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The modified Latarjet procedure in female patients: clinical outcomes and complications

Jean-Pierre du Plessis, FCS SA Orth[a,b,c,*], Robert P. Dachs, FCS SA Orth[a], Basil C. Vrettos, FRCS Eng[a,c], David Maasdorp, MBChB[a], Joseph M.A. Oliver[a], Saralee C. Curtis[a], Stephen J.L. Roche, FCS SA Orth[a,c]

[a]*Department of Orthopaedic Surgery, University of Cape Town, Groote Schuur Hospital, Cape Town, South Africa*
[b]*Department of Orthopaedic Surgery, New Somerset Hospital, Cape Town, South Africa*
[c]*Life Orthopaedic Hospital, Cape Town, South Africa*

Background: The aim of this study was to assess the short- and medium-term complications and clinical outcomes of female patients after a modified Latarjet procedure. A review of the literature was also conducted for outcomes of the modified Latarjet procedure in female patients and differences reported between male and female patients.

Method: We retrospectively reviewed the clinical notes of all female patients who had modified Latarjet procedures from 2001 with at least 1 year of follow-up. Patients were interviewed for an Oxford Shoulder Score, Western Ontario Shoulder Instability Index, Oxford Shoulder Instability Score, and subjective shoulder value. A literature review was performed of the electronic database PubMed; 343 papers were assessed for clinical outcomes based on gender.

Results: Twenty-nine patients were available for inclusion in the study. There were 13 complications in 11 patients (34%). The median postoperative Western Ontario Shoulder Instability Index score was 433; Oxford Shoulder Score, 42; and Oxford Shoulder Instability Score, 36. The median subjective shoulder value was 87%. Of these patients, 37.5% returned to sport. The reoperation rate was 13.8%. We found no literature reporting the outcomes of the modified Latarjet procedure in female patients.

Conclusion: There are no published data comparing outcomes of the modified Latarjet procedure in male and female patients. Female patients had a lower postoperative return to sport and shoulder scores after the modified Latarjet procedure compared with literature reports. Whereas female gender should not be a contraindication to the Latarjet procedure, selection of patients in this group may need to be more stringent.

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

Keywords: Latarjet procedure; clinical outcomes; complications; female gender; shoulder instability; shoulder dislocation

The incidence of shoulder dislocations in female patients varies according to the population group being assessed. Many epidemiologic studies focus purely on high-risk populations, which are predominantly male.[18] A recent epidemiologic study looking at the incidence of shoulder dislocations in rugby players in France reported 1317

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*Reprint requests: Jean-Pierre du Plessis, FCS SA Orth, PO Box 897, Howard Place, 7450 Cape Town, South Africa.

E-mail address: jp@shoulderelbow.co.za (J.-P. du Plessis).

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dislocations in men and 28 in women, giving an incidence of 10/10,000 in men and 5/10,000 in women. This study looking at a predominantly male contact sport obviously does not reflect the general population.[5] Whereas young men have the highest risk of primary anterior shoulder dislocation requiring closed reduction and recurrent dislocation,[20,24] in the general population, female patients make up between 25% and 28.2% of primary anterior shoulder dislocations. Female patients are reported to have a higher median age at primary dislocation (49-54 years) compared with men (30 years). Young men have a 6.7 times greater incidence of primary anterior shoulder dislocation; overall, men had a 2.8 times higher incidence of primary dislocation.[20,21,31] In adolescent patients aged 10-16 years, female patients made up 20% of all primary anterior shoulder dislocations.[19] This illustrates that significant numbers of female patients have anterior shoulder dislocations.

The modified Latarjet procedure is well proven to stabilize recurrent anterior shoulder instability, with recurrence rates of <1% reported.[28,30] It has been suggested to provide superior results to soft tissue stabilization in patients with bone loss,[6,7] in patients playing contact or competitive sports, and in those with ligament laxity.[2] Recent literature has highlighted that it is not without complications, however.[12-14,26] The Instability Severity Index Score gives guidance in deciding who will or will not benefit from an arthroscopic stabilization and therefore when an open procedure may be indicated,[2] but there is little information about contraindications to a modified Latarjet procedure and which patients may do worse with this procedure. There is some evidence that complications may be more severe in patients who are epileptic or those who abuse alcohol or drugs.[12] Outcomes in terms of redislocation are also not as good in epileptic patients who have had the modified Latarjet procedure.[25] There is little evidence relating to outcomes and complications in other groups of patients. It seems that with the increased reports of complications after the modified Latarjet procedure, there is a need to narrow our selection of patients further to try to identify which patients benefit most from this procedure and in which patients it should be avoided.

