

Posterior Shoulder Instability: Comprehensive Analysis of Open and Arthroscopic Approaches

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Abstract

Whether open surgery and arthroscopic repair of posterior shoulder instability have similar success rates remains unknown, but the literature suggests that arthroscopic soft-tissue stabilization procedures equal open surgery in managing posterior shoulder instability.

A comprehensive PubMed computer search of the English-language literature from 1988 to 2004 was performed using the key phrase *posterior shoulder instability*. Studies included in our analysis addressed the surgical treatment of recurrent posterior instability and multidirectional instability with primarily a posterior component of instability; studies were excluded if their minimum follow-up was less than 1 year, if their patients had a history of habitual posterior shoulder instability, or if their patients had either bony procedures or thermal capsulorrhaphy. Data collected from each study included patient demographics, instability classifications (traumatic vs atraumatic), previous shoulder stabilizations, and clinical outcomes. After identifying and reviewing 283 abstracts, we found that 16 articles fulfilled the inclusion criteria—9 open studies (173 patients) and 7 arthroscopic trials (186 patients). The 2 treatment groups had similar sex distributions ($P>.25$). Mean age was 23 years for the open group and 26 years for the arthroscopic group ($P<.02$). Clinical outcomes were rated satisfactory by 72% of patients in the open group and 83% of patients in the arthroscopic group ($P<.55$), controlling for age. Eighty-five percent of patients treated with an open technique and 81% of patients treated arthroscopically returned to sports ($P<.82$). This study demonstrated no statistical difference in clinical outcomes for patients treated with either open or arthroscopic surgery for posterior shoulder instability.

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Although not as common as anterior instability,¹ recurrent posterior instability (RPI) of the shoulder ranges in incidence from 2% to 11.6%^{2,3} and remains one of the more confusing and difficult conditions to treat. Higher failure rates and complications may be related in part to lack of differentiation of voluntary and involuntary instability, traumatic and atraumatic causes, and unidirectional and multidirectional conditions.³ Disagreements regarding underlying etiology, including detachment of posterior aspect of labrum, capsular laxity, anterior humeral head defects, increased retroversion of humeral head, and posterior glenoid deficiency, have also added to the confusion as to how to treat this condition.^{2,4-7} Although most surgeons agree on instituting a program of physical therapy to strengthen the rotator cuff and scapular musculature,^{5,8} little consensus exists on which single surgical approach to use to stabilize these injuries after nonoperative measures have failed.

The numerous open surgical procedures that have been used to address RPI of the glenohumeral joint can be divided into those primarily addressing bony pathology and those targeting soft-tissue abnormalities. The former, including posterior bone blocks, glenoid osteotomy, and rotational osteotomy of the humerus, have yielded inconsistent results.^{4,9-11} Surgeons performing open soft-tissue stabilization procedures have emphasized the importance of addressing the redundant capsular laxity in the posteroinferior region of the glenohumeral joint; these procedures include the reverse Putti-Platt, the reverse Bankart repair, and various capsular shift procedures.^{12,13} Bigliani and colleagues¹⁴ reported on a series of 35 shoulders in 34 patients with RPI with a superior shift of the posteroinferior aspect of the capsule. After a mean follow-up of 5 years (range, 2-12.5 years), 17 of the 35 shoulders were rated excellent, 11 good, 1 fair, and 6 poor. Six of the 7 unsatisfactory results were in shoulders that had previously undergone attempts at stabilization. The authors concluded that successful results were achieved in 23 of the 24 shoulders in which the capsular shift procedure was the initial repair. Others have reported similar favorable results.^{10,15}

In contrast to the several open surgical techniques, arthroscopic posterior shoulder stabilization procedures have rapidly increased in use in light of their potential benefits of reduced soft-tissue dissection, improved visualization of the entire glenohumeral joint and subacromial

