Short-Term Outcomes of Glenoid Bone Block Augmentation for Complex Anterior Shoulder Instability in a High-Risk Population

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Purpose: To describe the short-term clinical outcomes of glenoid bone block augmentation in a high-demand population, as well as to describe its clinical success and complications at greater than 2 years' follow-up in an at-risk military population. **Methods:** All patients undergoing anterior capsulorrhaphy with coracoid process transfer or anterior bone block augmentation (Current Procedural Terminology code 23662 or 23460) for shoulder instability between 2006 and 2012 were isolated from the Military Health System Management Analysis and Reporting Tool. Demographic and occupational parameters were identified, and multiple surgical factors and clinical outcomes were extracted from the medical record and US Defense Manpower Data Center. **Results:** A total of 64 service members (65 shoulders) underwent anterior bone block procedures, including coracoid transfer (n = 59, 90.8%), distal tibial allograft (n = 3, 4.6%), and autologous or allograft iliac crest bone graft (n = 3, 4.6%). This group was predominately comprised of men (n = 59), and the mean age was 25.9 years (range, 19 to 45 years). A total of 19 perioperative complications, including 8 neurologic injuries, 6 infections, and 4 hardware failures, occurred in 16 patients (25%). At a mean 2.4-year follow-up, 21 patients (32.8%) reported persistent shoulder pain and 15 patients (23.4%) disclosed subjective apprehension or recurrent instability. Secondary surgical procedures were performed in 12 patients (18.8%), including 4 revisions (6.3%). Ultimately, 20 patients (31.3%) underwent a medical discharge for persistent shoulder disability. Univariate analysis showed that the presence of a perioperative complication ($P = .049$) and tobacco use ($P = .038$) were associated with increased risk of subsequent surgical failure. **Conclusions:** Anterior glenoid bone block procedures for shoulder instability with concomitant bone loss enable a return to high-demand physical function. The short-term complication profile (25%), recurrence rate (23%), and persistence of shoulder pain (33%) should be emphasized during preoperative counseling, particularly in an active military population and revision setting. Although moderately successful in the military, anterior bone block procedures for complex shoulder instability can be associated with significant short-term complications and morbidity. **Level of Evidence:** Level IV, therapeutic case series.

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Recurrent anterior shoulder instability may frequently result in glenohumeral bone defects, with involvement of the anterior-inferior glenoid in up to 90% of cases.[1] Given the exceedingly high failure rate associated with isolated labral repair in the presence of bony defects,[2] anterior bone block procedures

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have been increasingly used for patients with complex anterior shoulder instability and significant glenoid or bipolar bone loss.[3-5]

Since the original description of the Bristow procedure by Helfet,[6] several authors have further modified the initial technique of coracoid transfer popularized by Latarjet.[7-9] In addition, the viability of free bone graft transfer, including both distal tibial allograft[10] and tricortical iliac crest graft[11] (i.e., Eden-Hybinette procedure[12,13]), has previously been established. However, although such techniques are effective at mitigating subsequent episodes of shoulder instability, few studies have evaluated the comprehensive short-term complications and clinical outcomes of these procedures using contemporary techniques,[5,14,15] particularly within a high-demand patient population.[16]

The purpose of this study was to evaluate the short-term clinical outcomes of glenoid bone block augmentation for bone loss with recurrent anterior shoulder instability, as well to describe its clinical success and complications at greater than 2 years' follow-up in an at-risk military demographic. We hypothesized that the anterior glenoid bone block procedures would be successful at preventing subsequent episodes of shoulder instability in military service members, despite the variable rates of postoperative complications.

Methods

Protocol approval was obtained from our institutional review board. We performed a retrospective review of all tri-service US military service members undergoing isolated anterior capsulorrhaphy with coracoid process transfer (Current Procedural Terminology code 23662) or anterior bone block augmentation (Current Procedural Terminology code 23460) for anterior shoulder instability (*International Classification of Diseases, Ninth Revision* code 718.31, 718.81, or 831.00) from the Military Health System Management Analysis and Reporting Tool (M2) between January 1, 2006, and April 31, 2012. Patients of nonmilitary status and patients with multidirectional laxity or associated posterior glenohumeral instability (with or without concomitant posterior or superior labral repair) or with incomplete medical documentation or insufficient follow-up (i.e., <24 months' follow-up) were excluded. However, patients with early clinical failure and medical separation before 24 months were included in our comprehensive statistics to limit nonresponder bias. The M2 database is an established managed care tool that has been used for clinical outcomes research after the surgical treatment of a variety of orthopaedic conditions, including anterior shoulder stabilization.[17] It contains data primarily from the Medical Data Repository, which is operated by the Military Health System and populated by end users of the military electronic health record for all beneficiaries. The Military Health System offers worldwide coverage for all TRICARE beneficiaries, which includes over 9.5 million active-duty service members, activated National Guard and Reserve service members, retirees, and family members, through the direct care system at Department of Defense facilities or purchased care using civilian providers.

Demographic and occupational parameters were extracted from the M2 dataset, including age, military rank, branch of military service, military treatment facility, and operating surgeon. Patients were queried within the Armed Forces Health Longitudinal Technology Application electronic medical record, and line-by-line analysis was subsequently performed to confirm underlying diagnosis, surgical procedure, and date of surgery. Individual surgeon preference dictated surgical indications, operative technique, and source of bone graft. Further chart review yielded additional patient-based factors (e.g., military occupational specialty, laterality, limb dominance, prior shoulder surgery) and surgical factors (e.g., graft source, surgical technique, method of fixation, operation by a surgeon fellowship trained in sports medicine or shoulder surgery). The following clinical and functional outcomes were also abstracted: perioperative complications, postoperative range of motion (as measured during formal physical therapy sessions), secondary surgical interventions, recurrent shoulder instability or apprehension (e.g., patient-reported instability event with or without formal shoulder reduction, 2+ anterior load-shift examination with reproduction of symptoms, and subjective feelings of instability with abduction or external rotation), radiographic findings, activity limitations, and deployment history.

In addition, the US Defense Manpower Data Center and US Army Physical Disability Agency databases were queried to identify all individuals with postoperative combat deployments, as well as current military status, and those undergoing a medical discharge for persistent shoulder dysfunction after the index procedure. For the purposes of this study, the primary outcome measures were revision operations after the index procedure and military discharge for persistent shoulder-related disability.

Statistical Analysis

Statistical means with 95% confidence intervals and/or standard deviations were calculated for continuous variables. Categorical data were expressed as frequencies or percentages. Univariate and χ^2 analysis was performed to evaluate the association between potential risk factors and the primary outcome measures. $P < .05$ was considered statistically significant.

Results

A total of 64 service members with 65 shoulders undergoing anterior glenoid bone block procedures were identified during the study period (Table 1).