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Variation in technique and postoperative management of the Latarjet procedure among orthopedic surgeons

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Background: The Latarjet procedure has become a treatment of choice for glenohumeral instability in the setting of large glenoid osseous defects (>20%) and for prior failed soft tissue repairs. However, surgical techniques and postoperative rehabilitation protocols vary among expert shoulder surgeons. The purpose of this survey study was to characterize the variation in current practice patterns among fellowship-trained orthopedic shoulder surgeons and identify factors related to variation.

Methods: A 9-question survey was created (SurveyMonkey, San Mateo, CA, USA) and distributed to orthopedic surgeons who are active members of the American Shoulder and Elbow Surgeons or American Orthopaedic Society for Sports Medicine. The survey asked questions regarding surgeon experience with the Latarjet procedure, fellowship training, open vs. arthroscopic approach, method of coracoid-to-glenoid fixation, period of sling use postoperatively, and time before clearance to return to sport. Subgroup analysis was performed to determine whether further variation was evident between surgeons who completed sports medicine vs. shoulder and elbow fellowship training.

Results: In total, 242 surgeons completed the survey. Of these, 55% indicated performing a sports medicine fellowship and 39% indicated completing a shoulder and elbow fellowship. Among all surgeons, the classic open Latarjet procedure was the strongly preferred technique (79%), followed by the open congruent-arc (17%) and all-arthroscopic (3%) techniques. With respect to fixation, 98% used screw fixation and only 1% indicated cortical button use. With respect to the postoperative course, >85% of surgeons preferred immobilization for 3-6 weeks after the procedure and 42% of respondents stated they waited ≥6 months prior to clearing their patients to return to sport. Subgroup analysis revealed that surgeons who completed a shoulder and elbow fellowship performed the classic open technique 89% of the time compared with 63% of those who completed a sports medicine fellowship ($P < .001$).

Conclusion: The results of our survey study indicate an overall strong preference for the open classic Latarjet technique as well as an overall strong preference for screw fixation of the coracoid graft to the glenoid among all surgeons. Shoulder and elbow fellowship–trained surgeons are significantly more likely to perform open surgery with a classic technique compared with sports medicine fellowship–trained surgeons. Furthermore, the significant variation in postoperative sling use and return to sport suggests that further research is needed to develop an evidence-based postoperative Latarjet rehabilitation protocol.

Level of evidence: Survey Study; Experts

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Keywords: Latarjet; glenoid defects; shoulder instability; survey study; rehabilitation; shoulder and elbow fellowship; sports medicine fellowship

Institutional review board approval was not required for this survey study.

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Anterior shoulder instability is a common sequela of traumatic anterior shoulder dislocation, with an annual incidence of 1.5%-2.0% in the general population.[5,7] Osseous defects of the glenoid can be found in isolation or in combination with humeral defects in up to 90% of patients with recurrent anterior shoulder instability.[9,21] Isolated glenoid defects approaching 20% of the articular surface and bipolar lesions containing "off-track" humeral defects are associated with recurrent instability after soft tissue–based repairs.[8,24,25]

Several methods of glenoid bone augmentation have been previously described for the management of glenoid bone defects. These have classically included coracoid autograft (Latarjet procedure), iliac crest autograft, and more recently, tibial plafond allograft.[6,10] The Latarjet procedure has become a treatment of choice for glenohumeral instability in the setting of osseous defects such as pathologic glenoid bone loss or off-track Hill-Sachs lesions and as a surgical treatment in the setting of instability following prior soft tissue–based repairs.[8,24,25] The outcomes of the Latarjet procedure have been excellent, with recent reports showing durable results at 10-year follow-up.[13] The procedure involves performing osteotomy of a portion of the coracoid process along with the conjoined tendon attachment and transferring it to the anterior glenoid to provide additional bony articulation for the glenohumeral joint. The stability of the procedure is provided by the triple effect of the bony augmentation of the anterior glenoid, the accompanying capsulolabral repair, and the dynamic sling effect of the conjoined tendon.[4] In 2009, Burkhart and De Beer introduced a congruent-arc modification to the open technique, rotating the coracoid 90° from the classic Latarjet position, with the potential added benefits of a larger graft surface area and a closer radius of curvature to the glenoid (Fig. 1).[4,19] Techniques for performing primarily arthroscopic coracoid transfer have been developed and adopted by some shoulder surgeons, with the possible benefit of improved accuracy of graft placement and decreased wound complications.[22] There are further variations in the technical details of the procedure, notably the choice of implant for coracoid graft fixation. Moreover, postoperative management following the procedure varies among expert orthopedic shoulder surgeons.[13,15]

