Abstract
The surgical treatment of recurrent posterior shoulder instability via a posterior approach has had a variable degree of success reported in the literature with recurrence rates ranging between 8% and 45%. The purpose of this study was to review the results of posterior capsulorrhaphy in a consecutive series of patients with recurrent posterior instability. Seventeen consecutive patients underwent operative management for posterior glenohumeral instability. The dominant shoulder was involved in ten patients. All patients were male with an average age of 28.1 years (range: 16 to 54 years). Ten patients had sustained a specific injury which precipitated the instability. Six patients reported dislocations requiring formal closed reduction maneuvers; the remainder described episodes of recurrent subluxation with spontaneous reduction. All patients underwent a posterior capsulorrhaphy using an infraspinatus splitting approach. Eight shoulders required repair of a posterior capsulolabral detachment. In addition, one patient required augmentation with a posterior bone block for significant glenoid rim deficiency. Outcome was assessed by personal interview, clinical assessment, and standardized radiographs. At an average follow-up of 3.9 years (range: 1.8 to 10.8 years) patients estimated their overall shoulder function to be 81% of the contralateral unaffected shoulder. The subjective result was excellent for eight patients, good for five patients, fair in two patients, and poor in two patients. One of the poor outcomes was in a patient with glenohumeral degenerative changes at the index procedure which progressed and eventually required a total shoulder arthroplasty. The other poor result was in a patient found to have a full-thickness rotator cuff tear 10.6 years after the index procedure. Two patients (12%) had recurrence of their instability. Both of these patients sustained a significant re-injury which precipitated their symptoms. Five patients complained of occasional night pain at the time of their last follow-up examination. Only one patient (who was re-injured) had to change professions as a result of shoulder symptoms. Posterior capsulorrhaphy for treatment of isolated posterior glenohumeral instability yields satisfactory clinical results. Recurrent instability in this series was associated with a specific re-injury and did not appear to increase with longer follow-up.

The surgical management of recurrent posterior glenohumeral instability is a challenging problem. There is disagreement concerning the etiology of the instability,13 the indications for surgery, and the specific procedure to be performed. Reports of the results of operative treatment of posterior shoulder instability using an open posterior approach have documented variable degrees of success. Recurrence rates range from as low as 8% to as high as 45%. Numerous soft tissue and bony techniques have been described for posterior stabilization.4-11

In this study, we review our experience performing an open posterior capsulorrhaphy in 17 patients with unidirectional posterior glenohumeral instability. The preoperative findings, operative technique, and mid-term results are reported to document the outcomes of the operative management of this uncommon condition.

Materials and Methods
A retrospective review was performed on 17 consecutive patients with unidirectional posterior instability who underwent an open posterior capsulorrhaphy between June
1989 and June 1999. Procedures were performed by two surgeons (A.S.R and J.D.Z.). All patients were male. Their mean age was 28.1 years (range: 16 to 54 years). The right shoulder was involved in 11 (65%) patients; the dominant extremity was involved in ten (59%) patients.

The etiology of the subluxation or dislocation was antecedent trauma in ten (59%) patients. Six of these patients sustained significant dislocations which required formal closed reduction. The remaining seven (41%) patients denied any initial traumatic event, but rather developed instability in association with their daily activities. All patients failed nonoperative treatment including a minimum of six months of a structured physical therapy program.12

Prior to surgery, nine (53%) patients reported significant pain: four patients had persistent pain and five patients described pain only with the extremity. Eight (47%) patients reported pain only with episodes of instability and were otherwise pain-free. Four (24%) patients had vague symptoms of “dead arm” that did not correlate with any neurologic deficits based upon electromyography and nerve conduction studies. All patients demonstrated significant compromise of function preoperatively. Fourteen (82%) patients reported instability with simple activities of daily living. Two (12%) patients described instability with overhead activity that spontaneously reduced with lowering of the affected arm. One (6%) patient was unable to participate in athletic activities due to transient subluxation. One patient described episodes of instability that awakened him from sleep. All but one patient exhibited involuntary instability; the single voluntary dislocator was not habitual in nature.

Three (18%) patients underwent previous surgery. One patient underwent thermal capsular shrinkage; the other two patients underwent capsulorrhaphy procedures, one staple capsulorrhaphy and one reverse Bankart repair. Four (24%) additional patients underwent arthroscopic evaluations, without any definitive treatment other than arthroscopic debridement. Ten (59%) patients had no prior surgical intervention.

