Posteroinferior Glenohumeral Laxity Is Associated With Posterior Shoulder Tightness Among Adolescent Baseball Players

Juzen Memorial Hospital KENGO Kirimura

ISAKOS 2023 Congress

COI Disclosure Information

Presenter: Kengo Kirimura MD

I have no financial relationship to disclose.

Purpose

The purpose of this study was to evaluate the relationship between posterior shoulder joint tightness and posteroinferior shoulder laxity using zero-position radiographs in adolescent baseball players.

Material & Methods

- 134 youth symptomatic baseball players

  (mean age: 14.8Y, average height: 165.9cm)

  (Average age to start baseball: 8.1 Y

  <10Y : 127 players(94%))

  (mean duration playing period 6.6Y)

- little leaguer's shoulder 47 cases
- painful baseball shoulder 82 cases
- Labrum injury 5 cases

Dominant shoulder Rt 117 shoulders Lt 17 shoulders

How to evaluate the laxity of inferoposterior capsule

Hashimoto 1995

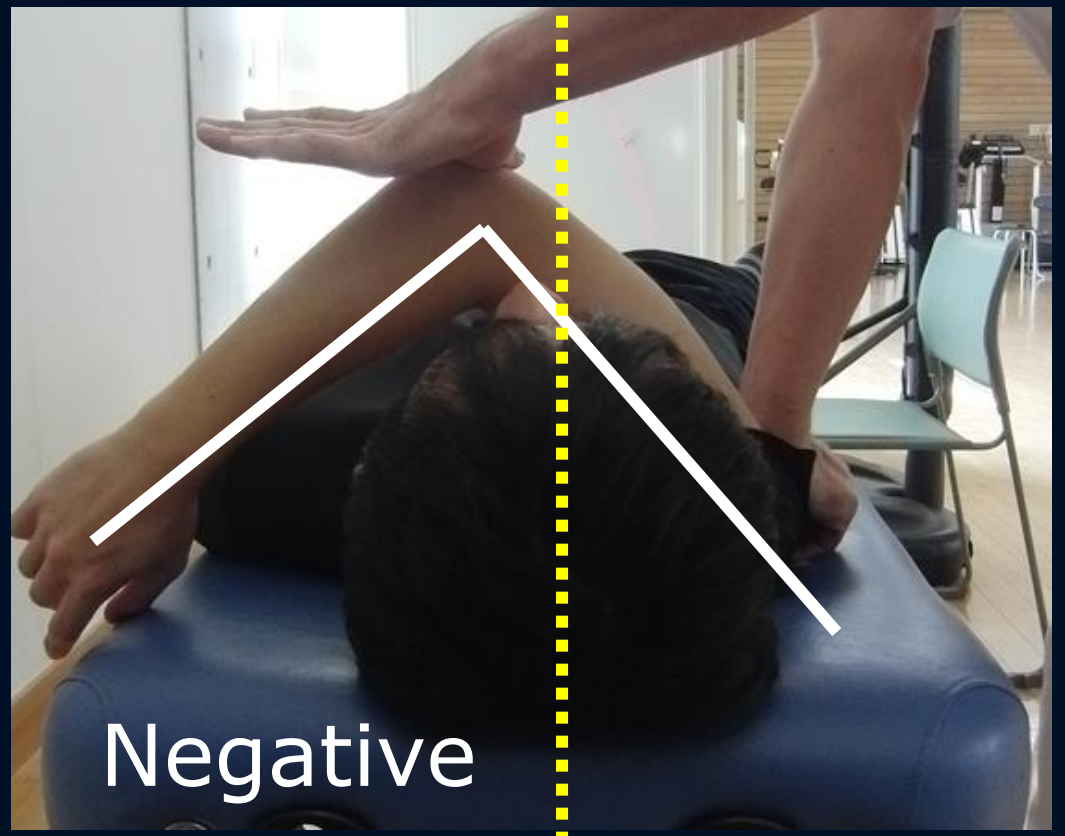
The Free surface of humeral head angle(FSH angle) is the angle at which the glenoid surface and the humeral head do not come into contact with each other, which is formed by the line drawn from the center of the maximum diameter of the humeral head to the inferior edge of the glenoid at the zero position of the anterior-posterior view radiograph (Fig). When the FSH angle was less than 80 degrees is taken as negative; however, 81-85 degrees from the boundary range.

In this study,

FSH angle of 85° or more = slipping positive.

