Arthroscopic Capsulolabral Reconstruction for Posterior Shoulder Instability Is Successful in Adolescent Athletes

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Background: Posterior shoulder instability is an increasingly common pathology recognized in athletes. Adolescent athletes are especially at risk for this condition due to the widespread participation in numerous sports, including both overhead throwing and collision activities. Little data are available regarding surgical outcomes in these athletes with only a single small case series (N = 25) currently published.

Methods: In total, 68 athletes (82 shoulders) with unidirectional posterior shoulder instability were treated with arthroscopic posterior capsulolabral reconstruction and underwent an evaluation at a mean of 36 months postoperatively. The average age for our cohort was 17.2 years (range, 14 to 19 y), with 66 males (80%) and 16 females (20%). A total of 55 athletes (67%) participated in contact sports and 32 athletes (39%) participated in overhead throwing. Thirty athletes (37%) participated in multiple sports. Preoperative and postoperative outcomes data were retrospectively reviewed, and included the American Shoulder and Elbow Surgeons (ASES) shoulder score, subjective stability score, strength, range of motion, and return-to-play status. Intraoperative findings and methods of fixation were also recorded.

Results: Mean ASES score improved from 48.6 to 85.7 ($P < 0.001$) after surgery. There were also significant improvements in stability, pain, and functional scores after surgery. Contact, throwing, and multisport athletes all showed similar scores at preoperative and follow-up timepoints, and no differences were noted between these athlete groups for any patient-reported outcome measure. Female athletes tended to have significantly lower preoperative and postoperative ASES scores, specifically within the pain domain when compared with males. With regard to the method of internal fixation, patients who underwent capsulolabral plications with suture anchors showed a trend toward greater improvement in ASES scores which did not reach statistical significance. Overall, 89% of athletes were able to return to competition, with 71% returning to their preinjury level of play. In total, 8.5% of athletes failed their initial surgical procedure with continued pain or instability that required revision surgery.

Conclusions: Arthroscopic capsulolabral reconstruction is a reliable treatment for unidirectional posterior shoulder instability in an adolescent population, and does well for athletes involved in a variety of sporting activities.

Level of Evidence: Level IV—case series.

Key Words: shoulder, arthroscopy, posterior instability, sports medicine

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Traditionally, posterior shoulder instability is considered a relatively rare entity, with posterior dislocations comprising only 2% to 10% of all glenohumeral dislocations. More recently, recurrent posterior glenohumeral subluxation (RPS) has become increasingly recognized as a shoulder pathology effecting athletes across numerous sports.[1,2] The clinical presentation of a patient with RPS differs from that of a patient with the more common anterior instability in that pain with activities is the most common complaint with instability as a secondary concern.[1,3–9] The location of the pain can be variable and is often reproduced with the shoulder in the provocative position of 90 degrees of forward flexion, adduction, and internal rotation.[10,11] The combination of shoulder pain and instability often hamper the athletes' ability to perform sport-specific activities and can limit their effectiveness and participation.

RPS has been identified in a variety of competitive activities, including contact and noncontact sports, collision sports (American football), and overhead sports.[12–17] The majority of literature regarding surgical management of RPS focuses on arthroscopic capsulolabral repair and is almost entirely derived from data combining adult and adolescent patients. Outcome of posterior shoulder instability stabilization in an adolescent population is of particular interest for a number of reasons. First, anterior shoulder instability literature has documented an inflated risk of failure after shoulder stabilization procedures in this younger population likely attributed to a higher level of performance demanded from the shoulder after surgical repair.[18–20] The activity level of adolescents with posterior shoulder instability would likely mirror this, and failure levels may subsequently be inflated. Second, adolescent athletes often have not yet identified an isolated sport of

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specialization compared with older athletes. With a wider range of sports participation, intraoperative surgical considerations must take all relative sporting goals into consideration when performing a capsulolabral repair.

To our knowledge, only one study to date has detailed the outcomes of posterior capsulolabral repair in an adolescent population.[21] Because of its relatively low sample size, comparisons between different sports, injury patterns, and repair constructs were not feasible. The goal of this study was to further improve our understanding of outcomes of posterior shoulder stabilization in the young, active adolescent population and identify potential risk factors for failure.

METHODS

The current study involves a group of 68 adolescent athletes (82 shoulders) who underwent arthroscopic capsulolabral reconstruction by a single surgeon for isolated posterior shoulder instability between January 1998 and December 2014. Institutional review board (IRB) approval was obtained before starting the study, and all patients provided informed consent to participate before study enrollment.