In our practice, we noticed that a number of our female patients did not respond well to the modified Latarjet procedure. With this in mind, we undertook to review the clinical results of the female patients in our practice who had undergone the modified Latarjet procedure. We also searched the literature for outcomes in female patients with which we could compare our results.

Materials and methods

Clinical review

The databases of the 3 senior surgeons were reviewed to identify female patients who had undergone the modified Latarjet procedure. Patients included had undergone the anterior shoulder stabilization surgery between 2001 and 2014; this allowed at least 1 year of follow-up.

Thirty-two patients were identified. Twenty-nine patients had adequate clinical notes (91%) that allowed inclusion in the study. Nineteen patients were able to be contacted for a full telephone interview (60%). Ten were not able to be contacted, and so only their latest clinical notes were available for use. Three (9.4%) patients were lost to follow-up.

Patients identified were interviewed by telephone to complete the Western Ontario Shoulder Instability Index (WOSI) score, Oxford Shoulder Instability Score, and Oxford Shoulder Score and to provide a subjective shoulder value. These scores were completed by telephone or where possible by e-mail. The WOSI score has been shown to be one of the most reliable, valid, and responsive scores for assessing shoulder instability. The other scores were included to assess outcomes in areas other than instability.

Patients were not subjected to further radiologic investigation specifically for this study. All patients had routine follow up radiographs at 6 weeks postoperatively. Symptomatic patients had further radiologic studies only if required. Radiologic complications were documented only in symptomatic patients. Bone resorption and healing were assessed in these patients using plain radiographs of the shoulder. They were assessed on 3 views, the anteroposterior, lateral, and modified axillary views.

The average age at first dislocation was 27.6 years (range, 11-47 years). The average age at which they had the modified Latarjet procedure was 37.2 years (range, 20-66 years); 78.3% of patients had the modified Latarjet procedure on the dominant arm. Preoperatively, 16 patients played sport (55%); 6 patients played >1 sport.

A number of patients had medical comorbidities that may affect outcomes in instability surgery.[12] Three patients were epileptic, 2 patients had documented alcohol problems, and 1 of the epileptic patients also had problems with drug abuse. Our policy is to operate only on epileptic patients who are seizure free for at least 3 months and are under the care of a neurologist.

The indication for the modified Latarjet procedure was recurrent anterior instability in patients playing contact sport, those with significant bone loss (defined as anterior glenoid bone loss of >10% or a Hill-Sachs lesion of >20%), and those with a failed soft tissue stabilization procedure. Bone loss was assessed by arthroscopic examination or on preoperative computed tomography (CT) scan. A failed soft tissue stabilization was the indication in 4 patients.

In all cases, the operation was performed by a fellowship-trained shoulder surgeon or a fellow under direct supervision. The surgical technique of the modified Latarjet procedure is that described by Walch and Boileau.[28] A relatively low beach chair position was used with the patient at 45° to the horizontal. The approach was through an anterior axillary incision and the deltopectoral interval. The coracoid was harvested as close to the base as possible, leaving the coracoclavicular ligaments intact. The graft was prepared on the inferior surface, removing soft tissue and decorticating the bone. In all cases, the axillary and musculocutaneous nerves were checked to confirm their position, and they were protected throughout the procedure. The glenohumeral joint was then approached through a subscapularis split at the junction of the superior two-thirds and the inferior third. The anterior glenoid was prepared, and the graft was fixed in position using 2 screws. The articular surface of the glenoid was visualized to confirm that there were no screws in the joint and also to confirm that the placement of the graft was not too lateral. The capsule and tendon of the subscapularis were closed. Hemostasis was achieved, and the wound was closed. After the operation, the patients were placed in a shoulder immobilizer for comfort and allowed to begin range of motion exercises guided by pain. Positions

of abduction and external rotation were avoided for 6 weeks, and contact sport was allowed from 4 months postoperatively.

Statistical analysis was carried out with the help of the University of Cape Town statistics department. Data from shoulder scores were analyzed using a Wilcoxon rank sum test for nonparametric data. Statistical significance was defined as a P value of $\leq .05$. In analyzing the clinical outcomes scores, the median was used as opposed to the mean because the numbers were relatively small and it was thought that the median would give a more representative figure, less affected by the outliers.

