

# Current Concepts in ACL Prevention



**Robin West, MD**

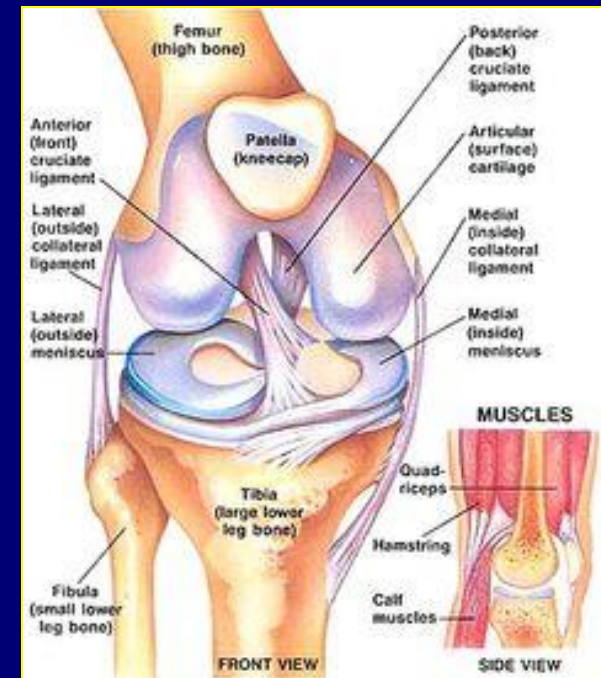
*Associate Professor, Georgetown University Medical Center*

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*Orthopaedic Surgeon & Medical Director, Inova Sports Medicine*

# What is the ACL?

- One of 4 major knee ligaments
- **Ligaments: strong, dense connective tissue that attach bone-bone across a joint**
- **ACL provides frontal support and rotational stability to your knee**



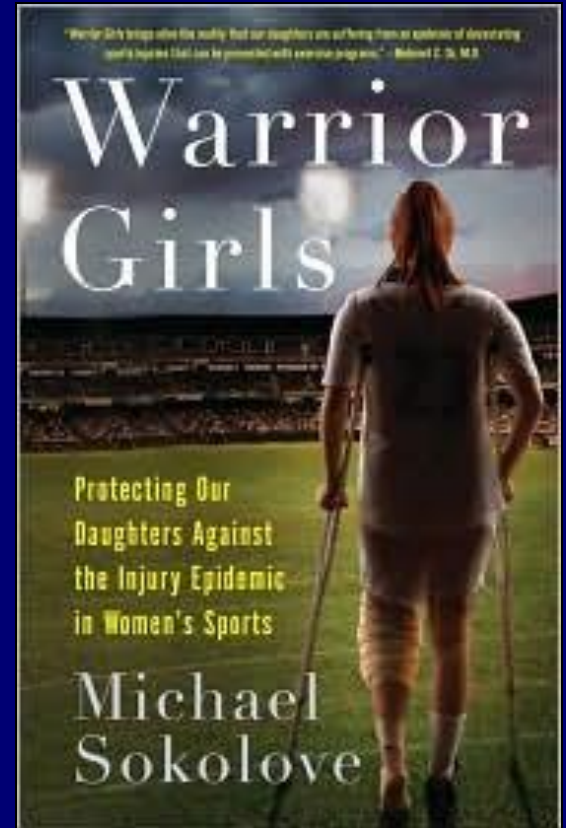
# How Common Are ACL Injuries?

- **250,000+ ACL tears/yr**
- **Account for 64% of all knee injuries in cutting sports**
- **50% people with ACL tears have meniscal tears**



# How Common are ACL Injuries?

- **Girls are 4-10X more likely to tear their ACL**
- **70% occur from non-contact mechanism**



# How Common Are ACL Injuries?

- **Since Title IX Act in 1974, female athletic participation has increased:**
  - 5 fold at collegiate level
  - 10 fold at HS level



# Prevalence of ACL Injuries

## Basketball and Soccer

### BIG 10

Men 3/145 **2.1%** Women 27/140 **19.3%**

### PAC 10

Men 1/138 **0.7%** Women 16/130 **12.9%**

### ACC

Men 5/119 **4.2%** Women 19/115 **16.5%**

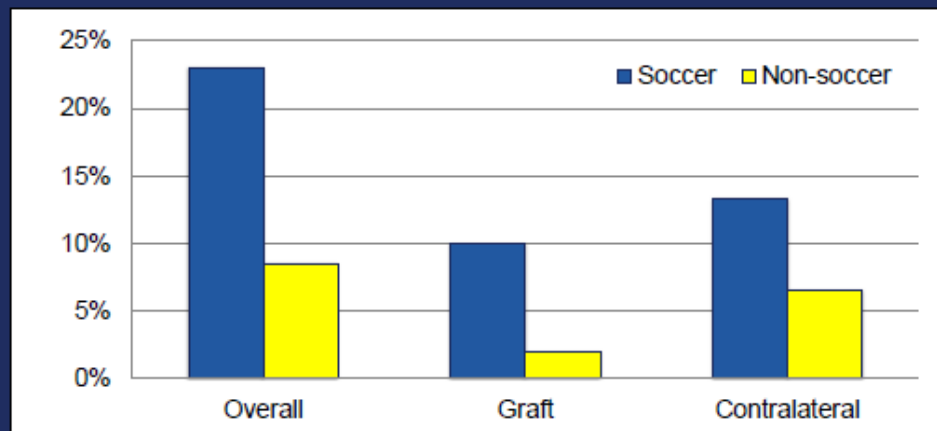
### COMBINED DATA

Men 9/402 **2.2%** Women 62/385 **16.1%**



# Competitive Female Soccer Players More At Risk for ACL Injury

- 90 soccer players vs 247 non-soccer female athletes s/p ACLR
- 23% versus 8.5% chance of ACL graft failure or contra-lateral knee injury



# What is the Treatment for ACL Injuries?

- **Non-Surgical**
  - Poor option in young, active patients
  - 90% ACL tears will develop meniscal tears
  - 70% will develop articular cartilage defects within 10 yrs





# What is the Treatment for ACL Injuries?

- **Surgical**
  - Good option in young, active patients
  - 75-90% success rate for stable knee
  - Only 60-65% chance to return to play at prior level
  - Complications: stiffness, infection, recurrent instability



# What is the Recovery After an ACL Injury?

- **6-12 months of rehab**
- **Missed playing time, decreased performance, financial burden, family disruption**
- **Over 5 yrs, NFL study showed 79% return to play with 1/3 reduction in performance in running backs/ wide receivers**



# Why Are Girls More At Risk Than Boys?

## *Non-Modifiable Risk Factors*

- **Anatomical**
  - Notch stenosis
  - Ligamentous laxity
  - Increased lat tibial slope
- **Developmental**
  - Boys undergo neuromuscular spurt
- **Hormonal**
  - ACL estrogen receptors



# How Common Are ACL Injuries?

## *Modifiable Risk Factors*

- **Basis of ACL prevention programs**
- *70% of ACL injuries are non-contact!!!*
- **Neuromuscular deficits**
  - **Ligament Dominance**
  - **Quadriceps Dominance**
  - **Leg Dominance**
  - **Trunk Dominance**



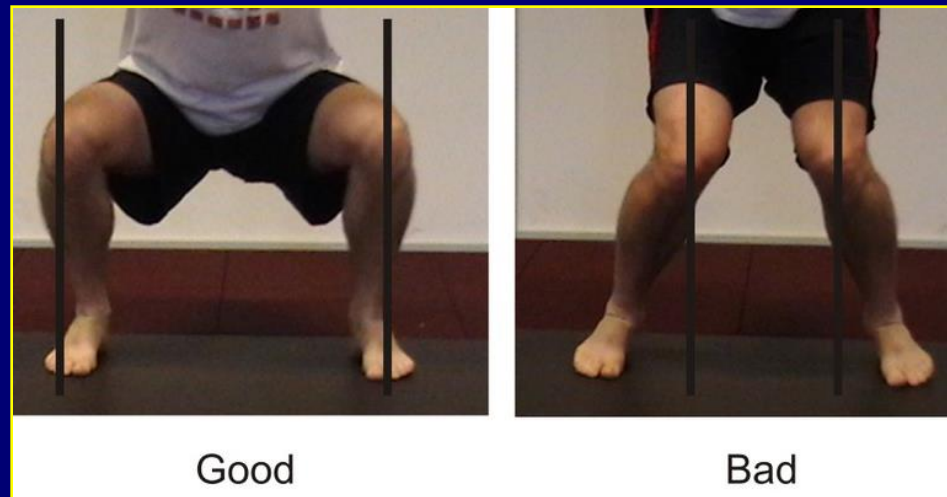
# Ligament Dominance

- **Supporting musculature does not adequately contract**
  - **More force is imparted on bone, cartilage, and ligaments**
- **Valgus knee collapse results in high ground reaction forces**



# Quadriceps Dominance

- **Women preferentially activate quads over HS**
- **More ACL strain**
- **Stiff-legged extended landing position**



# Leg Dominance

- Women show side-side flexibility, coordination, muscular asymmetry



# Trunk Dominance

- During landing, deceleration, and pivoting, female's trunk motion is excessive and directed by inertia
- Leads to high knee abduction moments and ground reaction forces





# Can We Predict an ACL Injury?

## Tuck Jump Assessment

### Knee and Thigh Motion

	Pre	Mid	Post
① Lower extremity valgus at landing	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
② Thighs do not reach parallel (peak of jump)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
③ Thighs not equal side-to-side (during flight)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

### Foot Position During Landing

	Pre	Mid	Post
④ Foot placement not shoulder width apart	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
⑤ Foot placement not parallel (front to back)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
⑥ Foot contact timing not equal	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. Excessive landing contact noise	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

