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ORIGINAL STUDY

The latarjet procedure for anterior shoulder instability: a consecutive prospective series of 50 cases

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The Latarjet is a successful primary and revision option for anterior shoulder instability. However, recent reports have highlighted varying complication rates. Our study prospectively collected clinical, functional and radiological outcomes of patients undergoing the procedure.

Forty-eight consecutive patients (fifty shoulders) underwent the Latarjet procedure in a single UK centre. Clinical, radiological and functional follow-up was performed.

Mean clinical follow-up was 32 months and radiological follow-up 20 months. 95% shoulders were subjectively graded "excellent" or "good" and 5% "fair". Mean Rowe, Oxford Shoulder Instability Score, American Shoulder and Elbow self-assessment Score and Subjective Shoulder Value Score all improved post-operatively ($p<0.001$). No infections, dislocations, revisions or metalwork-related complications occurred. There was one intra-operative coracoid fracture and five transient neurological injuries, resolving within three months. The long-term complication rate was 2%.

The Latarjet procedure is safe and reliable for treating anterior shoulder instability with a very low long-term complication rate providing excellent clinical and functional outcomes.

Keywords : Latarjet ; shoulder ; instability ; complications.

INTRODUCTION

Recurrent anterior shoulder instability can be treated with anatomical and non-anatomical surgical techniques. The Latarjet procedure is a non-anatomical osseous operation that can be used in the primary or revision setting. It involves the transfer of the coracoid process with attached conjoined tendon to the antero-inferior glenoid process *(13,14)*. The detached coracoid is laid flat on the neck of the scapula and secured with screws. Anatomical soft tissue procedures such as 'Bankart' repairs involve reconstructing the avulsed capsule and repairing the labrum to the glenoid rim *(2)*. However, the Latarjet procedure has been argued to be more reliable than an anatomical capsulo-labral repair *(3)*.

There is limited evidence describing the short-term complications encountered after the Latarjet procedure, hindered further by various modifications of the surgical technique. Some reports have shown low complication rates (5-7%) although these did not disclose neurological injury *(1,4)*. Others have reported the risk of nerve damage being as high as

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10% *(22)*. There is also a range of re-dislocation rate from 0 to 20% *(21,24)*.

Several studies have begun to redress this assumed under-reporting of complications following the Latarjet procedure. Shah et al. *(22)* reported an overall complication rate of 25% and Butt et al. *(5)* a 27% incidence of post-operative complications. Our aim was to prospectively study clinical, functional and radiological outcomes and to record all complications of patients undergoing the Latarjet procedure over a six-year period in a single UK centre.

METHODS

Forty-eight patients underwent fifty consecutive Latarjet procedures at a single UK centre between 2006 and 2012. All procedures were performed by the senior author. Indications for surgery were anterior glenohumeral instability with evidence of glenoid bone deficiency greater than 25%, an engaging Hill-Sachs lesion or a previously failed arthroscopic or open anterior capsular procedure.

Patients were followed up clinically, complications documented and range of movement recorded at six weeks, three months, six months and one year and then annually. Jobes anterior apprehension test was performed post-operatively to evaluate residual anterior instability *(11)*. Range of movement was recorded by the patient on a visual chart and compared to the contralateral arm by the reviewing clinician (Diagram 1). Radiographs were also taken at the time intervals above. Radiographic union was defined as no radiolucent lines visable in two planes. Radiographs were also assessed for signs of arthritis using the Samilson scale *(20)*. Pre and post-operative functional assessment involved using a modified Rowe score, the Oxford Shoulder Instability Score (OSIS-new), the American Shoulder and Elbow self-assessment score (ASES), and the Subjective Shoulder Value score (SSV) *(18,19)*.

Data was collected and analysed in Microsoft Excel. Statistical analysis was performed in SPSS. Two tailed t tests were used to calculate p values associated with comparisons between variables (mean values) and a p value of <0.05 was considered statistically significant for all comparisons.