Therefore, the purpose of this study was to characterize the variation in current practice patterns among fellowship-trained orthopedic shoulder surgeons and identify factors related to variation. A specific secondary aim of the study was to determine whether the type of fellowship of the surgeon led to variation in technique and rehabilitation protocol. We hypothesized that surgeons would prefer open surgery with screw fixation and that we would not see practice differences between sports medicine (SM) fellowship–trained surgeons and shoulder and elbow (SE) fellowship–trained surgeons.

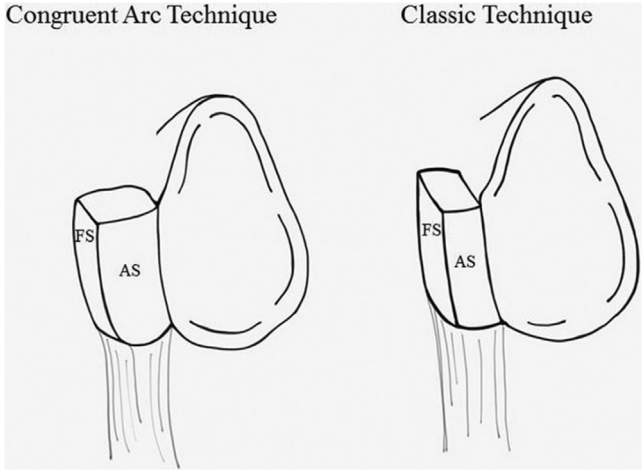

Figure 1 *Left,* Schema of the congruent-arc coracoid transfer with the articular surface (*AS*) having a greater width than the fixation surface (*FS*). The AS of the coracoid in the congruent-arc technique originated from the inferior surface of the coracoid's native anatomic position. *Right*, Schema of the classic technique of coracoid transfer with the FS having a greater width than the AS. The AS of the coracoid in the classic technique originated from the lateral aspect of the coracoid's native anatomic position. Image courtesy of Peter J. Millett, MD, MSc, Steadman Philippon Research Institute, Vail, CO, USA.[18]

Materials and methods

A 9-question survey was created (SurveyMonkey, San Mateo, CA, USA) and distributed to orthopedic surgeons who are active members of the American Shoulder and Elbow Surgeons (ASES) or American Orthopaedic Society for Sports Medicine (AOSSM). ASES has around 990 active members; AOSSM, roughly 4000 members. The survey was sent directly to all active members of ASES via e-mail. The study was highlighted in an e-mail to all members of AOSSM and made available on the society website. The survey was anonymous and completely voluntary for the participants. A copy of the survey is shown in Supplementary Appendix S1. The first 3 questions of the survey involved the demographic data of the survey taker with respect to the fellowship performed, duration of current practice, and number of Latarjet procedures performed to date. The next 3 questions discussed preferences regarding the specifics of the Latarjet procedure: classic vs. congruent-arc technique, open vs. arthroscopic procedure, and whether the surgeon uses fluoroscopy intraoperatively. The seventh question involved the preference of fixation (solid screws [4.0 or 4.5 mm vs. 3.5 or 3.75 mm], cannulated screws [4.0 or 4.5 mm vs. 3.5 or 3.75 mm], or cortical button), and questions 8 and 9 involved postoperative rehabilitation.

The survey was left on the AOSSM website for 3 months before the responses were tallied. Only completed surveys in which all 9 questions were answered were included in the analysis. Of note, there are a few surgeons who are members of both ASES and AOSSM. Although multiple responses to the survey using the same browser were disabled using a SurveyMonkey feature, it is possible that surgeons who are members of both

societies responded twice using 2 different browsers. A subgroup analysis was then performed to determine whether there were any further trends based on fellowship choice and overall experience. The Fisher exact test (Microsoft Excel; Microsoft, Redmond, WA, USA) was then performed to determine whether there was a clinically significant ($P < .05$) difference in the preference for the Latarjet technique, use of arthroscopy, and use of fluoroscopy between surgeons who completed an SM fellowship and those who completed an SE fellowship. The study was approved by the IRB at our institution.

