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The open Latarjet-Patte procedure for the treatment of anterior shoulder instability in professional handball players at a mean follow-up of 6.6 years

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Background: The popularity of team handball is increasing, with >10 million children playing this overhead throwing and collision sport with highest demands on the shoulder joint. Because of the risk of recurrent instability, the Latarjet-Patte (LP) procedure has been recommended to treat young competitive players. This is the first LP outcome study in professional handball players.

Methods: We retrospectively included 20 shoulders (18 players [17 male patients]; mean age, 22.9 years [range, 17-35 years]; minimum follow-up period, 2 years; mean follow-up period, 6.6 years) operated on by 3 expert surgeons (2011-2020) with the Walch LP technique. We documented preoperative hyperlaxity (25%, n = 5), affected throwing arm (55%, n = 11), position (backcourt, winger, and goalkeeper, 22% each; full back and pivot, 17% each), >2 dislocations prior (20%, n = 4), >10 dislocations prior (5%, n = 1), previous failed Bankart or humeral avulsion of glenohumeral ligament (HAGL) repair (10%, n = 2), and large Hill-Sachs lesions (HSLs) (20%, n = 4). Clinical and radiographic outcomes, visual analog scale score, Subjective Shoulder Value, Walch-Duplay score, Rowe score, and return-to-sport (RTS) rate were recorded.

Results: The RTS rate was 85% (17 of 20 shoulders); rate of RTS at the same level, 80% (16 of 20); and rate of RTS with no throwing pain, 73% (8 of 11). The time to training with a ball was 3.2 months, and the time to competition was 4.9 months. The mean Rowe score, Walch-Duplay score, and Subjective Shoulder Value were 90 points, 88 points, and 89%, respectively. Shoulder symptoms led players to give up handball in 2 cases (10%), whereas 1 player (5%) stopped playing handball for other reasons. We recorded 1 recurrent dislocation (5%) (non-throwing arm, winger, no recurrence after rehabilitation). Persistent apprehension occurred in 1 goalkeeper (5%). Residual pain was seen in 4 shoulders (20%); this was relieved by screw removal in 1. Resistant pain (throwing shoulder) was seen in 2 backcourt players (10%, 1 of whom had a large HSL) and 1 goalkeeper (5%; large HSL with >10 dislocations prior),

Institutional review board approval was obtained from Vivalto Santé Comité d'Ethique de la Recherche Clinique (CERC) (study no. S-2022-06; IRB no. CERC-VS-2022-11-1). All study protocols in this retrospective study were performed in accordance with the ethical standards of the institutional review board, as well as the 1964 Declaration of Helsinki and its subsequent amendments and latest ethical standards. All players signed informed consent forms to be examined at final follow-up and to allow their clinical and radiographic data to be included in this study. Patient data were collected, protected, and deidentified for the outcome analysis.

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all 3 of whom were aged > 30 years. Bone block positioning was correct (no lateral overhang) in all shoulders. At final follow-up, 1 shoulder (5%) showed mild arthritic changes (>10 dislocations, large HSL).

Conclusion: The open LP procedure is consistent in providing shoulder stability combined with return-to-throwing performance in professional handball players with a short time to RTS and high same-level RTS rate without increasing the risk of arthritic changes. Throwing shoulders of backcourt players, large HSLs, or age > 30 years may have an increased risk of persistent symptoms.

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

Keywords: Shoulder; instability; professional handball; team handball; throwing; overhead; Latarjet; contact sports

Handball, so-called team handball in the United States, is a fast-moving, indoor overhead throwing contact sport resulting in a substantial number of acute and chronic upper-extremity injuries. The handball weighs approximately 450 g.[13] A team consists of 6 field players and 1 goalkeeper. Not all positions are exposed to the same throwing activity and velocity. Overhead throws by backcourt players yield ball speeds of 130-150 km/h. A player will perform ≥48,000 throwing motions per season. The shoulders of handball players are therefore subjected to high repetitive stresses, mostly caused by an overhead throwing movement, comparable to those of baseball pitchers. Therefore, increased external rotation ability is required in the throwing arm. However, handball players are different as the handball throwing motion has additional complex features that may impact potential pathologies in the shoulder.[26] Handball is not only an overhead throwing sport but also a contact sport where players commonly encounter upper-extremity and body contact during or at the end of the throwing action. This contact is unpredictable and may expose the shoulder to additional loads in different directions.