### Plyometric Technique

8. Pause between jumps	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9. Technique declines prior to 10 seconds	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10. Does not land in same footprint (excessive in-flight motion)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Total \_\_\_\_\_ Total \_\_\_\_\_ Total \_\_\_\_\_



#### Ligament Dominance

- Lower extremity valgus at landing
- Foot placement not shoulder width apart



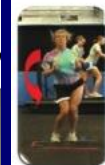
#### Quadriceps Dominance

- Excessive Landing contact noise



#### Leg Dominance or Residual Injury Deficits

- Thighs not equal side to side during flight
- Foot placement not parallel (front-to-back)
- Foot contact timing not equal



#### Trunk Dominance ("Core" Dysfunction)

- Thighs do not reach parallel (peak of jump)
- Pause between jumps
- Does not land in the same footprint



#### Technique Perfection

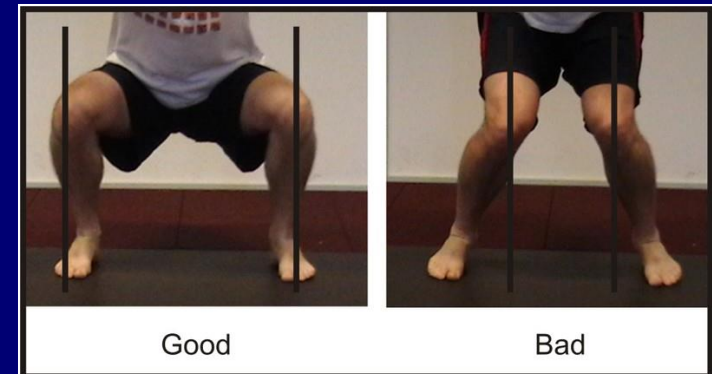
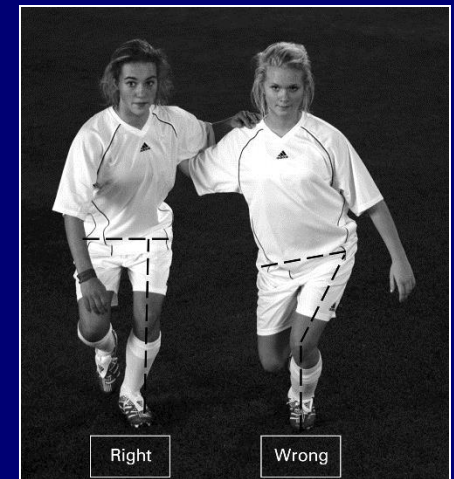
- Perfect Technique declines prior to 10 seconds



Myer GD, et al. Tuck jump assessment for reducing anterior cruciate ligament injury risk. Athletic Therapy Today. 2008; 13(5):39-44

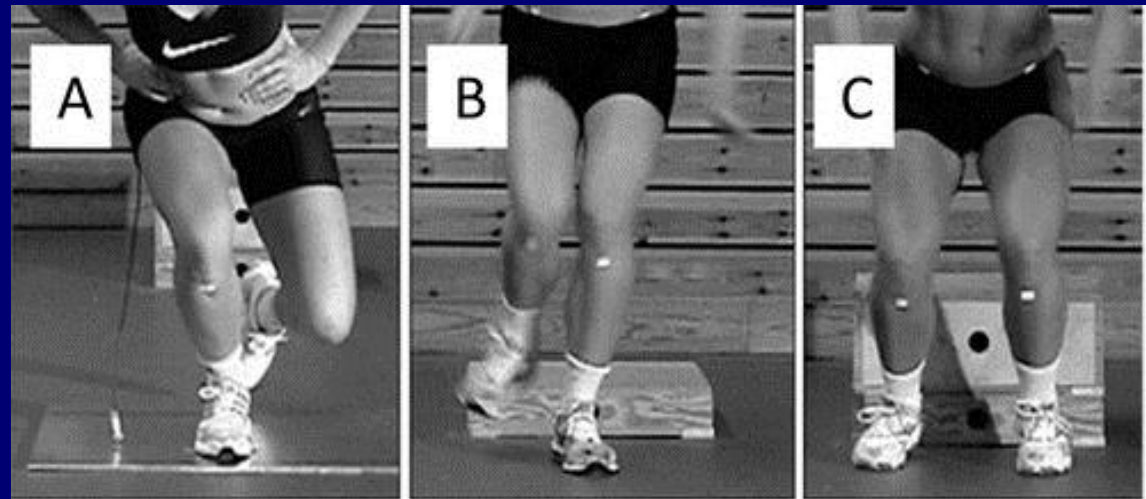
# Can We Predict an ACL Injury?

- **Single leg squat**
  - Screen hip and core strength
- **Single leg hop and hold**
  - Assess symmetry and control
- **Vertical drop**
  - Monitor valgus collapse

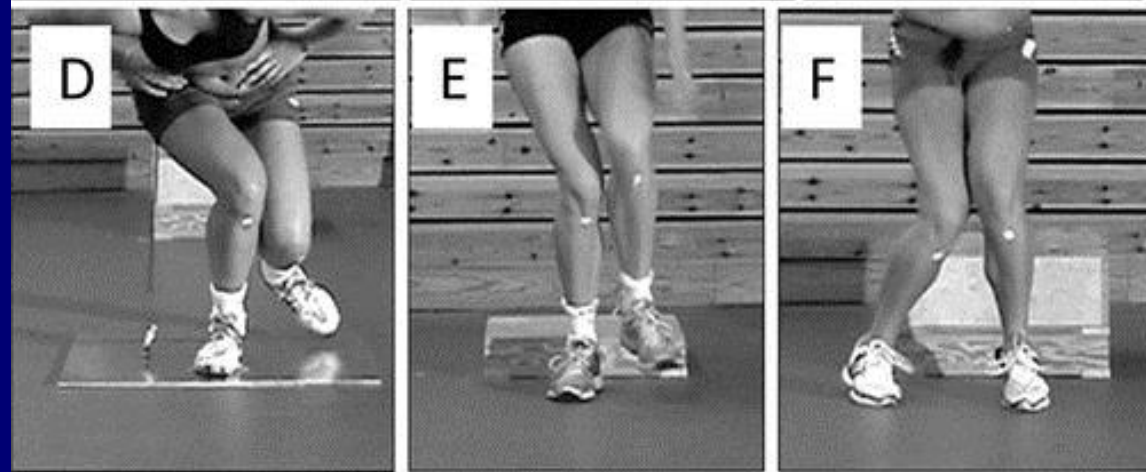


# Can We Predict an ACL Injury?

**GOOD**



**BAD**

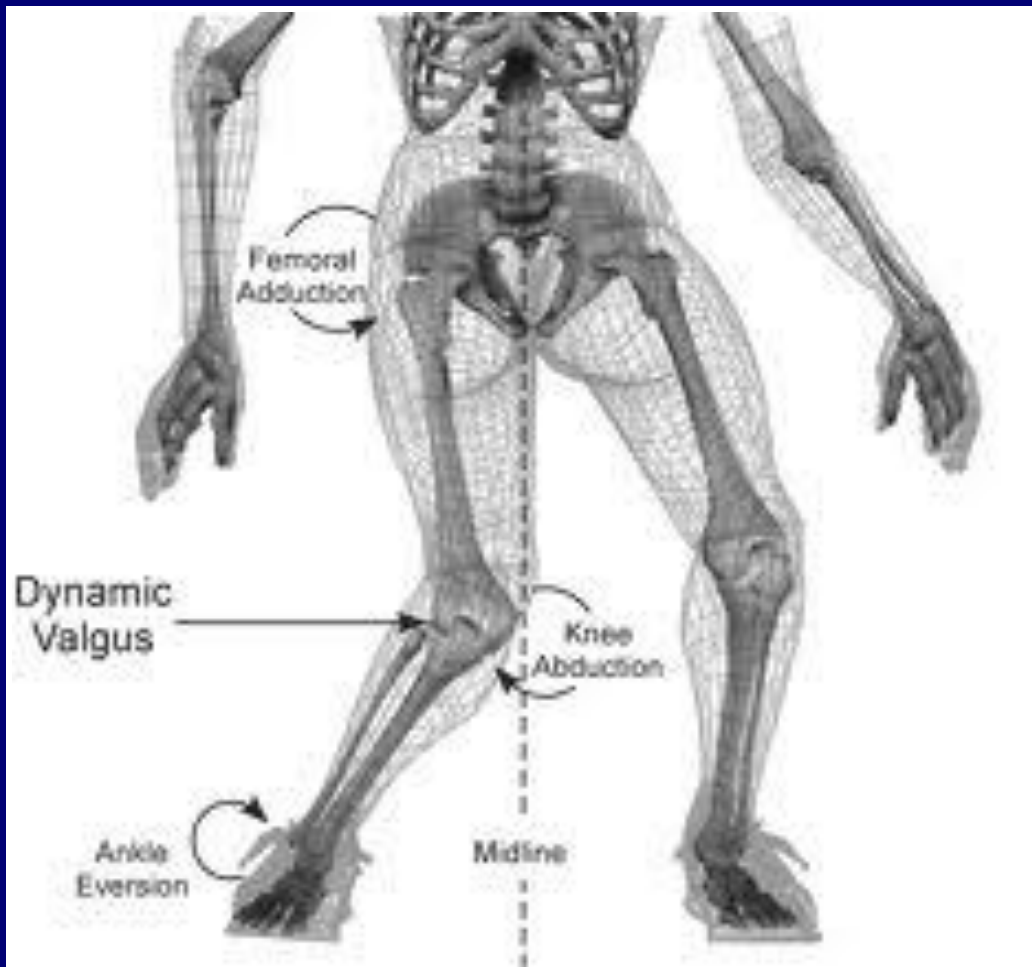


# Can We Prevent an ACL Injury?

- **Time off from sport**
  - Cross-training to increase balance and strength
  - Improves performance
- **General strengthening and stretching program**
- **Neuromuscular Training!!!!!!!**