Inclusion criteria were (1) athletes of any sport and level of competition undergoing surgery between the ages of 10 and 19 years per the WHO definition of adolescence, (2) minimum 2-year postoperative follow-up, (3) the presence of unidirectional posterior instability, and (4) the absence of symptoms of instability in any direction other than posterior. Exclusion criteria were patients outside the stated age range at the time of surgery, patients who displayed multidirectional instability (MDI), and patients with habitual or psychogenic voluntary shoulder subluxations. MDI is an important etiology of shoulder pain to differentiate from isolated posterior shoulder instability. During our preoperative and intraoperative examinations, MDI was carefully assessed, and any patient with findings consistent with MDI was subsequently excluded from the study. All patients included in the study failed an initial course of preoperative physical therapy focusing on motion restoration and rotator cuff/periscapular muscle strengthening as well as avoidance of aggravating activities. The timing for surgery was based on patient preference, sport, level of competition, and desire to return to competitive athletics.

Patient Evaluation

All patient data were reviewed retrospectively with clinical examinations, radiographs, and subjective grading scales. Recorded patient demographics included age, sex, sport, position (throwers vs. nonthrowers), type of sport (contact vs. noncontact), level of competition, dominant versus nondominant arm, and length of follow-up.

The clinical examination included measurements of active and passive ranges of motion (ROMs) and evaluation of strength and instability, among other tests. Instability was specifically evaluated with testing for anterior and posterior translations, inferior translation, anterior apprehension, posterior apprehension, and generalized ligamentous laxity. Posterior shoulder stability and symptomatic translation were assessed with the jerk test,[10] posterior load and shift test, and posterior stress test.[11] The sulcus test was performed with the arm adducted and in both neutral and external glenohumeral rotations and assessed for an inferior component of instability.[22] Patients with an inferior component of glenohumeral instability in clinic or at intraoperative examination, as showed by a positive sulcus sign that did not resolve with glenohumeral external rotation, were diagnosed with MDI and subsequently excluded from the study. Once a patient was excluded, their data were no longer maintained within our IRB-approved database. External rotation of the humerus was included to tighten the anterior capsular structures during the sulcus examination in an effort to reduce the rate of false positive findings. Standard radiography and magnetic resonance imaging (with or without arthrography) were performed on all patients in conjunction with the clinical examination to aid in the diagnosis and evaluation of capsulolabral pathology.

Both preoperatively and at the latest follow-up, patient outcome was evaluated using the American Shoulder and Elbow Surgeons (ASES) shoulder score (range, 0 to 100), which combines a subjective functional scale measuring activities of daily living (ADL) (0 to 3 for each of 10 tasks, with a total score of 0 to 30) and a subjective pain scale (0 to 10, with 10 being the worst). Equal weight is given to the cumulative ADL score and the amount of pain experienced by the patient in determining the overall ASES score. Failure is defined as an ASES score of <60 at latest follow-up. Because the ASES scale does not measure stability, a subjective stability scale (0 to 10; 0 = completely stable, 10 = completely unstable) was also added preoperatively and at each follow-up. Failure is defined as a stability score of > 5 at latest follow-up. In addition, patient-described strength (0 to 3; 0 = none, 1 = markedly decreased, 2 = slightly decreased, 3 = normal) and ROM (0 to 3; 0 = poor, 1 = limited, 2 = satisfactory, 3 = full) scales were evaluated at the latest follow-up. Intraoperative findings and surgical repair constructs were also recorded for each patient.

Operative Treatment

Patients who met inclusion criteria and failed nonoperative management were selected for surgery. All procedures were performed by the senior author (J.P.B.).

Before each operation, an examination under anesthesia was performed but results were not recorded. Of note, a dynamic stability examination was performed before the surgical start and the sulcus test was repeated. Patients showing signs of MDI at this time were excluded from the study as per the criteria above. At the start of each surgery, a diagnostic arthroscopy was performed to identify pathology within the posterior capsulolabral complex including capsular laxity, capsular tears, labral fraying, and labral tears. Once the pathologic abnormalities were identified, the procedure was tailored to the specific injury pattern. One of 3 different procedures was performed based on the preoperative clinical examination, magnetic resonance arthrogram, examination under anesthesia, pathologic findings at diagnostic arthroscopic