The number of young players aged < 17 years is on the rise, with >10 million players registered with the International Handball Federation. Injuries to the shoulder including traumatic instability are increasing. Owing to the outlined mechanical exposure of shoulders in handball, young competitive players have a very high risk of recurrent instability after nonoperative and arthroscopic Bankart stabilization. A reduced return-to-sport (RTS) rate (46%) was recently reported in young professional players aged < 20 years after arthroscopic Bankart repair.[19] According to risk-of-recurrence criteria published by Balg and Boileau,[1] a Latarjet-type procedure has been recommended as a primary stabilization procedure in competitive players as soon as additional risk factors are identified. This is the first series of open Latarjet-Patte (LP) procedures carried out by expert surgeons to treat anterior instability in professional handball players with clinical and radiographic mid-term results as well as RTS analysis.

Materials and methods

In this retrospective study, we included professional handball players with symptomatic shoulder instability who were operated on by 3 expert surgeons with the LP procedure as modified by Walch.[28] We excluded players who played in a league below the third-tier professional league, those with no traumatic capsuloligamentous or bony lesions (Hill-Sachs or glenoid side), and those who had other types of pathology such as posterior or voluntary instability or nonspecific pain when throwing. The inclusion criteria were ≥1 full anterior dislocation or multiple anterior subluxations with apprehension. All players had positive anterior apprehension test[23] and relocation test findings.[12,27]

A total of 20 shoulders in 18 professional players met these criteria and were included between 2011 and 2020. During this period, no Bankart repairs were undertaken by the participating surgeons for active professional handball players after a traumatic shoulder dislocation.

Preoperative shoulder and patient characteristics are summarized in Table I. All players had traumatic shoulder instability that occurred while playing handball. Instability was present in both shoulders in 2 players subsequently. There were 17 players of male sex. The mean age at the time of surgery was 22.9 years (range, 17-35 years), the mean time from the first dislocation to surgery was 21 months (range, 0-90 months), and the mean number of dislocations was 2.4 (range, 1 to >10). One player with multiple subluxations associated with apprehension and a labral Bankart lesion was included. The throwing arm was affected in 55% of shoulders (n = 11). Three players showed preoperative humeral avulsion of glenohumeral ligament (HAGL) lesions. Previous repair of Bankart or HAGL lesions was performed in 2 players (10%). Mean glenoid bone loss was 10.5% (range, 0%-25%), assessed on preoperative computed tomography scans with an established circle method.[10] Large Hill-Sachs lesions (HSLs) were visible on anteroposterior (AP) radiographs in internal, neutral, and external rotation in 4 shoulders (20%). General hyperlaxity was recorded in 5 players (25%). Playing positions were almost equally distributed (backcourt, winger, and goalkeeper, 22% each [n = 4]; full back and pivot, 16% each [n = 3]).

Follow-up

The minimum time to follow-up was 2 years, and the mean time to follow-up was 6.6 years (range, 2-11 years). All patients underwent follow-up that included instability scores, an RTS questionnaire, and radiographs.

Radiographic evaluation

Radiographic evaluation consisted of AP views, Y-views, and external rotation, internal rotation, and axillary views according to Bernageau et al.[3] Combined glenoid and humeral bipolar bone loss was presented in 9 patients (45%), and HSLs were identified

in 17 shoulders (85%). Of these HSLs, 4 were considered large (20%). All shoulders included in this study (N = 20) underwent complete radiographic follow-up.