Literature review

We searched the electronic database PubMed for literature reporting clinical outcomes in patients who had undergone the modified Latarjet procedure. Words searched were "Latarjet procedure," "coracoid transfer," and "glenoid bone loss instability." We also searched the references of these papers for relevant literature.

Results

Clinical outcomes

Complications

In our study group, there were 13 complications in 11 patients (34%). Four patients had prior soft tissue stabilizations; only 1 of these developed a complication.

Recurrent instability

Seven patients had complications related to persistent instability; 4 patients had recurrent dislocations, 1 patient had a recurrent subluxation, and 2 patients were persistently apprehensive (both subjectively and with the anterior apprehension test result positive on clinical examination).

Other complications

Two patients were symptomatic with graft-related complications. One had a graft fracture and 1 had graft resorption resulting in pain.

Neurologic complications were seen in 2 patients; both of these patients had diffuse plexopathies with nondermatomal pain and altered sensation in the arm and hand. The symptoms resolved completely in 1 patient. Although they improved in the other patient, there were still some residual symptoms at final follow-up.

There was a superficial wound infection in 1 patient. This cleared up after a 2-week course of antibiotics (flucloxacillin).

Outcome scores

Median outcome scores and ranges are listed in Table I.

The scores in patients who had had complications were worse compared with the group of patients who did not develop complications. All scores except the WOSI score reached statistical significance in this regard (Table II).

The worst outcomes as evidenced by all the scores were in the patients who had complications related to recurrent instability after the Latarjet procedure. The only score in which this was not significantly different was the Oxford Shoulder Score. This score reflects general shoulder function rather than specifically focusing on instability (Table III).

Table I Median outcome scores and ranges

Scores	WOSI	OSIS	OSS	SSV
Median	433	36	42	87%
Range	63-1927	12-47	33-48	5%-100%

WOSI, Western Ontario Shoulder Instability Index; *OSIS*, Oxford Shoulder Instability Score; *OSS*, Oxford Shoulder Score; *SSV*, subjective shoulder value.

Table II Median scores in patients who developed complications compared with those patients who did not develop complications

	WOSI	OSIS	OSS	SSV
No complications	390	41	44	90%
Complications	910	29	37	70%
P value	.09	.05	.03	.05

WOSI, Western Ontario Shoulder Instability Index; *OSIS*, Oxford Shoulder Instability Score; *OSS*, Oxford Shoulder Score; *SSV*, subjective shoulder value.

Table III Median outcome scores for patients with complications related to instability compared with those who developed other complications or had no complications

Complications	WOSI	OSIS	OSS	SSV
Recurrent instability	980	26	39	70
Other	383.5	42	37.5	90
None	390	41	44	90
P value	.02	<.01	.14	<.01

WOSI, Western Ontario Shoulder Instability Index; *OSIS*, Oxford Shoulder Instability Score; *OSS*, Oxford Shoulder Score; *SSV*, subjective shoulder value.
The *P* value in this case compares those who had recurrent instability with the other 2 groups.

Reoperations

Four patients required subsequent surgery after the modified Latarjet. This gave a reoperation rate of 13.8%.

An Eden-Hybinette procedure was done in 3 patients for recurrent dislocations. Although all 3 patients stabilized after the procedure, 1 patient remained unhappy with the result. She reported continued pain and loss of function, and her final subjective shoulder value was 5%.

One patient had a scope and removal of screws after graft fracture. The patient remained symptomatic but refused further surgery.

Table IV The number of different sports played by 16 patients and those to which they were and were not able to return

Sport	No. of patients	Not able to return	Able to return
Swimming	7	5	2
Tennis	4	3	1
Horse riding	3	1	2
Netball/basketball	2	2	0
Running	2	0	2
Water-skiing	1	1	0
Martial arts	1	1	0
Surfing	1	0	1
Paddling	1	1	0
Mountain biking	1	1	0
Total	23	15	8

Return to sport

Of the 16 patients who played sport preoperatively, only 6 patients returned to sport (37.5%).

Patients who were able to return participated in swimming (2), horse riding (2), running (2), surfing, and tennis. Those who were not able to return had participated in swimming (5), tennis (3), netball (2), horse riding, paddling, and martial arts.

Of the patients who did not develop a complication after the modified Latarjet procedure, 60% were able to return to sport (6/10). None of the patients who developed a complication returned to sport (0/6) (Table IV).