Clinical findings included a positive posterior stress test as well as a positive load and shift test in all patients. A sulcus sign was present in ten (59%) patients, but was not associated with pain or apprehension. All patients were thus diagnosed with unidirectional posterior instability. None of the patients in this investigation exhibited clinical evidence of multidirectional instability, although ten patients did demonstrate some degree of ligamentous laxity.

Routine preoperative radiographs (anteroposterior views with the shoulder in internal and external rotation, scapular-Y view, and axillary view) of the affected shoulder were obtained for all patients. One patient was found to have a glenoid rim fracture with resulting glenoid insufficiency that would eventually require augmentation. A second patient demonstrated evidence of early degenerative changes with a small inferior humeral head osteophyte. No other radiographic abnormalities were identified.13

All capsulorrhaphy procedures were performed using a posterior deltoid-splitting approach.14 The infraspinatus was then split horizontally between its superior and inferior portions. A standard posterior capsular shift was performed in which the posteroinferior aspect of the capsule was shifted superiority and the superior leaf of the capsule was shifted inferiorly.15 When a posterior capsulolabral detachment was identified (eight patients), a reattachment was performed using sutures passed through bone tunnels. One patient underwent a posterior glenoid bone graft in addition to a posterior capsular shift. Postoperatively, all shoulders were immobilized in an orthosis for approximately six weeks maintaining 10° to 15° of abduction, 10° of extension, and 10° of external rotation. A structured and supervised rehabilitation program was then initiated consisting of active and active-assisted range of motion for four weeks followed by strengthening exercises. Strenuous activities, including returning to athletics, were restricted for 9 to 12 months following surgery.

Outcome assessment was based upon stability, subjective shoulder function, pain, range of motion, and return to work. Patients were asked to assess their surgical result as excellent, good, fair, or poor. In addition, they were asked to score their overall shoulder function as a percentage of their contralateral uninvolved shoulder. Recurrence of instability was defined as an outcome failure.

Results

Intraoperatively, all patients were found to have a thin, redundant posterior capsule. A capsulolabral detachment was found in eight patients, and all were repaired in combination with the capsulorrhaphy. One patient required a

<table>
<thead>
<tr>
<th><em>Patient self-assessment of the involved shoulder as a percentage of function of the uninvolved shoulder</em></th>
<th>Excellent</th>
<th>Good</th>
<th>Fair</th>
<th>Poor</th>
<th>Functional Score*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trauma</td>
<td>6</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>83%</td>
</tr>
<tr>
<td>No Trauma</td>
<td>2</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>78%</td>
</tr>
<tr>
<td>Prior Stabilization</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>73%</td>
</tr>
<tr>
<td>Surgery Without Stabilization</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>0</td>
<td>79%</td>
</tr>
<tr>
<td>No surgery</td>
<td>5</td>
<td>3</td>
<td>0</td>
<td>1</td>
<td>85%</td>
</tr>
<tr>
<td>Overall</td>
<td>8</td>
<td>5</td>
<td>2</td>
<td>2</td>
<td>81%</td>
</tr>
</tbody>
</table>
bone block for a posterior glenoid deficiency from a prior fracture. One patient, whose radiographs showed mild degenerative changes, was found to have significant superior and posterior glenoid cartilage loss involving 20% of the glenoid surface area.

The average follow-up was 3.9 years (range: 1.8 to 10.8 years). Based upon patient’s self-assessment, the outcome was excellent in eight (47%) patients, good in five (29%) patients, fair in 2 (12%) patients, and poor in 2 (12%) patients. One of the poor outcomes was in the patient with significant glenohumeral cartilage loss. This patient required a total shoulder arthroplasty two years later for significant pain. The other poor result was in a patient who was found to have a full-thickness rotator cuff tear 10.6 years following surgery and which was unrelated to the index procedure. Each patient also assessed the treated shoulder as a percentage of the function of the contralateral uninvolved extremity. The average overall score as assessed by the patients was 81% (range: 15% to 95%) (Table 1).

Twelve (71%) patients were essentially pain-free at the latest follow-up; five (29%) patients complained of occasional pain, mostly at night. Activity-related pain was described in one patient who complained of shoulder pain only during athletic activities. A former police officer, this patient is also the only one (6%) in this series who had to change professions. Postoperative range of motion was comparable to the uninvolved shoulder in 15 of the 17 patients. The only exceptions were in the two cases of recurrent instability. Both patients had significant limitation of range of motion postoperatively. Both developed recurrent instability following an injury sustained after returning to work. One patient subsequently underwent thermal capsular shrinkage with improvement from a 15% to 60% subjective shoulder score, and self-assessment as a fair surgical outcome. The other patient was involved in a Workers Compensation claim and declined any further surgical treatment. His subjective score was 35%, with a fair surgical outcome.