Surgical technique

All patients underwent the LP procedure as modified by Walch[2,28] with minor modifications (screw sizes and brands, as well as capsular repair technique). Patients were placed in the beach-chair position with the arm draped free. A 4- to 6-cm incision was made below the tip of the coracoid process. After dissection of the deltopectoral interval, the coracoacromial ligament was released in external rotation and abduction, 1 cm lateral to the coracoid process, leaving a stump. Next, the pectoralis minor was released off the coracoid in adduction, and a coracoid osteotomy was performed with an angulated saw from medial to lateral at the junction of the horizontal-to-vertical part, aiming for a length of 20-25 mm, prior to additional release of the posterolateral side of the conjoint tendon. The coracoid was everted, and its inferior surface was decorticated with a saw and predrilled superiorly and inferiorly (2 holes, 7-10 mm apart, 2.5 or 3.2 mm). The subscapularis was split two-thirds up and one-third down with the arm in external rotation. A vertical capsulotomy was made as close as possible to the joint line not to waste capsular tissue, which could lead to over-tightening of the capsular repair associated with limitation of external rotation. Retractors were used in 4 directions: intra-articular, in the subscapularis fossa, and in the scapula above and below the scapular neck in contact with bone. The objective for bone block fixation was a position flush with the subchondral bone avoiding lateral overhang, which was previously associated with arthritic changes.[11,15] Twenty procedures were carried out by 3 expert surgeons. Each specialized shoulder surgeon had >5 years of experience with LP surgery. Seven procedures were carried out with a drilling offset guide, with the use of two 4.0-mm non-cannulated screws (DePuy-Synthes, Warsaw, IN, USA) in 4 cases and two 4.5-mm non-cannulated screws (DePuy-Synthes) in 3 cases. In these 7 shoulders, 2 suture anchors (Y-Knot Flex, 1.3 mm; ConMed, Largo, FL, USA) were used for capsulolabral repair to the glenoid rim in maximal external rotation and abduction of the arm not to limit external rotation. Eight shoulders were treated with 2 non-cannulated 4.5-mm screws (Arthrex, Naples, FL, USA) by the freehand technique as described by Walch. Five shoulders were operated on using 2 non-cannulated 4.0-mm screws (Zimmer, Warsaw, IN, USA) by the Walch freehand technique. In 13 shoulders, the coracoacromial ligament stump was repaired to the vertical capsular curtain (Fig. 1, *B* and *C*) in abduction and maximal external rotation of the arm, and in 7 shoulders, the capsulolabral repair was performed to the glenoid rim with anchors as described earlier.

Rehabilitation

The shoulders of the athletes were mobilized with active-assisted and closed-chain exercises during weeks 1-4 but were protected in a sling when physiotherapy was discontinued. Physiotherapy was programmed 1-2 times per day for every player. At week 6, radiographs were obtained to confirm the bone block position and uneventful bony healing. Running was allowed from week 6, and stretching was continued, aiming to achieve full range of motion (ROM) between 8 and 10 weeks after surgery. Proprioceptive exercises and strengthening were commenced in week 7 and increased as soon as full ROM was achieved. Light training with a ball without body contact was usually started 3 months after surgery. Return to competition in training sessions was only allowed after players passed specific RTS tests without major deficits or apprehension and once good proprioceptive control was achieved, usually 3.5-4 months after surgery.

Table I Summary of preoperative characteristics of included shoulders and patients

	Data
Shoulders, n	20
Patients, n	18
Sex: M/F, n	17/1
Age, mean (range), yr	22.9 (17 to 35)
Previous dislocations, mean (range)	2.4 (1 to >10)
Previous Bankart or HAGL repair, n (%)	2 of 20 (10)
Time to Latarjet surgery, mean (range), mo	21 (0 to 90)
HSL, n (%)	17 of 20 (85)
Large HSL, n (%)	4 of 20 (20)
% Glenoid bone loss, mean (range)	10.5 (0 to 25)
Bipolar bone loss, n (%)	9 of 20 (45)
HAGL lesion, n (%)	3 of 20 (15)
Instability in throwing arm, n (%)	11 of 20 (55)
Hyperlaxity, n (%)	5 of 20 (25)
Position, n (%)	
Backcourt throwing	4 of 18 (22)
Other	14 of 18 (78)

M, male; *F*, female; *HAGL*, humeral avulsion of glenohumeral ligament; *HSL*, Hill-Sachs lesion.

Clinical assessment

All patients were assessed routinely at 1, 3, and 6 months, 1 year, and final follow-up. Minimum follow-up time was 2 years, and mean follow-up period was 6.6 years (range, 2-11 years).

For the non-throwing shoulder, reduced external rotation of <10° compared with preoperative ROM and reduced internal rotation of ≤2 vertebral levels not leading to patient complaints was defined as being below the minimal clinically important difference for postoperative ROM. For the throwing arm, increased external rotation of ≥10° compared with the non-throwing shoulder was considered a mandatory rehabilitation requirement for return to normal throwing performance.