Comorbidities

A high-risk group of patients has previously been identified. These patients are at higher risk for development of more severe complications and poor outcomes. These patients include epileptic patients and patients with drug and alcohol addiction.[12] In this group of female patients, the number of high-risk patients was small (5 patients). Of these 5 patients, 3 had recurrent dislocations. Twenty-four patients did not have one of these risk factors, and only 1 patient had a recurrent dislocation. These numbers are obviously small, and so it is difficult to draw statistical significance from them.

Other comorbidities in the patients without complications included asthma (3), hypothyroidism, hypertension, depression, and human immunodeficiency virus infection. Comorbidities in the patients with complications included asthma, diabetes, breast cancer, and hypoplastic anemia.

Literature

There were 343 papers identified in the literature review; 50 papers reported on clinical outcomes of the modified Latarjet procedure. These were further assessed for clinical results to compare redislocation rates, outcomes scores, return to sport, complications, and reoperation.

No reports on clinical outcomes took gender into account. Papers that did report the number of male and female patients reported small numbers of female patients and did not select them out when reporting results.

One paper reported the outcomes of anterior instability surgery (both the Bankart repair and Bristow-Latarjet procedure) between the genders.[17] A trend was found toward worse outcomes in female patients that reached statistical significance only in the Disabilities of the Arm, Shoulder, and Hand score ($P = .009$). For revision surgery for recurrent instability, there was no difference. However, this paper was assessing outcomes of all anterior instability surgery and was not limited to the modified Latarjet procedure.

Discussion

Hovelius et al[17] showed a trend to worse outcomes in female patients who had undergone anterior shoulder instability surgery. This, however, included all patients who had a Bankart repair or Bristow-Latarjet procedure.

There is no literature highlighting outcomes of the modified Latarjet procedure in female patients to which we can compare our findings. Most outcomes-based studies report on predominantly male subjects. Direct comparison with our small group is therefore difficult to interpret, but there are some findings that are worth noting.

Our group of patients had a complication rate of 34%. This is only slightly higher than some recently reported complication rates but is still high. Recent case series and a large meta-analysis have reported complication rates as high as 25%-31%.[12,13,26]

Warner's group reported clinically detectable nerve injury of 20.6% after the modified Latarjet procedure.[10] A recent meta-analysis found neurologic complications to occur in only 1.8% of cases. The authors did however note that the complication rate extracted from retrospective data "is likely an underestimation of the true complication rate."[13] We had 2 cases of diffuse plexopathy, 1 of which was thought to be due to an interscalene block. The symptoms thought to be related to the block resolved. The other patient continued to have nondermatomal "pins and needles" and pain in the arm and hand at final follow-up.

Redislocation rates are reported between 1% and 7.5%,[4,9,13,16,30,32] with recurrent subluxations between 1% and 13%.[4,9,13,16] Worse outcome scores were reported in patients with repeated episodes of instability after the Latarjet procedure.[16] Our redislocation rate was 13.7% (4 of 29 patients), which is high in comparison. We also found worse outcomes scores in patients with complications related to instability (either redislocation or subluxation). This confirmed our findings in a previous study.[12]

The median scores and ranges are highlighted in Table I. It is difficult to compare these across other studies because

a number of different scoring systems are used. Many other authors report good results through various scoring systems. Burkhart and De Beer reported a Constant score of 94.4 and Walch-Duplay score of 91.7.[8] Hovelius et al found that 97% of patients in their later series were satisfied or very satisfied.[16] Allain et al, using the Rowe score, reported 88% good or excellent results,[1] and Walch reported subjective good or excellent results in 98% of subjects, although objective results were good or excellent in only 76% of patients.[30] So although most patients are happy with the results of the modified Latarjet procedure, there are some who do not do well, and this is the group we need to identify. Our patients with the worst clinical results were those who developed a complication, specifically a complication resulting in some form of recurrent instability (either subluxation or dislocation). This is something that has been shown in other studies as well.[1,12,16] Patients with alcohol or drug abuse problems and epileptic patients also had more severe complications when they occurred.[12] We also found a higher proportion of dislocations in this group of patients, although our numbers were small.

