



Youth Thrower's Shoulder

Definition

- Youth Thrower's Shoulder is an inflammatory condition involving the growth plate of the humerus, near the shoulder, due to various repetitive overhead sporting activities
- Growth plates are only found in individuals that are growing, thus this condition is isolated to skeletally immature children and adolescents
- This condition is called "youth thrower's shoulder" due to its association with baseball, waterpolo, tennis, volleyball, and football

Risk Factors

- Year round participation in overhead throwing sports
- Absence of rest between games such as weekend tournaments
- Pitching greater than 100 innings per year
- Poor throwing mechanics
- Pitch type such as curveball throwing
- Individuals who play several positions in the same season, such as pitcher and catcher

Mechanism

- In order for children to achieve his or her full growth potential, bones must grow in a longitudinal direction which is accomplished by the growth plate found at the ends of a bone
- Several growth plates exist in the bone that creates the upper arm, aka the humerus. The growth plate responsible for Youth Thrower's Shoulder is closest to the shoulder joint (Figure 1)
- Growth plates are composed of a cartilaginous matrix with cells arranged in nests and columns which continually divide and subsequently ossify therefore providing increasing length to the extremity
- Compared to surrounding bone, ligaments, and tendons, the cartilage is relatively weak and subject to injury with repeated stresses such as throwing
- Repeated stress on the growth plate results in inflammation which is the biological process that results in pain, tenderness, warmth, redness, and swelling (figure 2)
- If stress is continuous and severe across the growth plate, small fractures (breaks) in the growth plate may occur.

Figure 1

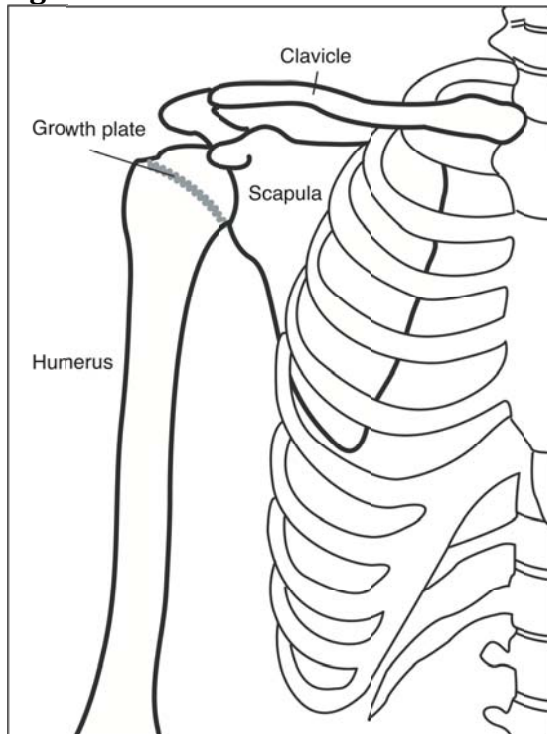
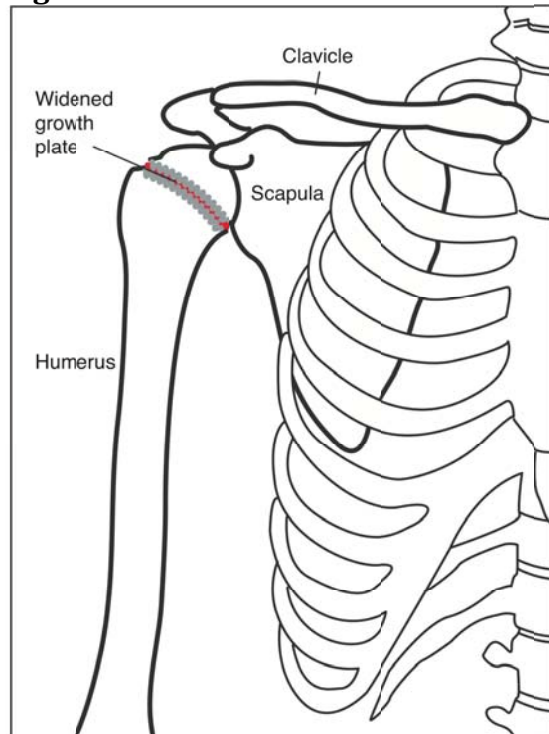


Figure 2



Symptoms

- Symptoms may include but are not limited to
 - Swelling of the upper arm
 - Swelling of the shoulder
 - Pain with throwing
 - Local tenderness of the upper arm
 - Decreased throwing speed
 - Less throwing control

Diagnostic Work-Up

- Diagnosis is usually made by physical exam and radiographs of the involved shoulder
- Radiographs commonly appear normal, but may also show widening of the space corresponding to the growth plate (figure 3)
- If the diagnosis is in question or the patient notes other unusual symptoms, magnetic resonance imaging (MRI) may be useful (figure 4) in assessing the degree of injury and excluding other conditions.