Results

In total, 244 orthopedic surgeons responded, and 242 (99%) completed the entire survey. The 242 complete responses were analyzed. Of the 242 orthopedic surgeons,133 (55%) completed an SM fellowship, 94 (39%) completed an SE fellowship, 5 completed dual fellowships (SE and SM in 3, hand and SM in 1, and trauma and SM in 1), 4 did not complete a fellowship, 3 completed a hand fellowship, 1 completed a trauma fellowship, 1 completed a pediatric fellowship, and 1 completed an arthroscopy fellowship. Regarding surgical experience, 138 surgeons (57%) indicated being in practice for >10 years, and 110 surgeons (45%) had performed ≥25 Latarjet procedures in their careers (Figs. 2 and 3). Among all surgeons, the classic open Latarjet technique was the strongly preferred method (79%), followed by the open congruent-arc (17%) and all-arthroscopic (3%) techniques. Although only 3% of surgeons stated they performed an all-arthroscopic Latarjet technique, 30% stated they still performed parts of the procedure arthroscopically compared with 50% who stated they did not perform an arthroscopy at all and 19% who stated the decision to perform an arthroscopy was case specific. Only 16% of surgeons stated they routinely used fluoroscopy compared with 79% who did not and 11 surgeons (5%) indicating case-by-case use. The choice of implant for coracoid graft fixation is presented in Figure 4, with variation noted in screw type (cannulated vs. solid) and size, as well as a minority of surgeons opting for alternative implants. Over 85% of surgeons preferred

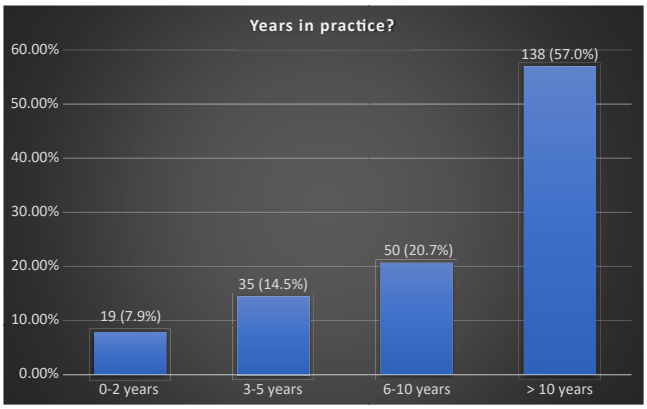

Figure 2 Breakdown of all 242 responses to question 2 of survey: "How many years have you been in practice?"

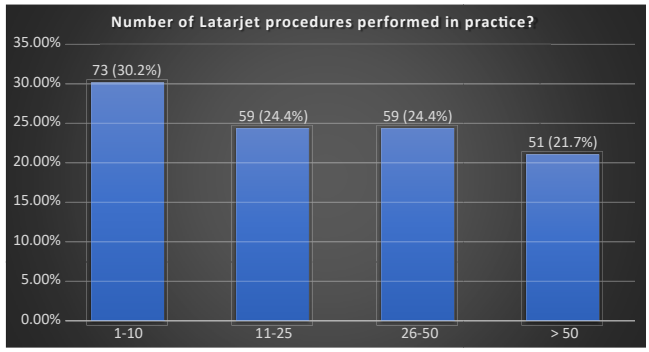

Figure 3 Breakdown of all 242 responses to question 3 of survey: "How many Latarjet procedures have you done in practice?"

immobilization for 3-6 weeks after the procedure (Fig. 5). Finally, regarding clearance to return to full activity including contact or collision sports, 50% of surgeons stated they cleared their patients at between 3 and 5 months and 46% of respondents stated they waited ≥6 months (Fig. 6).

Subgroup analysis was performed regarding surgical preferences with respect to fellowship training in SM vs. SE because these were the 2 most common fellowships performed (94% of overall responses). Surgeons who completed SE fellowship preferred the classic open technique significantly more than SM fellowship–trained surgeons ($P < .001$, Fig. 7). Furthermore, SM fellowship–trained surgeons indicated they performed an arthroscopy during parts of the Latarjet procedure significantly more frequently than SE-trained surgeons ($P < .001$, Fig. 8). Subgroup analysis based on surgical experience showed that surgeons in practice for 0-5 years were significantly more likely to use fluoroscopy than those in practice for >5 years ($P < .001$, Fig. 9). Subgroup analysis did not reveal any difference between fellowship backgrounds with respect to screw type ($P = .54$), screw diameter ($P = .22$), or postoperative rehabilitation ($P = .34$). Finally, there was no difference in the period of sling use postoperatively and the time to return to sport based on surgeon experience ($P = .43$).