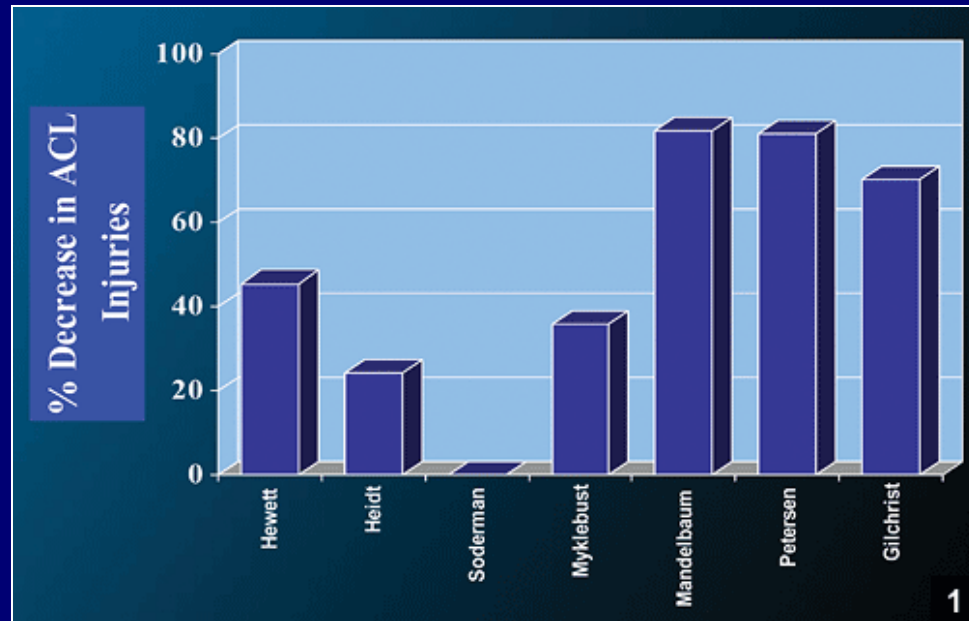


# *Position of Vulnerability*



# ACL Prevention Training Programs

- Many different ones (PEP, Sportsmetrics)
- All appear to be effective
  - 20-80% reduction rate in ACL tears
- Risk reduction of 52% in female and 85% in male athletes



# ACL Functional Training Programs

- **Universal neuromuscular training is cost-effective while high-tech, video screening is not**



# ACL Prevention Training Programs

- **Ideal program**
  - **Stretching**
  - **Strengthening**
  - **Plyometric**
  - **Agility**
  - **Education**
  - **Verbal feedback**
  - **Timing**
    - 10-20 mins 3X/wk pre-season
    - 1X/wk in season





# Why is Compliance an Issue?

- **Expensive**
- **Time consuming**
- **Deters from practice**



## Overview

# *ACL Prevention Training Programs*

- Compliance should **NOT** be an issue!
- **Expensive?**
  - Can be done with the team
- **Time consuming?**
  - Will not deter from practice:  
Incorporate it in warm-up!
  - **Fact: *Performance increases!!!***



# Return to Play After ACL Reconstruction

Systematic review on RTP: 69 studies, 7556 patients  
after ACLR, mean f/u 41.5 months

Return to Some Form of Sports	81%
Return to Pre-Injury Level of Sports	65%
Return to Competitive Sports	55%

## Factors associated with return to sport:

1. Male gender
2. Younger age
3. Elite athlete
4. Positive psychological response

# Summary

- Prevention is the best medicine!
- PEP and Sportsmetrics have the largest (very successful!) clinical studies in the US
- Pick a well designed program
- These programs benefit boys and girls



# Thank You

A photograph of the United States Women's National Team (USWNT) players and coaching staff huddled together on a soccer field at night. The players are wearing white jerseys and shorts, while the coaching staff is in black. The scene is illuminated by stadium lights, creating a dramatic atmosphere.

**STRONG ALONE.  
CHAMPIONS TOGETHER.**

Celebrate the USWNT's third worldwide title in their official championship gear. #NoMaybes

[SHOP THE COLLECTION](#)

The official crest of the United States Soccer Federation, featuring a shield with a soccer ball in the center, three stars above it, and the letters 'USA' below the ball.

# Questions?

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# CONCUSSION IN YOUTH ATHLETES

**Jess Wertz, DO, CAQSM**

**Inova Sports Medicine**

**October 26, 2015**

# TODAY'S TOPICS....

- Defining concussion
- Review how common concussion is in youth
- Consider forces or mechanisms that may contribute to head injury in youth
- What to expect when an athlete sustains a concussion
- Current tools for assessment of concussion injury
- Current management and prevention recommendations
- Commonly asked questions



Roughly 9 in 10 (87 percent) Americans do not know the correct definition of a concussion



# DEFINING CONCUSSION



Injury to the brain caused by contact or non-contact forces

\*\*\*Does NOT require a hit to the head NOR loss of consciousness!!

No structural damage!

Energy crisis of the brain....

Like an explosion of neurotransmitters, the chemicals in your brain that affect how we feel and function

# INCIDENCE



- Concussion accounts for approximately 9% of all high school athletic injuries (highest in contact/collision sports)
- It is estimated as many as 3.8 million are affected annually in the United States
- Many do not seek medical attention so numbers likely higher
- In sports with similar playing rules, the reported incidence of concussion is higher in females than males

# RISK FACTORS FOR SPORTS RELATED CONCUSSION

- A history of concussion does not necessary put an athlete at greater risk for concussion
- Certain sports, positions, and individual playing styles have a greater risk of concussion
- Youth athletes may have a more prolonged recovery and are more susceptible to a concussion accompanied by a catastrophic injury
- Pre-existing mood disorders, learning disabilities, ADHD, migraines may make an athlete more susceptible to concussion as well as complicate recovery

# MECHANISM/BIOMECHANICS



- Differences exist between adults and pediatric patients
  - Relative size of the head compared with the rest of the body
  - Brain water content
  - Vasculature
  - Degree of myelination
  - Shape of the skull
  - Weak cervical strength
- Physiological differences may be why youth often have longer recovery times

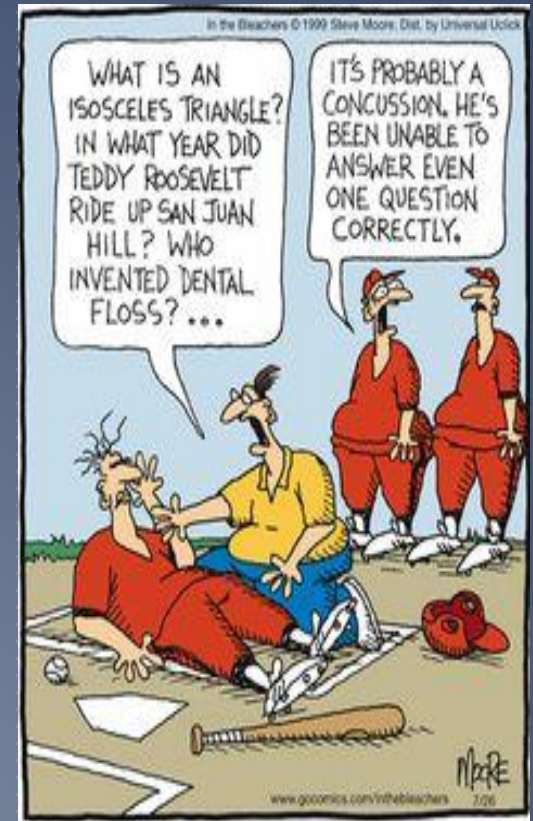
# WHAT TO EXPECT/LOOK FOR WHEN AN ATHLETE HAS A SUSPECTED CONCUSSION....

- ◆ Athlete is stumbling on the field, confused, slow to respond or responding to questions incorrectly or asking to have questions repeated, slurring speech
- ◆ May only complain of a mild headache and/or dizziness
- ◆ Sudden nausea or even vomiting, sensitivity to light/noise, seeing double or blurriness
- ◆ Not feeling right, feeling like in a fog, difficulty remembering plays or instructions



# ASSESSMENT

- Tools to help accurately identify concussion:
  - Pull athlete out and ask about Symptoms!
  - Sideline assessment by Team ATC if available
  - Neuropsychological computer testing – ImPACT
  - Balance testing
  - VOMS – Vestibular Oculomotor testing – Looking at the EYES



**TABLE 3. Signs and Symptoms of a Concussion**

**Physical**

Headache  
Nausea  
Vomiting  
Balance problems  
Dizziness  
Visual problems  
Fatigue  
Sensitivity to light  
Sensitivity to noise  
Numbness/tingling  
Dazed  
Stunned

**Cognitive**

Feeling mentally “foggy”  
Feeling slowed down  
Difficulty concentrating  
Difficulty remembering  
Forgetful of recent information and conversations  
Confused about recent events  
Answers questions slowly  
Repeats questions

**Emotional**

Irritable  
Sadness  
More emotional  
Nervousness

**Sleep**

Drowsiness  
Sleeping more than usual  
Sleeping less than usual  
Difficulty falling asleep

## Assessment - Symptoms

- Headache is the most commonly reported symptom with dizziness coming in second
- Loss of consciousness only occurs in about 10% of concussions
- Some symptoms overlap with other disorders such as sleep disturbances, depression and ADHD, helpful to determine if present prior to injury



# TYPES OF CONCUSSION

- Vestibular
- Ocular - motor
- Cognitive
- Post-traumatic Migraine
- Cervical
- Anxiety/Mood



# NEUROCOGNITIVE TESTING

- Good idea to get a baseline ImPACT testing prior to the sport season
- If a concussion occurs then we will have data for what is normal for the athlete and can compare post-concussion data to this
- Ideal for contact sport athletes
- Age for testing as young as 8 or 9 years old but we may be able to test as young as 5 years old very soon
- Recommend getting a new baseline every year in youth athletes as they have a large education learning curve and their brains are rapidly developing during this time





