Trends and Risk Factors for 1-Year Revision of the Latarjet Procedure: The New York State Experience During the Past Decade

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Abstract

Little research has been conducted evaluating surgical trends during the past 10 years and subsequent procedure risk factors for patients undergoing bone-blocking procedures for the treatment of anterior shoulder instability. The Statewide Planning and Research Cooperative System database was queried between 2003 and 2014 to identify patients undergoing soft tissue or bone-blocking procedures for anterior shoulder instability in New York. Patient demographics and 1-year subsequent procedures were analyzed. Multivariate logistic regression analyses were conducted to identify 1-year subsequent procedure risk factors. From 2003 through 2014, a total of 540 patients had Latarjet procedures performed. During this period, the volume of Latarjet procedures increased by 950%, from 12 procedures in 2003 to 126 procedures in 2014. The volume of open Bankart repairs declined by 77%; arthroscopic Bankart repairs fluctuated, being up (328%) between 2003 and 2012 and then down (6%) between 2012 and 2014. Of the 540 patients, 2.4% (13 of 540) required intervention for recurrent shoulder instability events. Age older than 20 years and workers’ compensation were identified as independent risk factors for reoperation. The number of bone-blocking procedures, such as the Latarjet, has increased by nearly 1000% during the past decade in New York. Only 2.4% (13 of 540) of the patients had subsequent shoulder instability interventions. [Orthopedics. 201x; xx(x):xx-xx.]

The Latarjet procedure, which involves transferring the coracoid process to the anterior glenoid, was first described in 1954 by Michel Latarjet,1 who used it for the treatment of recurrent anterior shoulder instability. In 2010, the reported incidence of anterior instability requiring surgical fixation was 24 cases per 100,000 patients, and there has been an increase in the incidence of recurrent instability, especially among young men, contact-sport athletes, and military personnel.2,3

Although the Bankart repair is a common choice for the treatment of anterior shoulder instability in the United States, accumulating evidence suggests that undressed glenoid rim or humeral head bone deficiencies may lead to a higher postoperative recurrence rate.4-10 Published studies indicate that the Bankart repair may be contraindicated in patients with glenoid bone loss exceeding 25%.11,12 As a result, the use of bone-block strategies on the anterior glenoid, including the Latarjet procedure, has grown in popularity for managing anterior shoulder instability in patients with evidence of bone defects at...
or above 20%.13,14 The improvements in technique and patient selection criteria for the Latarjet procedure have mirrored the recent increase in overall procedural volume. Degen et al13 evaluated the American Board of Orthopaedic Surgery database from 2004 to 2013 and found a tenfold increase, from 0.14% to 1.4%, in bone-block stabilization procedures performed by recently trained orthopedic surgeons in the United States. However, only 72 bone-block stabilization procedures were reported during the entire study period.

To the authors’ knowledge, no previous large-database analysis has been conducted during a 10-year period evaluating demographic risk factors associated with subsequent reoperations within 1 year of undergoing the Latarjet procedure. The authors performed a statewide longitudinal large-database analysis to identify trends in the use of the Latarjet procedure, patient demographics, 1-year revision rate, and rate of need for ipsilateral shoulder surgery for patients who underwent the Latarjet procedure for anterior instability during the past decade in New York. The authors hypothesized that an increase in Latarjet procedures would be associated with a concomitant decrease in competing primary soft tissue stabilization procedures.

Materials and Methods

The New York Statewide Planning and Research Cooperative System database was used to conduct a retrospective case-control analysis of the patients who had a Latarjet procedure between 2003 and 2014. All patients who had Current Procedural Terminology code 23462 were included in this study. Encrypted unique patient identifiers were used to track patients longitudinally. Patient demographics, including age, sex, race, and type of insurance, were obtained. Complications were identified for each patient using previously described International Classification of Diseases, Ninth Revision, codes.16 Data involving stabilization procedures preceding the Latarjet procedure, specifically anterior capsulorrhaphy with bone block (Current Procedural Terminology code 23460), open Bankart repair (Current Procedural Terminology code 23455), and arthroscopic Bankart repair (Current Procedural Terminology code 29806), were recorded. Subsequent ipsilateral shoulder diagnoses and procedures within 1 year of the primary Latarjet procedure were collected using unique patient identifiers. Additionally, the authors divided the study sample into 2 groups based on 1-year complication status. Finally, they subdivided the patient population based on age by decade.