Table I. Data Collected From Each Eligible Article

Number of patients
Open or arthroscopic procedure
Patient sex
Patient age
Length of follow-up
Any previous surgery
Traumatic versus atraumatic shoulder injury
Number of patients with satisfied versus unsatisfied results
Number of patients who returned to sports and in what capacity
Complications

space, and quicker recovery times. McIntyre and colleagues¹⁶ reviewed the results of an arthroscopic posterior capsular shift procedure in the treatment of 20 shoulders in 19 patients with symptomatic RPI. Twelve of the 20 shoulders had posterior Bankart lesions, and 10 had anterior Hill Sachs lesions. A suture punch was used to place multiple sutures through the posterior ligamentous complex. After a minimum follow-up of 24 months, 15 shoulders were rated excellent, 1 good, 1 fair, and 3 poor. Five of the patients had a recurrence of their instability (2 recurrent dislocations and 3 subluxations), with all failures occurring in patients with posterior Bankart lesions and 4 of the 5 patients having a voluntary component to their instability. Arthroscopic evaluation facilitated diagnosis of posterior instability with visualization of intra-articular pathology, which is difficult to identify during open procedures. Although many authors have examined the various surgical techniques for treating posterior shoulder instability, we still do not know if the results of arthroscopic repair are similar to those of open procedures.

We conducted this study to review the literature and compare clinical outcomes of open versus arthroscopic soft-tissue reconstruction procedures in the treatment of posterior shoulder instability. Our hypothesis was that the literature supports similar clinical outcomes for arthroscopic and open approaches.

MATERIALS AND METHODS

Eligibility Criteria

In our review, we included only those studies (1) that were primary studies addressing the surgical treatment of posterior shoulder instability and multidirectional instability with primarily a posterior component of instability; (2) that had a minimum follow-up of 1 year; and (3) that had been reported in the literature.

Study Identification

An online computer search using PubMed was performed of all available articles published in English from 1988 up to and including October 2004. The key phrase *posterior shoulder instability* was entered into the query search box of the Pubmed website (www.ncbi.nlm.nih.gov/PubMed). The limits placed on the search were “English” in the language category and “human” in the study category. The resulting abstracts were then printed and reviewed for relevance to the

study. In addition, review articles were used to identify any additional articles for inclusion.

The inclusion and exclusion criteria were established before study collection (Table I). In addition, we removed from the analysis children younger than 18 years, patients with a history of habitual posterior shoulder instability or superior labral anterior to posterior (SLAP) tears, and patients who had had either bony procedures or thermal capsulorrhaphy. Studies for which we could not separate the results of patients who had undergone bone block procedures or thermal capsulorrhaphy from the results of patients who had undergone pure soft-tissue anatomic reconstructions were also excluded from the analysis.

Data Extraction

For each of the eligible articles, relevant data were collated by Dr. Kakar, and their relevance was discussed by the 2 senior reviewers, Dr. Voloshin and Dr. Schepsis. Although an interobserver κ statistic was not calculated, the reviewers agreed 100% on which studies to include and exclude. Information collected from all studies included patient demographics, instability classifications (traumatic, atraumatic), previous shoulder stabilization reconstructions (anterior, posterior), surgical techniques, clinical outcomes, and complications (Table I). Clinical outcome was deemed satisfactory if the patient had no recurrence and/or had minimal pain with sports or strenuous physical activity; outcome was deemed unsatisfactory if the patient had a recurrence or had pain that prevented either sports or job participation.

Data Analysis

Collected data were input into Microsoft Excel for analysis. Data were pooled by a simple summation method, and means for each continuous numeric field were calculated. Patient demographic details were compared between the treatment modalities with independent sample t tests or χ^2 statistics. Percentages of satisfactory outcomes within each group were evaluated for homogeneity by computing the mean percentage satisfactory result and comparing it with each study result. Within the arthroscopic group, none of the individual study results deviated from the mean by more than 2 SDs; within the open surgical group, 1 study by Hurley and colleagues,¹³ had a result that was more than 2 SDs below the mean. The analysis was carried out 2 ways—with the Hurley et al study¹³ included and again with it excluded. Inclusion of this study did not change the final results.

A statistical analysis program (Stata; College Station, TX) was used to compare treatment groups' frequencies of satisfactory and unsatisfactory outcomes. Outcome frequencies were first compared in univariate models with treatment as the independent factor and then in models that also included age, sex, previous trauma, or previous surgery. As none of these covariates influenced the estimates of the outcome frequencies or whether the frequencies were statistically significant, the initial, univariate results are presented. Statistical significance was assigned at $P < .05$.