Figure 3

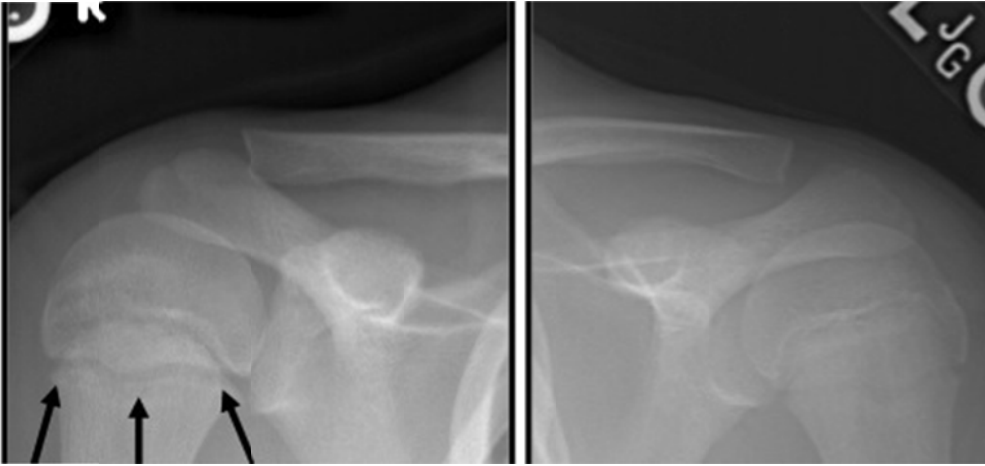


Figure 4



Fig. 3 X-ray of a symptomatic shoulder shows subtle proximal humeral physal widening (solid arrows). Comparison radiograph of the contralateral shoulder is with normal physal morphology. Fig. 4. MRI of the right shoulder shows signal change surrounding the physis (open arrows), which is consistent with growth plate inflammation.

Treatment and Prevention

- Youth Thrower’s Shoulder is only an issue when the growth plate of the humerus remains active. The growth plate typically closes in girls between 14 to 17 years of age and 16 to 18 years of age in boys
- Fortunately in patients that are still growing, Youth Thrower’s Shoulder typically resolves with proper treatment but may progress to chronic shoulder pain as an adult if not properly addressed.
- The best treatment is prevention. The number of pitches an individual throws in a season should be monitored and regulated by both the parent and the coach.

Recommendations from the USA Baseball’s Medical and Safety Advisory Committee:

Recommended Pitch Counts for Youth Throwers

Age in Years	Pitches/Game	Pitches/Week	Pitches/Season	Pitches/Year
9-10	50	75	1000	2000
11-12	75	100	1000	3000
13-14	75	125	1000	3000
15-16	90	2 games/week		
17-18	105	2 games/week		

Recommended Rest Days for Youth Throwers

Age in Years	Pitches/Day	Rest Period (days)
7-16	60+	4
	41-60	3
	21-40	2
17-18	75+	4
	51-75	3
	26-50	2
	1-25	1

- Youth throwers **should avoid** the following
 - Throwing breaking pitches such as curve balls or sliders
 - Multiple appearances in a single game
 - Returning to play after being removed from the game
 - Year round participation in a single sport. Refrain from playing a particular sport a minimum of *at least* 3 months per year. Note that the player may participate in other sports (i.e. a baseball player may participate in basketball during this timeframe)
- Youth throwers **should** focus on
 - Participating in active rest after the season ends
 - Ensuring proper body and throwing mechanics
 - Participating in year-round physical conditioning, particularly core-strengthening

Treatment of Active Symptoms

- At no time should a player throw with pain
- Cessation of aggravating activities is the best and most effective treatment for youth throwers with active symptoms. Temporarily stopping the irritating motion allows the growth plate to heal
- In some instances, the player may be referred to a physical therapy program to improve strengthening and stretching of the surrounding muscles, identify hazardous throwing mechanics, and rehabilitate the player back to peak performance