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surgery, and surgeon experience: (1) capsulolabral plication without suture anchors, (2) capsulolabral plication with suture anchors, or (3) capsulolabral plication with suture anchors and additional plication sutures.[1] In general, shoulders with a loose, redundant (patulous) capsule without a discrete labral tear underwent capsulolabral plication with or without suture anchors. Those with labral tears underwent capsulolabral plication with suture anchors. In patients with a labral tear, who showed residual capsular laxity after anchor fixation, supplemental capsular plication sutures were added. Pathologic capsular laxity identified intraoperatively was made by visual inspection both at the time of diagnostic arthroscopy and after labral repair, when applicable. This inspection focused primarily on the tensioning of the posterior inferior glenohumeral ligament complex. Determination of adequate capsular tension, or the need for additional plication sutures, was a subjective decision made by the senior surgeon on a case by case basis, and the patient's sport-specific ROM was taken into consideration. Regardless of the capsulolabral reconstruction technique implemented, the greatest intraoperative challenge was achieving an optimal level of glenohumeral stability while maintaining adequate capsular laxity to permit sport-specific ROM. To judge posterior glenohumeral stability restoration and motion, patients were taken out of traction while in the lateral decubitus position and a posterior load and shift and posterior stress test were performed to evaluate the balance of stability and ROM achieved during the surgical repair.

Postoperative Rehabilitation

Immediately after surgery, the patient was placed in an UltraSling (DonJoy, Carlsbad, CA), which immobilizes the shoulder in ~30 degrees of abduction while preventing internal rotation. The sling was used for 4 to 6 weeks, depending on the degree of capsular plication performed at the time of surgery and the patient's baseline soft tissue laxity. Patients began active wrist and elbow motion as well as gentle passive scaption exercises immediately. Active elevation of the arm was not allowed until the fourth week.

When sling immobilization was discontinued, gentle passive ROM exercises, including pain-free internal rotation, were advanced. Active-assisted ROM exercises and isometric internal and external rotation exercises were also initiated at this time. By 2 to 3 months postoperatively, the patient progressed to full passive and active ROMs. At this time, strengthening exercises with an emphasis on the rotator cuff, periscapular and posterior deltoid muscle groups were initiated.

For nonthrowing athletes, isokinetic testing was performed at 6 months. Once an athlete was able to achieve 80% strength and endurance compared with the contralateral side, a sport-specific rehabilitation protocol was initiated. At 4 months postoperatively, all throwing athletes were started on a regimented throwing protocol that progressed their pitch count and velocity over a 2 to 3-month period. Once throwing athletes were able to perform full-speed throwing for 2 consecutive weeks without symptoms, return to full competition was permitted. All athletes were required to achieve full ROM without pain, full strength, and endurance comparable with the contralateral side before return to competition.

Statistical Analyses

The preoperative and latest follow-up ASES scores, stability scores, functional scores, and pain-level findings were compared using a paired-sample student *t* test. Comparisons between groups, including delineation by type of sport (contact, collision, throwing) and sex, were made by using the student *t* test. Outcome comparisons between multiple groups, which included intraoperative findings and surgical fixation methods, were analyzed by analysis of variance (ANOVA) for continuous variables and χ^2 modeling for nonparametric data. Statistical analyses were performed with P set at 0.05.

RESULTS

Patient Demographics

In total, 82 shoulders in 68 adolescent athletes were included in this study. The average age was 17.2 years (SD, 1.2; range, 14 to 19 y). In total, 66 shoulders (80%) were male and 16 were female (20%). The majority of individuals were high school competitors (n = 61, 74%), with the remainder participating in collegiate (n = 18, 22%) and recreational (n = 3, 4%) sports. A total of 55 athletes (67%) participated in contact sports and 32 athletes (39%) participated in overhead throwing. Thirty athletes (37%) endorsed active participation in multiple competitive sports. All athletes had preoperative outcomes data and 2-year follow-up data. Patient demographics and primary sporting category at time of surgery are seen in Table 1.

Outcomes

Table 2 displays the preoperative and postoperative scores for shoulder performance in both the throwing and nonthrowing athletes.

ASES Scores

The mean preoperative ASES score for all athletes was 48.6 (range, 2 to 95). At latest follow-up, the mean

TABLE 1. Summary of Patient Characteristics

Characteristic	Number
Sex	
Male	66
Female	16
Mean follow-up (y)	3.75
Level of participation	
College	18
High school	61
Recreational	3
Multisport	30
Contact athletes	55
Football	44
Noncontact athletes	27
Throwers	32
Nonthrowers	50

Characteristics of participants broken down by sex, sport level, and sporting group.

