



Glenoid version is a risk factor for subsequent shoulder dislocation after first-time traumatic shoulder dislocation in athletes.

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BACKGROUND

High school and college athletes who participate in contact sports are at an increased risk for shoulder dislocation events. The shoulder is the most commonly dislocated major joint in athletes, accounting for approximately half (54.9%) of sports-related dislocations in young adult athletes (1,2). In a recent epidemiology study, shoulder dislocation data from the High School Reporting Information Online (RIO) and the National Collegiate Athletic Association (NCAA) injury Surveillance Program databases were analyzed from the 2004/2005 through the 2013/2014 academic years in 11 sports. 598 shoulder dislocations were reported in high school athletes (overall shoulder dislocation rate of 2.04 per 100,000 athlete-exposures) and 352 shoulder dislocations were reported in college athletes (overall shoulder dislocation rate of 2.58 per 100,000 AEs) (3). The vast majority of these injuries (>95%) occur in an anterior and inferior direction (2,4)

Following a traumatic shoulder dislocation, the shoulder is subsequently less stable and is at increased risk of re-dislocation or recurrent subluxation, particularly in active young athletes (5,6). In patients younger than 20 years old at the time of their initial traumatic shoulder dislocation, the risk of recurrent instability is cited as being between 72-100%, while for patients aged between 20-30 years old the risk of recurrent instability is 70-82% (7). In one 25-year follow up study of patients with anterior shoulder dislocations conducted by Hovelius et al, 38% of patients between the ages of 12-25 years required surgical stabilization for recurrent instability (8).

When high school and college athletes present to the orthopaedic sports medicine clinic after a first time shoulder dislocation, an important discussion is held between the physician and the athlete regarding their care moving forwards. While many of these patients will ultimately require a shoulder stabilization procedure, oftentimes athletes wish to finish their athletic season and will undergo a period of physical therapy with gradual return to sport as tolerated.

The purpose of this study was to examine the outcomes of a series of cases of high school and college athletes who elected to proceed with physical therapy after a first time shoulder dislocation. A second goal of the study was to investigate whether radiographic measurements on patient shoulder MRIs were associated with outcome measurements such as ability to finish their athletic season, occurrence of subsequent shoulder dislocations, and need for an eventual shoulder stabilization procedure.

METHODS

Study design

A retrospective chart review was performed using our institution's electronic medical record to identify student athletes who presented to clinic with first time shoulder dislocations. Through chart review patient gender, race, age at first dislocation, sport, and direction of shoulder dislocation were identified. Chart review was used to identify if the athlete was able to finish their season, if they had one or more subsequent dislocation events, if they went on to have a stabilization procedure performed, and the time to surgery from their first dislocation.

MRI Analysis

The shoulder MRI of each patient's injured upper extremity was reviewed, with these imaging studies being obtained after the first time shoulder dislocation and prior to any surgical interventions. The glenoid bony version, chondral version, and labral version were measured on the axial view along with the glenoid bony width and glenoid labral width using previously described guidelines (9) (Figure 1).

Inclusion and Exclusion criteria

In order to be included in the study, patients needed to be high school or college athletes who had sustained a traumatic first-time shoulder dislocation while playing their sport. They additionally needed to have first elected to pursue nonoperative management of their shoulder dislocation with a course of physical therapy, with the intention of finishing their athletic season. Patients were excluded from the study if they were younger than 13 years of age.

Statistical analysis

Summary statistics and correlation analyses were performed by a statistical analyst. Summary statistics for both continuous and categorical variables were generated from the data set. Normality testing for continuous variables were performed based on whether or not the distribution was normal, with parametric testing applied to data with a normal distribution and non-parametric testing applied to data that was not found to have a normal distribution. Statistical significance was set at p value < 0.05.

Figure 1.

