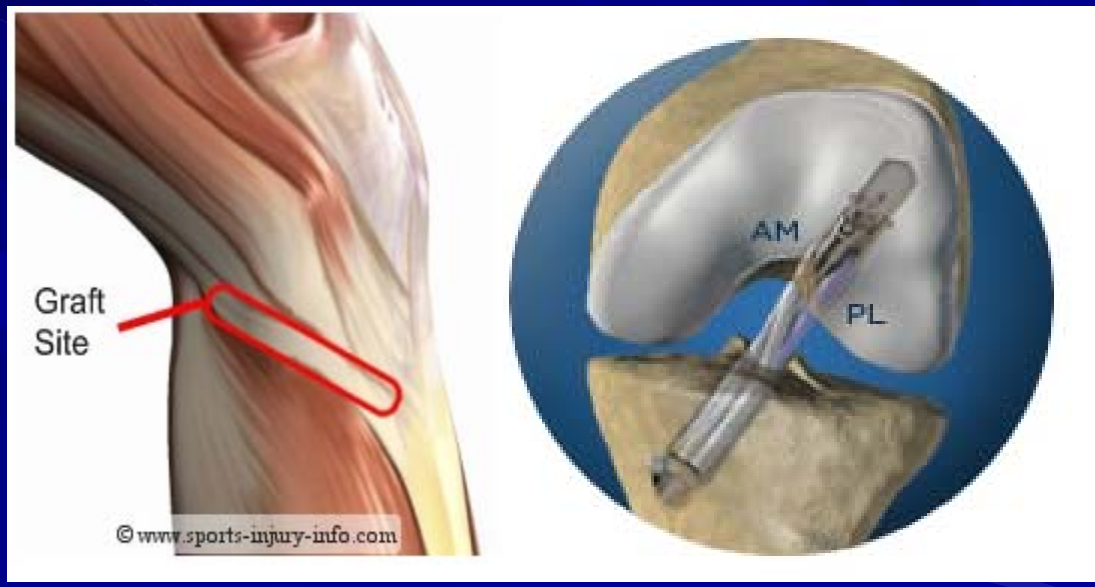
Treatment

- In general, we counsel youth athletes with ACL tears to have them reconstructed





Patellar Tendon

Hamstring

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Prevention

- Teaching female athletes proper stance and landing techniques has been shown to significantly reduce ACL tears

Prevent injuries and Enhance Performance (PEP) Program

- Santa Monica Orthopaedic and Sports Medicine Research Foundation has created a program that has been found to reduce the number of ACL injuries by up to 88%
- Exercises can be found in hand-out and at www.aclprevent.com

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Summary

- Concussions and ACL injuries are common in youth sports
- Prompt diagnosis and treatment are critical to successfully treating these athletes
- Clinical advances can help us prevent future injuries

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Thank You

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