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TABLE 2. Summary of Patient-reported Outcomes (Total 82 Shoulders)

	Preoperative		Latest Follow-Up		
Outcome Measure	**Score**	**95% CI**	**Score**	**95% CI**	**T Score (*P*)**
ASES (0-100, 0 being worst)	48.6 ± 2.1	44.4-52.7	85.7 ± 1.8	82.2-89.3	15.5 (< 0.001)
Stability (0-10, 0 being most stable)	7.6 ± 0.2	7.1-8.0	2.0 ± 0.2	1.6-2.4	19.2 (< 0.001)
Pain (0-10, 10 being worst pain)	6.3 ± 0.3	5.7-6.9	1.8 ± 0.2	1.3-2.2	13.7 (< 0.001)
Function (0-27, 0 being worst)	17.8 ± 0.7	16.4-19.2	26.8 ± 0.5	25.9-27.7	11.8 (< 0.001)

Average ASES, stability, pain, and functional scores preoperatively and at latest follow-up showing significant difference in T scores for all values.
All values are listed as the mean results with corresponding SEs.
ASES indicates American Shoulder and Elbow Surgeons shoulder score; CI, confidence interval.

ASES score had improved to 85.7 (range, 25 to 100). This change was statistically significant ($t = 15.5$; $P < 0.001$). Patients across all variety of sports, including contact athletes, American football players, and overhead throwers, showed a similar trend in improvement after surgery. No differences were noted in the change in ASES scores between the different sporting categories or for multisport athletes. Females had lower presurgical and postsurgical ASES scores than males. This was mostly driven by higher pain ratings at all timepoints. By ASES criteria, 7 failures were noted at follow-up (8.5%) defined as ASES score below 60. Thus, 91.5% of adolescent athletes had excellent or good outcomes based on the ASES criteria postoperatively.

Stability

Evaluating the patient-described stability scale (0 = stable, 10 = grossly unstable), the mean preoperative stability score for all athletes was 7.6 (range, 0 to 10). At latest follow-up, the mean stability score had improved to 2.0 (range, 0 to 8). This change was statistically significant ($t = 19.2$; $P < 0.001$). Patients across all variety of sports, including contact athletes, American football players, and overhead throwers, showed a similar trend in improvement after surgery. No differences were noted in the change in stability scores between the different sporting categories or for multisport athletes. Female athletes tended to have higher postoperative stability scores than male athletes. By stability score criteria, 3 failures were noted at follow-up (3.6%) defined as stability score > 5. Thus, 96.7% of adolescent athletes had excellent or good outcomes based on the stability criteria postoperatively.

Pain

Using a standardized subjective pain scale (0 to 10; 0 = no pain, 10 = severe pain), the mean preoperative pain score for all athletes was 6.3 (range, 0 to 10). At the latest follow-up, the mean pain score was 1.8 (range, 0 to 9). This change was significant ($t = 13.7$; $P < 0.001$). Again similar trends were noted between sporting classes and multisport athletes. Females showed significantly higher pain scores at both the preoperative and final follow-up timepoints when compared with their male counterparts.

Function

Analyzing the functional scale portion of the ASES scoring system (0 to 30, 0 being worst) the mean preoperative functional score for throwers was 17.8 (range, 0 to 30). At the latest follow-up, the mean functional score was 26.8 (range, 6 to 30). This improvement was statistically significant ($t = 11.8$; $P < 0.001$). The various sporting classes as well as multisport athletes again showed similar trends. No differences were noted between male and female athletes.

ROM and Strength

A patient-described subjective ROM (0 to 3; 0 = poor, 1 = limited, 2 = satisfactory, 3 = full) and strength (0 to 3; 0 = none, 1 = markedly decreased, 2 = slightly decreased, 3 = normal) scales were recorded at the latest follow-up visit. For all athletes, 40 (48%) reported full ROM, 39 (48%) reported satisfactory motion, and 3 (4%) reported limited motion. For all athletes, 47 (57%) reported normal strength, 30 (37%) reported slightly decreased strength, and 5 (6%) reported significantly decreased strength. No differences with regard to ROM or strength were noted for any sporting group, including the multisport athletes.