Table II. Studies of Open Surgical Stabilization Included in This Review

Study	No. of Patients	Results*	
		Satisfactory	Unsatisfactory
Fronek et al ⁹	6	5	1
Bigliani et al ¹⁴	34 (35 shoulders)	27	8
Dugas et al ²⁷	17	16	1
Tibone & Bradley ²⁰	40	24	16
Fuchs et al ¹⁸	21 (22 shoulders)	14	8
Hawkins & Janda ¹²	14	13	1
Misamore & Facibene ¹⁹	14	13	1
Hurley et al ¹³	22	4	18
Calderoni et al ¹⁷	5	3	2

*Results were deemed *satisfactory* if patients had no pain or pain only with sports/strenuous work activity, had no recurrent dislocation/subluxation, or were able to return to work or *unsatisfactory* if patients had pain with activities of daily living, had recurrence of instability, or could not work.

RESULTS

Literature Search

Our online computer search identified 283 abstracts. After reviewing the abstracts, we found that 16 articles published between 1988 and 2004 fulfilled the inclusion criteria, representing 359 patients who underwent surgical stabilization for posterior shoulder instability. Nine of the 16 studies involved open procedures (173 patients; Table II), and the other 7 involved arthroscopic procedures (186 patients; Table III). Three studies within the open surgical group included patients who had undergone concomitant bone block procedures to address posterior glenohumeral instability. Fronek and colleagues⁹ and Calderoni and colleagues¹⁷ reported on 11 and 10 patients, respectively, who had undergone an open posterior capsulorrhaphy, 5 of which in each study had undergone concurrent bone block procedures. Fuchs and colleagues¹⁸ performed posteroinferior capsular shift procedures on 24 patients, 3 of whom had undergone previous bone block or posterior glenoid osteotomies. For the purpose of this review, patients who had undergone additional bony reconstructions were excluded from the study. We could not identify any prospective randomized studies evaluating either open or closed surgical treatment of RPI.

Table III. Studies of Arthroscopic Surgical Stabilization Included in This Review

Study	No. of Patients	Results*	
		Satisfactory	Unsatisfactory
Antoniou et al ²¹	41	24	17
Williams et al ²⁸	26	24	2
Wolf & Eakin ³	14	12	2
Abrams et al ²⁶	48	42	6
McIntyre et al ¹⁶	19	15	4
Kim et al ²⁴	27	26	1
Goubier et al ²⁹	11	11	2

*Results were deemed *satisfactory* if patients had no pain or pain only with sports/strenuous work activity, had no recurrent dislocation/subluxation, or were able to return to work, or *unsatisfactory* if patients had pain with activities of daily living, had recurrence of instability, or could not work.

Table IV. Patient Demographics

Technique	Open	Arthroscopy
Number of studies	9	7
Number of patients	173	186
Mean age, y	23.9	25.6
Mean follow-up, mo	52	35.7
Mean % male	73	76
Past surgery, %	33	12
History of trauma, %	57	92

Deficiencies in the Literature

In reviewing the literature studies, we found that approximately half of them could not be clearly classified according to the methodology used. Although most were retrospective reviews, this assumption could not be positively made. Many authors described a consecutive series of patients but did not report whether the data were collected prospectively or retrospectively.

Numerous other deficiencies were noted in the reviewed articles. Many authors did not comment on number of patients treated, length of follow-up, use of objective parameters to gauge recovery, and degree to which patients were able to return to their preinjury level of sports participation. When objective scoring systems were used, there was no consistency in the type used, leading to difficulties in comparing results between studies.

Patient Characteristics

The demographic details of the patients treated in the open versus arthroscopic groups are summarized in Table IV. Demographics included number of patients, mean age, mean length of follow-up, and proportion of males versus females. The 2 groups were comparable in terms of number of patients treated and sex distribution ($P > .25$). Patients tended to be younger in the open group (23.9 vs 25.6 years; $P < .02$) and to be followed up longer (52 vs 35.7 months; $P = .06$), and they had an almost 3-fold higher rate of previous shoulder surgery ($P < .001$). Patients within the arthroscopy group had a much higher incidence of traumatic injury resulting in posterior shoulder instability compared with patients in the open group ($P < .001$). Table V summarizes the surgical techniques used in the open and arthroscopic groups.

