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Cortical suture button fixation vs. bicortical screw fixation in the Latarjet procedure: a biomechanical comparison

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Background: The Latarjet procedure traditionally has been performed with 2 screws in an open manner. Recently, cortical suture button fixation for coracoid transfer has been used in hopes of mitigating complications seen with screw placement. The aim of this study was to evaluate a cortical suture button and technique currently available in the United States compared with screw fixation in the Latarjet procedure in a cadaveric model.
Methods: We randomly assigned 9 matched pairs of fresh-frozen cadaveric shoulders (N = 18) to undergo the Latarjet procedure with either screw fixation or cortical suture button fixation. After fixation, all shoulders underwent biomechanical testing with direct loading on the graft vas a material testing system. Cyclic testing was performed for 100 cycles to determine axial displacement with time; each graft was then monotonically loaded to failure.
Results: The maximum cycle displacement was significantly less for screw fixation vs. cortical suture button fixation (3.1 ± 1.3 mm vs. 8.9 ± 2.1 mm, $P < .0001$). The total load at failure was 481.1 ± 88.8 N for screws and 175.5 ± 95.8 N for cortical suture buttons ($P < .0001$). Bony damage to the surrounding anatomy was more extensive at failure in the screw-fixation group.
Conclusion: At time zero, the cortical button fixation and technique did not resist direct loads to the graft as much as traditional screw fixation, although bony damage to the surrounding anatomy was more extensive in screw fixation than button fixation. In the event of unanticipated loading, this could place a patient at higher risk of graft migration, which could lead to unintended early outcomes. These results support the need for implants and techniques specifically tailored to the Latarjet procedure and should bring into question the adoption of a cortical button and technique not specific to the procedure.
Level of evidence: Basic Science Study; Biomechanics

Keywords: Shoulder; Latarjet; coracoid transfer; shoulder instability; glenoid bone loss

Institutional review board approval was not required for this basic science study.

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Anterior glenohumeral instability and its treatment options have been a subject of considerable research and discussion in the orthopedic literature, especially cases involving glenoid bone loss. Anterior glenoid bone loss is present in up to 22% of first-time shoulder dislocations and up to 90% of patients with recurrent instability, making it a key component in assessing risk of chronic instability and deciding on treatment options.[22] Multiple studies have shown increased glenohumeral instability with bone loss of 20%-30%,[3,10,20,22] as well as an increased failure rate when these bony defects are only addressed with an isolated soft tissue Bankart repair.[3,7,17,19] The Latarjet procedure has become a popular remedy for anterior glenohumeral instability, especially in the setting of a loss in anteroinferior glenoid bone stock.[16,29] It has been shown to decrease the risk of recurrent instability to as low as 2.9% for redislocation and 5.8% for subluxation events; however, complication rates connected to this surgical procedure have been reported to be as high as 30%.[9,15,25,30]

Complications linked solely to the hardware itself are responsible for 6.5% of all complications of the Latarjet procedure. Hardware cutting out of the glenoid bone or migrating into a position that can cause irreparable damage to the glenohumeral joint has been documented at a rate of 3.8%.[8,31] Even without failure, the placement of screws can lead to hardware irritation and has been reported to occur in 2.7% of patients who underwent the procedure.[8] These complications have driven surgeons to assess other methods of fixation for the coracoid graft.

Tensioned suture buttons have gained popularity recently in a variety of orthopedic procedures. These devices are composed of strong suture interwoven between 2 metal buttons that are tensioned through opposing bony cortices. This allows for compression through the suture and across the metal buttons. This type of fixation is currently being widely used in the United States to aid in reduction of acromioclavicular joint separations and syndesmotic repair in ankle fractures.[18,23] Recently, clinical and biomechanical studies have described the use of these devices for bony fixation, specifically in the Latarjet procedure.[4-6,12,21,28] Cortical button fixation, until recently, had not been approved by the US Food and Drug Administration for use in the Latarjet procedure, limiting clinical studies to Europe and Asia.[5,6,12,28] A recent biomechanical study by Provencher et al[21] assessed the fixation strengths of screws vs. cortical button constructs when pulling on the graft through the attached conjoint tendon. This tension-based model showed no significant difference between the fixation methods and further recommended continued study of suture buttons as a primary method of fixation, especially in a direct-loading model.[21]

Currently, no widely published studies have similarly evaluated any available cortical suture button in the Latarjet procedure when the graft itself has been directly loaded. The aim of this study was to compare coracoid graft fixation between a cortical suture button, widely available in the United States, and solid screws when the graft is directly loaded. Our null hypothesis was that there would be no significant difference between the 2 fixation methods.