All fifty (100%) cases had clinical follow-up with forty-one (82%) achieving combined clinical, radiological and functional follow-up. Isolated functional and radiological follow up was achieved in forty-one (82%) and forty-two cases (84%) respectively. Mean clinical follow up was 32 months (range 6-74) and mean radiological follow up was 20 months (range 2-74).

Mean age was twenty-seven years (range 17-63) and forty-eight (96%) shoulders were male. Forty-five (90%) were right hand dominant and twenty-six (52%) of the operations were right-sided. Seven (14%) patients were military personnel or professional athletes. Forty-seven (94%) shoulders had polar type 1 instability and 6% had type 2 instability *(16)*. Eight (16%) were undergoing revision surgery (7 previous arthroscopic Bankart repairs, 1 open capsular shift). Thirty-three (66%) had a preoperative arthroscopy that diagnosed significant glenoid bone loss or an engaging Hill-Sachs lesion. The remaining patients were either revision procedures (16%) or had significant bone loss diagnosed by preoperative imaging.

The technique used corresponds to that described by Edwards and Walch *(8)*, which is an adaptation of Latarjet's original descriptions *(4,5)*. The patient was placed in the beach-chair position, under general anesthesia with an interscalene block. An 8cm anterior incision was made and a deltopectoral approach was performed. The coracoacromial ligament was released from the lateral border of the coracoid and the pectoralis minor tendon was released from the medial border. The osteotomy was made as close as possible to the base of the coracoid at its insertion into the scapular neck using a bent oscillating saw. The undersurface of the coracoid was then flattened using the same saw. The dimensions of each coracoid graft were measured and recorded. A single 4.5 mm hole was drilled at the mid-point of the harvested coracoid from the deep to the superficial surface. The coracoid with the attached conjoined tendon was then mobilized to allow a tension-free transfer. The subscapularis tendon was divided horizontally between the superior third and inferior two thirds, taking capsule and tendon in the same layer by sharp dissection. One pointed retractor was inserted between the

capsule and the superior part of the subscapularis immediately medial to the palpated joint line as cranially as possible. A second pointed retractor was then positioned between the subscapularis and capsule at the inferior aspect of the scapular neck. The capsule was incised horizontally in the line of the subscapularis tenotomy. A humeral head retractor was inserted into the glenohumeral joint, the humeral head reclined, and the antero-inferior region of the glenoid rim was identified. Using the "clock face" terminology, the labrum and capsule between 3 and 6 o'clock were resected, and all soft tissue and periosteum was removed from the anterior aspect of the scapular neck, to leave a bleeding bony bed. The prepared coracoid was then laid flat on the anterior aspect of the scapular neck so that the lateral border of the coracoid was flush with the anterior aspect of the glenoid rim. With the graft in situ, a 3.2mm drill bit was placed through the previously drilled 4.5mm hole in the coracoid in order to prepare the hole in the scapular neck. The screw length was then measured, recorded, tapped and the appropriately sized single large fragment 4.5 mm screw (Synthes, Paoli, Pennsylvania) introduced to secure the coracoid in position. The lateral part of the subscapularis split was closed with one absorbable suture and the wound was closed in layers.

The patient began assisted range of motion immediately post-operatively and wore a sling for comfort only for the first two weeks. The need to avoid combined abduction or external rotation for the first six weeks was stressed to the patient and physiotherapist.

Radiographic examination was performed at six weeks at which point active strengthening exercises were started. At the end of the third postoperative month patients were allowed to return to contact sport training.

RESULTS

There was only one permanent complication: one patient (2%) had recurrent episodes of subluxation, defined as recurrent positive apprehension testing post operatively. 5 patients (10%) noticed transient neurological symptoms all of which completely recovered within 3 months (clinically three musculocutaneous nerves, one radial nerve and one ulnar nerve). No metalwork irritation, fractures or failures were identified. One intra-operative coracoid fracture occurred, fixed intra-operatively with a variable pitch screw. There were no surgical site or deep infections, re-dislocations or re-operations in this case series.