# ImPACT™ Clinical Report

Exam Type	Baseline	Post-Injury 1	Post-Injury 2	Post-Injury 3	
Date Tested	08/17/2010	01/10/2011	01/17/2011	01/27/2011	
Last Concussion		01/08/2011	01/09/2011	01/09/2011	
Exam Language	English	English	English	English	
Test Version	2.0	2.0	2.0	2.0	

Composite Scores	Percentile scores if available are listed in small type.									
Memory composite (verbal)	76	15%	61	1%	68	4%	93	71%		
Memory composite (visual)	85	86%	56	14%	63	21%	81	73%		
Vis. motor speed composite	36.8	35%	30.3	6%	31.08	9%	44.05	70%		
Reaction time composite	0.58	39%	0.79	2%	0.81	1%	0.52	75%		
Impulse control composite	11		13		9		7			
Total Symptom Score	4		19		28		3			

Cognitive Efficiency Index:    0.16                      0.13                      0.3                      0.53

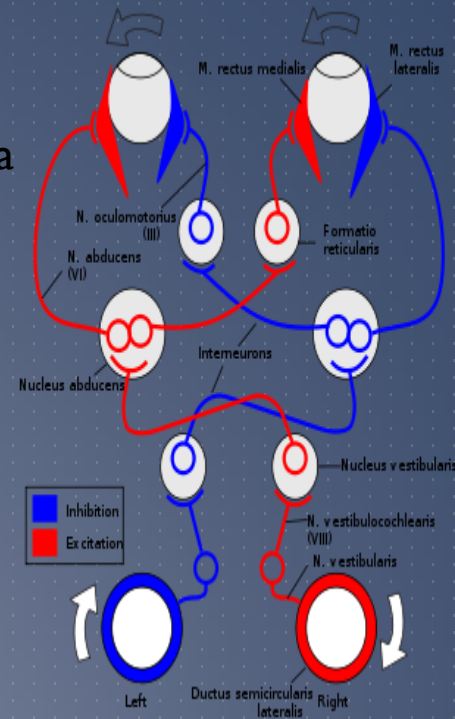
# BALANCE TESTING

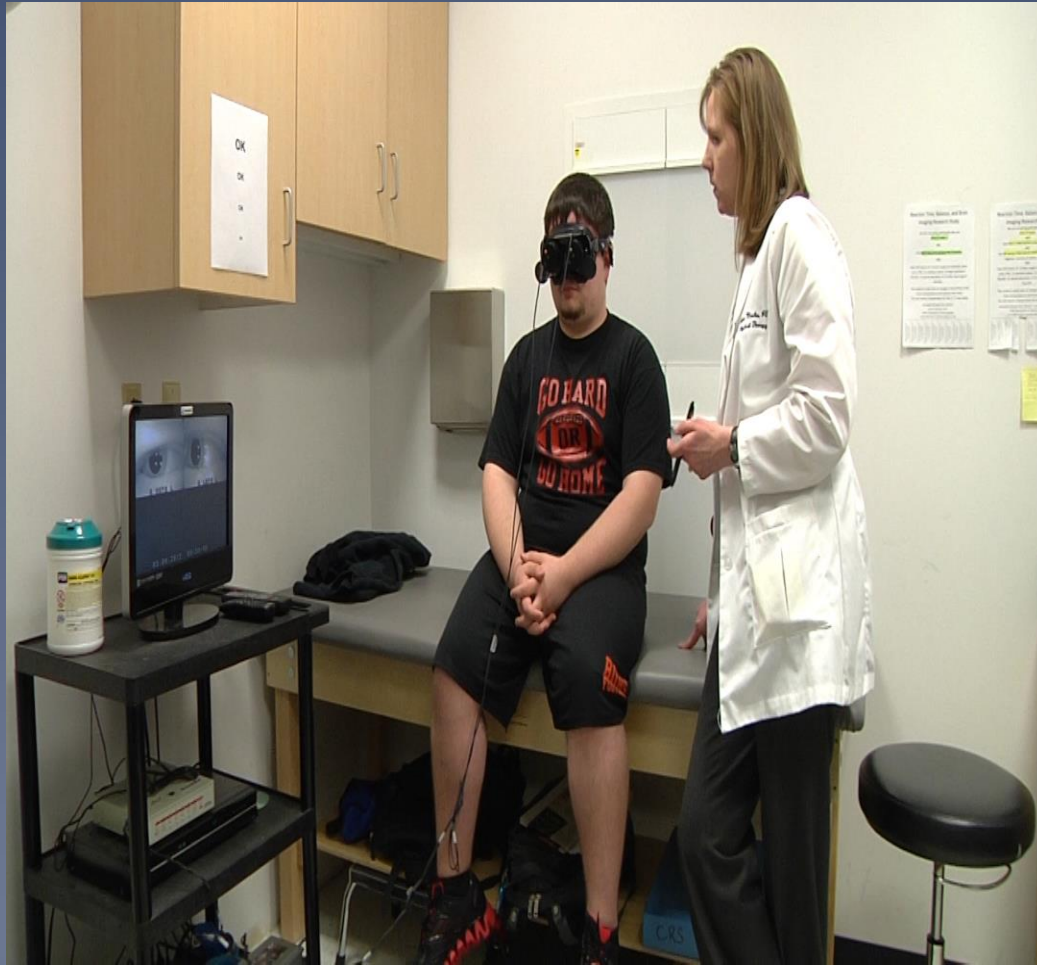


Simple balance tests can be useful but what we have found to be even more valuable is vestibular-ocular testing....

# VESTIBULAR-OCULAR TESTING

- Your vestibular system is located in your ears and provides you with a sense of motion, balance and equilibrium
  - When this system is off balance you may feel dizzy, nauseated or have a headache
- Your ocular system is your eyes and contributes to the vestibular system so that you feel balanced
- These systems in your ears and eyes communicate to provide you with good balance and after a concussion and can be thrown off
- Evaluation of this system is key in the treatment of concussion because if you persist to have concerning findings than an athlete may be returning to play before complete recovery from their concussion
  - This system is often overlooked and findings missed!







# MANAGEMENT

- Who can manage concussions?
  - Healthcare professionals with specific training and experience in the assessment and management of concussion
  - Competence should be determined by training and experience, not dictated by specialty
- Golden Rule
  - There is no same day return to play for any athlete diagnosed with concussion





# SECOND IMPACT SYNDROME

- When premature cognitive or physical activity occurs before full recovery of a concussed brain it may be vulnerable to prolonged dysfunction
- May put an athlete at risk for potential cerebral swelling



# INDICATIONS FOR NEUROIMAGING

- The vast majority of athletes with a sports-related concussion do NOT need neuroimaging
- Standard neuroimaging such as CT or MRI of the brain are negative in concussion but are used to evaluate for more severe brain injury
- May consider if athlete is experiencing worsening headaches, nausea/vomiting, amnesia/confusion, focal neurological signs



# MANAGEMENT



- Most concussions resolve within 14-30 days
- Cognitive and physical rest is key to symptom resolution and preventing lingering symptoms
- However, it is also important to regulate the athlete's daily routine as soon as possible after the injury
- A return-to-play progression involves a gradual, stepwise increase in physical demands, sports-specific activities, and the risk for contact

# RETURN TO PLAY PROTOCOL

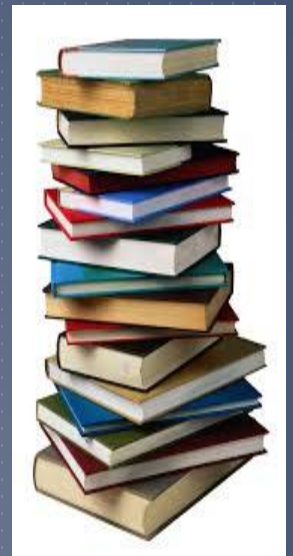
**TABLE 5. Graduated Return-to-Play Protocol**

<b>Rehabilitation Stage</b>	<b>Objective of Stage</b>
No activity	Recovery
Light aerobic exercise	Increase heart rate
Sport specific exercise	Add movement
Non-contact training drills	Exercise, coordination, and cognitive load
Full-contact practice	Restore athlete's confidence; coaching staff assesses functional skills
Return to play	



# MANAGEMENT – RETURN TO SCHOOL

- No standardized guidelines for returning an athlete to school
- If an athlete experiences increased symptoms with cognitive stress, may need to consider academic accommodations
- Some athletes have persistent neurocognitive deficits despite being symptom free, these athletes should continue to be withheld from contact sports



# MORE EXTENSIVE TREATMENTS

- Vestibular therapy
- Ocular therapy
- Exertional therapy
  
- May need referrals to neurology, neuropsychology, or even behavioral neuro-optometry
  
- Rx medication management may be needed

# DISQUALIFICATION FROM SPORT



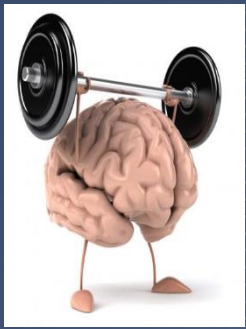
- There are no evidence-based guidelines for disqualifying/retiring an athlete from sport after concussion
- Each case should be carefully deliberated and an individualized approach to determining disqualification taken

# PREVENTION



- EDUCATION is a key part of recognition, management and prevention
- Headgear use in contact sports may offer a protective effect from impact injuries, but do not prevent concussions
- No evidence that mouth guards offer any protection from concussions





# QUESTIONS?



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# COMMON UPPER EXTREMITY INJURIES IN YOUTH SPORTS

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CAUSES AND PREVENTION

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Assistant Professor of Orthopaedic Surgery, Clinical Educator  
Georgetown University School of Medicine  
Virginia Commonwealth University School of Medicine