An RTS questionnaire was completed by all players regarding the return to playing handball (time to training with the ball, time to competition, return to same level, date of cessation of handball, and reason for cessation if applicable) as well as other sporting activities at the time of review. Functional assessment of the shoulders was carried out with the Walch-Duplay and Rowe scores.[22] Pain was evaluated with a visual analog scale, and the Subjective Shoulder Value (SSV) was recorded.[8]

Radiographic criteria at follow-up

The position of the bone block was evaluated at final follow-up on the Bernageau view (Fig. 2). If the coracoid was flush, in line with the glenoid without lateral overhang or medial offset, the bone block position was rated to be correct.

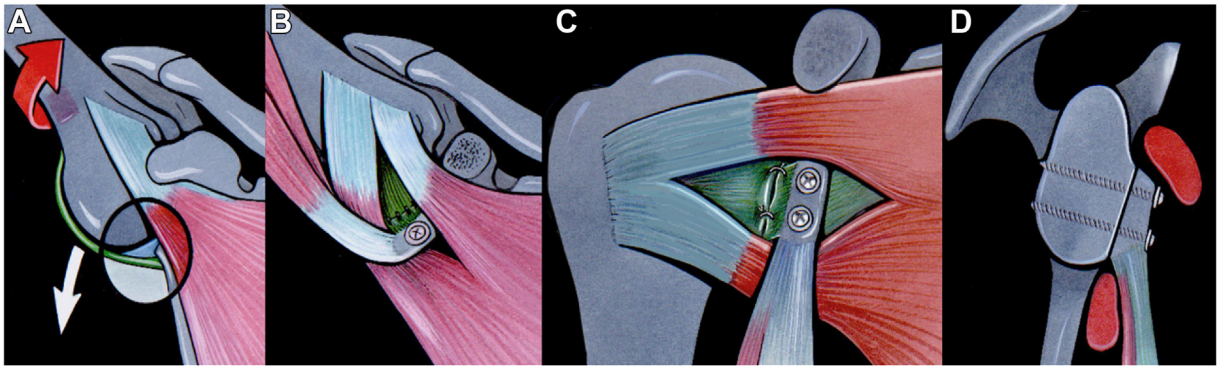

Figure 1 Walch Latarjet-Patte procedure. (**A**) Abduction–external rotation (*red arrow*): preoperative anterior-inferior bony and capsulolabral (*black oval*) instability (*white arrow*) below subscapularis. (**B**) Abduction–external rotation with hammock (subscapularis) and sling effect (conjoint tendon). (**C**) Subscapularis split and coracoid fixation with 2 screws and vertical capsule–to–coracoacromial ligament repair. (**D**) Side view of glenoid with coracoid fixation flush with glenoid below its equator.

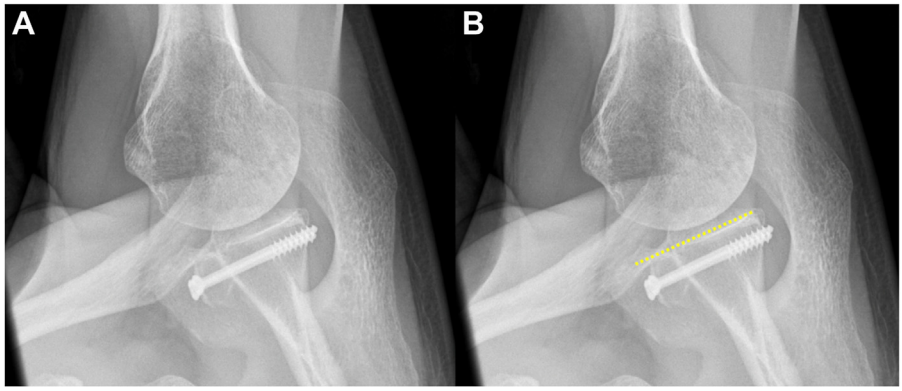

Figure 2 Assessment of bone block position and union on Bernageau view. (**A**) No radiolucent lines between bone block and scapula. (**B**) Bone block positioned flush at level with anterior glenoid rim (*yellow dashed line*).