Discussion

The Latarjet procedure yields excellent results in cases of large glenoid osseous defects, but there is very little literature on the preferred management of patients undergoing the Latarjet procedure with respect to the method of fixation, postoperative immobilization, and return to activity. In this study, we characterized contemporary Latarjet procedure practices among expert shoulder surgeons, specifically drawing from ASES and AOSSM membership. Our primary findings include an overall preference for the open classic Latarjet technique with an overall preference for screw fixation of the coracoid graft to the glenoid. However, we found significant variability in multiple aspects of

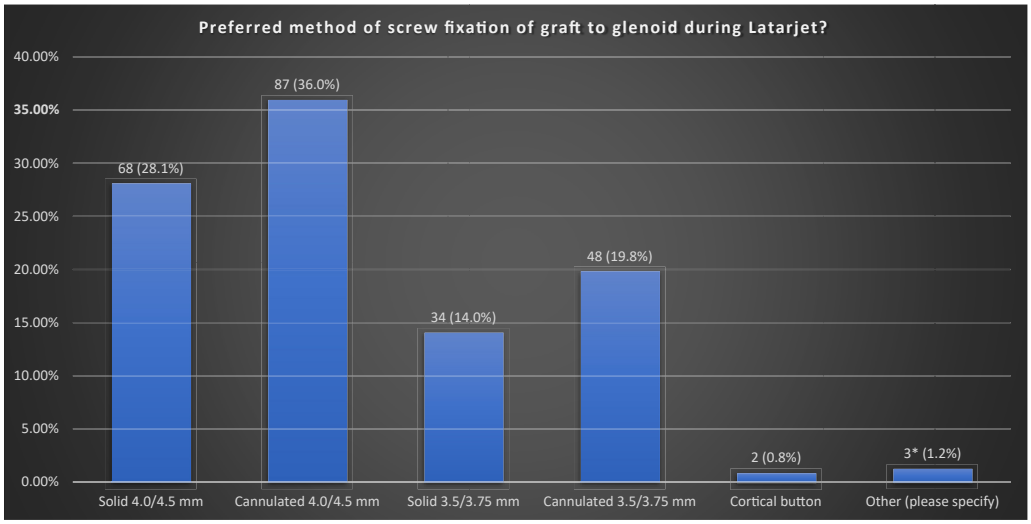

Figure 4 Breakdown of all 242 responses to question 7 of survey: "What is your preferred method of screw fixation for Latarjet transfer?" *The 3 other methods of fixation were as follows: method depends on bone block/coracoid size (n = 1), mini plate (n = 1), and helical nail (n = 1).

surgery and postoperative management. Notable large variations in answers included the period of sling use postoperatively, time before clearance for full-contact activity postoperatively, and use of arthroscopy for parts of the procedure.

In this survey study, the open classic technique was the overwhelmingly preferred technique among orthopedic surgeons, with 79% stating it was their preferred choice. It is interesting to note that this technique was also much more commonly preferred among surgeons who completed an SE fellowship (89%) compared with those who had performed an SM fellowship (63%). Currently, the classic technique and the congruent-arc technique (also referred to as the "modified Latarjet" technique) are the 2 most accepted open Latarjet techniques. During the classic technique, the inferior surface of the coracoid is removed and fixed to the anterior surface of the glenoid. In the congruent-arc technique, the coracoid is simply rotated 90° so that its medial aspect becomes fixed and congruent with the anterior surface of the glenoid (Fig. 1). Theoretical benefits of the congruent-arc technique are a larger surface area to fix to the glenoid and a similar radius of curvature to the glenoid allowing greater anterior humeral translation prior to dislocation. Both procedures are traditionally performed using an open deltopectoral approach to the shoulder. In a comparative biomechanical study between the 2 techniques, Montgomery et al[19] noted an increased surface area

