



Surgical treatment of anterior shoulder instability with glenoid bone loss with the Latarjet procedure in active-duty military service members

Christian A. Cruz, MD, Joshua Sy, DO, Rebecca Miles, BS, Craig R. Bottoni, MD, Kyong S. Min, MD*

Department of Orthopaedic Surgery, Tripler Army Medical Center, Honolulu, HI, USA

Introduction: The arthroscopic Bankart repair in the setting of glenoid bone loss has high rates of failure. In patients with anterior glenoid bone loss, the Latarjet provides glenohumeral stability through restoration of the glenoid bone, the conjoint tendon acting as a sling on the subscapularis, and anterior capsulolabral repair. Active-duty military personnel are at high risk for glenohumeral instability and have been equated to the contact athlete; most are young, male, and engage in contact sports. The purpose of this study is to assess the return to full-duty rates in active-duty military personnel following the Latarjet for anterior glenohumeral instability with glenoid bone loss.

Methods: A retrospective review of all glenohumeral instability procedures were reviewed at a tertiary training hospital from June 2014 to June 2019. The patient population consisted of active-duty military personnel with glenoid bone loss and anterior glenohumeral instability, who were treated with a Latarjet. The primary outcome was return to full-duty status.

Results: There were 50 patients identified for the study. Four patients were lost to follow-up, leaving 46 of 50 patients (92.0%) eligible for this study. The average age at the time of the index procedure was 23.1 years. The average percentage bone loss was 18.4%. Forty-one patients (89.1%) were able to return to full-duty status. Four patients (8.7%) sustained a recurrent dislocation following the Latarjet; all 4 dislocations occurred during a combat deployment. Four patients (8.7%) reported episodes of subluxation without dislocation. Forty-one patients (89.1%) reported that their shoulders felt stable, and we found an average return to full duty at 5.3 months

Conclusion: In our active-duty military cohort, we found an 8.7% rate of recurrent instability after a Latarjet procedure, and 41 patients (89.1%) were able to return to full-duty status. In conclusion, the Latarjet procedure in the active-duty military population with anterior glenoid bone loss resulted in a high rate of return to duty, excellent functional outcomes, low rate of recurrent instability, and a low overall complication rate.

Level of evidence: Level IV; Case Series; Treatment Study

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Keywords: Shoulder instability; contact; collision; athlete; Latarjet; active-duty military

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*Reprint requests: Kyong S. Min, MD, Department of Orthopaedic Surgery, Tripler Army Medical Center, 1 Jarrett White Rd, 4F, Honolulu, HI 96859, USA.

E-mail address: kyongminmd@gmail.com (K.S. Min).

Anterior glenohumeral instability is common in the collision athlete. Risk factors for recurrent shoulder instability include male sex, contact athlete, age younger than 20 years, and glenoid bone loss.^{1,3,6,23,25} In the United States, most patients with anterior shoulder instability are treated with an arthroscopic Bankart repair.^{4,8,9,16,18,30} However, in

patients with critical and subcritical glenoid bone loss, there is an 89% and 42.9% risk of failure with arthroscopic Bankart repair alone, respectively.^{5,27}

The Latarjet is a procedure used to treat anterior glenohumeral instability by transferring the coracoid to the anterior glenoid.¹⁴ The Latarjet provides glenohumeral stability through the “triple effect” as described by Patte. Stabilization is achieved through restoration of the glenoid bone, the conjoint tendon acting as a sling on the subscapularis, and anterior capsulolabral repair.^{14,23}

In Europe, the Latarjet is often the initial surgical treatment for anterior shoulder instability, with or without bone loss. Neyton et al²¹ retrospectively assessed 34 rugby players stabilized with the Latarjet, finding a 65% return to play and concluding that the procedure resulted in good outcomes in this population. Ranalletta et al²⁴ retrospectively evaluated 50 competitive rugby players stabilized with the Latarjet, reporting excellent outcomes with no cases of postoperative dislocation or subluxation. In both of these studies, the Latarjet was performed to treat anterior glenohumeral instability, with or without glenoid bone loss.

