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Open shoulder stabilization: current trends and 1-year postoperative complications



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Background: Shoulder instability is commonly treated by arthroscopic stabilization. However, open stabilization procedures remain important in management of complex instability. Despite continued use of these procedures, the relative frequency of related complications remains poorly described. This study investigates current trends in open shoulder stabilization and characterizes major postoperative complications.

Methods: PearlDiver, a national insurance database of orthopedic patients, was used to identify open shoulder stabilization procedures from 2007 to 2010. *Current Procedural Terminology* codes for 4 procedures—Bankart repair, coracoid transfer, and anterior and posterior glenoid bone grafting—were used to track procedural trends. The 1-year postoperative complications were identified and categorized into 5 groups: dislocation treated with closed reduction, closed manipulation under anesthesia, reoperation with arthroscopy, reoperation with open surgery, and others. χ^2 analysis determined statistical significance.

Results: There were 2678 open shoulder stabilization procedures performed, with a 1-year complication rate of 12.3%. Relative proportion of open Bankart repairs decreased (82.5% to 69.8%), whereas proportion of coracoid transfers increased (7.7% to 19%). Posterior glenoid bone grafting had the highest complication rate (20.7%). Rate of total complications was 9.8% in patients 10–24 years, 13.6% in patients 25–54 years, and 25.9% in patients >55 years.

Conclusions: Based on our patient database sample, a significant decline in the relative use of open Bankart repair was observed. Our analysis indicates that the use of bone transfer procedures was correlated with significantly higher reoperation rates than open Bankart repair, particularly in the older patient cohort. Further studies comparing open stabilization procedures with contemporary arthroscopic techniques are indicated.

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Shoulder instability is a common^{19,22,39} and challenging orthopedic problem spanning an extensive patient demographic with an estimated incidence of 23.9 per 100,000.⁴⁸ Recurrent dislocation, apprehension, shoulder pain, and inability to participate in athletic activities are the most common symptoms,^{14,26,28} with glenohumeral arthrosis a potential long-term sequela. After first-time anterior dislocation, conservative management is typically

recommended. Recurrence rates range between 17% and 96%, with younger patients having higher risk.^{11,39,43} However, there is still debate about the indications for initial surgical management of primary dislocations. For young patients who regularly take part in physically demanding athletic pursuits, initial surgical management has been shown to be beneficial.^{7,8,10,13,18,21,24,38} A systematic review by Longo et al²⁸ reported a significantly lower recurrence rate after surgical management (9.6%) compared with conservative management (37.5%) of primary anterior shoulder dislocations.

The indication for surgical management in the case of recurrent shoulder instability is much less controversial, with a strong indication for surgical intervention.^{28,36,45} Furthermore, in the case of significant glenoid bone defects, surgical treatment with soft tissue stabilization alone is generally not sufficient.^{5,9} The integrity of the

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Table I
Current Procedural Terminology (CPT) codes included in each of the 5 complication groups

Complication group	CPT code and definition
Dislocation—closed treatment	<ul style="list-style-type: none"> • 23650 - Closed treatment of shoulder dislocation, with manipulation; without anesthesia • 23655 - Closed treatment of shoulder dislocation, with manipulation; requiring anesthesia
Closed adhesion release	<ul style="list-style-type: none"> • 23700 - Manipulation under anesthesia, shoulder joint, including application of fixation apparatus (dislocation excluded)
Reoperation—arthroscopy	<ul style="list-style-type: none"> • 23020 - Capsular contracture release (eg, Sever type procedure) • 29805 - Arthroscopy, shoulder, diagnostic, with or without synovial biopsy (separate procedure) • 29806 - Arthroscopy, shoulder, surgical; capsulorrhaphy • 29807 - Arthroscopy, shoulder, surgical; repair of SLAP lesion • 29819 - Arthroscopy, shoulder, surgical; with removal of loose body or foreign body • 29820 - Arthroscopy, shoulder, surgical; synovectomy, partial • 29821 - Arthroscopy, shoulder, surgical; synovectomy, complete • 29822 - Arthroscopy, shoulder, surgical; débridement, limited • 29823 - Arthroscopy, shoulder, surgical; débridement, extensive • 29824 - Arthroscopy, shoulder, surgical; distal claviclectomy including distal articular surface (Mumford procedure) • 29825 - Arthroscopy, shoulder, surgical; with lysis and resection of adhesions, with or without manipulation • 29826 - Arthroscopy, shoulder, surgical; decompression of subacromial space with partial acromioplasty, with or without coracoacromial release • 29827 - Arthroscopy, shoulder, surgical; with rotator cuff repair
Reoperation—open surgery	<ul style="list-style-type: none"> • 23450 - Capsulorrhaphy, anterior; Putti-Platt procedure or Magnuson type operation • 23455 - Capsulorrhaphy, anterior; with labral repair (eg, Bankart procedure) • 23460 - Capsulorrhaphy, anterior, any type; with bone block • 23462 - Capsulorrhaphy, anterior, any type; with coracoid process transfer • 23465 - Capsulorrhaphy, glenohumeral joint, posterior, with or without bone block • 23466 - Capsulorrhaphy, glenohumeral joint, any type multidirectional instability • 23107 - Arthrotomy, glenohumeral joint, with joint exploration, with or without removal of loose or foreign body • 23331 - Removal of foreign body, shoulder; deep (eg, Neer hemiarthroplasty removal) • 23660 - Open treatment of acute shoulder dislocation • 23670 - Open treatment of shoulder dislocation, with fracture of greater humeral tuberosity, with or without internal or external fixation
Other	<ul style="list-style-type: none"> • 23470 - Arthroplasty, glenohumeral joint; hemiarthroplasty • 23472 - Arthroplasty, glenohumeral joint; total shoulder (glenoid and proximal humeral replacement (eg, total shoulder)) • 23030 - Incision and drainage, shoulder area; deep abscess or hematoma