Return to Sport

In total, 73 athletes (89%) returned to competitive sports postoperatively. Of those returning to play, 71% (n = 58) noted that they had returned to their preinjury level of performance. Return-to-play rate by different sporting groups are displayed in Table 3. Overhead-throwing athletes appeared to have a slightly lower rate of return to play when compared with the other sporting groups; however, no statistical significance was noted. Multisport athletes were able to return to play in 87% of cases (n = 26), and 57% of

TABLE 3. Percent of Athletes Who Were Able to Return to Sports After Surgery and the Percent of Athletes Who Returned to Their Preinjury Level of Performance, Broken Down by Sporting Groups

RTP		
Sport	**% RTP Total**	**% RTP Full**
Overall	89	71
Throwers	84	59
Nonthrowers	92	78
Contact	91	75
Football	91	77
Noncontact	85	63
Multisport	87	57

RTP indicates return to play.

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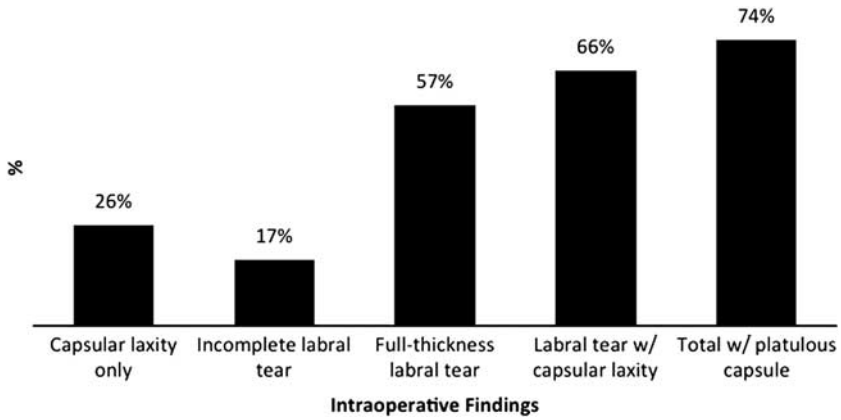

FIGURE 1. Percent distribution of intraoperative findings by pathoanatomy. w/indicates with.

returnees reached their preinjury level of performance. There were no statistically significant differences in return-to-sport rates between sexes.

Operative Evaluation

Surgical Findings

Figure 1 displays the intraoperative pathoanatomy findings. In total, 47 (57%) had a full-thickness labral tear, 14 (17%) had a partial thickness labral tear, and 21 (26%) had an intact labrum. All athletes with an intact labrum (n = 27, 33%) had operative findings consistent with a patulous posterior capsule. For adolescent athletes with labral pathology, 40 athletes (40/61, 66%) were also found to have a patulous posterior capsule. In total, patulous posterior capsules were identified in 61 athletes (74%).

When comparing return-to-sport rates with intraoperative findings, no statistical differences were noted among the total cohort of adolescent athletes. In total, 92% of athletes with labral tears (56/61) were able to return to sport, compared with 81% (17/21) with intact labrums on operative intervention. When performing subset analyses based on sport, the presence of labral tears showed a significant effect on return to play among multisport athletes, with 95% (20/21) of athletes with labral tears and 67% (6/9) of athletes with intact labrums returning to sports ($\chi^2 = 4.5$; $P = 0.04$). A trend toward significance was seen in the overhead throwers, with 91% (21/23) of throwers with labral tears and 66% (6/9) throwers without labral tear successfully returning to sport ($\chi^2 = 3.0$; $P = 0.08$). Contact athletes and football players did not show differences in return-to-play rates based on intraoperative findings.

Surgical Procedures

Figure 2 displays the distribution of operative procedures by athlete group. Of the surgical procedures performed, 22 (27%) were capsulolabral plications without suture anchors, 44 (54%) were capsulolabral plications with suture anchors, and 16 (20%) were capsulolabral plications with suture anchors and supplemental plication sutures. No differences were noted in preoperative or postoperative outcomes for pain, function, ASES, or stability scores when comparing reconstruction techniques.