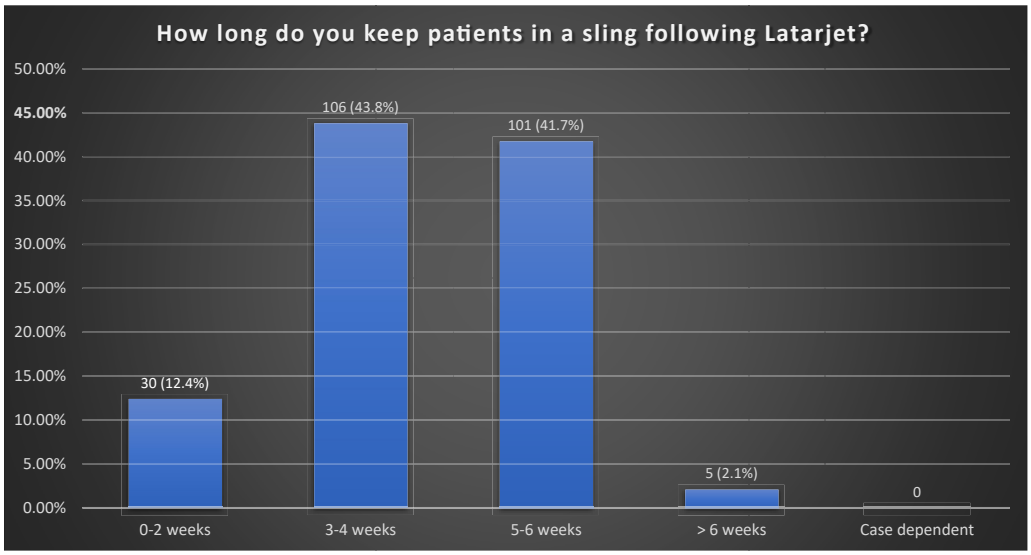

Figure 5 Breakdown of all 242 responses to question 8 of survey: "How long do you keep your patients in a sling following a Latarjet procedure?"

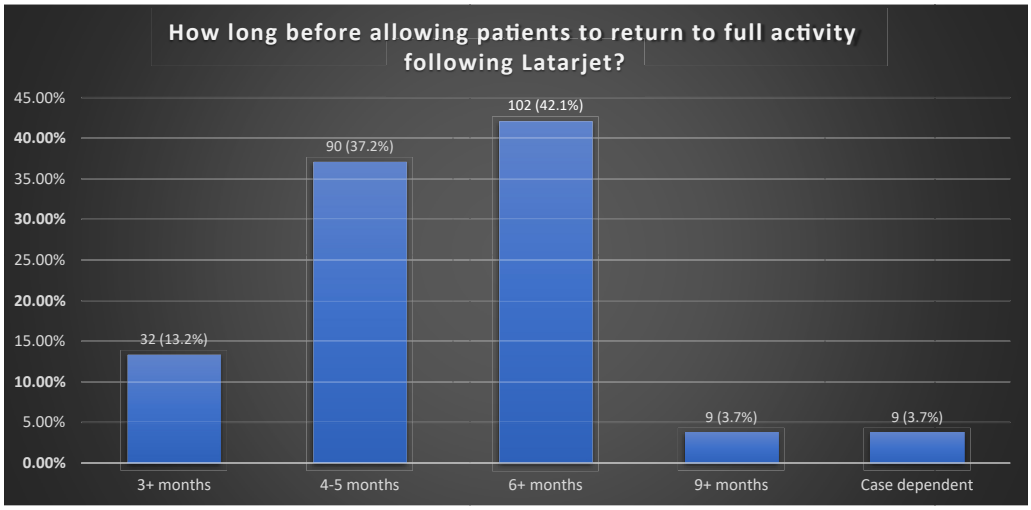

Figure 6 Breakdown of all 242 responses to question 9 of survey: "Assuming an uncomplicated post-operative course, how long before you allow your patients to return to full activity including contact/collision sports following a Latarjet?"

of healing to the glenoid and superior initial fixation with the classic technique but restoration of a larger glenoid defect with the congruent-arc technique. Alternatively, the all-arthroscopic Latarjet technique has been described more recently with the added advantage of smaller incisions but the disadvantage of being a more technically challenging procedure.[17,18]

Several systematic reviews have been performed to determine whether there are differences in clinical, functional, and radiographic outcomes between open and all-arthroscopic Latarjet procedures.[12,14] Horner et al[12] performed a retrospective review of 8 studies, with a total of 580 patients treated in an all-arthroscopic manner and 362 patients treated with an open Latarjet procedure. They noted that patients treated with arthroscopic Latarjet procedures had significantly lower immediate postoperative pain scores but had equivalent pain scores to the open cohort by 1 month postoperatively. Three of the included studies found no significant difference in coracoid graft positioning between the open and arthroscopic Latarjet techniques, and two of the studies found no significant difference in screw divergence angles between the open and arthroscopic Latarjet techniques. Arthroscopic procedures were noted to take, on average, 20 minutes longer than open procedures, but open procedures had twice the complication rate (6.4% vs.