The reoperation rate in our patients was 13.8%. An Eden-Hybinette procedure was performed in 3 patients after recurrent dislocations, and 1 patient required removal of screws after graft fracture. In the literature, reoperation rates are reported between 4% and 10%,[12,15,16] and the meta-analysis of Griesser et al reported a 7% reoperation rate.[13] Our patients had a higher reoperation rate despite the relatively short follow-up of only 1 year.

Two of the 3 patients who had an Eden-Hybinette procedure were happy with the result. The third patient still reported pain and apprehension. Another patient had removal of screws after a broken graft. She was also not happy with the result, and although she was offered further surgery, she declined.

Only 37.5% of our patients returned to sport. This is much lower than literature-reported rates. In addition, patients who developed complications had a 0% return to sport rate, whereas in those with no complications, 60% returned to play. The low return to sport rates may to some extent be explained by the relatively high average age at first dislocation (27.6 years) and age at surgery (37.2 years). This still does not account for the fact that no patients who developed a complication were able to return to sport.

The average age at first dislocation in our patients was in fact younger than literature-reported averages for female patients. The average age at surgery was 36.8 years in those patients who did not develop a complication and 37.7 years in those who did.

Neyton et al reported that only 1 of 34 rugby players did not return to rugby because of their shoulder.[23] Hardy found that 100% of 47 patients (46 male, 1 female) were able to return to sport; 64% of these patients returned at the same level. The patients who were less likely to be able to return to the same sport were those engaged in sports involving overhead activities. These patients also had lower WOSI scores.[3] High rates of return to the same sport (92%) and return at the same level (83%) were also reported by Allain et al[1] and Walch and Boileau.[28] Our group of patients had a much lower rate of return to sport, and the patients who were unable to return to sport tended to play more overhead sports, such as tennis and netball. Those who were able to return were more likely to run, swim, or horse ride.

There are gender-specific anatomic differences in the shoulders, with absolute size of glenoid and coracoid being larger in men than in women.[11,22] The ratio of coracoid thickness to glenoid anteroposterior distance has been shown to be statistically larger in men when measured on both cadaveric specimens and CT scans. CT scan measurement allows the potential to assess the coracoid size preoperatively to better plan surgery.[11,22]

At a meeting of the Japan Shoulder Society in 2014, a paper was presented that suggested that 14% of Japanese women had coracoids that were inappropriately small for a Latarjet procedure based on literature recommendations of size.[27] Measurements looking at ratios of coracoid thickness and glenoid anteroposterior distance have estimated that bone defects of >35.4% in men and 34.4% in women are not reconstructable by the coracoid bone graft.[22]

Although differences in outcomes are not reported, anatomic differences have prompted differences in surgical technique for male and female patients. Hovelius et al described using smaller screws for female patients before any of the research was done on gender-specific anatomic differences.[16]

Whereas the sling effect has been shown to provide the majority of support in the Latarjet procedure, in the mid-range of rotation, the bone block contributes nearly 50% to stability.[29] The proportionally smaller coracoid of the female patient may then have an impact on the outcomes of the modified Latarjet procedure.

This study group may present a slightly different group of patients from those we see described in the literature. The average age at first dislocation is relatively high compared with that seen in predominantly male patient groups. The average delay from primary dislocation to surgery is also long (nearly 10 years) in this group. This may explain the use of the modified Latarjet procedure in a group of older patients. The delay to surgery with ongoing recurrent instability increases the amount of bone loss, and so by the time these patients go to surgery, the modified Latarjet is indicated. This delay was due to socioeconomic issues including access to health care.

There are inherent weaknesses to this study; it is retrospective and comprises small numbers with limited follow-up. We were also not able to accurately report on the amount of bone loss because this had been inconsistently documented. This may be relevant, given the suggestion that the smaller coracoid size could have an impact on outcomes. This is, however, the first report to our knowledge highlighting gender-specific differences in outcomes after the modified Latarjet procedure. This may point to a potential patient group that requires more careful selection of patients for the modified

Latarjet procedure. It is hoped that this will be a catalyst for further research on this subject.

Conclusions

To our knowledge, this is the first report of outcomes of the modified Latarjet procedure in female patients. In this group, the outcomes scores and rates of return to sport were lower than reported in the literature for case series of predominantly male patients. This study confirmed the poor outcomes in patients who developed instability-related complications after the modified Latarjet procedure and highlighted the risk factors of epilepsy and drug and alcohol abuse. Female gender should not be a contraindication to the Latarjet procedure, but selection of patients within this group may need to be more stringent.

Disclaimer

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