



Athletes diagnosed with anterior and posterior shoulder instability display different chief complaints and disability

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Background: Anterior shoulder instability is a common complaint of young athletes. Posterior instability in this population is less well understood, and the standard of care has not been defined. The purpose of the study is to compare index frequency, treatment choice, and athlete disability following an incident of anterior or posterior shoulder instability in high school and collegiate athletes.

Methods: A total of 58 high school and collegiate athletes (n=30 athletes with anterior instability; n=28 athletes with posterior instability) were included. Athletes suffering from a traumatic sport-related shoulder instability episode during a team-sponsored practice or game were identified by their school athletic trainer. Athletes were referred to the sports medicine physician or orthopedic surgeon for diagnosis and initial treatment choice (operative vs. nonoperative). Athletes diagnosed with traumatic anterior or posterior instability who completed the full course of treatment and provided pre- and post-treatment patient-reported outcome measures were included in the study. The frequency of shoulder instability was compared by direction, mechanism of injury (MOI), and treatment choice through χ^2 analyses. A repeated measures analysis of variance was used to compare the functional outcomes by treatment type and direction of instability ($\alpha = 0.05$).

Results: Athletes diagnosed with anterior instability were more likely to report a chief complaint of instability (70%), whereas those diagnosed with posterior instability reported a primary complaint of pain interfering with function (96%) ($P = .001$). The primary MOI classified as a contact event was similar between anterior and posterior instability groups (77% vs. 54%, $P = .06$) as well as the decision to proceed with surgery (60% vs. 72%, $P = .31$). In patients with nonoperative care, athletes with anterior instability had significantly more initial disability than those with posterior instability (32 ± 6.1 vs. 58 ± 8.1 , $P = .001$). Pre- and post-treatment Penn Shoulder Scores for athletes treated with early surgery were similar ($P > .05$). There were no differences in functional outcomes at discharge in those treated nonoperatively regardless of direction of instability ($P = .24$); however, change in Penn score was significantly greater in those with anterior (61 ± 18.7) than those with posterior (27 ± 25.2) instability ($P = .002$).

Conclusion: Athletes with anterior instability appear to have different mechanisms and complaints than those with posterior instability. Among those that receive nonoperative treatment, athletes with anterior instability have significantly greater initial disability and change in disability than those with posterior disability during course of care.

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Glenohumeral instability is a common and debilitating problem frequently associated with the young athletic population.^{11,18,20} It presents as a spectrum from subtle microinstability to frank dislocation events requiring reduction.²⁰ Multidirectional instability is often associated with ligamentous laxity, whereas unidirectional instability^{12,19} is more traumatic in etiology.^{9,14,19} The frequency, etiology, chronicity, severity, and direction¹² of instability are other important descriptors.

Traumatic unidirectional instability typically manifests with an anterior or posterior predominance. Anterior instability occurs more frequently with a prevalence of 1.7% in the general population.¹² It is thought to occur 15-20 times more often than posterior instability. Contact athletes and military personnel are particularly at risk.^{8,11} It most often occurs when an excessive rotational force is applied to the abducted and externally rotated arm.

Posterior instability is less common. It can occur with chronic repetitive loads of the posterior labrum, as seen in football linemen, weightlifters, military personnel, and rowers.^{2,4} Less frequently, traumatic posterior dislocation can occur with seizure activity, electrocution, or high-energy trauma.¹³ It typically occurs when a posteriorly directed force is applied to a forward flexed and internally rotated arm.

The clinical presentation of shoulder instability in the young athletic population often varies based on its severity and direction (anterior or posterior). The treatment outcomes remain poorly understood, particularly with regards to patient satisfaction.³ The purpose of this study is to compare presenting complaints, disability, and treatment differences between anterior vs. posterior shoulder instability in high school and collegiate athletes.