Bony union of the coracoid was assessed on the Bernageau view. Absence of radiolucent lines between the coracoid bone block and glenoid was considered a successful union. The glenohumeral joint was assessed for any evidence of degenerative changes such as osteophyte formation on the humerus or glenoid (or both) and/or evidence of joint space narrowing on the AP and other views (Fig. 3) and was classified according to Samilson and Prieto.[24]

Statistics

Descriptive statistics were used for data analysis.

Results

A summary of subjective outcomes, scores, and RTS rates is provided in Table II.

Subjective outcomes and functional scores

The mean SSV was 89% (range, 60%-100%), and the mean Rowe score was 90 points (range, 65-100 points). A Rowe score $\leq$ 90 points was seen in 7 shoulders (35%), 5 of which were throwing shoulders (5 of 7 shoulders [71%] with a score $\leq$ 90 points and 45% of all throwing shoulders in the cohort [5 of 11]). The mean Walch-Duplay score was 88 points (range, 60-100 points).

RTS results

The RTS rate was 85% (n = 17), and the rate of RTS at the same level of professional handball was 80% (n = 16). The time to training with a ball was 3.2 months (range, 2.5-4.5 months), and the time to competition was 4.9 months (range, 3.5-7 months). Two players (10% of shoulders) had to give up handball because of the shoulder. One player stopped playing handball for other reasons. A large HSL was seen in all players who stopped playing handball (3 of 3; 100% of those who stopped), with age > 30 years in 67% (2 of 3), multiple dislocations (>3) in 67%, and a backcourt position in 33% of shoulders (1 of 3) among those who stopped playing handball.

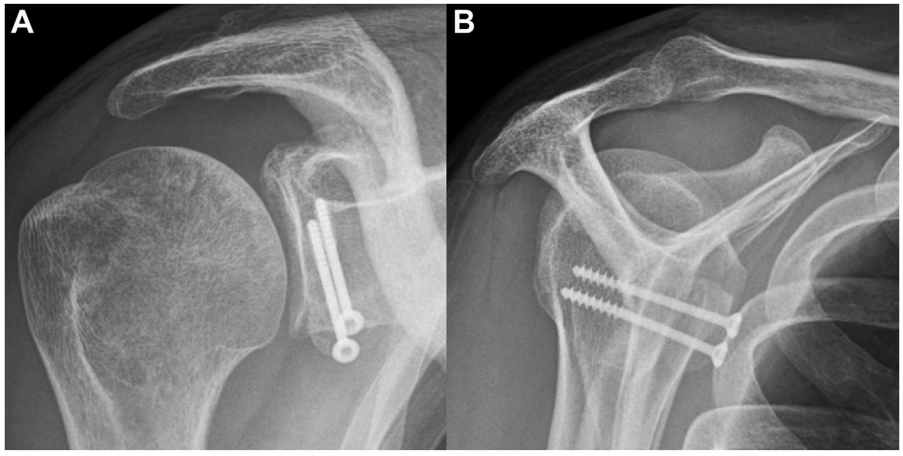

Figure 3 Anteroposterior view (**A**) and Y-view (**B**) after Latarjet-Patte procedure.

Radiographic outcomes

Bone block positioning was correct (no lateral overhang and bone block inferior to glenoid equator) in all shoulders as shown in Figures 2 and 3. At final follow-up, 1 shoulder (5%) showed mild arthritic changes, that is, Samilson-Prieto grade I[24] (>10 dislocations, large HSL).

ROM, pain, instability, and complications

No clinically visible scapulothoracic dyskinesia was recorded in any athlete. Labral repair was not associated with improved or, in contrast, worse results (stiffness). Minor clinically unimportant loss of external rotation of $<10^{\circ}$ or loss of internal rotation of ≤ 2 vertebral levels was recorded for 3 non-throwing shoulders, not showing an association with symptoms and RTS. All but 1 throwing shoulder achieved $>10^{\circ}$ more external rotation than the non-throwing shoulder, which is considered important to return to full throwing performance. In the aforementioned throwing shoulder, an associated loss of internal rotation of ≤ 2 vertebral levels was also recorded.