Zero position X-ray

Posterior shoulder tightness was evaluated using the modified supine assessment of the posterior shoulder tightness test



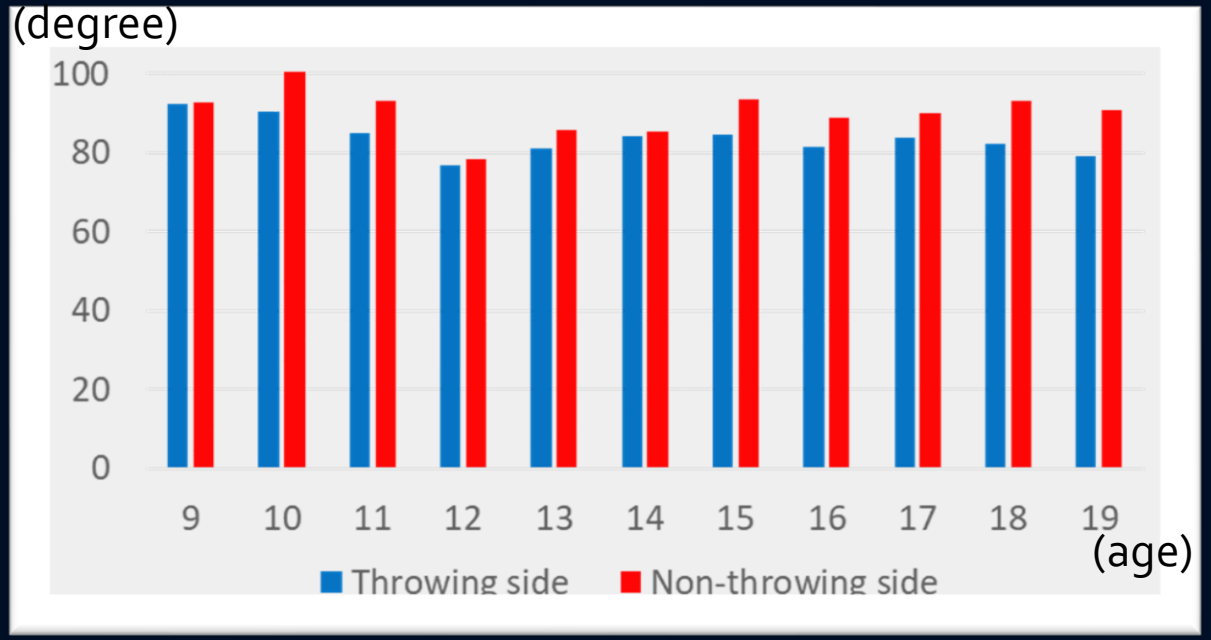
The test is positive if the position of the olecranon in this shoulder position is not exceeding the nose, with a positive test being indicative of posterior tightness of the shoulder.

Results

	Throwing side	Non-throwing side	*P*-value
laxity positive	57 (40.7%)	74(53.7%)	0.001
Average FSH angle	82.9±12.3°	89.0±12.8°	0.001
Posterior tightness positive	127(94.8%)	40(29.9%)	0.001
Laxity positive + tightness positive	55/57(96.4%)	20/74(27%)	

Mean of the FSH angle by age

A comparison of FSH angle by age showed that the throwing side was smaller than the non-throwing side across all age groups.



When the FSH angle was greater on the throwing side than on the non-throwing side, It was defined as the FSH+ group, and when it was smaller, it was defined as the FSH- group.

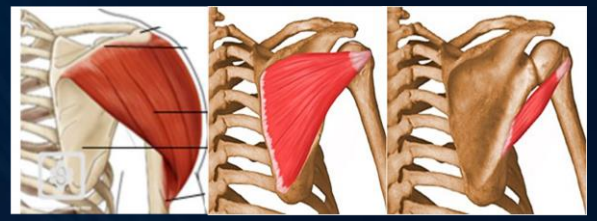
	FSH -	FSH +	P value
Age	14.9	14.5	0.219
Height	167.2	166.0	0.918
BMI	21.0	21.1	0.888
Starting age	8.1	8.5	0.12
Years of experience	6.9	6.0	0.023*

Fisher's exact test

Discussion

Mechanism of posterior tightness of shoulder formation

- In the throwing motion in baseball, significant force is generated in the posterior shoulder, in the release to follow-through phases
- Decreasing IR may be caused by reduced posterior shoulder soft tissue flexibility
- The posterior rotator cuff absorbs a large amount of traction energy, then the posteroinferior capsule absorbs the remaining minimal energy