Methods

This cohort study used prospectively collected data that was retrospectively reviewed. Athletes participating in scholastic sports at 20 high schools and 2 colleges in upstate South Carolina were screened for eligibility over a 2-year period. Institutional review board approval was obtained before data collection. Inclusion criteria incorporated a traumatic anterior or posterior shoulder instability episode during a school-sponsored athletic activity that resulted in time loss in participation and received care in our tertiary care facility. Athletes had to be initially evaluated by the athletic trainer to be included and referred for medical care and study participation after verification of the school-sponsored athletic injury. Patients who had multidirectional instability, a

previous documented shoulder instability episode, completed eligibility in the sport of injury, or refused care were excluded.

The athletic trainer recorded the demographic data, including age, gender, date and mechanism of injury, and sport. A board-certified sport medicine physician or orthopedic surgeon within our tertiary care faculty confirmed the direction and classification of instability based on history, physical examination, and imaging. The athlete chose the initial course of treatment following the medical evaluation based on guidance from the treating physician. The chief complaint, type of treatment (nonoperative vs. operative), and care plan information was collected.

Athletes initially treated with surgery were placed in the operative cohort group. All surgeries were arthroscopic capsulolabral reconstruction in the lateral decubitus position. The extent of labral pathology was recorded at surgery. Three to 5 knotless suture anchors were used depending on lesion size and surgeon preference. Rotator interval and/or portal closure was performed per surgeon preference. No additional Remplissage or bone augmentation procedures were deemed necessary by the treating surgeon. Patients were placed in a sling for 6 weeks post-operatively. A standardized rehabilitation program was used and consisted of passive range of motion beginning at 3 weeks, active range of motion at 6 weeks, resistance exercise at 8 weeks, and weight-training at 10-12 weeks. Return to sport was permitted no earlier than 6 months from date of surgery.

All athletes were monitored during follow-up care until discharge. Patients were discharged from care when they met established criteria and per the agreement of the treating physician, physical therapist, and athletic trainer. Criteria for return-to-sport clearance in both the operative and nonoperative cohorts included the absence of pain at rest, during activity, or with training; the absence of an apprehension sign; symmetric shoulder range of motion (90% of unaffected side); a 67% external-internal rotation strength ratio within the affected extremity; and the ability to load upper extremity body weight during functional movement without apprehension.^{5,10,15,17} The date of return to full participation in the index injury sport was recorded by the athletic trainer. Athlete sport, position, and subsequent injury were monitored throughout the season to identify all time-loss events. Success was determined by participation in the sport of injury, position of injury, and completion of the next season without a time-loss injury.

Patient-reported outcome measures (PROMs) in the form of Penn Shoulder Scores were collected at the initial physician visit and at the time of return to sport. Means and standard deviations were calculated for all demographic and descriptive variables. Chi-square and relative risk analyses were used to compare the success of nonoperative vs. operative care for anterior vs. posterior instability as well as for the total cohort. Repeated measures analyses of variance were used to compare the effect of direction of instability, treatment type, and PROMs (pre-post) on the ability to return to sport within treatment types. An alpha level of $P < .05$

Table I Patient demographics of anterior and posterior instability patients

	Age	Height, cm	Weight, kg	Therapy duration, no. of visits
Anterior	17.7 ± 2.8	177.2 ± 7.7	86.9 ± 30.8	25 ± 21.0
Posterior	20.1 ± 8.8	177.9 ± 12.1	116 ± 59.8	24 ± 11.6
<i>P</i> value	.15	.83	.08	.8

Table II Chief presenting symptom based on direction of instability

	Anterior	Posterior
Pain	9	27
Instability	21	1

was used for all statistical analyses. All data were analyzed with SPSS, version 24 (IBM, Armonk, NY, USA).

Results

Fifty-eight athletes were included in this study. Thirty athletes were diagnosed with anterior instability and 28 with posterior instability. The athletes were of similar age, weight, and height regardless of direction of instability (Table I). The primary mechanism of injury classified as a contact event was similar between anterior and posterior groups (77% vs. 54%, $P = .06$).