Eight of the ten patients with a traumatic etiology for the instability reported good or excellent results. Five of the seven patients without a history of trauma had good or excellent results. There was one fair and one poor result in each group. Two of the three patients who had previous stabilization procedures had good or excellent results, and one had a poor result. Nine of the ten patients who had no prior surgery had good or excellent result, and one had a poor result. Six of the seven patients without ligamentous laxity had good or excellent results, with one fair result. Seven of the ten patients with ligamentous laxity had good or excellent results, one fair result, and two poor results.

**Discussion**

The incidence of posterior glenohumeral instability is very uncommon representing approximately 2% to 3% of all shoulder instability.\(^\text{16}\) Two-thirds of these cases can be treated successfully by nonoperative means, usually with a strengthening program. Thus surgical treatment of posterior glenohumeral instability is a relatively infrequent event. It is not surprising that there are only a few reports in the literature describing this small subset of patients. Of the published series of posterior shoulder capsular repair, a variety of surgical techniques is described and surgical outcomes have been variable as evidenced by a wide range of recurrence rates.

Success rates have increased dramatically over the last decade. This trend appears to coincide with the recognition that the primary pathologic anatomy involves the capsule, not the glenoid or proximal humerus. Recent results of posterior capsulorrhaphy procedures have been encouraging. Bigliani and colleagues\(^\text{17}\) report an 11% incidence of recurrent instability, with good or excellent results seen in 28 of 35 shoulders. Six of the seven unsatisfactory results were in shoulders that had undergone previous attempts at stabilization. Hawkins and associates\(^\text{18}\) reported no recurrent instability, with patient satisfaction in 13 out of 14 cases. Misamore and coworkers\(^\text{19}\) treated 14 athletes with traumatic recurrent posterior shoulder subluxations; 13 of 14 had good or excellent results returning to their pre-injury level of athletic activity without recurrent instability. One athlete experienced recurrent instability requiring additional surgery and ultimately was unable to return to the same level of athletic competition.

Our investigation reviewed a consecutive series of 17 patients with posterior glenohumeral instability. We have demonstrated the efficacy of an open posterior capsulorrhaphy using an infraspinatus-splitting approach. Overall, 76% of the patients assessed their result as either good or excellent. The two poor results were associated with glenohumeral arthritis and a full-thickness rotator cuff tear. Both cases of recurrent instability were secondary to trauma, even though one case exhibited an initial atraumatic etiology. Both of these patients were satisfied with their surgical result prior to the recurrence.

There does not appear to be any correlation in our series between postoperative patient satisfaction and preoperative characteristics including: traumatic etiology, prior stabilization procedure, or the presence of ligamentous laxity. The one patient in our series who participated in competitive athletics was able to return to the previous level of athletic competition.

The posterior joint capsule has been shown to be the primary restraint to posterior translation, particularly in the position of flexion and internal rotation.\(^\text{20-22}\) The majority of patients in this series had posterior capsular redundancy as the primary etiology of their instability. Even when coupled with a posterior capsulolabral detachment, the posterior capsule was clearly abnormal. A capsular shift procedure to reduce capsular volume successfully addressed the underlying pathologic anatomy. Care is needed to avoid over-tightening the capsular structures to prevent anterior displacement of the humeral head and excessive postoperative stiffness.
Arthroscopic management of posterior instability has gained popularity recently. Wolf described a technique of arthroscopic capsular plication in 14 patients. He achieved 12 good or excellent results. There was one (7%) recurrence and 9 out of 10 patients returned to sports. In a similar study by McIntyre, arthroscopic stabilization in 20 patients (12 of whom had posterior Bankart lesions) resulted in recurrent instability in 25%. Arthroscopic results may be approaching the results of open repair, however further studies are necessary to objectively compare these two different techniques.

Overall, 76% of the patients in this series achieved a satisfactory result. At final follow-up, including the failed repairs, patients estimated their shoulder function to be, on average, 81% of the uninjured shoulder. The current strategy of addressing capsular and capsulolabral pathology in the operative management of recurrent posterior glenohumeral instability has made capsulorrhaphy a reliable procedure with predictable surgical outcomes.

References