The authors used R version 3.3.1 software (R Foundation for Statistical Computing, Vienna, Austria) to collect the data from the Statewide Planning and Research Cooperative System database and to conduct statistical analyses. A trend analysis was conducted by querying the database for patients undergoing either isolated open Bankart repair or arthroscopic Bankart repair for the same study period (2003 to 2014). Chi-square analysis was performed to determine statistical significance between categorical variables. Differences between numerical variables were calculated using the Student’s t test. A multivariate logistic regression was performed assigning the readmission status as the independent variable and controlling for the following demographics: age, sex, insurance, neurological comorbidities, and delirium. Results were considered statistically significant if P<.05.

Results

Shoulder Stabilization Procedure Trends During the Past 10 Years

From 2003 through 2014, a total of 540 patients underwent Latarjet procedures. There was a steep increase (950%) in annual surgical volume during this time period, from 12 procedures in 2003 to 126 procedures in 2014. Simultaneously, the rate of open Bankart repairs declined by 77% between 2003 and 2014 (from 173 to 39), whereas arthroscopic Bankart repairs fluctuated, being up by 328% between 2003 and 2012 (from 273 to 1169) and then down by 6% between 2012 and 2014 (from 1169 to 1100). Despite this increase in Latarjet procedures, the arthroscopic Bankart procedure continued to be the most common surgery for anterior shoulder instability (Figure).

Patient Demographics for Latarjet Procedures

The average age of the patients undergoing Latarjet procedures was 29.4±11.8 years, with males representing 84.3% (n=455). Ethnic groups, as categorized in the statewide database, included 70.7% (n=382) white, 6.7% (n=36) black, 6.9% (n=37) Hispanic, and 15.7% (n=85) “other.” Health payers were reported as private, Medicaid, workers’ compensation, Medicare, and “other” for 78.0% (n=421), 9.4% (n=51), 8.0% (n=43), 3.3% (n=18), and 1.3% (n=7) of the study population, respectively. Of the 540 patients undergoing Latarjet procedures, there were 26.5% (n=143) who had undergone previous soft tissue stabilization procedures (Table 1). Patients with prior stabilization procedures were, on average, younger than those without prior procedures (25.7±8.7 years vs 30.8±12.6 years, P<.001).

Patient Demographics for Latarjet Procedures by Gender Subgroup

Regarding sex, the average age of the female patients was 35.7±14 years, compared with 28.3±11.1 years for the male patients; this age difference by sex was statistically significant (P<.001). Gender disparity was highest for patients younger than 20 years (male:female ratio, 94:8; P=.015) and lowest for patients older than 40 years (male:female ratio, 63:33; P=.001).

One-Year Complication Diagnoses and Subsequent Procedures

Collectively, 27 patients had 38 complications as primary diagnoses for ipsilateral shoulder problems within 1 year following primary Latarjet procedures. Three patients...
had 2 or more recurrent dislocations. Primary complication diagnoses included recurrent dislocation (n=20; 52.6%), device complication (n=7; 18.4%), joint stiffness or sprain (n=5; 13.2%), acromioclavicular joint separation (n=1; 2.6%), rotator cuff rupture (n=1; 2.6%), biceps tendon rupture (n=1; 2.6%), joint derangement (n=1; 2.6%), and unrelated shoulder diagnosis (n=2; 5.2%). Most of the readmitted patients were male (92.5%) and older (33.2±11.8 years, \( P=0.021 \)).