Twenty-one of the thirty athletes with anterior instability (70%) presented with a chief complaint of instability, whereas 9 complained mostly of pain (30%). All but 1 of the athletes with posterior instability presented with a chief complaint of pain (96%), and 1 complained of instability (4%). Athletes were nearly 16 times more likely to have posterior instability if their chief complaint was pain ($P = .001$; risk ratio = 15.9, 95% confidence interval = 2.3-66.4) (Table II). There was no difference in the decision to proceed with surgical treatment between the anterior and posterior instability groups (60% vs. 72%, $P = .31$).

Patients who had surgery presented with significant disability as measured by Penn scores in both the anterior (20) and posterior (28) instability groups (Table III). Additionally, postoperative Penn scores showed significant improvement in both anterior (89) and posterior (86) instability groups. The nonoperative anterior instability cohort presented with a Penn score of 32, whereas the posterior cohort presented with a Penn score of 58 (Table IV). Both anterior and posterior instability patients made significant improvement after completion of nonoperative management (anterior 89, posterior 86).

Several statistically significant differences were found between the anterior and posterior instability groups. Patients presenting with posterior instability who underwent operative treatment presented significantly more disabled than those who were treated nonoperatively (28 vs. 58, mean

difference = 31; $P = .002$). In all instability patients treated nonoperatively, those with anterior instability presented significantly more disabled than those with posterior instability (32 vs. 58, mean difference = 27; $P = .01$). There were no differences in Penn scores at discharge in those treated nonoperatively regardless of direction of instability ($P = .24$); however, anterior instability patients saw significantly greater change in Penn score as compared to posterior instability patients (61 ± 18.7 vs. 27 ± 25.2 , $P = .002$). Lastly, there were no differences between patient satisfaction scores pretreatment (anterior 2.9 ± 3.5 vs. posterior 2.0 ± 3.0 ; $P = .39$). However, when patients were asked about satisfaction with their shoulder after completion of either nonoperative or operative treatments on a 10-point scale, those with anterior instability were significantly more satisfied with their results than were patients who had posterior instability (7.9 ± 2.7 vs. 6.3 ± 3.1 ; $P = .04$).

Discussion

The most notable finding was that athletes had different complaints based on the direction of the instability. Athletes with anterior shoulder instability complained mostly of instability (70%), whereas pain was the most common complaint in posterior shoulder instability (96%). There was no difference in incidence of preceding traumatic event between groups. Patients with posterior instability were significantly less satisfied at final follow-up than those treated for anterior instability.

Athletes with anterior instability were significantly more disabled than those with posterior instability. Patients with posterior instability who were treated surgically had significantly worse initial presenting Penn scores than those treated nonoperatively. No differences were found between the operative and nonoperative cohorts of the athletes with anterior instability. Once the athletes returned to play following completion of physical therapy, no subsequent differences were found in Penn scores between the nonoperatively treated anterior and posterior instability groups.

The results of this study are similar to the findings of others. In a study of Naval cadets with an average age of 24 years, Bernhardson et al³ found the primary complaint of cadets with anterior instability was instability, compared to a primary complaint of pain in cadets with posterior instability. They also found that patients with anterior instability presented with significantly more disability than patients with posterior instability. Our results show that similar

Table III Pre- and postsurgical Penn scores based on direction of instability

Timing	Mean	SE	95% confidence interval	
			Lower bound	Upper bound
Anterior				
Pre	19.937	5.684	8.546	31.329
Post	89.25	3.457	82.323	96.177
Posterior				
Pre	27.571	4.962	17.628	37.515
Post	85.571	3.017	79.525	91.618

SE, standard error.