The indications for a Latarjet in the United States are generally more conservative, and the Latarjet is typically reserved for patients with critical glenoid bone loss. The scientific literature for the Latarjet in contact and collision athletes in the United States is limited. Dekker et al⁹ from the Steadman Philippon Research Institute published a series of 23 professional athletes treated for anterior glenohumeral instability, 5 of whom were treated with a Latarjet. Their study demonstrated no differences in return to competition for those who received an arthroscopic Bankart repair vs. an open Latarjet.

Active-duty military personnel are at high risk for glenohumeral instability; most are young, male, and engage in contact sports. They are required to be trained in combatives (hand to hand combat) and navigate through obstacle courses. On an annual basis, all active-duty military personnel are required to take a fitness assessment (Army Combat Fitness Test, Navy Physical Fitness Test, Air Force Physical Fitness Test, and Marine Combat Fitness Test). These evaluations require execution of complex shoulder maneuvers (pull-ups, push-ups, overhead press, planks, power throw, etc), which places the glenohumeral joint in positions susceptible to dislocation.

The purpose of this study is to assess the rate of return to full duty in active-duty military personnel following the Latarjet for anterior glenohumeral instability with glenoid bone loss. We hypothesize that the Latarjet for anterior shoulder instability with glenoid bone loss will result in high return to full-duty rates in active-duty military personnel.

Materials and methods

A retrospective review of all glenohumeral instability procedures were reviewed at a tertiary training hospital from June 2014 to

June 2019. Inclusion criteria included active-duty military personnel (Army, Navy, Marine, Air Force), anterior glenohumeral instability, glenoid bone loss, and surgical treatment with a Latarjet with a minimum follow-up of 2 years. Exclusion criteria included associated glenohumeral pathology (SLAP tear, rotator cuff tear, fracture, acromioclavicular joint pathology, posterior labral tear), and multidirectional instability.

For all patients, the operative report was reviewed to verify the indications and procedure performed, advanced imaging (magnetic resonance imaging or computed tomography) was reviewed to measure glenoid bone loss as described by Gerber and Nyffeler,¹³ and history was reviewed to identify number of dislocations and previous procedures. Demographic information included age at first dislocation and sex.

The patients that met inclusion criteria were contacted. The primary outcome was return to full-duty status. Patients were asked (1) how long after their Latarjet were they able to return to full-duty status; (2) how long they remained on a limited duty status; (3) how long until they passed a military physical fitness test; (4) if they had any episodes of dislocation; and (5) if they had any episodes of subluxation. A dislocation was strictly defined if the injury required a manual reduction. A subluxation was defined as an injury that resulted in the shoulder shifting or slipping, or subjectively, caused a sense of instability. Furthermore, the following patient-reported outcomes were collected: Western Ontario Shoulder Instability Index (WOSI), American Shoulder and Elbow Surgeons Standardized Shoulder Assessment Form (ASES) questionnaire, and Single Assessment Numeric Evaluation (SANE). Postoperative range of motion was obtained by the documented range of motion from the patient's final physical therapy evaluation.

The Latarjet procedures in this study were performed open by a fellowship-trained (Sports or Shoulder and Elbow) surgeon, using rigid fixation (2 screws). The cohort consisted of both subscapularis split and subscapularis tenotomy, congruent arc and incongruent arc, and extra-articular capsulolabral repair and intra-articular capsulolabral repair. All patients underwent standardized postoperative restrictions and physical therapy protocol. Patients were immobilized in a sling for 4 weeks postoperatively, with pendulum exercises beginning immediately. Physical therapy began at 2 weeks postoperatively with passive and active-assist range of motion exercises.

Statistical analysis

Descriptive statistics for return to active duty; redislocations after surgery; WOSI, ASES, SANE, and visual analog scale scores; postoperative range of motion; nerve injury; and bone loss were determined for all patients. The primary outcome was return to full-duty status. Secondary outcomes were recurrent dislocation, subjective stability, complications, and amount of time required to pass a military fitness test. Statistical analysis was performed using Microsoft Excel. Unpaired *t* tests were performed to compare SANE, ASES, and WOSI scores. Significance was assumed for *P* values <.05. Based on historical data, a power analysis was conducted with redislocation as the variable of interest. This variable was chosen because it was thought to be the most likely to differ postoperatively

between the study groups. Based on an effect size of 0.5 and an alpha value of 0.8, a minimum of 48 patients per study group (96 total) was required to achieve a power of 0.9.