Table V. Surgical Technique for Posterior Shoulder Instability

Technique	Procedure	No. of	
		Studies	Patients
Open	Posterior capsulorrhaphy	7	134
	Reverse Putti Plat	2	39
Arthroscopy	Posterior capsular plication	5	119
	Posterior Bankart	1	26
	Posteroinferior capsulolabral augmentation	1	41

Clinical Outcomes

Clinical outcomes for patients in the open and arthroscopic groups are summarized in Tables II and III, respectively. Patients were deemed as having a satisfactory result if they had no pain or pain only with sports or strenuous work activity, had no recurrent dislocation/subluxation, or were able to return to work; unsatisfactory outcomes were recorded if patients had pain with activities of daily living, had recurrence of instability, or could not work. When clinical outcomes were compared between the different treatment modalities, no statistically significant differences were noted, with a satisfactory rating of 72% calculated for the open group and 83% for the arthroscopic group ($P < .55$). In each treatment group, much variation was reported by individual authors. In the open group undergoing posterior capsulorrhaphy, 13 patients had a satisfactory result and 1 an unsatisfactory result, according to Misamore and Facibene¹⁹; in contrast, using a similar technique, Tibone and Bradley²⁰ found that 24 patients had a good result and 16 a poor result.

Studies varied in their reporting of patients who had previously undergone anterior and posterior shoulder stabilization procedures. Reports that did not identify these patients were still included in our analysis, as excluding them would have resulted in a much smaller patient sample size. In the studies that did identify patients who had undergone previous shoulder stabilization procedures, it was not possible to tell how many of the satisfactory and unsatisfactory results were tied to these patients. Excluding them would have further reduced the overall patient population pool. When we controlled for patients who had undergone previous surgery, there was no statistically significant difference between patients in the open and arthroscopic groups.

Owing to differences in reporting and insufficient information, it was very difficult to obtain meaningful comparisons involving return to sports after instability repair. Some studies did not report any information on return of sports.^{18,21} For the data reported in the literature, there was no statistical difference in terms of return to sports between the treatment groups, with 85% of patients undergoing open surgical stabilization and 81% treated arthroscopically being successful in their pursuits ($P < .82$). Even among the studies that did provide this information, there was no consensus in reporting whether patients were able to return to their preinjury level of activity. Of the 34 patients treated with the open capsular shift procedure, 16 of 17 that were rated excellent in terms of their recovery were able to return to sports, but only 6 reached their preinjury level of participation (Bigliani and colleagues⁵).

DISCUSSION

Operative treatment for RPI should be considered in symptomatic patients who have failed adequate trials of conservative therapy for usually 3 to 6 months.²² Traditionally, this treatment has focused on addressing the redundant posterior capsule^{5,9,10}; more recently, proponents have also advocated increasing glenohumeral stability by restoring the glenolabral concavity.²³ The several surgical options that have been described have had varying degrees of success,⁵ with controversy arising over the optimal method for treating posterior instability of the glenohumeral joint: open or arthroscopic.

Hawkins and Janda¹² reported favorable results with an open posterior capsulotendinous tensioning procedure. Thirteen of 14 patients were satisfied with their outcome and had no further recurrence of posterior instability. Using the capsular shift procedure, Bigliani and colleagues¹⁴ found that 23 of 24 patients had a successful result. Despite these encouraging outcomes, inconsistencies in results from other surgical approaches have been striking. Studies have shown varying degrees of success in relieving patients' pain and instability. According to Tibone and Ting,¹¹ of 20 athletes with recurrent posterior subluxation of the shoulder treated by capsulorrhaphy with a posterior staple, 3 had recurrence of the posterior instability, and 3 still had moderate or severe pain. Only 1 patient was able to throw as well as he had before the injury.