glenoid's osseous architecture has been identified as key in the success of surgical repair.^{9,23,31,35,40} This has led to increased interest in open autograft and allograft bone grafting procedures to address osseous glenoid deficiency. Despite their frequent use, the incidence of and complications after open bone transfer stabilization procedures are unknown.

Our study's purpose was 2-fold. The first aim was to investigate the current practice trends of 4 open shoulder stabilization procedures (open Bankart repair, coracoid process transfer, anterior glenoid bone grafting, and posterior glenoid bone grafting) during a 4-year period from 2007 to 2010. Our second aim was to identify the rate of complications requiring a secondary procedure within a 12-month period after each index procedure.

Methods

We performed a retrospective review of the PearlDiver patient record database (www.pearldiverinc.com; PearlDiver Inc., Fort Wayne, IN, USA) for the years 2007 through 2010. This is a commercially available, insurance company database of >12 million orthopedic patients that is searchable by Current Procedural Terminology (CPT) codes from the United Healthcare insurance provider (United Healthcare, Minnetonka, MN, USA).

To track major procedural trends in open stabilization procedures, we conducted a search using the CPT codes associated with the following 4 procedures: open Bankart repair [23455], coracoid transfer [23462], anterior glenoid bone grafting [23460], and posterior glenoid bone grafting [23465]. We were able to report the frequency of procedures performed but were unable to report the incidence of each index procedure as the PearlDiver database does not release the aggregate patient population size.

Next, to evaluate for postoperative complications after open shoulder stabilization, we tracked 5 categorized complication groups for a 12-month postoperative period for each of the 4 index procedures. The CPT codes for the 5 complication groups—dislocation with closed treatment, manipulation under anesthesia, reoperation

with arthroscopy, reoperation with open surgery, and others (infection or arthroplasty)—are listed in Table I. A case of complication was identified when 1 of the 4 index procedure codes was followed by a specific complication-related CPT code within the 12-month period after the index procedure for each unique patient identifier. We calculated the incidence of each complication group and compared it by index procedure type as well as by age group (10-24, 25-54, and >55 years).

χ^2 analysis was used to determine the statistical significance among complication groups with regard to index procedure and age. Linear regression was used to assess the significance of trends over time. A *P* value of < .05 was considered to be significant.

Results

A total of 2678 open shoulder stabilization procedures were performed during the 4-year period 2007-2010, with 2101 open Bankart repairs, 302 coracoid transfers, and 79 anterior and 196 posterior glenoid bone grafting procedures identified. Within the 12-month postoperative period, the average total number of patients who required an additional procedure was 12.3%. Table II shows the annual number of procedures performed and rate of complication.

During the 4-year study period, there was a significant decrease in open Bankart repair from 82.5% (672) to 69.8% (388) relative

Table II
Summary of number of index procedures performed and associated complication rate by year

Year	Open stabilization procedures	No. of complications	Complication rate (%)
2007	815	79	9.7
2008	671	95	14.2
2009	636	83	13
2010	556	69	12.4
Total	2656	326	12.3

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