Of the 27 patients, 26 had subsequent ipsilateral shoulder surgery as primary procedures, whereas only 1 (3.7%) patient underwent a nonsurgical intervention (closed reduction). Ipsilateral shoulder surgeries included revision shoulder instability surgeries (n=12; 44.4%), acromioclavicular joint stabilization (n=4; 14.8%), hardware removal (n=4; 14.8%), rotator cuff repair (n=2; 7.4%), biceps tenodesis (n=1; 3.7%), superior labrum anterior and posterior repair (n=1; 3.7%), incision and debridement (n=1; 3.7%), and manipulation under anesthesia (n=1; 3.7%) (Table 2).

**Multivariate Logistic Regression Analysis**

Age older than 20 years (odds ratio, 0.18; 95% confidence interval, 0.01-0.85) and workers’ compensation (odds ratio, 3.72; 95% confidence interval, 1.28-9.38) were independent risk factors for the need for reoperation on the ipsilateral shoulder within 1 year of a Latarjet procedure. Ethnicity, insurance, surgeon volume, and previous soft tissue stabilization procedures were not significantly different between patients who required reoperation and those who did not (Table 1).

**Discussion**

This study examined the surgical trends in New York for treating anterior shoulder instability. The results indicated a significant increase in the volume of bone-block procedures between 2003 and 2014. In addition, there was a decrease in the volume of open Bankart repairs, but the volume of arthroscopic Bankart repairs continued to increase. Evaluation of first-year readmissions showed that, during the 10-year study period, 27 (5%) of the patients were readmitted for subsequent interventions in the ipsilateral shoulder. Of these, 2.2% were associated with revision procedures.

Historically, Bankart repair has been the preferred surgical treatment option for symptomatic shoulder instability; bone-block procedures have been used in the revision or salvage setting. More recently, however, as understanding of shoulder instability has improved, bone-block procedures have been recommended for patients with critical bone loss. Itoi et al were the first to note that patients with anteroinferior glenoid bone loss of greater than 25% are less likely to fail with bone-blocking procedures as compared with soft tissue procedures. Similarly, in 2007, the instability severity index score was first described to predict failure of soft tissue procedures based on patient and instability factors. It was recommended that patients with an instability severity index score of greater than 6 undergo a bone-block procedure instead of a Bankart repair.

As these recommendations evolve, one would presume that the number of bone-block procedures would increase. This has been the trend in New York, where rates increased by 950% from 2003 to 2014. In the current study, the arthroscopic stabilization was increasingly used until 2012, when it accounted for approximately 90%.
of all shoulder stabilization procedures performed. These results are consistent with national data from 2008 to 2012 recently reported in the study by Bonazza et al19 using the MarketScan database. They reported that, during the study period, arthroscopic stabilization increased from 88.2% to 91.7%. These results are reflective of statewide trends reported in the current study. These findings are in line with those of Mahure et al,20 who evaluated the risk factors for subsequent instability or revision surgery after arthroscopic Bankart repair using the Statewide Planning and Research Cooperative System database and found an increasing trend in the use of Bankart repair in New York from 2003 until 2011. However, in more recent years (2013 to 2014), for which national trends are not present in literature, the authors’ analysis reflects that the use of the arthroscopic Bankart procedure decreased from 2012 to 2013 and then plateaued from 2013 to 2014. Interestingly, however, the rate of Bankart procedures did not show a consistent decreasing trend, as hypothesized. Historically, patients who experienced a primary dislocation were treated conservatively with physical therapy.21 Recent data have suggested that overall outcomes are improved in this setting by treating these patients with an arthroscopic soft tissue procedure.21-24 Therefore, the continued increase in Bankart repairs performed may represent a more aggressive approach by surgeons in