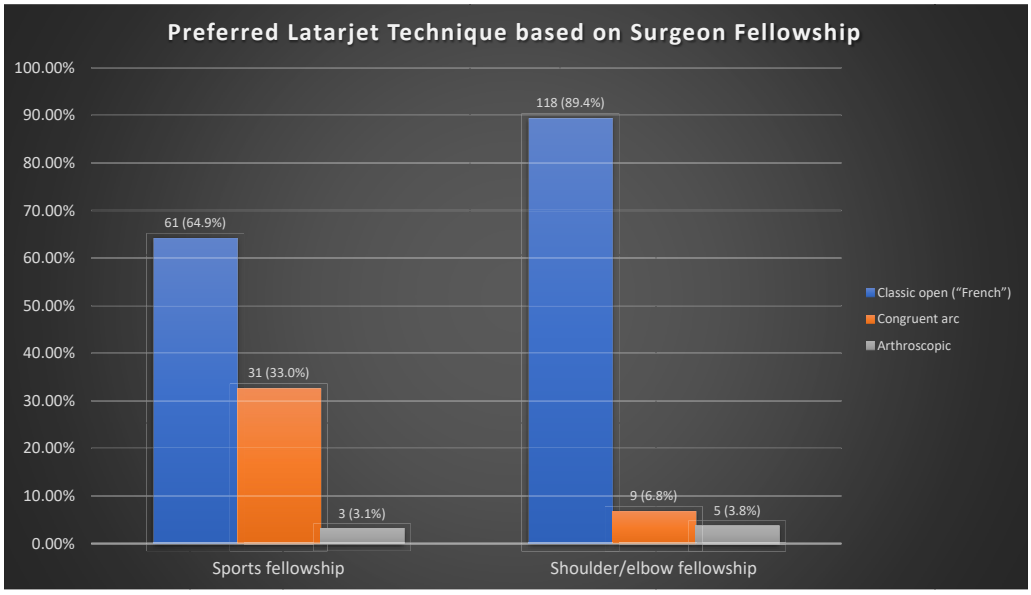

Figure 7 Breakdown of preferred Latarjet technique based on type of fellowship. Only surgeons who completed a sports medicine fellowship (n = 94) or shoulder and elbow fellowship (n = 133) were included because these 2 fellowships comprised 93.8% of responses to question 1.

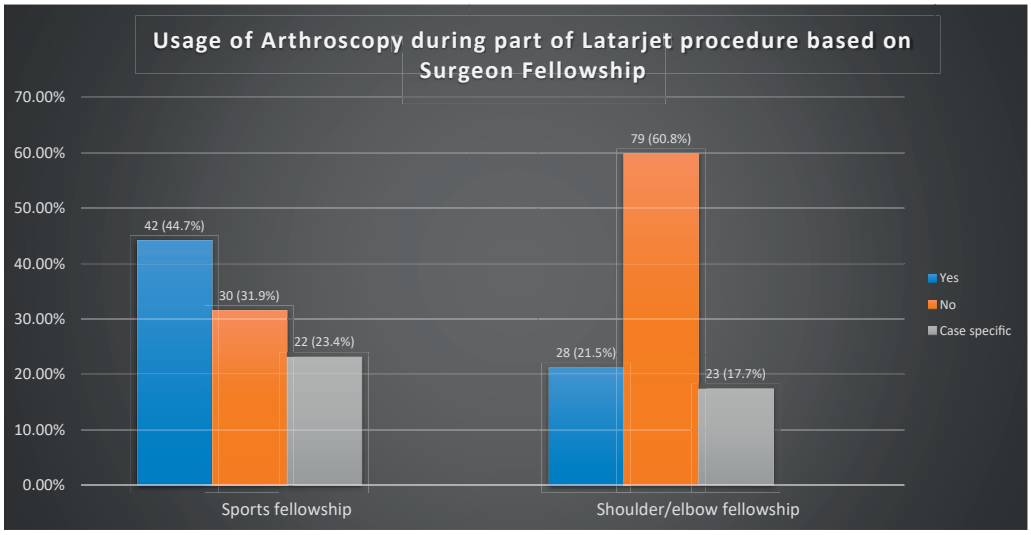

Figure 8 Performance of arthroscopy during part of Latarjet procedure based on type of fellowship. Only surgeons who completed a sports medicine fellowship (n = 94) or shoulder and elbow fellowship (n = 133) were included because these 2 fellowships comprised 93.8% of responses to question 1.