98% of patients considered their surgery to be successful and 95% would recommend their surgery to a friend. 95% of patients subjectively graded their surgical outcome as "excellent" or "good", 5% were graded "fair" (the patient with recurrent subluxation).

When compared to the contralateral side post-operatively, 42% of patients demonstrated full external rotation (ER), 40% had reduced ER by 10-20°and 18% were reduced by 20-30°, whereas full combined forward flexion was achieved in 90% patients (Table I).

No patients had pre-operative osteoarthritis on x-rays; one patient at 2 years postoperatively demonstrated Samilson grade 2 arthritic changes *(20)*. 15 (30%) patients had coracoid non-union and 3 (6%) had coracoid lysis. All patients with lysis had non-union of the coracoid. Despite the radiological appearance, only one patient with non-union rated their operation not successful and that they would not recommend their surgery. The remaining patients with non-union still rated their outcome as good or excellent. With such good subjective follow-up from these patients radiological non-union was not classified as a complication.

Mean screw length was (range 34-56 mm) with the mean coracoid dimensions measured during surgery to be 29 x 19 x 15 mm.

All functional scores significantly improved post-operatively ($p < 0.01$). Mean OSIS, ASES, Rowe and SSVS scores all increased from 20 to 43 (OSIS), 58 to 95 (ASES), 34 to 88 (Rowe) and 47 to 89 (SSVS) respectively (Table II).

Mean return to work time was 89 days (range 1-365), return to driving was 37 days (range 7-112), complete pain relief was 13 days (range 7-112) and mean time until sleeping through the night was 10 days (range 1-84).

Table I. — Post-operative clinical range of movement

	Post-operative N = 50
Combined Flexion Full	45 (90%)
Combined Flexion 20° From Full	4 (8%)
Combined Flexion 45° From Full	1 (2%)
Combined Flexion To Shoulder Height	0
External Rotation Full	21 (42%)
External Rotation 10-20°From Full	20 (40%)
External Rotation 3 20-40° From Full	9 (18%)

Table II. — Pre-operative and post-operative functional shoulder score

	Pre-operative score N=41	Post operative score N=41	Statistical significance
Mean OISS new (range)	20 (18 – 22)	43 (41 – 45)	P < 0.01
Mean ASES (range)	58 (50 – 66)	95 (92 – 98)	P < 0.01
Mean ROWE (range)	34 (0 – 90)	88 (40 – 100)	P < 0.01
Mean SSVS (range)	47 (39 – 55)	89 (84 – 93)	P < 0.01

83% (34/41) of patients returned to sport at their pre-injury level, including professional sport. When the remaining group of 7 patients (17%) where questioned further as to the reasons for not returning to sport, 7 reported a fear of further injury or dislocation despite the absence of any symptoms, 5 had on-going pain preventing participation and two were no longer participating in sport due to a restricted range of movement.

DISCUSSION

The permanent postoperative complication rate of 2% in this case series from a large UK centre is lower than previously suggested by Shah et al. *(22)* and compares favorably with the majority of published work in this area *(5,6).* The redislocation rate following surgery was 0% with only one (2%) patient complaining of continuing subluxation: however, this patient reported no pain and rated their surgical outcome as excellent. Our reported instability rate is comparable to the 1% by Edwards and Walch *(8)* but is lower than the 4% rate by Schmid et al. *(21)* and 5% documented by deBeer et al. *(6)*. A systematic review published in 2012 demonstrated a subluxation rate of 2% and a 6% recurrent instability rate *(5)*.

There were no metalwork failures and no complaints of metalwork irritation. One intra-operative coracoid fracture occurred: the fracture was immediately reconstructed and the procedure continued uneventfully, with clinical follow-up revealing no signs of recurrent instability or further complications. Interestingly Edwards et al. *(8)* demonstrated a reduced coronoid fracture rate by avoiding the use of a 4.5 mm cortical screw: this was the exact screw size used in all the patients in this series. The 2% intra-operative fracture rate was higher than the 1.1% rate in the series of 1658 patients reported by Butt et al. *(5)* but hardware complications were much less in our study (none) compared to 6.5%.