Materials and methods

Study design

Nine matched-pair, fresh-frozen cadavers with a mean age of 52 years (range, 32-65 years) and mean body mass index of 26 kg/m^2 (range, 18-40 kg/m^2) were used in the study. The matched pairs included 5 female and 4 male specimens, which were previously donated for research purposes and subsequently purchased by our institution. One shoulder in each matched pair was randomly assigned to undergo screw fixation or suture button fixation of the coracoid graft. The other shoulder in the matched pair was then assigned to the opposite group. Cadaveric specimens were excluded from the study if any of the following were noted: signs of arthritis, lack of the coracoid, previous surgical procedure, or antecedent glenoid bone loss.

Specimen preparation

Each specimen was prepared by a single surgeon (R.C.W.) under the guidance of a shoulder and elbow fellowship–trained faculty orthopedic surgeon (N.H.M.). Each scapula, including the coracoid, was first dissected free of surrounding soft tissue. The bare spot of each glenoid was then estimated based on the intersection of the largest longitudinal diameter and the longest width of the en face view of the glenoid. The bare spot was marked, along with the widest width of the glenoid. A digital caliper was then used to measure from the bare spot to the anterior-most edge of the glenoid (A) and from the bare spot to the posterior-most edge of the glenoid (B) along the widest width. By use of the formula ([B – A]/2B) × 100%, 25% of the anterior aspect of the glenoid was marked.[22] A sagittal saw was then used to create a defect at the 3-o'clock position of the anterior aspect of the glenoid amounting to 25% of the total glenoid width.

The autograft was obtained by performing an osteotomy 25 mm from the tip of the coracoid. The medial aspect of the graft was decorticated in standard fashion and then placed into the glenoid defect with the inferior surface as the face of the glenoid. The inferior aspect of the coracoid was used as the glenoid face in a manner described by Ghodadra et al,[13] commonly referred to as a "congruent-arc Latarjet procedure." The coracoid graft was then secured to the glenoid defect with two 2.0-mm Kirschner wires spaced evenly across the graft with a minimum of 10 mm between the 2 devices. A reduction clamp was added to stabilize to the graft to ensure reproducibility between specimen preparations.

For specimens assigned to the screw group, the K-wires were sequentially removed and the tracts for the wires were over-drilled with a 2.5-mm drill bit. Then, 3.5-mm fully threaded stainless steel cortical screws (Stryker/Howmedica, Kalamazoo, MI, USA) were inserted and tightened to achieve subjective fixation and compression. For specimens assigned to the cortical suture button group, the first K-wire was removed and the wire tract was over-drilled with a 4.0-mm drill to allow passage of the posterior button and 4 strands of FiberWire (Arthrex, Naples, FL, USA) with a

