

# Shoulder and Elbow Injuries in the Pediatric Athlete

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## Introduction

- Overuse injuries and traumatic injuries
- The changing anatomy of the adolescent athletes make them prone to specific injury patterns
- Proper training and understanding of the growing athlete can be protective of some of the injuries seen in the pediatric athlete

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## Epidemiology

- 2 million sports related injuries annually
- Single season
  - 50% of all players complain of shoulder and elbow pain
  - Pitchers complain of pain in shoulder or elbow in 15% of their appearances

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## Anatomy and Development

- Upper extremity growth
  - 80% comes from the proximal humeral physis
- Proximal humeral epiphyseal ossification center appears by age 6 months and fuses between ages 14 – 18 years
- Elbow has 6 ossification centers, earliest appears at 1 yr and fuses around age 12 yrs

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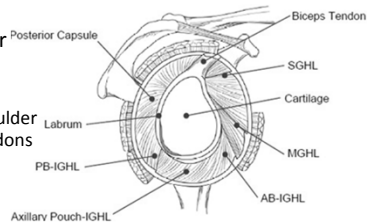
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## Anatomy and Development

- Static shoulder stabilizers
  - Glenohumeral ligaments
  - Capsule
  - Rotator interval
  - Labrum
- Dynamic shoulder stabilizers
  - Rotator cuff
  - Surrounding shoulder muscles and tendons



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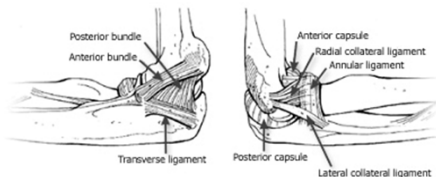
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## Anatomy and Development

- Elbow stabilizers
  - Bony articulations
  - Medial and lateral ligament complexes
    - Ulnar collateral ligament
    - Lateral collateral ligament



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## Proper Training

- Guidelines from: American Sports Medicine Institute USA Baseball Medical and Advisory Committee:

- Pitch Counts
  - Per game
  - Months per season
- Rest days
- Arm fatigue
- Pitch velocity
- Type of pitch

Age (y)	Maximum Pitches Per Game
7-8	50
9-10	75
11-12	85
13-16	95
17-18	105

Pitches	Days Rest
1-20	No calendar day
21-40	1 calendar day
41-60	2 calendar days
> 61	3 calendar days

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## Proper Training

- Energy generated from lower extremity thru torso to the upper extremity
- Higher level athletes, have more delayed trunk rotation → less load to the shoulder → decrease injury risk




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## Little League Shoulder

- Proximal humeral physis affected by repetitive rotational stresses
- Presentation:
  - Age 11 – 13
  - Pain with throwing
  - Tenderness over proximal humeral physis
- Imaging
  - Not needed, but supportive
  - Xray: widening of the physis, fragmentation of lateral metaphysis, sclerosis, cystic changes, demineralization

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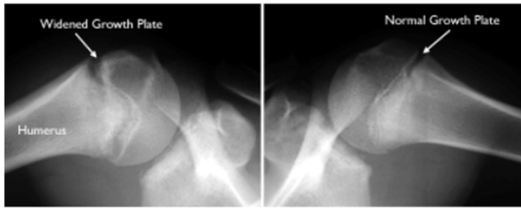
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## Little League Shoulder



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## Little League Shoulder

- Treatment:
  - Rest
  - Most require 3 months of no pitching
  - Rehab:
    - Rotator cuff strengthening
    - Periscapular muscle strengthening
    - Core strengthening
  - Gradual return progressive throwing program

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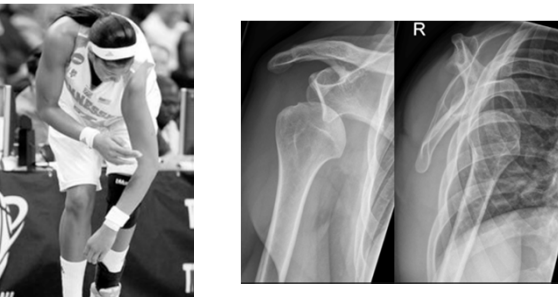
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## Shoulder Instability