McLean Youth Soccer – Injury Prevention Workshop  
October 26, 2015

# WHY EXERCISE?

- Regular exercise increases self-esteem, and reduces stress/anxiety/DEPRESSION
  - Farmer ME. *Am J Epidemiol.* 1998
- Athletes are less likely to be heavy smokers and use drugs
  - Kino-Quebec, 2000. Physical Activity: a determinant of health in youth
  - Escobedo LG. *JAMA.* 2003
- Athletes are more likely to stay in school
  - Zill N. Adolescent Time Use, Risky Behavior and Outcomes. 1995
- Learn teamwork, self-discipline, sportsmanship, leadership, and socialization
  - Cahill BR. Intensive Participation in Children's Sports. 1993
- Builds self-esteem, confidence, fitness, agility
- Builds cardiovascular health

# Cons?

- More than 3.5 million kids under the age of 14 receive medical treatment for sports injuries each year
- Children ages 5-14 account for nearly 40% of all sports related injuries treated in a hospital
- Overuse injuries are responsible for nearly half of all sports related injuries to middle and high school students



# Cons?

- 20% children 8-12yo and 45% ages 13-14 will have arm pain during a single youth baseball season
- Since 2000, there has been a 5x increase in the number of serious shoulder and elbow injuries among youth baseball and softball players
- The CDC estimates that more than half of all sports injuries in children are preventable



# Shoulder Injuries

- Rotator cuff
- Instability
- Labral pathology
- Little Leaguer's shoulder



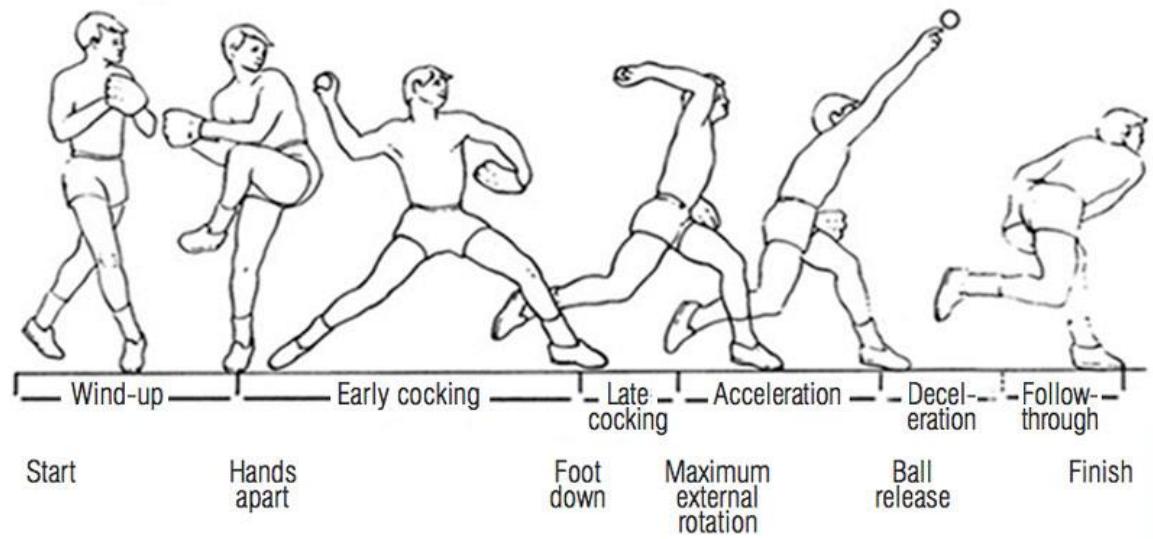
# Throwing Biomechanics

- Throwing a baseball in an unnatural movement
- Excessively high forces are generated at the elbow and shoulder with overhead throwing
- Throwing requires flexibility, strength and coordination



# Phases of Pitching

- Wind-up
- Early Cocking
- Late Cocking
- Acceleration
- Deceleration
- Follow Through



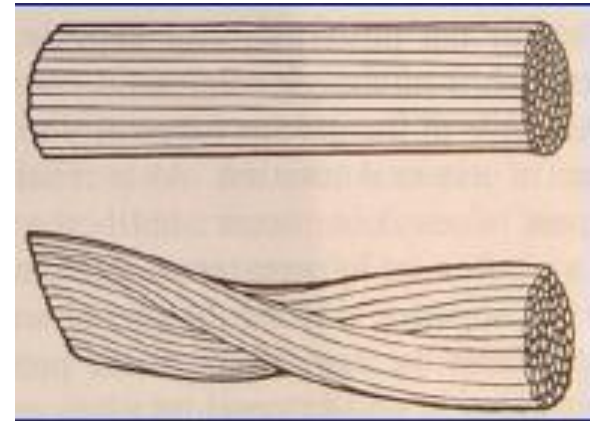
- Remember the **Kinetic Chain!**





# Rotator Cuff Injuries

- Tensile overload
  - Forces generated in cuff during pitching can cause tendinosis and collagen breakdown
- Internal Impingement
  - Supraspinatus and infraspinatus contact the posterosuperior aspect of the labrum during maximum ER
  - Causes chronic compressive injury
  - Results in a partial undersurface rotator cuff and labral fraying



# Rotator Cuff Injuries: Evaluation

- History
  - Specific injury or insidious onset?
  - Pain during cocking usually impingement
  - Pain during deceleration, commonly tensile failure
- Physical Exam
  - AROM/PROM
  - Glenohumeral translation
  - Impingement signs
  - Weakness secondary to pain, fatigue—rarely a full-thickness cuff tear

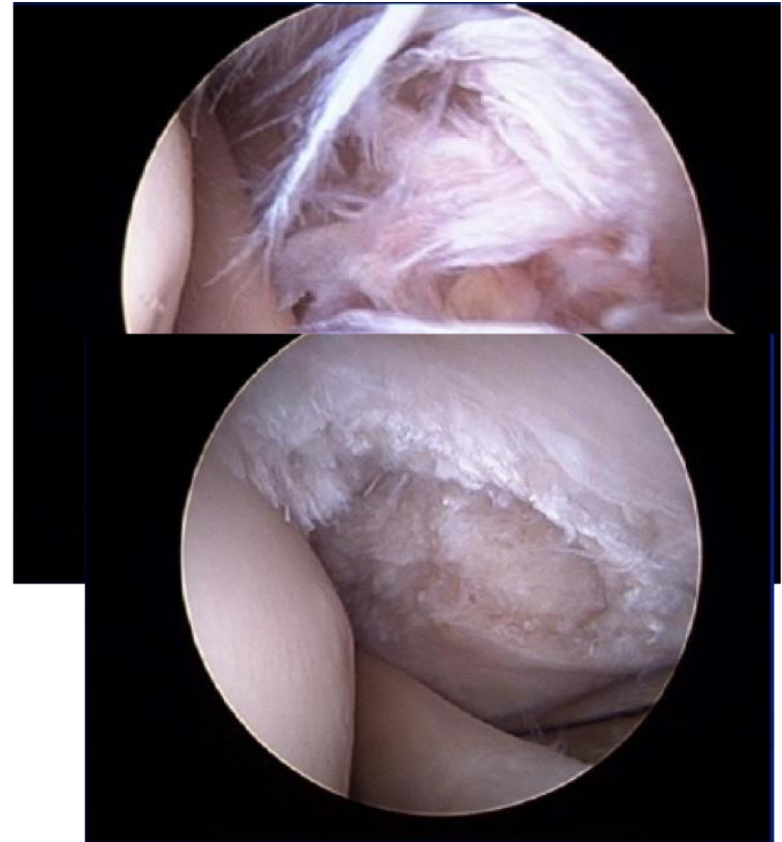
# Rotator Cuff Injuries: Evaluation

- Radiology:
  - Plain films-AP, Y, axillary
  - MRI



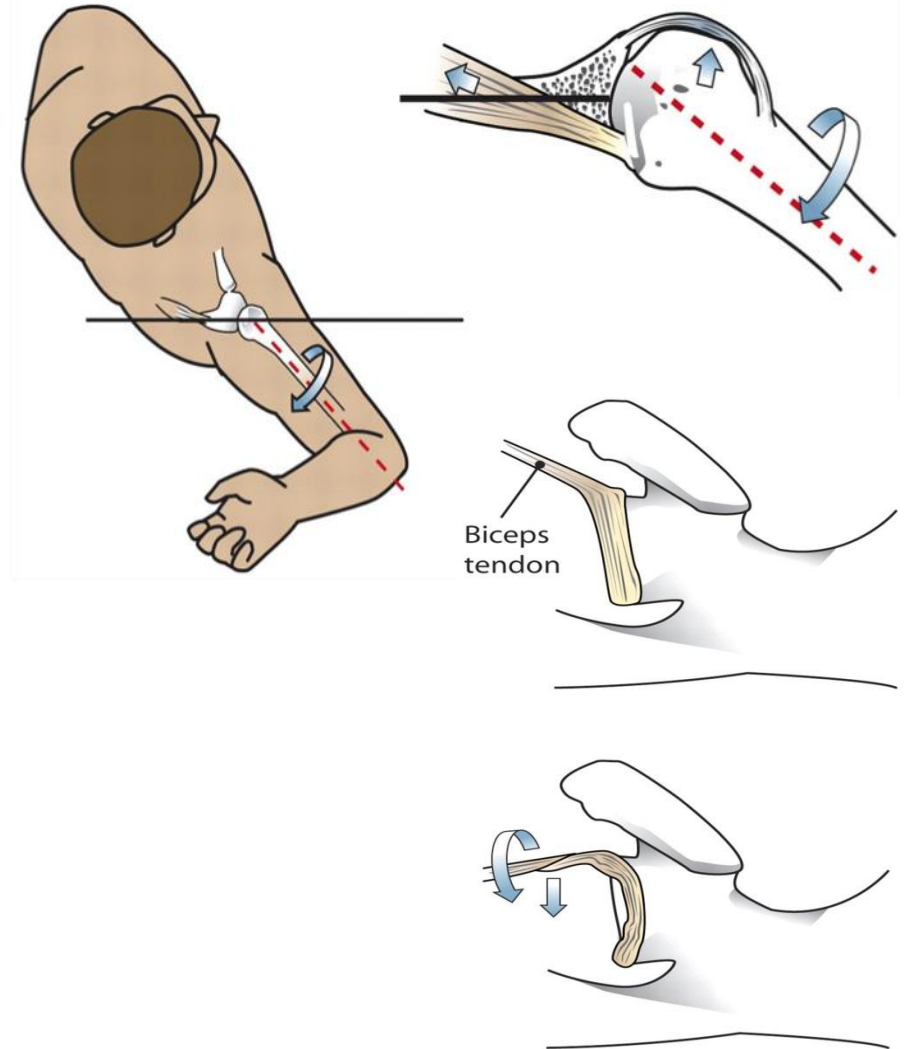
# Rotator cuff Injuries: Treatment

- Rest
- Rehab
  - Restore ROM
  - Strengthen cuff and scapular stabilizers
  - Maintain conditioning
  - Throwing program
- NSAIDs
- Surgery--rare