↓

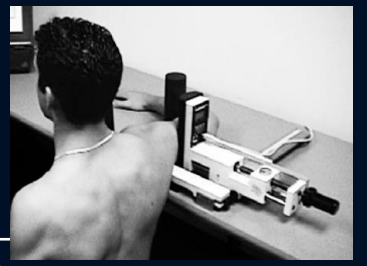
microtrauma

↓

thickness ↑ elasticity ↓

Burkhart 2003
Thomas 2011
Takenaga2015

Laxity in throwing shoulder

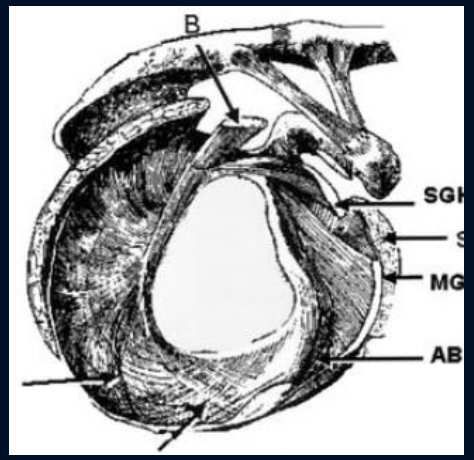


Crockett	2002	Anterior laxity=Posterior laxity	professional
Crawford	2006	Anterior laxity=Posterior laxity	High school
Borsa	2005	Anterior laxity < posterior laxity	professional

Originally, the anterior capsule is thicker and stronger than the posterior capsule

Posterior

Thinnest



Anterior

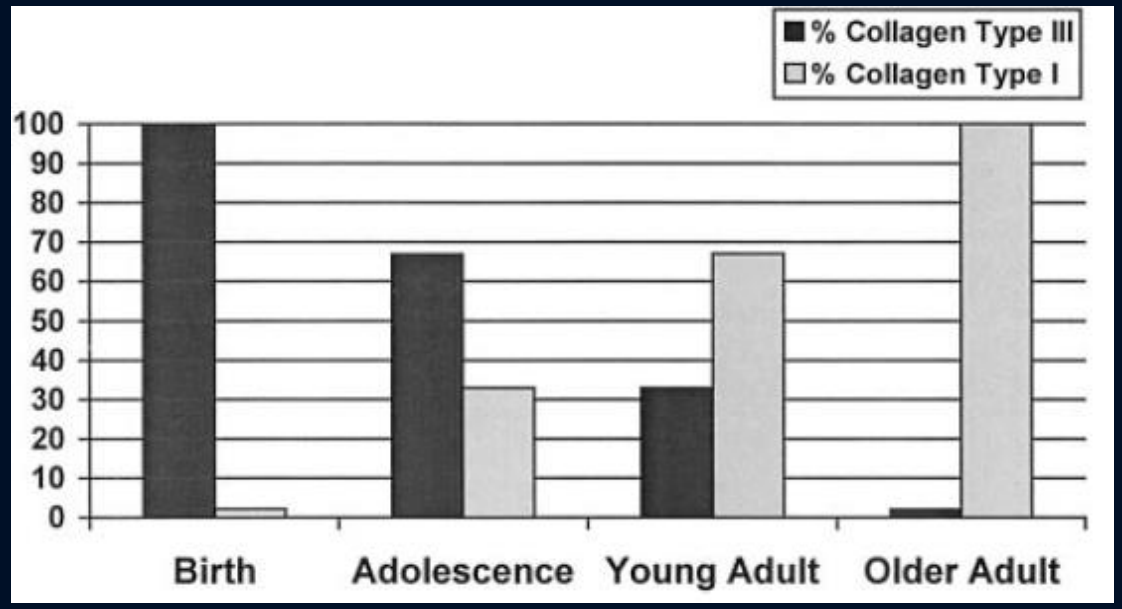
Thickest + strongest

The main absorption of traction force is estimated to be the posterior muscle group

Borsa 2005

The changing ratio of collagen type Ⅰ and type Ⅲ in capsule

The reason for the high FSH angle positivity in adolescents is related to the ratio of type I collagen with low elasticity to type III collagen with high elasticity.



Elasticity　　Type Ⅲ　＞＞　Type Ⅰ

Walton2002

Conclusion

Shoulder posterior tightness occurred in 94.8% due to throwing motion. Since the slipping angle on the pitching side is smaller than that on the non-throwing side at all ages of adolescence, it is highly possible that the traction force is also absorbed by the potero-inferior capsule.

Reference

Burkhart SS, et al.: The disabled throwing shoulder: spectrum of pathology. Part I: pathoanatomy and biomechanics. Arthroscopy. 2003;19:404-420.

Borsa PA , et al.: Correlation of range of motion and glenohumeral translation in professional baseball pitchers. Am J Sports Med. 2005 ;33:1392-1399.

Hashimoto T, et al.: Dynamic analysis of intraarticular pressure in the glenohumeral joint. J Shoulder Elbow Surg. 1995 ;4:209-218.

Takenaga , et al.: Posterior Shoulder Capsules Are Thicker and Stiffer in the Throwing Shoulders of Healthy College Baseball Players. Am J Sports Med. 2015 ;43:2935-2942.

Thomas SJ , et al.: A bilateral comparison of posterior capsule thickness and its correlation with glenohumeral range of motion and scapular upward rotation in collegiate baseball players. J Shoulder Elbow Surg. 2011;20:708-716.