3.8%). Furthermore, a recent study by Valsamis et al[23] noted that surgeons require between 30 and 50 arthroscopic Latarjet procedures to improve their operative efficiency as well as their graft positioning. As such, the authors recommended that only those specialty surgeons who perform very high volumes of Latarjet procedures adopt the arthroscopic technique. It is important to note that 80% of the respondents to our survey indicated having performed ≤50 Latarjet procedures in their careers and, as such, are most likely still mastering the open procedure prior to switching to the all-arthroscopic technique.

In our survey study, although an all-arthroscopic procedure was performed only 3% of the time, 30% of the respondents stated they used arthroscopy for part of the procedure. The latter notion was much more pronounced in those who completed an SM fellowship (44%) than in those who completed an SE fellowship (21%) ($P < .001$, Fig. 8). The reported benefits of performing an arthroscopy just prior to performing an open Latarjet procedure have been previously studied.[3] Arrigoni et al[3] performed a retrospective study of 33 patients who underwent an arthroscopy just prior to an open Latarjet procedure in the same surgical setting. They noted that 73% of the patients had associated lesions identified and addressed arthroscopically that were likely to have been missed if an open-only procedure had been performed (including 21 superior labrum anterior-

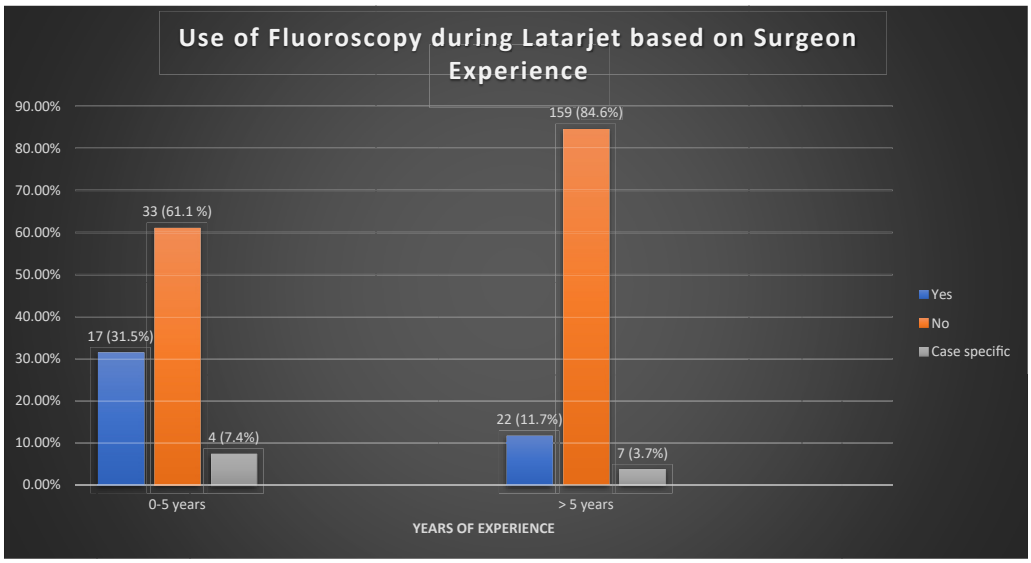

Figure 9 Use of fluoroscopy during Latarjet procedure based on years in practice. Responses to question 2 were separated into 0-5 years (n = 54) and >5 years (n = 188), and a subgroup analysis was performed.

posterior [SLAP] lesions, 2 rotator cuff tears, 2 loose bodies, and 1 posterior Bankart lesion). It is interesting to note that the small minority of surgeons performing an all-arthroscopic Latarjet procedure (3% total) was roughly the same in the SM and SE groups in our study.