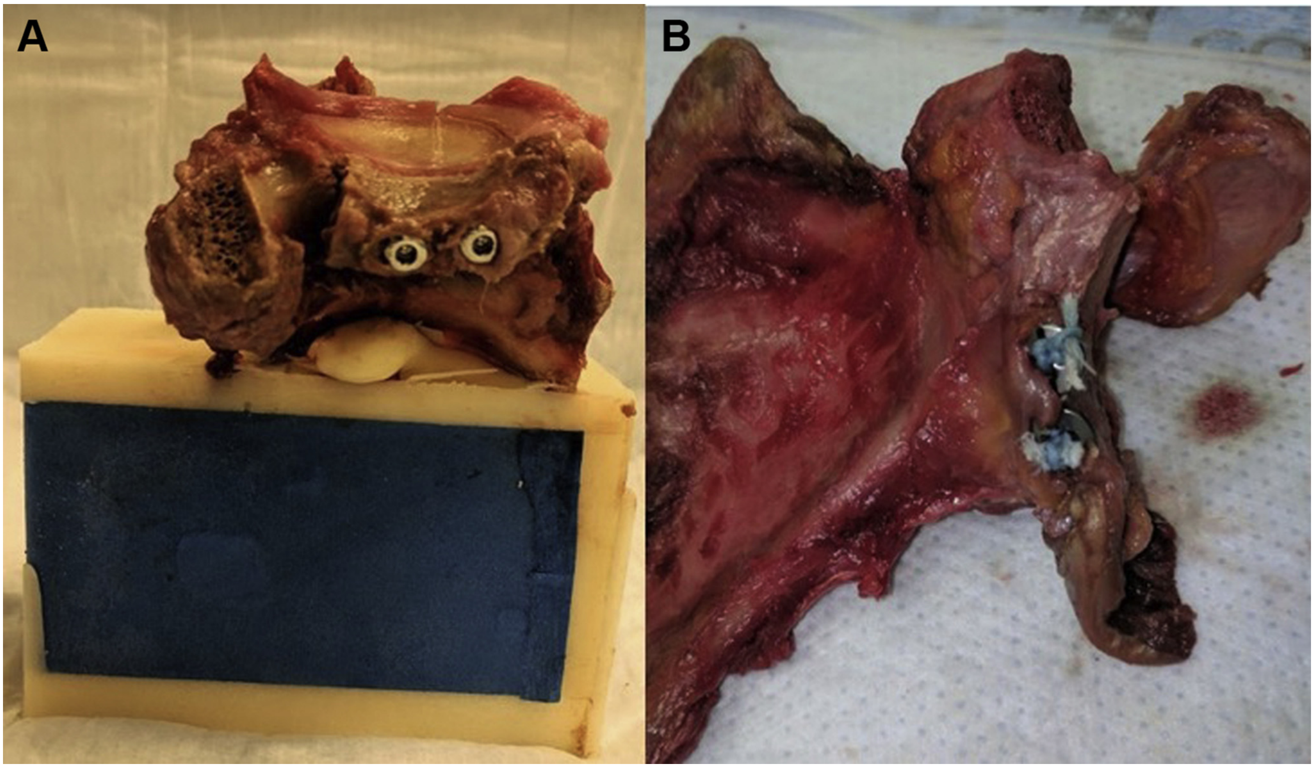

Figure 1 Examples of both preparations prior to mounting and testing: screw fixation (**A**) and cortical button fixation (**B**).

diameter of 0.98 mm each. The buttons were joined by a continuous loop of No. 5 FiberWire passed twice between the buttons, creating 4 strands of suture between the buttons. A nitinol wire with a suture-passing loop was then used to shuttle the distal cortical button and suture via the drill hole. The suture button (Arthrex) was flipped and tensioned with care to make sure that the distal button was sitting flush against the posterior glenoid. The suture was then tensioned by hand, as described in the device technique guide, with the aid of an assistant to mitigate any slippage of the suture and was tied in place with a locking surgeon's knot, followed by 6 alternating half-hitches. Finally, the second K-wire was removed, and all other steps were repeated, leaving each specimen with 2 points of fixation (Fig. 1).

Testing conditions

The testing protocol for this study was adapted from previously published screw comparison studies in which the graft was directly loaded.[2,26] After completion of each surgical procedure, the specimens were potted in polymethyl methacrylate. The acromion and a small portion of the inferior margin of the scapula were removed to fit within a custom rectangular potting mold. Each glenoid was placed in 30° of anteversion within each individual pot and then clamped to the base of the testing system. All biomechanical testing was conducted with the same MTS 858 Mini-Bionix testing system (MTS, Eden Prairie, MN, USA) that was equipped with a 2500-N axial load cell. Attached to the load cell was a simulated humeral head with a radius of curvature of 24 mm that was positioned directly over the middle of the graft to allow for maximal surface contact with the graft.[26] This, coupled with 30° of anteversion, yielded an anterior-inferior load vector for testing and was done to simulate a worst-case clinical scenario as described in previously published studies.[2,26] In addition, the width of the humeral head analog and the graft orientation allowed for only the graft to be loaded so as not to confound the data with glenoid contact (Fig. 2).