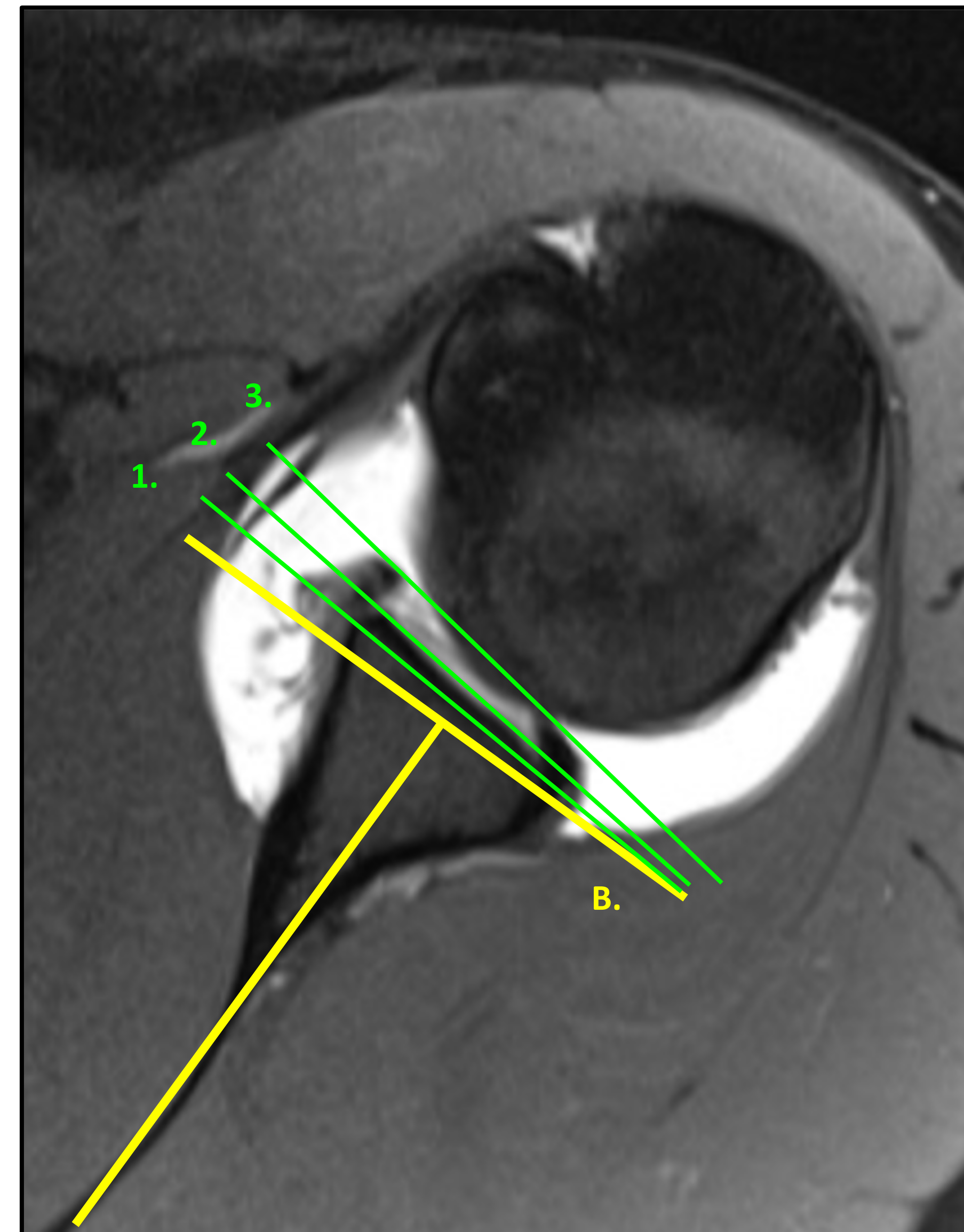


Table 1.

Summary Statistics of Patient Characteristics and Outcomes		
Gender	Male: 24/35 (68.6%)	Female: 11/35 (31.4%)
Age Group (years)	13-18 : 25/35 (71.4%)	19-23 : 10/35 (28.6%)
Finished Season	Yes : 29/35 (82.9%)	No : 6/35 (17.1%)
Subsequent Dislocation	Yes : 19/35 (54.3%)	No : 16 (45.7%)
Eventual Shoulder Stabilization Procedure	Yes : 32/35 (91.4%)	No : 3/35 (8.6%)

RESULTS

35 patients were included in the study, including 24 male and 11 female athletes. Mean patient age at first dislocation was 17.7 years old (range 13-23). The most common sport patients reported as their primary sport was football (14/35), followed by lacrosse (4/35) and rugby (4/35). 29 out of the 35 patients (82.9%) were able to finish their athletic season prior to requiring surgical intervention. 19/35 (54.3%) would go on to have one or more subsequent dislocation events, and 32/35 (91.4%) went on to have an eventual shoulder stabilization procedure (Table 1). Glenoid bony version, glenoid chondral version, and glenoid labral version were found to be significantly associated with patients sustaining one or more subsequent shoulder dislocations. Patients who did not sustain a subsequent dislocation demonstrated a significantly greater degree of glenoid retroversion than those patients who did go on to sustain one or more subsequent shoulder dislocations (Table 2). Glenoid width and labral width were not found to be significantly associated with any outcome measures.