Results

There were 50 patients identified for the study. Forty-seven patients were male and 3 were female. Four patients were lost to follow-up, leaving 46 of 50 (92.0%) patients eligible for evaluation. The average age at the time of the index procedure was 23.1 years (18-31). The average length of follow-up was 3.1 years (2-6.5). All patients were active-duty military at the time of the index procedure. The average percentage bone loss was 18.4% (8.1%-30.3%) (Table I), and their average postoperative range of motion was 60.2° of external rotation, 164.3° of forward flexion, and 162.7° of abduction.

Forty-one patients (89.1%) were able to return to full-duty status. Two patients (4.3%) underwent a medical evaluation board because of their shoulder and were discharged from active-duty service. One patient (2.2%) retired from the military for reasons other than shoulder injury. The average time from the index procedure to passing a military physical fitness test was 8.0 ± 2.8 months.

Four patients (8.7%) sustained a recurrent dislocation following the Latarjet. For primary Latarjet procedures, as the index procedure, the redislocation rate was 5.7% (2/35). For patients who had previously undergone an arthroscopic Bankart repair, the redislocation rate was 20.0% (2/10). In both patients, a total of 4 anchors were used to perform a capsulolabral repair. The average bone loss of the failures who had undergone a previous Bankart repair was 18.3% compared with 18.6% in the patients who had undergone a primary Latarjet. Four patients (8.9%) reported episodes of subluxation without dislocation. Forty-two patients (89.1%) reported that their shoulders felt stable.

The preoperative ASES score was 39.6 ± 11.7 ; postoperatively, the ASES score was 79.6 ± 17.3 ($P = .003$). The preoperative WOSI score was 1487.6 ± 354.7 ; postoperatively, the WOSI was 710.1 ± 388.1 ($P = .001$). The postoperative SANE score was 81.1 ± 14.1 (Table II).

When comparing primary to revision procedures, the average SANE score in the primary cohort was 83.1 ± 11.4 compared to 71.1 ± 16.9 in the revision cohort ($P = .03$). The average ASES in the primary cohort was 79.5 ± 16.8 compared to 73.0 ± 16.8 ($P = .17$). The average postoperative WOSI in the primary cohort was 710.5 ± 381.5 compared with 868.2 ± 367.1 in the revision cohort ($P = .15$) (Table III).

We identified 4 postoperative complications, all of which involved the musculocutaneous nerve. Three were transient neuropraxia, and 1 complication was a complete loss of musculocutaneous nerve function requiring further

Table I Demographics

Total patients, n	50
Lost to follow-up, n	4
Follow-up, n/N (%)	46/50 (92.0)
Sex	
Male	47
Female	3
Follow-up, yr, mean (SD)	3.1 (1.2)
Age at surgery, yr, mean (SD)	23.1 (5.8)
Surgery	
Primary	40
Revision	10
Glenoid bone loss, % (range)	18.4 (8.1-30.3)

operative procedures. Two of the 4 patients were unable to return to active-duty status and went on to receive a medical board. Two patients were able to return to full active-duty status.

Discussion

Our study demonstrates that the Latarjet procedure provides a high rate of return to full-duty status in active-duty military personnel. Anterior shoulder instability with glenoid bone loss has unacceptable rates of recurrent dislocation.^{5,27,28} Dickens et al^{10,11} published a 100% rate of recurrent dislocations in intercollegiate American football players with >13.5% bone loss, treated with an arthroscopic Bankart repair. Several studies have demonstrated suboptimal outcomes in collision athletes who undergo an arthroscopic Bankart repair.^{1,8,15,18} Shaha et al²⁷ evaluated arthroscopic Bankart repairs in a high-activity-level population and found unacceptable outcomes with bone loss above 13.5%. Recently, Chan et al⁸ reported a 26% failure rate after arthroscopic Bankart repairs in a high-risk military population.