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>No.</th>
<th>No</th>
<th>Yes</th>
<th>Odds Ratio (95% Confidence Interval)</th>
<th>P</th>
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<td>Age group</td>
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<tr>
<td>&lt;20 y</td>
<td>102 (18.9%)</td>
<td>101 (19.7%)</td>
<td>1 (3.7%)</td>
<td>0.18 (0.01-0.85)</td>
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<td>20-29 y</td>
<td>229 (42.4%)</td>
<td>217 (42.3%)</td>
<td>12 (44.4%)</td>
<td>1.09 (0.49-2.40)</td>
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<td>30-39 y</td>
<td>113 (20.9%)</td>
<td>106 (20.7%)</td>
<td>7 (26.0%)</td>
<td>1.36 (0.52-3.19)</td>
<td>.51</td>
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<tr>
<td>40-49 y</td>
<td>55 (10.2%)</td>
<td>50 (9.7%)</td>
<td>5 (18.5%)</td>
<td>2.15 (0.68-5.56)</td>
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<td>≥50 y</td>
<td>41 (7.6%)</td>
<td>39 (7.6%)</td>
<td>2 (7.4%)</td>
<td>1.04 (0.15-3.69)</td>
<td>.96</td>
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<td>Sex</td>
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<td>Male</td>
<td>455 (84.3%)</td>
<td>430 (83.8%)</td>
<td>25 (92.6%)</td>
<td>2.25 (0.65-15.40)</td>
<td>.23</td>
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<td>Female</td>
<td>85 (15.7%)</td>
<td>83 (16.2%)</td>
<td>2 (7.4%)</td>
<td>0.44 (0.07-1.54)</td>
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<td>Ethnicity</td>
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<td>White</td>
<td>382 (70.7%)</td>
<td>363 (70.8%)</td>
<td>19 (70.4%)</td>
<td>0.97 (0.43-2.42)</td>
<td>.95</td>
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<td>Black</td>
<td>36 (6.7%)</td>
<td>34 (6.6%)</td>
<td>2 (7.4%)</td>
<td>1.20 (0.17-4.31)</td>
<td>.82</td>
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<tr>
<td>Hispanic</td>
<td>37 (6.9%)</td>
<td>34 (6.6%)</td>
<td>3 (11.1%)</td>
<td>1.83 (0.40-5.64)</td>
<td>.38</td>
</tr>
<tr>
<td>Other</td>
<td>85 (15.7%)</td>
<td>82 (16.0%)</td>
<td>3 (11.1%)</td>
<td>0.69 (0.15-2.04)</td>
<td>.53</td>
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<td>Medicare</td>
<td>18 (3.3%)</td>
<td>18 (3.5%)</td>
<td>0 (0.0%)</td>
<td>-</td>
<td>-</td>
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<tr>
<td>Medicaid</td>
<td>51 (9.4%)</td>
<td>48 (9.4%)</td>
<td>3 (11.1%)</td>
<td>1.26 (0.28-3.82)</td>
<td>.72</td>
</tr>
<tr>
<td>Private</td>
<td>421 (78.0%)</td>
<td>403 (78.6%)</td>
<td>18 (66.7%)</td>
<td>0.54 (0.24-1.31)</td>
<td>.17</td>
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<tr>
<td>Workers’ compensation</td>
<td>43 (8.0%)</td>
<td>37 (7.2%)</td>
<td>6 (22.2%)</td>
<td>3.72 (1.28-9.38)</td>
<td>.02</td>
</tr>
<tr>
<td>Other</td>
<td>7 (1.3%)</td>
<td>7 (1.3%)</td>
<td>0 (0.0%)</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Surgeon volume</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High</td>
<td>41 (7.6%)</td>
<td>40 (7.8%)</td>
<td>1 (3.7%)</td>
<td>0.52 (0.02-2.53)</td>
<td>.49</td>
</tr>
<tr>
<td>Low</td>
<td>499 (92.4%)</td>
<td>473 (92.2%)</td>
<td>26 (96.3%)</td>
<td>1.94 (0.40-46.60)</td>
<td>.49</td>
</tr>
<tr>
<td>Previous soft tissue procedures</td>
<td>143 (26.5%)</td>
<td>139 (27.1%)</td>
<td>4 (14.8%)</td>
<td>0.48 (0.14-1.29)</td>
<td>.16</td>
</tr>
</tbody>
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*aCalculated using chi-square or Fisher’s exact test.
*bDashes indicate analysis not performed.
*cDefined by the number of Latarjet procedures performed annually (low, <10; high, ≥10).
treating patients with primary shoulder dislocations.