5 (10%) patients developed a neuropraxia post-operatively, diagnosed clinically as musculotanous nerve *(3)*, radial nerve *(1)* and ulnar nerve *(1)*. All 5 cases completely resolved within 3 months and all 5 patients rated their surgical outcomes as good or excellent (100%). There were no long-term nerve injuries in this study, similar to the results of a comparable sized series by Henry et al. *(9)*. A systematic review demonstrated a low (1.2%) rate of neuropraxia *(5)*. However Ho et al. (10) found an 8% rate of nerve injury: 3% had a diffuse plexopathy affecting multiple nerves, 3% had a well defined nerve deficit and 2% had poorly localising sensory lesions. The nerves affected were the musculotanous nerve, axillary nerve and the radial nerve, with the musculocutaneous nerve being most frequently affected. Traction was felt to be the major cause of this neuropraxia and a further case series of similar numbers mirrored this by demonstrating a neuropraxia rate of 10% with a 4% long-term nerve injury rate *(15)*.

Table III — Pre-operative and post-operative functional shoulder scores in complications group

	Pre-operative score complication group N=5	Post operative score complication group N=5
Mean OISS new (range)	22 (12 – 31)	45 (43 – 46)
Mean ASES (range)	55 (24 – 90)	96 (92 – 100)
Mean ROWE (range)	27 (0 – 55)	95 (80 – 100)
Mean SSVS (range)	38 (20 – 60)	94 (90 – 99)

Non-union of the coracoid occurred in 15 (30%) patients with 3 of those patients also demonstrating lysis. Despite the non-union appearance on x-ray, all these patients reported good or excellent functional results: this finding chimes with the results of deBeer et al. and Edwards et al., both of whom noted that nonunion was relatively common but was not associated with a poor functional result (6,8). CT scanning is regarded to be the gold standard for detecting non-union but was not used in this study as the senior author felt that the cost and radiation exposure were unwarranted.

All patients sustaining complications (one subluxation, five neuropraxias and one intraoperative fractures) achieved good surgical results. Two of these patients only completed clinical but not functional and radiological follow up (one neuropraxia and one intraoperative fracture). However, of the remaining 5 in this group 60% rated their surgical result as excellent and 40% as good. All of these patients would recommend surgery to a friend and all rated the surgery a success. Interestingly this group's mean functional scoring outcomes were higher than the group without complications (Table III).

Osteoarthritis was detected in one patient following surgery – Samilson grade 2. It has been argued that there is an increased risk of development of osteoarthritis following a Latarjet procedure if the coracoid is placed too laterally on the glenoid neck creating "over hang" *(1)*. Worse function has been associated with the development of osteoarthritis but there has been no correlation between the loss of external rotation postoperatively and the development of osteoarthritis *(1)*. Following a cohort of 58 patients over a mean time period of 14.3 years, Allain et al. found Samilson arthritis grade 2 or greater in 19% of patients *(1)*. Spoor et al. found a 5% rate of osteoarthritis (Samilson grade 2) in the 19 patients followed up for a mean period of 7.7 years *(23)*. The patients in this paper also had similar arthritic changes in the opposite shoulder. Ladermann et al. reviewed 117 patients who underwent a Latarjet procedure with a mean follow up of 16.2 years and found a 6% rate of Samilson grade 2 or above *(12)*.

83% of patients returned to sport at their pre-injury level following surgery. Murray and McBirnie presented 120 arthroscopic Bankart repairs for recurrent instability *(17)* with only 51% returning to sport. Our study demonstrates a higher return to sport following an osseous procedure compared to soft tissue stabilization: this has not been previously demonstrated in the literature.

CONCLUSION

This case series demonstrates an overall complication rate of 14% but with a low long-term complication rate for the Latarjet procedure of 2%. The authors believe the Latarjet procedure to be a safe and reliable operation providing excellent clinical and functional outcomes and would recommend it as a treatment option for recurrent anterior shoulder instability.

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