After preloading of each specimen to 1 N to ensure contact with the graft at the beginning of the first cycle of testing, axial displacement and load were set to zero. From this point, all grafts were cyclically loaded from 5-150 N at a rate of 1 Hz for 100 cycles. At the completion of the 100 cycles, the crosshead was returned to its position used at the start of cyclic loading. From this position, each graft was monotonically loaded at 0.5 mm/s until failure. Failure was defined as follows: (1) 7.0 mm of displacement of the graft based on crosshead displacement, which is twice the diameter of the stainless steel screw and was used as a parameter in previous studies[2]; (2) fracture of the glenoid; (3) fracture of the coracoid graft; (4) screw cutout; (5) screw breakage; or (6) failure of the TightRope device (Arthrex) (suture breakage or button failure).

Data analysis

For cyclic loading, maximum cycle stiffness of the constructs was calculated as the slope of the linear region of the loading curve of the 100th cycle. For failure testing, the load required to achieve 7.0 mm of displacement was recorded. Energy absorbed was calculated as the area under the load vs. displacement curve. Construct stiffness was calculated as the slope of the linear elastic region of the curve. Paired *t* tests were conducted to detect differences between the 2 groups with α set at .05 (Excel 2013; Microsoft, Redmond, WA, USA).

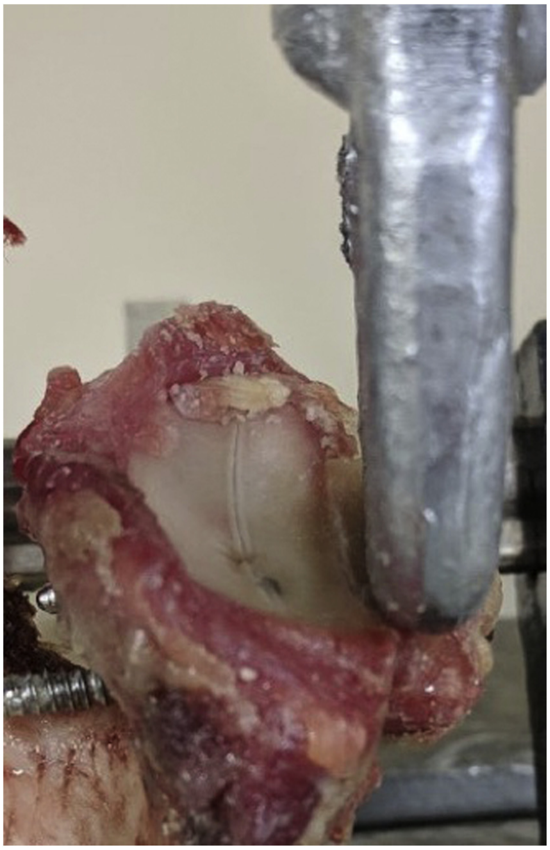

Figure 2 Example of testing setup with the scapula potted in polymethyl methacrylate with 30° of anteversion relative to the simulated humeral head, which is positioned directly over the graft to simulate a worst-case scenario in which the graft undergoes a direct load. A prepared specimen is shown with the humeral head analog in contact with the coracoid graft during cyclic testing.

Results

Cyclic testing

All specimens competed the cyclic testing without hardware failure. Although graft migration was visible in both groups, all implants remained intact with no observable detachment or loosening of the implant itself or damage to the glenoid articular surface or coracoid graft. The maximum cycle displacement was significantly less for screw fixation vs. cortical suture button fixation (3.1 ± 1.34 mm vs. 8.9 ± 2.1 mm, $P < .0001$). In addition, the maximum cyclic stiffness of the screws was significantly greater than that of the cortical suture buttons (208.4 ± 42.9 N/mm vs. 127.0 ± 39.8 N/mm, $P = .01$) (Table I).

Failure testing

For load-to-failure testing, the total load at failure and the energy absorbed at failure were both significantly higher for the screws than for the cortical suture button implants ($P < .0001$). The total load at failure was 481.1 ± 88.8 N for screws and 175.5 ± 95.8 N for cortical suture buttons. The energy absorbed by the constructs was 2095.1 ± 368.9 N · mm for screws and 761.8 ± 530.3 N · mm for suture buttons. Linear stiffness was also significantly higher in the screw group vs. the suture button group (129.6 ± 29.9 N/mm vs. 73.9 ± 29.1 N/mm, $P = .02$) (Table II).