- Can be anterior or posterior
- Can be traumatic or atraumatic



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## Shoulder Instability

- Mechanism of Injury
  - Force on an abducted, extended, externally rotated arm → acute dislocation
  - Repetitive microtrauma or subluxation in flexion, adduction and internal rotation → chronic posterior instability
- Associated injuries
  - Bankart: Avulsion of anterior inferior labrum with inferior glenohumeral ligament (IGHL)
  - HAGL: IGHL comes off the humeral side
  - Hill-Sachs
- Imaging
  - Xray
  - MRI in recurrent cases

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## Shoulder Instability

- Treatment
  - Acute: Immediate reduction
    - Traction counter traction
    - Hippocratic
    - Stimson technique
    - Milch Technique

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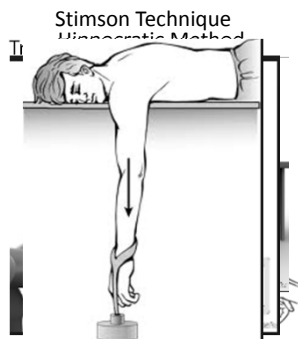
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## Reduction Maneuvers



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## Shoulder Instability

- Treatment:

- Recurrent anterior

- Appropriate imaging includes 3D CT and MRI
- Arthroscopic bankart repair
- Open HAGL repair

- Recurrent posterior

- Activity modification
- Rehab
- Posterior capsulorrhaphy



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## Shoulder Instability

- Who gets recurrent instability?

- 75 – 85% recurrence after initial traumatic dislocation
- Strong association of recurrence with male and younger age
- Ligamentous laxity
  - Multidirectional instability
- Hill-Sachs
- Missed HAGL
- Bony Bankart

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## Superior labral Anterior-posterior tears

- Secondary to microtrauma or acute trauma
  - Microtrauma: cocking phase of throwing cycle
  - Acute trauma: fall onto outstretched arm
- Presentation:
  - Pain in late cocking phase
  - Most Common complaint is decrease in pitch velocity
- Imaging
  - Xray: exostosis, sclerosis of GT, rounding of post glenoid rim
  - MRI: RC tears, labral tears, cysts, chondral lesions
  - MR arthrogram – most sensitive
- Treatment:
  - Conservative: posterior capsular stretching
  - Arthroscopic repair

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## Glenohumeral internal rotation deficit (GIRD)

- Starts in the early athlete
- Mechanics:
  - Increased humeral retroversion
  - Loss of internal rotation
  - Tightness of rotator cuff and posterior capsule
  - The humeral head now sits in abnormal posterosuperior position during rotation
- Treatment:
  - Posterior capsular stretching program
  - Arthroscopic posterior capsule release

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## Fractures

- Clavicle Fractures
  - Last bone to fuse
  - Most commonly treated non-operatively
  - Return to normal activity takes 2 to 3 months
  - Surgical:
    - Absolute: open, skin compromise, floating shoulder, neurovascular compromise

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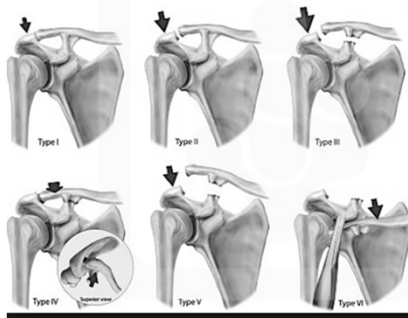
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- Acromioclavicular separation

### Rockwood Classification



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• Acromioclavicular separation



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• Sternoclavicular injuries

- Salter Harris I or II fracture of medial clavicle
- Anterior or posterior displacement of clavicle
- Evaluated with CT scan
- Posterior dislocations are concerning
- Reduction of posterior dislocation needs to be done with thoracic surgery back up

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**Fractures**

• Proximal humerus

- Significant remodeling capacity
- Non-displaced/minimally displaced treat conservatively
- Younger than age 11 can accept upto 20 degrees of angulation
- Older or with significant displacement then closed reduction and fixation