When comparing return-to-sport rates with operative procedures, no statistical differences were noted between athletes managed with or without anchors during capsular plication. 92% of adolescents with anchor fixations (55/60) were able to return to sport, compared with 82% (18/22) with anchorless fixations ($\chi^2 = 1.6$; $P = 0.21$). Similar to the intraoperative findings data, the usage of bone anchors showed a trend toward influencing return-to-play rates in the overhead thrower and multisport athlete groups. In overhead throwers, 91% (21/23) of throwers with anchors and 67% (6/9) throwers

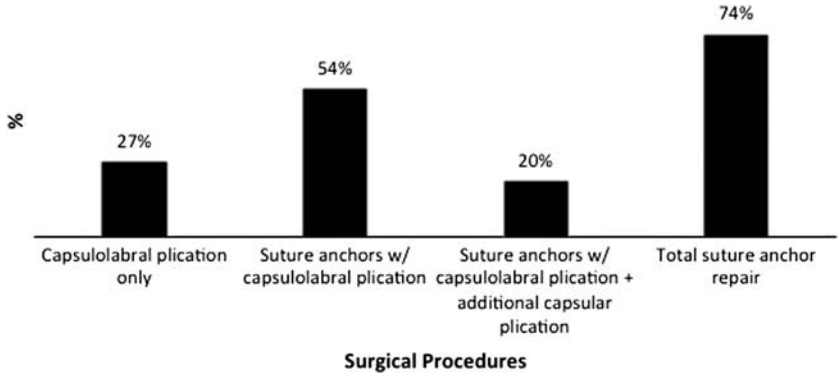

FIGURE 2. Percent distribution of operative procedure by fixation method. w/indicates with.

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without anchors successfully returning to sport ($\chi^2 = 3.0$; $P = 0.08$). In multisport athletes, 95% (19/20) of throwers with anchors and 70% (7/10) throwers without anchors successfully returning to sport ($\chi^2 = 3.6$; $P = 0.06$). Contact athletes and football players did not show differences in return-to-play rates based on repair construct.

Failures

According to the ASES scoring system, at the latest follow-up, there were 7 failures (8.5%) among all adolescent athletes, as defined by an ASES score <60. According to the stability scale, 3 adolescent athletes (3.6%) experienced excessive postoperative instability (stability score > 5) at latest follow-up, and notably all patients who had a failure by stability scale also failed by ASES score. Thus, a total of 7 patients (9%) failed at 2-year follow-up by patient-reported outcome scores. Three failures (3/21, 14%) occurred in athletes with intact labrums but patulous capsules and 7 failures (4/61, 6.5%) occurred in those with labral tears. With regard to operative procedures in the failure group, 3 athletes (3/22, 14%) underwent capsular plication alone and 4 athletes (4/60, 6.7%) underwent an anchor fixation repair. Because of the overall low failure rate, accurate statistical comparisons were not possible. Of note, all failures involved recurrent instability episodes and all occurred within 7 months of the surgical procedure. All patients who failed initial posterior capsulolabral plication were subsequently revised with a repeat arthroscopic capsulolabral plication with a suture anchor construct.

DISCUSSION

Although posterior shoulder instability is less prevalent than anterior instability, it has become an increased topic of discussion in orthopaedic literature over the past several years. The majority of data regarding outcomes of posterior stabilization surgeries is derived from studies with a mix of both adult and adolescent patients.[3,9,13,16,23–25] To our knowledge, the 2015 study by Wooten et al[21] remains the only study specifically analyzing the outcomes of arthroscopic posterior shoulder stabilization in an adolescent athlete population. The current study also focuses on outcomes of posterior capsulolabral repair in an adolescent population, but our increased sample size and data collection permitted comparisons of outcomes by sporting group, intraoperative pathology, and surgical procedure.

Similar to Wooten and colleagues, the current study showed arthroscopic posterior capsulolabral repair to be a successful means of treating symptomatic unidirectional posterior instability in adolescent athletes. Our cohort showed substantial improvements in ASES scores (and both the pain and functional domain subsets), stability scores, strength, and ROM following posterior capsulolabral repair. Athletes of different sporting groups, including contact athletes, overhead athletes, and American football players showed similar degrees of outcome score improvement across all domains after surgery. Overall, 89% of the athletes returned to sport after surgery.

Female athletes comprised 20% of our athlete cohort, and they were found to have lower preoperative and postoperative ASES scores when compared with male athletes, along with a higher postoperative stability score. The ASES score differentials were driven by increased pain domain scores at both timepoints, and this finding mirrors that of Wooten and colleagues. Interestingly, when looking at the difference between preoperative and postoperative ASES scores (and pain domain scores), female and male athletes had equal degrees of improvement after surgery. No differences were noted in return-to-play rates based on sex.