The Latarjet has demonstrated good to excellent results in the treatment of shoulder instability with and without bone loss.^{7,14,16,17,19,20,26,29} Allain et al² found that 88% of shoulders had an "excellent" result and no recurrent dislocations at a mean follow-up of 14.3 years. Similarly, Hovellius et al^{14,15} prospectively examined a cohort of 118 shoulders treated with a Latarjet and found an overall satisfaction rate of 98%. All these studies demonstrate good to excellent results with low rates of recurrence; however, these studies were not specific to the contact athlete and included patients with and without glenoid bone loss.

The literature for return to sport in contact athletes with glenoid bone loss is limited. The Latarjet demonstrated 65% to 93.7% return to sport for rugby players.^{21,24} In these studies, the Latarjet was performed in patients with and without glenoid bone loss. Privitera et al²² performed a retrospective review of outcomes following the Latarjet in contact and collision athletes. In their cohort of 46

Table II Patient-reported outcome scores

	ASES score	WOSI score	SANE score
Preoperative, mean (SD)	39.6 (11.7)	1487.6 (354.7)	
Postoperative, mean (SD)	79.6 (17.3)	710.1 (388.1)	81.1 (14.1)
<i>P</i> value	.003	.001	

ASES, American Shoulder and Elbow Surgeons Standardized Shoulder Assessment Form; WOSI, Western Ontario Shoulder Instability Index; SANE, Single Assessment Numeric Evaluation.

Table III Patient-reported outcomes: primary vs. revision procedures

	ASES score	WOSI score	SANE score
Primary, mean (SD)	79.5 (16.8)	710.5 (381.5)	83.1 (11.4)
Revision, mean (SD)	73.0 (16.8)	868.2 (367.1)	71.1 (16.9)
<i>P</i> value	.17	.15	.03

ASES, American Shoulder and Elbow Surgeons Standardized Shoulder Assessment Form; WOSI, Western Ontario Shoulder Instability Index; SANE, Single Assessment Numeric Evaluation.

shoulders, the average glenoid bone loss was 10.6% (range: 1.6%-30.3%). In addition, they reported a redislocation rate of 7%; 88% of patients perceived their shoulders as stable, but only 41% (21/39) returned to play at the same level.

Active-duty military personnel have unique job requirements and mandatory physical activity, which has previously been compared to collision athletes. The incidence of anterior shoulder instability in the general US population is 0.08 per 1000 person-years, and in collision athletes there is an incidence of 0.51 per 1000 athlete exposures.¹² In comparison, the incidence of anterior shoulder instability in military personnel is 1.69 per 1000 person-years.¹² The incidence of glenohumeral instability in military personnel is 21 times greater than the general population.¹²

In our active-duty military cohort, we found an 8.7% rate of recurrent instability after a Latarjet procedure; the average glenoid bone loss was 18.4% ± 4.8%. Of the 4 recurrent instability events, 3 recurrent dislocations occurred in combat while deployed, and 3 recurrent dislocations had previous failed Bankart repair. Forty-one patients (89.1%) were able to return to full-duty status. We found an average return to full duty at 5.3 months and completion of military physical fitness requirements 8.0 months postoperatively.

There are several limitations in this study. This is a retrospective study in which patients were contacted telephonically for their patient-reported outcomes, which potentially risks recall bias. Furthermore, several surgeons performed the Latarjet using differing techniques (congruent arc vs. incongruent arc; subscapularis split vs. subscapularis tenotomy), which may lead to different results. Lastly, the study was underpowered to determine

a difference in dislocation rate and patient-reported outcome measures between primary and revision procedures.

Conclusion

The Latarjet procedure in the active-duty military population with anterior glenoid bone loss resulted in a high rate of return to duty, excellent functional outcomes, low rate of recurrent instability, and a low overall complication rate.

Disclaimer

The views expressed in this article are those of the authors and do not reflect the official policy or position of the Department of the Army, Department of Defense, or the U.S. Government.

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