The following 8 phase throwing program is used to prevent re-injury

<u>Phase 1</u>	Little League	Junior/Senior League
Throwing Distance:	20 feet	25 feet
Number of throws per set	3 sets total: 15, 15, 20	3 sets total: 15, 15, 20
Rest between throws	12 seconds	12 seconds
Rest between sets	Six to eight minutes	Six to eight minutes
Intensity	50% of maximum	50% of maximum
Throwing mechanics	Light toss	Light toss

<u>Phase 2</u>	Little League	Junior/Senior League
Throwing Distance:	30 feet	40 feet
Number of throws per set	3 sets total: 15, 15, 20	3 sets total: 15, 15, 20
Rest between throws	12 seconds	12 seconds
Rest between sets	Six to eight minutes	Six to eight minutes
Intensity	50% of maximum	50% of maximum
Throwing mechanics	Light toss	Light toss

<u>Phase 3</u>	Little League	Junior/Senior League
Throwing Distance:	40 feet	50 feet
Number of throws per set	3 sets total: 15, 20, 20	3 sets total: 15, 20, 20
Rest between throws	12 seconds	12 seconds
Rest between sets	Six to eight minutes	Six to eight minutes
Intensity	70% of maximum	70% of maximum
Throwing mechanics	Light toss	Light toss

<u>Phase 4</u>	Little League	Junior/Senior League
Throwing Distance:	45 feet	60 feet
Number of throws per set	3 sets total: 20, 20, 25	3 sets total: 20, 20, 25
Rest between throws	12 seconds	12 seconds
Rest between sets	Six to eight minutes	Six to eight minutes
Intensity	75% of maximum	75% of maximum
Throwing mechanics	Light toss	Light toss

<u>Phase 5</u>	Little League	Junior/Senior League
Throwing Distance:	90 feet or 80% of target distance*	90 feet or 80% of target distance*
Number of throws per set	3 sets: 15, 15, 15	3 sets: 15, 15, 15
Rest between throws	12 seconds	12 seconds
Rest between sets	Six to eight minutes	Six to eight minutes
Intensity	50% of maximum	50% of maximum
Throwing mechanics	50% speed, overhead	50% speed, overhead

Phase 6	Little League	Junior/Senior League
Throwing Distance:	45 feet	60 feet
Number of throws per set	3 sets: 20, 20, 25	3 sets: 20, 20, 25
Rest between throws	12 seconds	12 seconds
Rest between sets	Six to eight minutes	Six to eight minutes
Intensity	75% of maximum	75% of maximum
Throwing mechanics	75% speed overhead, from mound	75% speed overhead, from mound

Phase 7	Little League	Junior/Senior League
Throwing Distance:	120 feet or 100% of target distance*	120 feet or 100% of target distance*
Number of throws per set	3 sets: 20, 20, 20	3 sets: 20, 20, 20
Rest between throws	12 seconds	12 seconds
Rest between sets	Six to eight minutes	Six to eight minutes
Intensity	Full as tolerated	Full as tolerated
Throwing mechanics	Overhead, from mound	Overhead, from mound

Phase 8	Little League	Junior/Senior League
Throwing Distance:	60 feet	60 feet
Number of throws per set	3 sets: 25, 30, 30	3 sets: 25, 30, 30
Rest between throws	12 seconds	12 seconds
Rest between sets	Six to eight minutes	Six to eight minutes
Intensity	Full as tolerated	Full as tolerated
Throwing mechanics	Overhead, from mound	Overhead, from mound

Phase 9	
Throwing mechanics	Pitch simulated game

Adapted from Axe, MJ et al. Development of a Distance-Based Interval Throwing Program for Little League-Aged Athletes AJSM 1996, 24(5): 594-602.

- *Target Distance = the maximum distance a player may accurately throw a ball before injury. An accurate throw is one that thrown to hit a specific target area 20-30 feet wide from a distance specified in the throwing program.
- Acceptable target ranges are as follows:
 - Child (<13 years of age): 80-120 feet
 - Adolescent (13 to 18 years of age): 120 feet
 - Young Adult (>18 years of age): 180 feet
- The player may only progress to a new level upon fully completing a given phase twice

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- **At no time should a player throw with pain.** Individuals that experience pain should stop *immediately* and consult their coach, trainer, and/or physician for further evaluation