Figure 1: Axial MRI demonstrating measurements of glenoid version. A line was drawn down the axis of the scapula (A) with a second line drawn perpendicular to the axis line (B). Bony version was measured as the angle between line B and a line connecting the apex of the subchondral bone anteriorly and posteriorly (1). Chondral version was measured as the angle between line B and a line connected the apex of the chondral surface at the chondrolabral junction anteriorly and posteriorly (2). Labral version was measured as the angle between line B and a line connecting the apex of the anterior and posterior labrums (3).

Table 1: Summary statistics describing the gender and age of the patients included in the study. Outcome measurements included what percentage of athletes were able to finish their athletic season while undergoing physical therapy after their first time shoulder dislocation, the percentage of athletes who sustained a dislocation event, and the percentage of athletes who ultimately went on to have a shoulder stabilization procedure.

DISCUSSION/CONCLUSION

When a student athlete sustains a first-time shoulder dislocation, it is important for the patient, the physician, and the parents to have a discussion regarding the care of the patient moving forward. Many patients are interested in continuing to play their sport and wish to begin physical therapy with the hope of completing their athletic season. While pursuing nonoperative management is often a reasonable course, it is important for patients and their parents to understand the natural history of first-time shoulder dislocations in young athletes.

In our patient cohort, 29 out of the 35 patients (82.9%) were able to continue participating in their sport at least in some capacity and did not pursue any surgical interventions until after the end of their athletic season. 19 of the 35 patients (54.3%) would go on to have one or more subsequent shoulder dislocations despite their participation in physical therapy. This is consistent with and even lower than other studies in the literature, which estimate that the redislocation rate after a first time traumatic anterior shoulder dislocation is between 72-100% for patients younger than 20 years old, and between 70-82% for patients aged 20-30 years old (7). A very high percentage of our patient cohort (91.4%) went on to have an eventual surgical stabilization procedure, most commonly labral repair +/- capsular plication. This high percentage of patients who went on to surgery may be explained at least in part by the fact that a good number of the patients in this cohort were referred to our operative physicians after being initially managed by nonoperative sports medicine physicians and continuing to have persistent shoulder pain and/or instability despite a course of physical therapy.

Previous studies have demonstrated that increased glenoid version is associated with an increased incidence of anterior shoulder instability (10,11). In one study in which 128 shoulder MRIs of patients with confirmed traumatic anterior shoulder dislocations and 130 shoulder MRIs of control group patients were compared, the mean version in the dislocation group was $-1.7^\circ \pm 4.5^\circ$ of retroversion while the mean version in the control group was $-5.8^\circ \pm 4.6^\circ$ of retroversion (P= 0.0000) (10).

In our patient cohort looking at all 35 athletes who sustained a traumatic anterior shoulder dislocation, the mean glenoid bony version was $-5.0^\circ \pm 1.9^\circ$ of retroversion, the mean glenoid chondral version was $-5.0^\circ \pm 1.9^\circ$ of retroversion, and the mean glenoid labral version was $-6.3^\circ \pm 2.7^\circ$ of retroversion. Mean glenoid bony width was 22.8 mm and mean labral width was 31.0 mm. Patients who sustained a subsequent shoulder dislocation were found to have significantly less glenoid bony, chondral, and labral retroversion compared to those patients who did not sustain a second dislocation event (Table 2).

Previous studies have demonstrated a relationship between increased glenoid anteversion and shoulder instability; however to our knowledge this is the first study to suggest a relationship between glenoid version and increased risk of subsequent shoulder dislocations after a first-time shoulder dislocation. Further research is indicated to continue to explore the relationship between glenoid version and shoulder instability following first time traumatic shoulder dislocations.

Table 2.

Relationship between Glenoid version and Risk of Subsequent Shoulder Dislocation				
Subsequent Dislocation	N	Mean glenoid bony version	Mean glenoid chondral version	Mean Glenoid labral version
Yes	19	$-4.4^\circ \pm 1.6^\circ$	$-4.4^\circ \pm 1.7^\circ$	$-5.2^\circ \pm 2.3^\circ$
No	16	$-5.8^\circ \pm 2.0^\circ$ (P=0.027)	$-5.8^\circ \pm 1.8^\circ$ (P= 0.022)	$-7.5^\circ \pm 2.7^\circ$ (P= 0.011)

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