# Shoulder Instability

- Stability relies on ligaments and rotator cuff action
- Inferior glenohumeral ligament
  - Maximally stretched in ER
  - Chronic stretching can cause functional incompetence
  - Causes cuff to work harder—can fatigue or tear



# Instability: Evaluation

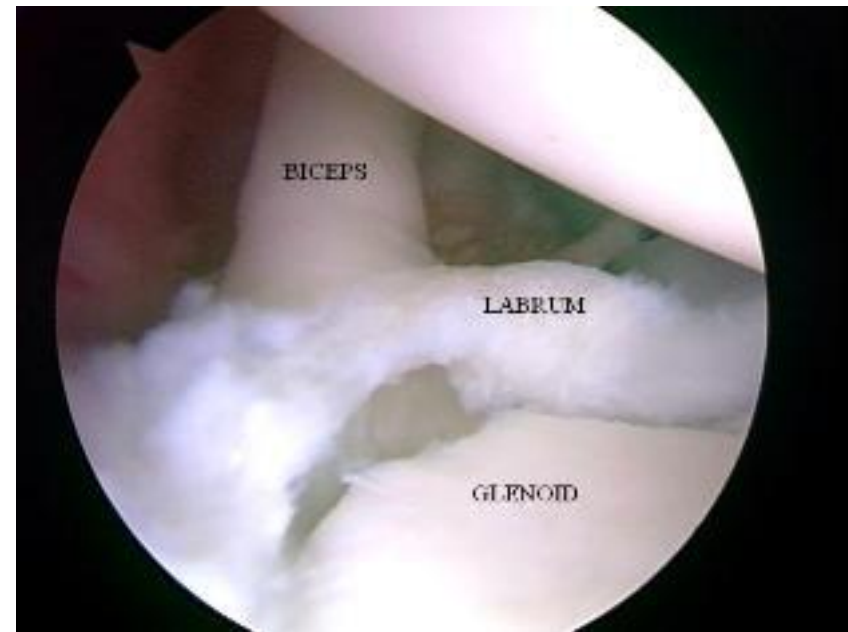
- H & P
- Symptoms due to cuff pain or micro-instability?
- Decreased velocity and early fatigue frequent complaints
- May describe clicking or catching

# Instability: Treatment

- Rest
- Rehab
  - As above, focused specifically on stretching the posterior capsule
- Surgical stabilization
  - Rare: unless traumatic instability, recurrence

# Labral Pathology

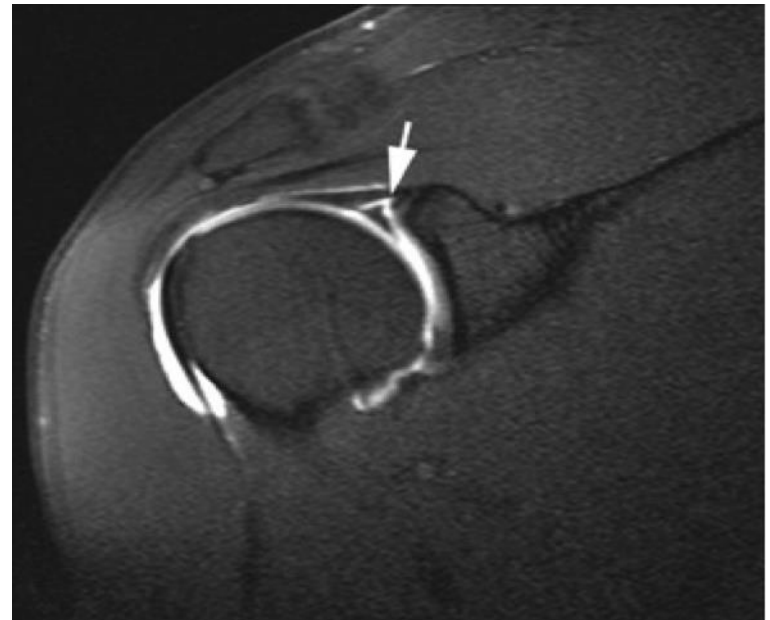
- Repetitive microtrauma results in fraying or tearing of the labrum
- Disruption of the biceps anchor causes pain and antero-inferior translation of the humeral head when completely detached
- Can occur alone, or in combination with instability or cuff pathology





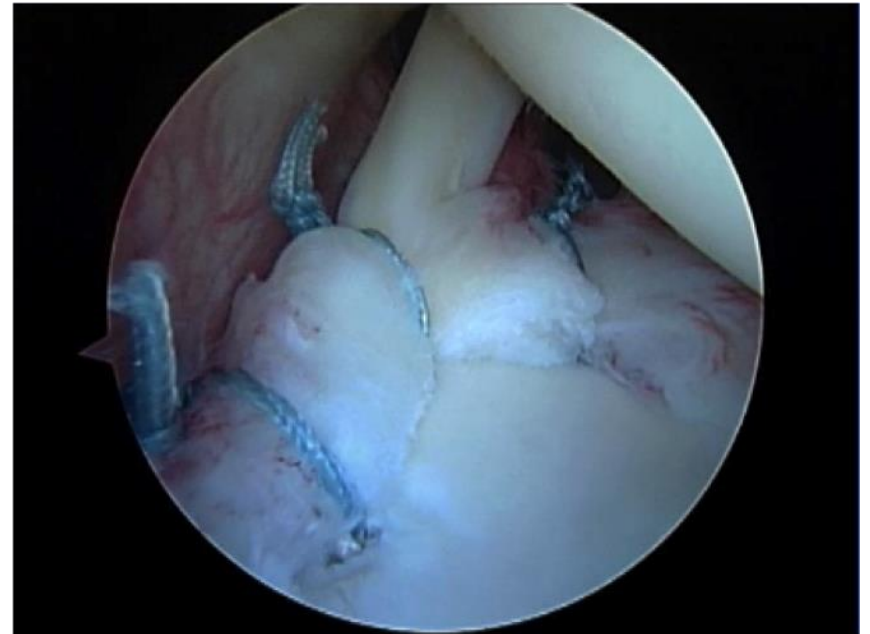
# Labral Pathology: Evaluation

- H&P as above
  - Pain during acceleration
  - Loss of velocity
  - + O'Brien's test
- Radiology
  - Xray
  - MRI arthrogram



# Labral Pathology: Treatment

- Rest
- Rehab
- Surgery
  - Labral repair
  - Labral debridement



# Little League Shoulder

- Osteochondrosis of the proximal humeral physis
- Caused by rotational stress applied to proximal humeral physis during throwing
- Overuse inflammation vs. stress fracture of the physis
- 35% of pitchers age 9-14
- Also:
  - Volleyball
  - Tennis
  - Cricket