Intraoperatively, the status of the posterior labrum was not found to influence return-to-play rates in any athlete group with the exception of overhead throwers. In the thrower group, athletes with intact labrums but a patulous capsule tended to have lower rates of return to play compared with athletes with a labral tear. Similarly, the repair construct (suture only vs. suture anchor) did not show differences in return- to-play outcomes outside of the overhead-throwing athletes. The overhead athletes showed lower return-to-play in suture only fixation repairs; however, these repairs were almost exclusively performed in athletes without frank labral tears. These findings parallel the findings of McClincy and colleagues in their study of overhead-throwing athletes across all ages.

Adolescent athletes are of particular interest when considering shoulder instability as they have shown a track record for increased likelihood of recurrent instability, both before and after stabilization surgery, in the anterior instability literature.[18–20] This is presumably due to their relatively higher physical demand and activity level when compared with older cohorts. In the current study, our failure rate was 8.5% when considering ASES and stability criteria, which is in line with the failure rates documented in the adult literature despite focusing on a young, highly active population. Similarly, when considering return-to-play rates, 89% of athletes returned to sports postoperatively, and 71% were able to reach their preinjury level of performance. These return-to-play rates were also similar to the adult literature and to Wooten and colleagues. Overhead athletes showed a trend toward lower rate of return, but no other sport-specific differences were noted.

Adolescent athletes are also an interesting group to study in that the variety of demands they place on their shoulder are often more varied than older athlete cohorts. In the current study, nearly 37% of participants endorsed active participation in multiple sports. At times, these combinations can influence patient care, such as planning the repair strategy for the high school offensive lineman who doubles as a starting pitcher. Generally speaking, the greatest intraoperative challenge in addressing posterior shoulder instability is achieving appropriate soft tissue stability while maintaining sufficient laxity to enable a full sport-specific ROM. Achieving this balance is difficult at baseline and is further complicated when the demands of multisport athletes present a conflict in optimal soft tissue management. In the current study, multisport athletes did not show many significant outcome differences compared with their peers involved in single-sport play, with mildly decreased subjective postoperative strength being the only source of disparity be-

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tween the 2 groups. Their return-to-play rates of 87% (57% to preinjury performance) also did not show a step-off compared with single-sport athletes. The results in multisport athletes are noteworthy but must be considered with caution. The return-to-sports question posed in the study was generalized to all sports, and we did not specify if multiple sports were resumed postoperatively. There is a distinct possibility that patients who responded as "successfully" returned to sports may have only returned to a single sport, in spite of their inclusion in the multisport category.

Limitations

This study does contain limitations that must be noted. First, validated scoring systems that incorporate strength, ROM, stability, and other factors including the Disabilities of the Arm, Shoulder and Hand (DASH) and Single Assessment Numeric Evaluation (SANE) scores were not included in this study. The original data collection on these patients began in the early 2000s before these more comprehensive scoring systems being validated. The main strength of this study was its sample size for a single surgeon, so data collection was kept uniform even after the updated scoring systems were available. The parameters used in this paper have been noted in numerous other studies so are useful for historical comparison, even for nonvalidated measures such as subjective strength and ROM. Using updated, more instability-centric scoring systems in the future would improve studies regarding posterior shoulder instability and may improve our understanding of why certain athletes fail to return to sports or their preinjury performance after surgical stabilization. A second issue with this study is that mechanism of injury data was not collected. Wooten and colleagues noted the presence of a traumatic injury influenced some outcome measures in the adolescent athlete, although adult studies have not shown similar trends. The inclusion of these data would improve the quality of the current study, and at the least its inclusion would help better define the role of injury acuity to outcomes in posterior shoulder instability. Another limitation of this study is that timing of return to sport was not available for review. Because of the 16-year follow-up period and paper charts, a significant proportion of patient charts were not available for direct review, making the exact timing of return to sports difficult to ascertain. Lastly, while an attempt was made to identify patients with MDI both during clinical evaluations and intraoperative examinations, it is quite possible that subtle cases of MDI or global soft tissue laxity were included in this series. Our clinical records were unreliable with notation of markers such as the Beighton score for soft tissue laxity, and future studies on shoulder instability should use this as a demographic factor in all patients.

CONCLUSIONS

Arthroscopic posterior capsulolabral repair for symptomatic unidirectional posterior instability is a reliable surgical procedure in adolescent athletes involved in a wide range of sporting activities. Care should be taken to adequately balance the demands of both stability and ROM of the posterior shoulder during repair.

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