Table IV Nonoperative pre- and post-treatment Penn scores

Timing	Mean	SE	95% confidence interval	
			Lower bound	Upper bound
Anterior				
Pre	31.5	6.077	19.322	43.678
Post	92.214	3.695	84.809	99.62
Posterior				
Pre	58.375	8.039	42.264	74.486
Post	85	4.888	75.203	94.797

SE, standard error.

presenting symptoms are found in a younger population of high school and collegiate athletes. Bernardson et al³ found better postoperative patient satisfaction and outcome scores after surgery for anterior shoulder instability as compared to surgery for posterior shoulder instability. They hypothesized this was due to the chronic nature of degenerative posterior labral changes in posterior instability vs. the acute labral disruption seen in anterior instability. Provencher et al¹⁶ noted a 9% failure rate after surgical stabilization of posterior instability due to persistent pain despite a stable shoulder. Aboalata et al¹ found visual analog scale pain scores after arthroscopic stabilization for anterior shoulder instability approached zero in their series. These studies suggest instability as seen in anterior instability can be more reliably treated than pain in posterior instability with operative intervention, leading to lower satisfaction and outcome scores in patients with posterior shoulder instability.

We also found that posterior instability patients were less satisfied than anterior instability patients after completion of nonoperative management. The subtle, chronic subluxations to the shoulder commonly seen in posterior instability differs from the acute, anterior dislocation event. This often results in a different presenting symptom and time to presentation. When athletes with posterior instability present to the office with a chief complaint of pain, they have likely failed prolonged conservative treatment with their athletic trainers, unlike anterior instability patients who have difficulty playing owing to complaints of instability. When reviewing

clinical notes from our patients, those with posterior instability had subjective shoulder complaints for a longer duration before seeking treatment than those with anterior instability. Furthermore, although not statistically significant, patients in our study with anterior instability trended toward having a specific traumatic event, whereas the posterior cohort trended toward a noncontact complaint. Therefore, anterior instability patients may see more significant gains with physical therapy as the acute process may be more readily reversed than a chronic problem that has degenerated over time.

To our knowledge, this is the first study to compare PROMs in a homogenous group of athletes presenting with differing directions of instability and include both operative and nonoperative cohorts. Cruz-Ferreira et al⁶ performed a nonrandomized trial comparing nonoperative and operative management of posterior instability. They found no difference in pretreatment PROMs between operative and nonoperative cohorts. Their population had a broad age range (16-48 years), and activity levels were not defined. The surgically treated posterior instability patients in our study presented with significantly worse Penn scores than those treated nonoperatively. We suspect the differences in baseline PROMs in our study as compared to the previous study is related to the demand placed on a young athlete's shoulder as compared to the general population.

The findings of this study reiterate that posterior and anterior instability are separate pathologies, demanding

differences in treatment algorithms based on initial disability and primary complaint. Our results indicate athletes with anterior shoulder instability who present with significant disability can have a satisfactory result on return to play with either conservative or surgical intervention. However, athletes with posterior instability presenting with significant disability are more likely to undergo surgical intervention. Our findings may prove to be particularly important in counseling athletes regarding in-season injuries and ability to return to play.

There are limitations to the study. The retrospective design could create a potential absence of data on potential confounding factors. The size of our study population is relatively small, but the findings are similar to other published literature. Only 1 PROM was used, but the Penn Shoulder Score has been shown to be a reliable and valid measure for assessing activities of daily living, recreation, function, satisfaction, and pain. The decision to use the Penn score attempted to capture complaints of both posterior and anterior instability patients.⁷ This study does not report on bone loss, which is a known risk factor for recurrence and reduction in PROM. However, no patient in our study required remplissage or bone augmentation suggesting the athletes included had no to minimal bone loss. Lastly, we are limited by short-term follow-up with an endpoint being return-to-play. The strength of the study is the separation of anterior and posterior instability and inclusion of both nonoperative and operative interventions in a young, athletic population.

Conclusion

Athletes with anterior instability appear to have different mechanisms and complaints than those with posterior instability. Anterior instability usually has a primary complaint of instability, whereas posterior instability typically presents with a primary complaint of pain. Among those that receive nonoperative treatment, athletes with anterior instability have significantly greater initial disability and change in disability than those with posterior disability during the course of care. Athletes treated for posterior instability may have persistent pain and less overall improvement in satisfaction scores compared to athletes with anterior instability.

Disclaimer

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