# Little League Shoulder: Diagnosis

- **History**

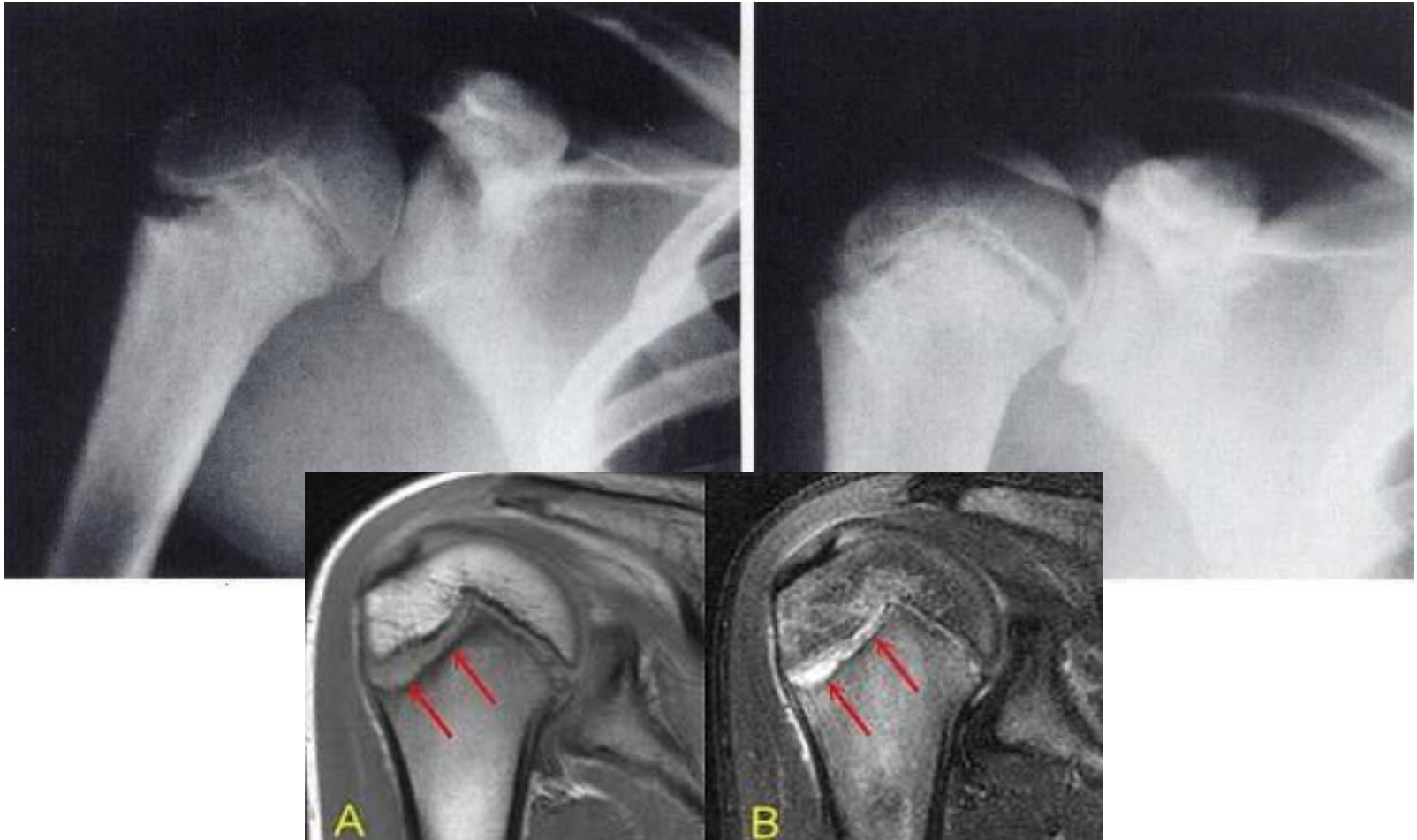
- Shoulder pain with pitching
- Common during fielding and ADL's

- **Physical exam**

- Proximal humerus physeal tenderness
- Painful arc of motion
- Weakness and pain with resisted shoulder abduction and external rotation

# Little League Shoulder: Imaging

- Clinical diagnosis
- May see widening of the physis



# Little League Shoulder: Risk Factors

- High volume
- Lack of experience
- Poor conditioning and muscle strength
- **Breaking balls prior to skeletal maturity**
  - **Increased risk of shoulder pain by 52%**

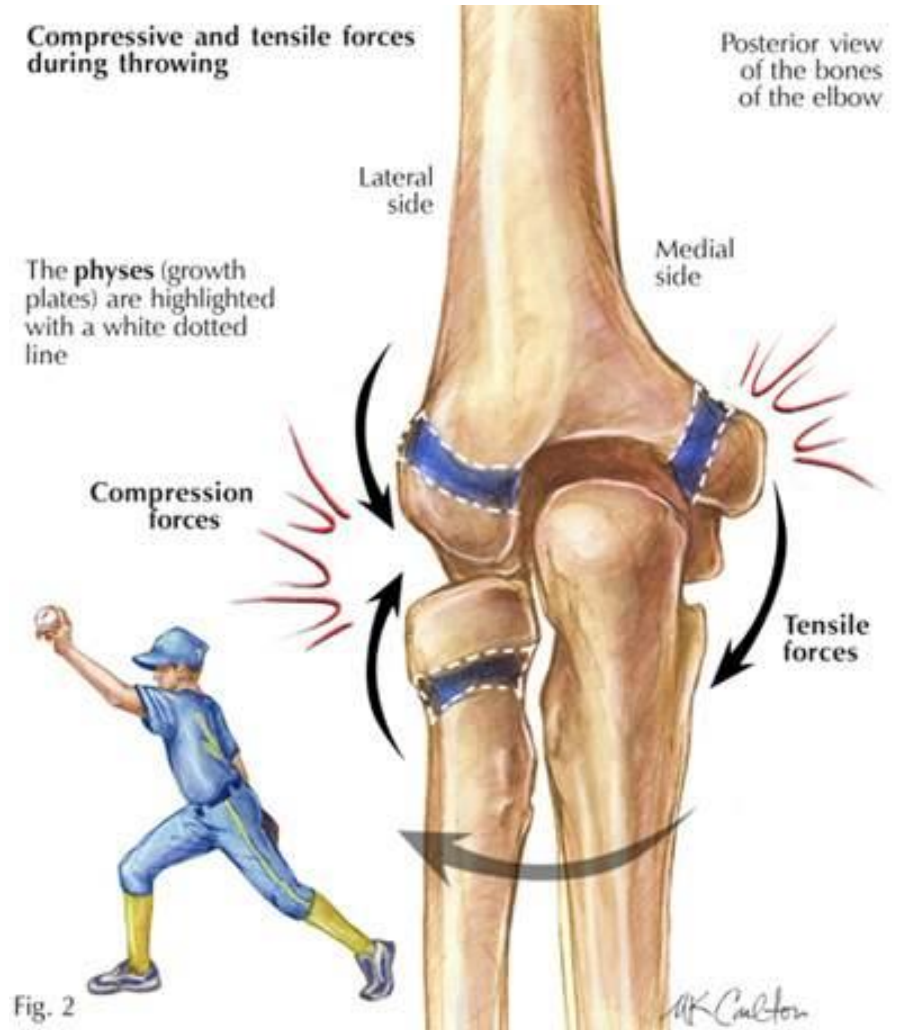
Lyman S. et al Effect of pitch type, pitch count and pitching mechanics on risk of elbow and shoulder pain in youth baseball pitchers. *AJSM* 2002;30:462-468.

# Little League Shoulder: Treatment

- Rest until symptoms subside with pain-free ROM
- Gradual return to throwing when symptoms subside—remodeling on xray can take several months longer
- Physical therapy usually not beneficial

# Elbow Injuries

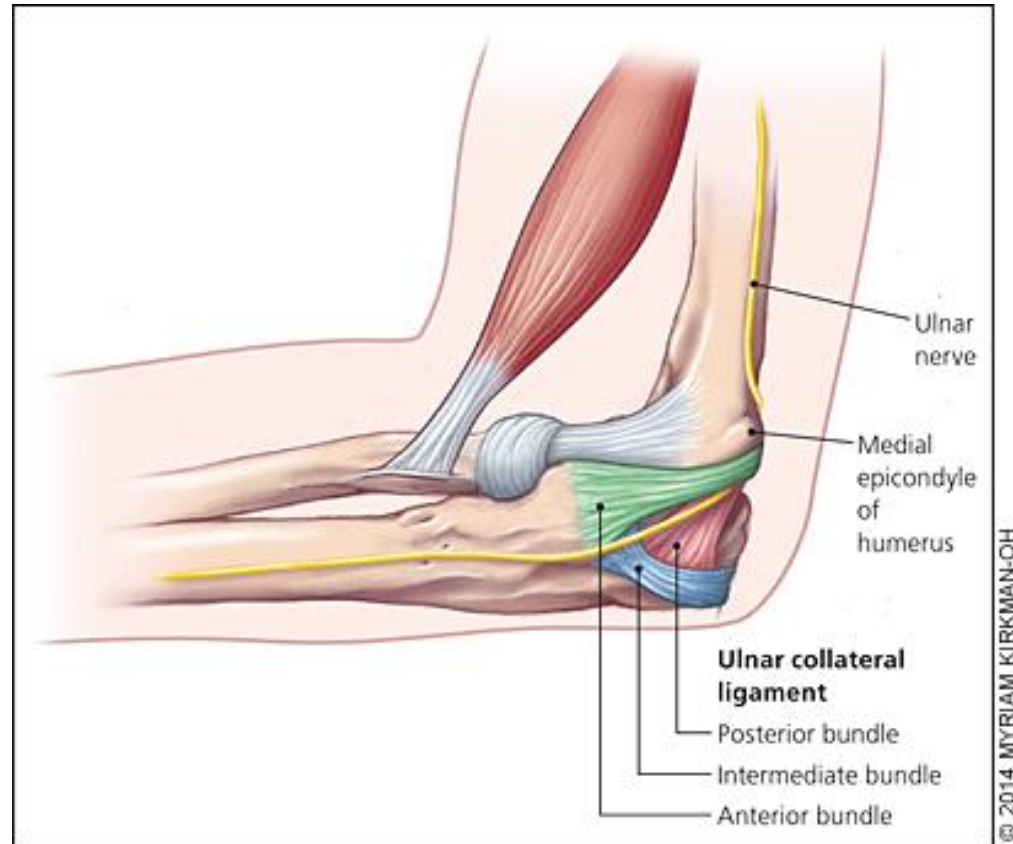
- Ulnar Collateral ligament injuries
- Little Leaguer's elbow (medial epicondyle apophysitis)
- Medial epicondyle Avulsion injury