The study was adequately powered based on the resulting P value for each metric. Post hoc power analysis for an α value of .05 revealed power of 100% for 100th cycle displacement, 100th cycle stiffness, load at 7 mm, energy at 7 mm, and failure stiffness.

Modes of failure

For the cortical suture button specimens, the mode of failure in every case was displacement of the graft and gap formation from the graft-glenoid interface with the sutures pulling medially at the bone-suture interface. For the screw-fixation specimens, the modes of failure were as follows: screw medialization and cutting through the glenoid neck cancellous bone without destruction of the glenoid face in 4 specimens, screw cutout of the coracoid graft in 2, and fracture of the graft in 3 (Fig. 3). None of the screw-fixation specimens cut out through the glenoid articular surface during testing. No implant failures (screw fracture or cortical suture button breakage) occurred in either group (Table III).

Discussion

The main conclusion derived from this study is that in the event that the coracoid graft is directly loaded immediately or very soon after fixation, solid screws will resist this load better than the aforementioned cortical suture button and technique. The results of this study are likely most applicable to those situations in which the coracoid graft is not protected, through either graft positioning error, overly rigorous early rehabilitation, or trauma. Currently, screws appear more likely to better resist a direct single load that would be seen with a large amount of force and were more resistant to multiple small repeated loads, although it is not clear if this resistance is clinically significant.

Screw fixation of the coracoid graft in the Latarjet procedure remains the most common method of fixation, is easily reproducible, and has been linked to good biomechanical and clinical outcomes.[9,15,25,30] However, this method of fixation is not without its drawbacks. Screws are implicated in several complications and are one of the more common causes of revision of the Latarjet procedure.[8,12,28,31] Correctly or incorrectly placed hardware can be prominent and can cause, at best, irritation and, at worst, articular damage requiring removal.[11] In the case of graft

Table I Cyclic testing results of screw fixation vs. cortical suture button fixation

	Screw fixation	TightRope fixation	*P* value
Maximum cycle displacement, mm	3.0 ± 1.3	8.9 ± 2.0	<.0001
Maximum cycle stiffness, N/mm	208.4 ± 42.9	127.0 ± 39.8	.01

Data are presented as mean ± standard deviation.

Table II Single load-to-failure results of screw fixation vs. cortical suture button fixation

	Screw fixation	TightRope fixation	*P* value
Load at failure, N	481.1 ± 88.8	175.5 ± 95.8	<.0001
Energy absorbed at failure, N · mm	2095.1 ± 368.9	761.81 ± 530.3	<.0001
Linear stiffness of construct, N/mm	129.6 ± 29.9	73.94 ± 29.1	.02

Data are presented as mean ± standard deviation.