In the current study, most of the patients undergoing primary Latarjet procedures were male (84%) and younger (<30 years; 61%). This is consistent with previous literature indicating that young patients with conservative treatment of traumatic shoulder dislocations are more likely to have recurrent instability and tend to be male.\(^{21,25}\) This also relates to the current authors’ finding that younger patients (25.7±8.7 years vs 30.8±12.6 years, \(P<.001\)) are more likely to undergo a soft tissue stabilization procedure prior to the primary Latarjet procedure. A large difference regarding sex was seen in young patients requiring a bone-block procedure. This difference was significantly reduced in the 40 years and older cohort (male:female ratio of 63:33 vs 94:8 for patients younger than 20 years). An explanation for this may be that as male patients at risk of developing recurrent anterior shoulder instability advance in age, their likelihood of engaging in physical activities potentially leading to recurrent dislocation is expected to decrease.\(^{26}\)

Results from the current study indicated that 13 (2.4%) of the 540 patients had 1 or more recurrent instability episodes within 1 year of undergoing the Latarjet procedure. Of these, 12 (2.2%) patients required surgical interventions and 1 (0.2%) required closed reduction without anesthesia at the first recurrence event after the primary Latarjet procedure. The current results are within the range (0%\(^{,17,27-29}\) to 8%\(^{-19,30-32}\)) of recurrent instability rates after Latarjet procedures that have been published in recent years. Postoperative stiffness and infection requiring debridement have been previously reported following shoulder stabilization procedures.\(^{33,34}\) In a systematic review by Gombera and Sekiya,\(^{35}\) it was found that overhead athletes, age older than 40 years, and having a nerve injury were factors associated with increased risk of rotator cuff tear following shoulder dislocation. Other postoperative procedures, such as acromioclavicular joint stabilization, biceps tenodesis, and superior labrum anterior and posterior repair, are less clearly related to the index Latarjet procedure.

Interestingly, multivariate analysis found that age older than 20 years was an independent risk factor for subsequent reoperation, which is possibly due to the cumulative effect of recurrent instability events on bone loss combined with the decreased healing capacity of older patients as compared with younger patients. This finding is supported by the results from a 15-year follow-up clinical series of Hovielius et al.\(^{36}\) In that study, the outcomes of 118 Latarjet procedures for recurrent dislocation were evaluated. It was found that when the first dislocation occurred before the age of 23 years, the incidence of glenohumeral arthropathy was significantly lower than when the first dislocation occurred at age 23 years or older. This indicates that older patients are potentially more prone to require subsequent procedures. The association between workers’ compensation and poor patient outcome after Latarjet procedures has been previously described by Mook et al.\(^{37}\) They evaluated 38 shoulders undergoing Latarjet procedures. Six of the patients had workers’ compensation. Mook et al found that the patients with workers’ compensation claims were significantly more likely to have postoperative instability.

This study had several limitations. First, the data were for patients in New York and may not be representative of patients in other locations. Furthermore, patients may have undergone their primary or revision surgery outside of New York, prohibiting the authors from capturing them in the database. These data expand on the available literature showing that surgeons are performing the Latarjet procedure at increasing rates. The procedure’s growing popularity encourages greater awareness in treatment selection for patients with recurrent anterior shoulder instability. Ultimately, physicians should continue to incorporate various considerations for treating anterior shoulder instability, including, but not limited to, individual patient characteristics, such as the degree of bone loss, age, activity level, and patient expectations.

**CONCLUSION**

During the past decade, there has been a rapid increase in the use of the Latarjet procedure for the treatment of glenohumeral instability. The number of patients with recurrent instability requiring surgical intervention after the primary Latarjet procedure remained low (2.2%) during the period of this study, echoing current literature.

**REFERENCES**