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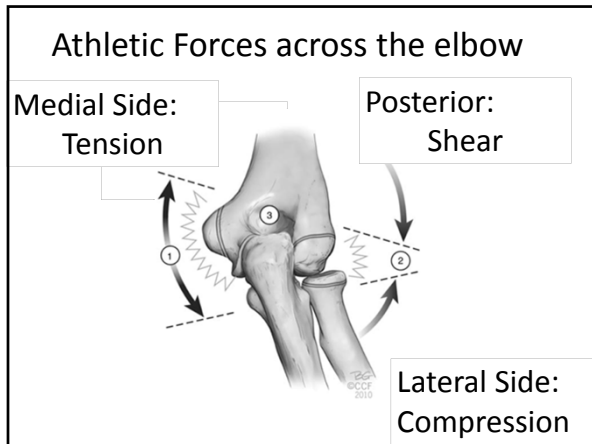
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- ### Little Leaguer's elbow
- **Medial Side**
    - Epicondyle avulsion
    - Apophysitis
    - UCL insufficiency
  - **Lateral Side**
    - Panner's disease
    - Osteochondritis dissecans
  - **Posterior**
    - Olecranon apophysitis

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- ### Little Leaguer's elbow
- **Medial epicondyle apophysitis**
    - Flexor-pronator mass and UCL
    - Presentation:
      - Insidious onset of progressive pain
      - Flexion contracture
      - Decreased pitch velocity and distance
      - Point TTP along with swelling
      - Pain but no instability with valgus stress
    - Xray: normal, possible fragmentation
    - Treatment: pitch rest

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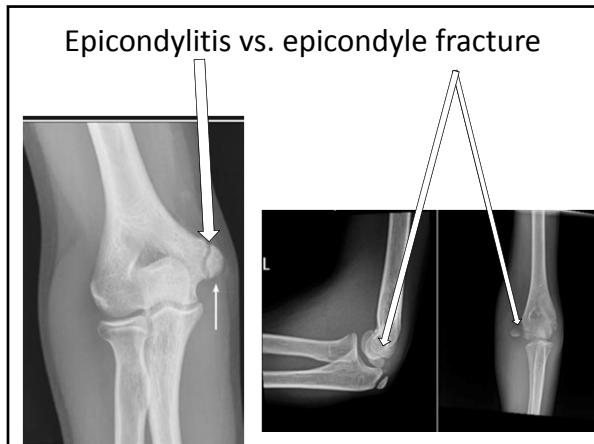
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**Medial Epicondyle fracture**

- Immobilized for short period
- Early ROM
- Surgical vs. nonsurgical depends on fracture displacement
- Out of sports for about 6 – 8 weeks

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**Little Leaguer's elbow**

- UCL injury
  - Seen older adolescents
  - Due repetitive microtrauma
  - Presentation:
    - Decreased pitch velocity
    - Ulnar nerve paresthesias
  - Imaging:
    - MRI
    - Xray – stress testing
  - Treatment:
    - Rehab and rest
    - Surgery for persistent sx
      - 75% rtn to same level of play

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## Little Leaguer's elbow

- Panner's disease
  - Seen in kids age 4 – 9
  - Capitellum has tenuous blood supply
  - Presentation
    - Insidious onset lateral sided pain
    - Elbow stiffness
  - Imaging:
    - Xray: fragmentation at the capitellum

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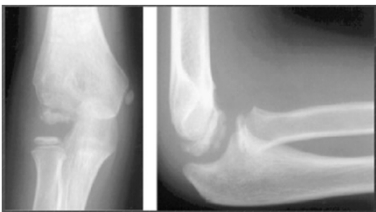
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## Little Leaguer's elbow

- Panner's disease



- Treatment
  - Conservative
  - Rtn to normal play 1 month
  - Radiographs will normalize after 2 years

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## Little Leaguer's elbow

- OCD
  - Older peds athletes
  - Presentation:
    - Point TTP, lack full extension, swelling
  - Imaging: MRI
  - Treatment:
    - Based status of physis, presence of loose body and if lesion is stable/displaced



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## Elbow dislocations

- FOOSH
- Posterior most common
- Immediate reduction
- Must demonstrate concentric reduction
- Treatment:
  - 7 to 10 days immobilization
  - Rtn to sports after pain, swelling resolved and with full ROM
  - Surgery with non-concentric reduction



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Thank you!

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