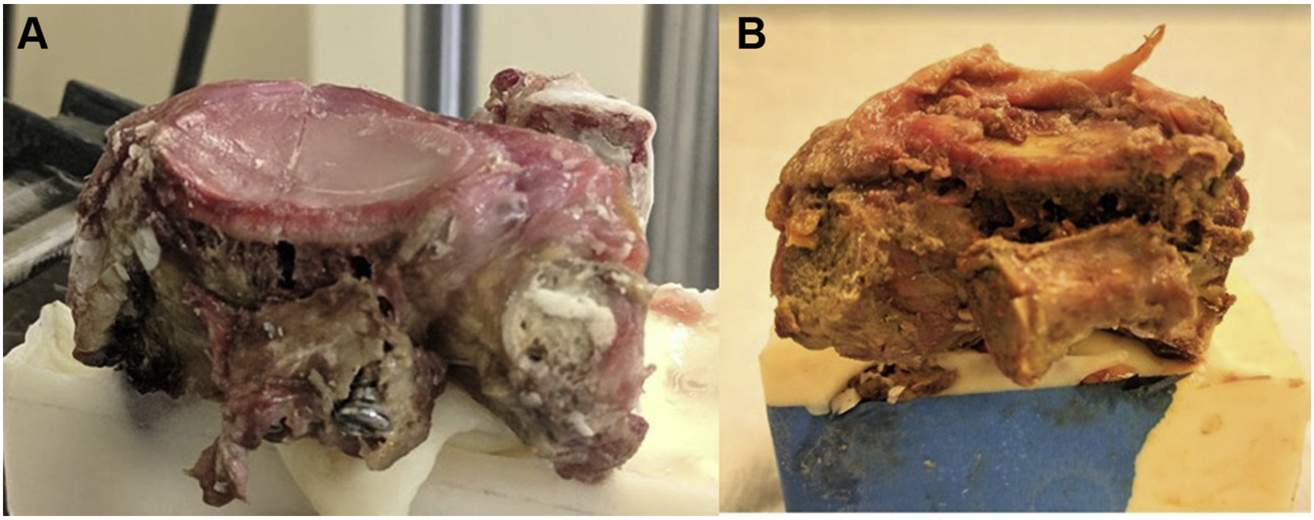

Figure 3 (**A**) Post-failure screw-fixation specimen showing graft fracture, as well as cutting through of the screw in the medial neck of the glenoid in a subchondral manner. (**B**) Post-failure TightRope specimen showing failure at the suture-bone interface where the graft was reduced.

Table III Mechanism of failure for screw fixation vs. cortical suture button fixation and age of each matched pair

Specimen	Specimen age, yr	Screw fixation	Cortical suture button fixation
Matched pair 1	32	Graft fracture	Graft-bone interface
Matched pair 2	44	Graft-bone interface	Graft-bone interface
Matched pair 3	48	Graft-bone interface	Graft-bone interface
Matched pair 4	50	Graft-bone interface	Graft-bone interface
Matched pair 5	54	Graft fracture	Graft-bone interface
Matched pair 6	57	Screw cutout of graft	Graft-bone interface
Matched pair 7	59	Screw cutout of graft	Graft-bone interface
Matched pair 8	63	Graft fracture	Graft-bone interface
Matched pair 9	65	Graft-bone interface	Graft-bone interface

non-incorporation or failure, these remaining steel screws also represent large metal foreign objects that can damage the surrounding anatomy and complicate future revisions. These limitations have led to continued attempts to find lower-profile, less potentially damaging methods of graft fixation.

Recent technical advancements in the arthroscopic Latarjet procedure have been discussed as a method that could reduce complications owing to direct visualization of the graft and neuroanatomy.[5,6,12,28] Cortical button fixation has been included in this discussion in an attempt to mitigate implant-related complications. The cortical button was introduced as a device with a lower profile that is less likely to cause damage to the surrounding anatomy in the event of complications. Until very recently, no cortical button systems were approved by the US Food and Drug Administration for application in the Latarjet procedure, and all devices currently available in the United States were first designed for other orthopedic conditions. This has limited research into these devices in the United States. In Europe and Asia, cortical button fixation with specific techniques for the Latarjet procedure has proved clinically successful and appears to be a viable option for graft fixation.[5,6,12,28] Gendre et al[12] reported a 91% early union rate, confirmed by 2-week and 6-month postoperative computed tomography, using the Latarjet procedure with cortical button fixation. They did not report any complications commonly seen with screw fixation. In a series of 88 patients who underwent the arthroscopic Latarjet procedure, Bonnevialle et al[6] reported a 6.8% rate of postoperative complications and noted good early clinical results. Xu et al,[28] in a retrospective review of 50 patients who underwent the arthroscopic Latarjet procedure with button fixation, found excellent clinical results with a complication rate of only 4% and improved clinical scores. In the largest study to date, Boileau et al[5] recently published a series of 137 patients who underwent arthroscopic fixation with 2-year follow-up. They reported a 95% rate of graft incorporation with no hardware complications. One of the key features of these procedures—and a technique note that must be stressed—is the use of a tensioner when fixing the buttons. This is not included in button systems currently available in the United States.