There are a wide range of accepted methods for coracoid-to-glenoid fixation during the Latarjet procedure. In our survey study, 98% of the respondents preferred screw fixation (56% cannulated and 42% solid), with only 2 surgeons selecting cortical button fixation. Of the surgeons who preferred screw fixation, 65% preferred larger-diameter screws (4.0 or 4.5 mm) compared with 35% who opted for 3.5- or 3.75-mm screws. Although traditional fixation with solid and cannulated screws remains popular, the cortical button has also received interest over the past several years. The cortical button has been noted to have similar biomechanical strengths to screw fixation regarding the coracoid bone stock, with theoretically decreased risks of hardware prominence and graft fracture.[16,20] However, Hardy et al,[11] in a retrospective comparative study, noted a statistically significantly increased risk of recurrent anterior dislocation in patients who underwent the Latarjet procedure with cortical button fixation compared with screw fixation. The pullout strength and cycles to coracoid graft failure between solid and cancellous screws have also been previously studied.[2] Alvi et al[2] performed a biomechanical study to determine the strength of stainless steel 3.5-mm solid screws vs. stainless steel 4.0-mm cannulated screws with respect to cycles to graft failure of the coracoid graft. They noted no difference between 3.5-mm solid and 4.0-mm cannulated screws regarding coracoid graft failure.

Regarding the return to sports following the Latarjet procedure, 13% of the survey respondents stated they would clear their patients to return to sport at 3 months postoperatively, 37% stated they would wait 4-5 months, and 46% stated they would wait $\geq$6 months. There was no difference with respect to return to sport following the Latarjet procedure based on the fellowship training of the surgeon. This wide variation in return to play following the Latarjet procedure is consistent with the current literature. Hurley et al[15] looked at 2134 total cases with a mean follow-up period of 83.5 months and noted that the overall rate of return to play was 88.8%, with 72.6% of patients returning to the same level of play; the mean time to return to play was 5.8 months. They noted a wide range of 3.2-8 months in this cohort. For comparison, a recent systematic review noted return-to-sport rates of 97.5% and 86.1% after arthroscopic and open Bankart repair, respectively, with a mean return-to-play time of 5.9 months after arthroscopic Bankart repair and 8.2 months after open Bankart repair.[1] Overall, we believe the large variation in return to play following the Latarjet procedure reflects a lack of validated criteria-based postoperative Latarjet rehabilitation protocols.

We are aware of the limitations to our survey study. It is unclear what percentage of surgeons viewed the survey on the AOSSM website compared with the number who filled it out, and as such, the complete response rate is not able to be calculated. There are a few surgeons who are members of both ASES and AOSSM. Although multiple responses to the survey using the same browser were disabled using a SurveyMonkey feature, it is possible that surgeons who are members of both societies responded twice using 2 different browsers. In addition, there are a large number of surgeons who are members of one or both societies who do not perform the Latarjet procedure in practice. As such, a calculated rate of response to the survey will not be able to decipher the number of members who do not perform the Latarjet procedure from the number of surgeons who perform the procedure but did not fill out the survey. Furthermore, the answer choices for each question were picked based on existing literature, and thus, surgeons filling out the survey may have simply selected the answer choice that most closely resembled their practice rather than choosing to write out a separate response. In addition, a power analysis was not performed to determine whether the appropriate number of responses was obtained to determine differences across variables. Finally, although this study presents a snapshot of the current variety of techniques and postoperative rehabilitation protocols among different surgeons, it does not reveal any information regarding patient outcomes or complications following the procedure with respect to specific techniques or rehabilitation protocols.

Conclusion

The results of our survey study indicate an overall strong preference for the open classic Latarjet technique as well as an overall strong preference for screw fixation of the coracoid graft to the glenoid among all surgeons. Furthermore, SE fellowship–trained surgeons were significantly more likely to perform open surgery with a classic technique compared with SM fellowship–trained surgeons. There were significant variations in the period of postoperative sling use, time before postoperative clearance to return to full-contact activity, and use of arthroscopy for parts of the procedure among surgeons. The arthroscopic Latarjet technique is an evolving surgical procedure that requires a large learning curve, and it is possible that future survey studies would reveal a larger transition from the open technique to the arthroscopic technique. Future studies should also focus on helping validate a postoperative rehabilitation protocol to identify the length of postoperative sling use, as well as time before clearance to return to full activity and contact sports.

Disclaimer

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Supplementary Data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jse.2020.07.027.

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