With the ever increasing use of arthroscopy in orthopedic surgery, many have advocated its use in treating posterior shoulder instability. Arthroscopy offers the distinct advantages of easier and more comprehensive examination of the glenohumeral joint and less trauma to the shoulder, thereby facilitating recovery. Kim and colleagues²⁴ evaluated the results of arthroscopic repair of posterior labral lesions and capsular shift in 27 patients. Suture anchors were used to repair the detached posterior capsulolabral complex to the glenoid in all cases. At a mean follow-up of 39 months, all patients had improved shoulder function and scores ($P < .001$) and returned to their preinjury sports activity. Mair and colleagues,²⁵ who used bioabsorbable tack fixation, reported similar favorable results, with 92% of patients successfully treated and not requiring additional revision procedures.

The literature tends to suggest that patients treated arthroscopically have clinical outcomes similar to those who have undergone open surgery. Our study corroborates this view, demonstrating that results reported in the literature are equivalent. Practitioners of modern arthroscopic techniques are constantly improving their methods of capsular plication. With further refinements in suture management and anchor placement, the success rate of posterior capsular plication is expected to improve but is not yet at that level at which results are significantly better than with traditional open techniques. Return to sports is an important outcome measure and is discussed in the Box at the top of page 659.

Many of the studies addressing management of posterior shoulder instability involve relatively small patient populations. By pooling the number of patients in both treatment groups and increasing statistical power, we aimed our analysis to directly compare open and arthroscopic surgery in the treatment of recurrent posterior shoulder instability. Ensuring patient group homogeneity was vitally important so that direct comparisons could be made. Strict inclusion criteria were set to limit the introduction of confounding factors, such as multidirectional instability, SLAP tears, and patients younger than 18 years. Arthroscopic stabilization of RPI may not be appropriate for all patients, including those with significant bone loss from the glenoid or humeral head or inadequate capsule to reconstruct.²⁶ To form a relatively homogenous group of

RETURN TO SPORTS

Return to sports is an important parameter to consider when evaluating the success of techniques that address shoulder instability.

From the numbers reported in the literature, there was no statistical difference in terms of return to sports activity between the treatment groups, with 85% of patients undergoing open surgical stabilization and 81% treated arthroscopically being successful in their pursuits ($P < .82$). Several studies have noted that patients seldom return to their preinjury level of sports participation after surgical management of posterior shoulder instability. Using a suture capsulorrhaphy technique to treat 40 athletes with RPI, Tibone and Bradley²⁰ had a 40% failure rate and found that the higher the competitive level of the athlete, the worse the overall results. The authors concluded that patients must be informed that, even if the shoulder is stabilized, functional results may not allow them to continue at the same competitive level.

patients in which open versus arthroscopic soft-tissue anatomic shoulder reconstruction procedures could be compared, we excluded from the study patients who had undergone previous bone procedures or thermal capsulorrhaphy.

The strength of inference from a review of the literature is only as good as the quality of the reported studies. Analyses that pool data from nonrandomized trials are subject to all the limitations of the primary studies and can result in a biased pooled estimate of effect. This possible bias must be kept in mind, as there are no prospective, randomized trials in the published literature on the treatment of posterior shoulder instability. Even though most demographic details of the patients were comparable, there is potential for confounders between the 2 groups. In addition, because lack of demographic information or information regarding treatment method forced exclusion of many studies, we cannot be sure how representative these 16 studies are with respect to the outcomes of interest. The studies varied in their reporting of important clinical data, such as range of motion and return to sports. In their study of 21 patients treated with the posteroinferior capsular shift procedure, Fuchs and colleagues¹⁸ made no reference to patients returning to any sports activity. Return to sports is an important parameter to report because, even though patients may be considered to have had satisfactory results if they had no further pain or instability after stabilization, they may not be able to return to their preinjury level of sports participation—thereby drawing questions as to whether the surgery was a success.

CONCLUSIONS

As with all reviews, this study is based on the strength of the literature it incorporates. The limitations of the studies analyzed include their not being prospective, randomized trials comparing the 2 techniques; their use of variable

outcome measures; and, in some cases, their inclusion of revision patients. Despite these limitations, the published literature reports no statistical difference in terms of patients' clinical outcomes between open and arthroscopic surgery for posterior shoulder instability.

AUTHORS' DISCLOSURE STATEMENT

The authors report no actual or potential conflict of interest in relation to this article.

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