Less has been published on the biomechanical analysis of cortical button fixation of coracoid grafts. Provencher et al[21] performed a biomechanical comparison of a cortical button, available in the United States with the addition of a suture tensioner, to screws, in which the 2 forms of fixation showed no significant differences. The study methodology centered around simulation of a normal postoperative course in which the primary forces placed on the graft occur through the still-connected conjoint tendon. Repetitive tension forces were placed through the tendon on the graft and resulted in similar ultimate load to failure, as well as strain at failure, when screws and cortical suture buttons were compared.[21] Along with the clinical data, this finding does support that suture button fixation in the Latarjet procedure is a viable option in experienced hands following a specific technique and in ideal postoperative situations.

Currently, there are few to no biomechanical data assessing how button fixation would compare in a direct-load model. Early direct loads placed on the graft by the humeral head are likely to lead to increased motion of the graft that could lead to nonunion, fibrous union, or even early fixation failure. This scenario of direct graft loading has been re-created a number of times when previous studies attempted to assess various screw types and graft positions available in Latarjet fixation.[2,25] Our study provides additional context regarding the viability of cortical button fixation or designs in such a scenario.

Alvi et al[2] compared 3.5-mm fully threaded stainless steel screws with 4.0-mm, partially threaded cannulated screws in a direct-load scenario in which the graft was repetitively loaded and then loaded to failure; they found no significant difference between the 2 fixation techniques. Similarly, Shin et al[26] assessed 5 different types of screw fixation by applying a force directly to the coracoid graft in a direct-load scenario. They found no significant differences between any of these methods. One of the constructs tested in their study was a 3.5-mm fully threaded cortical screw directly comparable to the screw fixation in our study. In this group, load to failure was reported to be 554.1 ± 163.3 N, which is similar to the value of 481.13 ± 88.79 N established in our testing. The likely difference between the two is in the Latarjet methodology, as Shin et al tested a classic Latarjet procedure and our study tested a congruent-arc Latarjet procedure, similarly to that of Alvi et al. Giles et al[14] have demonstrated that the classic Latarjet procedure is biomechanically more stable than the congruent-arc method, and a good follow-up study would be to re-create this study with the classic configuration, although applying an isolated and uniform direct load on the graft in this position is much more difficult. Load to failure of the screw construct in this study was higher than the load of 392 ± 150 N reported by Giles et al. Overall, our results with 3.5-mm fully threaded cortical screws fall within the accepted ranges of previously published tests under similar conditions.

There are no other published studies assessing cortical button strength in this manner with which to compare our results. As previously mentioned, Provencher et al[21] tested cortical buttons via force through the conjoint tendon and the findings are not comparable to our results. The suture button's design makes it ideal in resisting tension forces, and in the case of forces transmitted through the conjoint tendon, it appears equivalent to, if not slightly better than, a screw construct at resisting those forces.[21]

This study shows that a currently available cortical button with its insertion technique is much less able to resist loads applied to the graft directly. The button construct showed greater average displacement of the graft and significantly less stiffness than screw fixation. It is not surprising that suture button fixation would perform in this manner when compared with screws. The cortical button's currently approved use is in areas of ligamentous approximation in which screw fixation is often too stiff and some motion is inherent to these anatomic repairs.[18,23] The repetitive load results suggest that this lack of stiffness would allow more motion at the graft-glenoid interface if the graft were to experience direct loads. Early small repetitive loads to the graft due to surgeon error, patient noncompliance, and overzealous physical therapy are possible, which is why a period of sling immobilization is always recommended immediately after surgery.[27] Early loads combined with less stiffness could result in excess motion, and it is possible that excess motion could place these constructs at higher risk of graft migration, nonunion, or fibrous union.

It is interesting to note that the few clinical studies using a button for fixation have actually shown complication rates owing to nonunion, migration, or fibrous union lower than the 10.1% rate reported when screw fixation has been used.[8] Bonnevialle et al[6] reported 4 cases of graft migration (4.5%) in their case series comprising 88 procedures using an arthroscopic double-button technique, with all migrations occurring early in the learning curve of the procedure, when early technical mistakes may possibly lead to less-than-ideal conditions. Xu et al[28] reported no nonunions in their series of 50 patients even with 12% of the grafts positioned lateral to the face of the glenoid. Boileau et al[5] noted a 5% nonunion rate at 2-year follow-up with cortical button fixation, with 5% of their grafts having a lateral position.