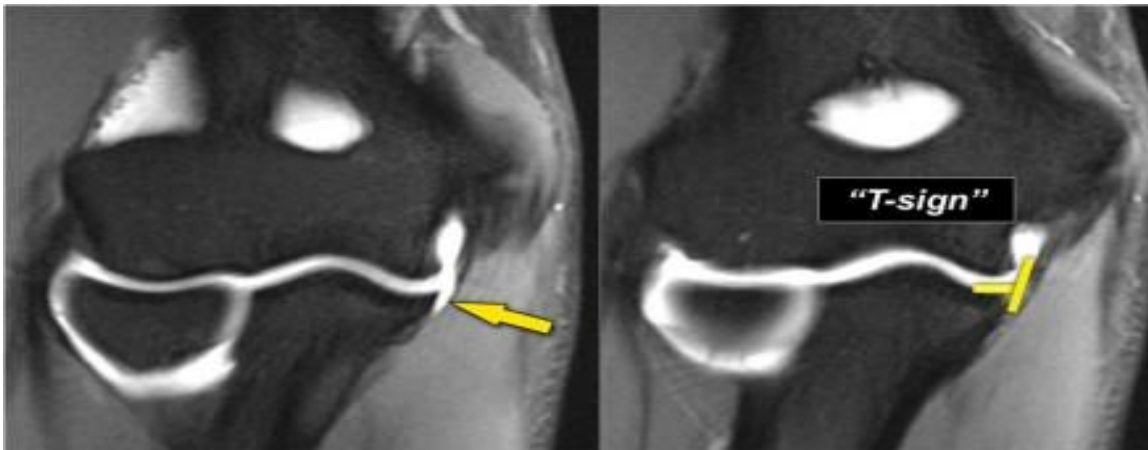
# Ulnar Collateral ligament

- Chronic valgus stress places ligament at risk for laxity or tearing
- Pitchers at highest risk



# UCL Injuries: Evaluation

- Medial pain during late cocking, early acceleration phase is hallmark
- Pain with valgus testing more reliable than laxity
- Laxity on valgus testing at 30 degrees minimal unless tear is complete
- MRI arthrogram to assess for complete tear



# UCL Injuries: Treatment

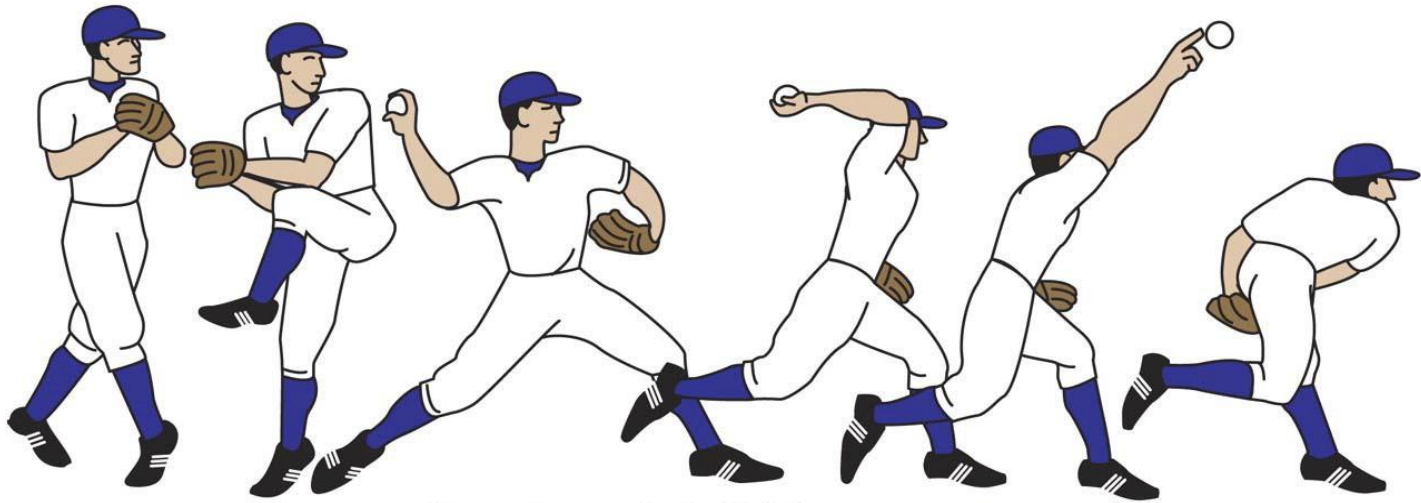
- Rest
- Physical therapy
- NSAIDs
- Return to throwing when pain-free
- Surgery—autologous tendon secured in tunnels in humerus and ulna

# Little Leaguer's Elbow

- Caused by excessive traction on the medial growth plate during the throwing motion
- Ligaments and tendons put tension on the end of the bone, causing inflammation of the growth plate and ultimately stress fracture
- Affects up to 50% of pitchers ages 9-14yo



# Little League Elbow: Mechanism



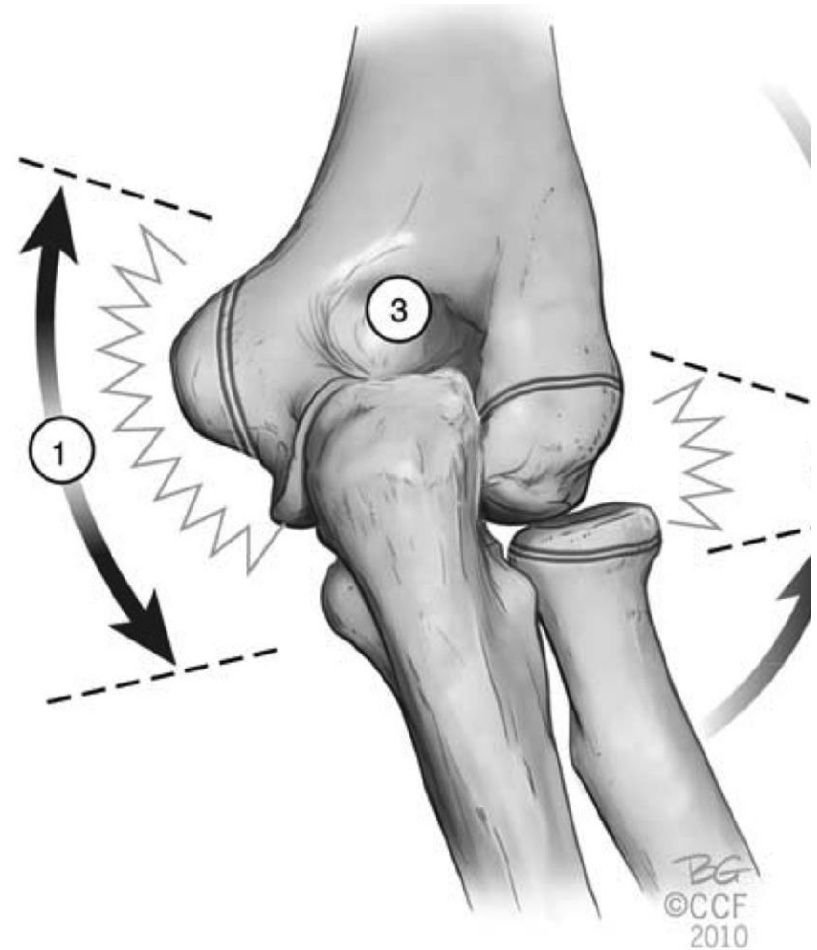
Changes that occur in the physis from overuse



Fig. 3

# Little Leaguer's Elbow: Mechanism

- 3 predominant forces to account for:
  1. Medial: Traction
  2. Lateral: Compression
  3. Posterior: Extension/Rotation



# Little League Elbow: Risk Factors

- High volume
- Lack of pitching experience
- Poor conditioning
- Breaking balls
  - More flexor-pronator action
  - Sliders: increased elbow pain by 86%

# Medial Epicondyle Avulsion Fracture

- Peak incidence ages 11-12
- Acute injury after forceful contraction of the flexor/pronator mass with a single pitch
- May have a history of apophysitis





# So What's The Solution??

- Pitch Limit!!
- Prevents injuries and prolongs careers
- Emphasize control, accuracy, and good mechanics in young pitchers
- Overuse injuries are preventable, especially those related to the UCL and the shoulder



# Tips for Preventing Overuse Injuries

- Warming up properly by stretching, running, and easy gradual throwing
- Rotating playing other positions besides pitcher
- Concentrate on age-appropriate pitching (Nolan Ryan didn't start pitching until he was in high school)
- Communicating regularly about how the athlete's arm is feeling
- Adhering to pitch count guidelines
- Avoiding pitching on multiple teams with overlapping seasons
- Not pitching with elbow or shoulder pain
- Not pitching on consecutive days
- Not playing one sport year round
- Never use a radar gun

# Pitch Limits: Current Recommendations

## Maximum Pitch Counts

Age	Pitches/Game
7–8	50
9–10	75
11–12	85
13–16	95
17–18	105

*Source: Little League Baseball*

# Pitch Types: Current Recommendations

## Age Recommended for Learning Various Pitches

Fastball	8 ± 2
Slider	16 ± 2
Change-up	10 ± 3
Forkball	16 ± 2
Curveball	14 ± 2
Knuckleball	15 ± 3
Screwball	17 ± 2

*Source: From work by James R. Andrews, MD, and Glenn S. Fleisig, PhD*

- Pitch type should also be limited to reduce injury
- Before age 10, only fast ball and change up should be permitted

# Pitching Mechanics

- Curveballs and sliders are related to joint pain in young pitchers
- These pitches place higher loads on the shoulder and elbow
- Curveballs require a new set of mechanics
- Adolescents are more susceptible to injury because of their open growth plates

# Prevention: Rest Periods

## Rest Periods Required

Ages 7–16 Number of Pitches	Ages 17–18 Number of Pitches	Required Rest
61+	76+	3 calendar days
41–60	51–75	2 calendar days
21–40	26–50	1 calendar day
1–20	1–25	No day of rest required

*Source: Little League Baseball*

# Conclusion

- Most upper extremity overuse injuries can be prevented with proper training and common sense.
- Learn to listen to your body: "no pain, no gain" does not apply here.
- Allow your body adequate time for recovery and response.
- Good communication between MDs, players, parents and coaches is key to diagnosing and treating these injuries

# Conclusions

- Incorporating strength training, increasing flexibility, and improving core stability will also help minimize overuse injuries
- Seek the advice of a sports medicine specialist or athletic trainer when beginning an exercise program or sport to prevent chronic or recurrent problems
- Return to play only when cleared by a health care professional.
- By adhering to the above recs, we should expect the occurrence of shoulder and elbow pain in the adolescent athlete to dramatically decrease



# Questions?

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