In all likelihood, the reason for the excellent clinical results with cortical button fixation is likely multifactorial. When low-profile implants combined with well-placed grafts are placed with specific techniques in compliant patients, it appears cortical button fixation can be equivalent to screw fixation in the Latarjet procedure.

When the coracoid graft encountered a single large force, the screw construct was much more able to resist this force and absorb more energy in comparison to the cortical screw construct. This single direct load has been previously investigated when other fixation methods have been compared to better understand the extreme limits of the implant constructs. A possible fall on or direct force to the operative arm while adducted or, even worse, abducted is a rare event but a definite possibility, especially in the typically young patients who undergo this procedure.[1,24] Our results suggest that if this were to happen, a graft affixed with the aforementioned cortical button by the standard technique would fail under smaller loads than if fixation had been performed with screws. It is worth considering this difference when choosing a fixation method, especially taking into account the patient and whether he or she is at increased risk of early traumatic events.

Although the screw construct is more able to resist a large direct load, when it does fail, it does so with considerably more surrounding damage. As outlined in Table III, 5 of 9 grafts in the screw-fixation group failed with damage to either the graft or the glenoid bone. No significant bony damage was seen in the failures of the cortical button fixation. Each suture button failed via displacement of the graft at the graft-glenoid interface, where the suture would allow the graft to displace medially 1-2 mm and then the graft would begin to turn with the suture cutting into the cancellous bone. In the study of cortical button fixation by Provencher et al,[21] the mode of failure was either failure at the graft-bone interface, similarly to this study, or failure of the clamp pulling tension through the conjoint tendon. There is little question that screws showed more variable and damaging failures. Graft fracture has also been described as an early complication in several studies about the Latarjet procedure.[8,11,15] This finding would suggest that the possible damage from a failure of graft incorporation would be mitigated by the cortical button fixation. One can imagine cases of trauma or high direct load in which screw fixation and button fixation would both fail. In these cases, button fixation would likely lead to less damage to the surrounding anatomy and allow for more options regarding revision techniques.

This study is subject to several limitations. The first limitation is the constraints placed on in vitro biomechanical testing. Although a cadaveric model can yield valuable information, it cannot completely replicate a live postoperative patient. Biomechanical testing using a skeletonized scapula can give a good basis for understanding the differences between implants; however, more testing would be needed to elucidate the potential of suture button fixation, including the classic Latarjet technique, as well as how labral or capsular repair would factor into the construct. This is a time-zero study and does not account for healing of the graft with time, so the results of this study are most applicable to the immediate postoperative period. The patient population that is subject to having recurrent shoulder instability due to bone loss is typically younger. There are likely differences in bone quality and fixation strength due to the age of our specimens, but the mean age of our specimens is similar to the ages in previously published biomechanical studies.[2,21,26] No computed tomography or dual-energy x-ray absorptiometry scans were performed prior to completion of biomechanical testing. This was mitigated by using matched pairs with the assumption that each patient has nearly identical anatomy bilaterally. Identical approaches were used for each shoulder to create an anterior bony deficit. Finally, and most important, the cortical button was not originally designed for the aforementioned procedure, and this system did not have a tensioning device such as that described in some of the clinical studies. Boileau et al[5] identified using a tensioner as a key step to the fixation, and our lack of a tensioner subjects our construct to more variability. Our data represent the closest approximation of what is available in the United States and can be used as a reference for the development of a cortical button system designed specifically for the Latarjet procedure to be used in the future.

Conclusion

In a scenario in which the coracoid graft experiences direct loads—either cyclic loads or a high single load—cortical screw fixation proved to be more resistant to graft migration or displacement compared with a cortical suture button currently available in the United States and its associated technique. The mechanisms of failure were more favorable in the cortical suture button group as there was less bony destruction. These biomechanical results suggest that cortical buttons and techniques developed for other procedures are likely not able to withstand loads directly placed on the graft as well as screws can, and in the event of unanticipated loading, this could place a patient at higher risk of graft migration, which could lead to unintended early outcomes. These results support the need for implants and techniques specifically tailored to the Latarjet procedure and should bring into question the use of a cortical button and techniques not specific to the procedure.

Disclaimer

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