Residual pain was noted in 4 players' shoulders (20%); this was relieved by screw removal in 1 case. Residual pain (throwing shoulder) was seen in 2 backcourt players (50% of those with residual pain), 1 of whom had a large HSL. In addition, 1 goalkeeper (5%) had residual pain associated with a large HSL and >10 dislocations prior to shoulder stabilization. All 3 players with residual pain were aged > 30 years (100% of shoulders with residual pain), and 2 had large HSLs (67% of those with residual pain).

Recurrent instability with a dislocation was seen in 1 shoulder (5%; non-throwing arm in a winger). The player recovered with rehabilitation alone. Persistent apprehension was seen in 1 goalkeeper's shoulder (5%). Coracoid nonunion was not observed.

We recorded 1 case of inferior screw breakage in the throwing arm of a backcourt player (5%) without the need for screw removal. Another backcourt player with residual pain underwent screw removal, resulting in relief of pain during daily activities but not while playing handball and throwing. Overall, there were 2 reoperations (10%), both screw removals, 1 of which (50%) showed complete resolution of symptoms and pain. At final follow-up, 1 shoulder (5%) showed grade I arthritic changes (>10 dislocations, large HSL).

Discussion

This is the first study of the LP procedure in players of professional handball, a sport with combined collision and overhead throwing activity and highest stress on the shoulder joint.[7] Players were operated on early after a traumatic shoulder dislocation, with a mean time from the first dislocation to surgery of 21 months. Some of these professional overhead throwing contact athletes with additional risk factors for recurrent dislocation[1] underwent early Latarjet surgery after the first dislocation, preferring to minimize the risk of recurrence and to avoid multiple rehabilitation periods.

The most important findings of this study are high rates of patient satisfaction (mean SSV, 89%), RTS (mean, 85%), return to the same level (mean, 80%), and sustainable stability (1 recurrence [5%]) after correctly performed LP procedures. The mean time to return to training and to competition was 3.2 months and 4.9 months, respectively. Adverse outcome analysis of residual pain and failure to RTS (15%) showed an association with throwing shoulders of backcourt players, large HSLs, age > 30 years, and multiple dislocations before the LP procedure.

The results of the LP procedure with a mean follow-up period of 6.6 years (minimum, 2 years) in this study of professional handball players are superior to those reported after arthroscopic Bankart repair in professional handball players with a mean follow-up period of 4.3 years.[19] The previous authors reported a similar RTS rate to ours (mean, 83%) but a lower rate of return to the same level (mean,

Table II Results at final follow-up

	Data
Mean SSV (range), %	89 (60-100)
Pain	4 shoulders (20%)/3 residual (15%)
Pain when throwing	2 shoulders in backcourt position (50% of those with pain)
Age > 30 yr in shoulders with residual pain, % (n)	100 (3 of 3)
Large HSL in shoulders with residual pain, % (n)	67 (2 of 3)
Backcourt position in shoulders with residual pain, % (n)	50 (2 of 4)
>3 Dislocations in shoulders with residual pain, % (n)	25 (1 of 4)
>3 Dislocations in shoulders with large HSLs, % (n)	50 (2 of 4)
Large HSL in shoulders with >3 dislocations, % (n)	50 (2 of 4)
Instability	1 shoulder (5%)
Reoperation rate	2 screw removals (10%)
Mean Rowe score (range), points	90 (65-100)
Lower Rowe score (≤90 points)	7 shoulders (35%; 5 throwing shoulders)
Mean Walch-Duplay score (range), points	88 (60-100)
RTS rate, % (n)	85 (17)
RTS rate at same level, % (n)	80 (16)
RTS rate with no pain in throwing arm, % (n)	73 (8 of 11)
Mean time to training (range), mo	3.2 (2.5-4.5)
Mean time to competition (range), mo	4.9 (3.5-7)
% Stopping handball (n)/% stopping because of shoulder (n)	15 (3)/10 (2)
Large HSL in patients stopping handball, % (n)	100 (3 of 3)
Age > 30 yr in patients stopping handball, % (n)	67 (2 of 3)
>3 Dislocations in patients stopping handball, % (n)	67 (2 of 3)
Backcourt position in patients stopping handball, % (n)	33 (1 of 3)

SSV, Subjective Shoulder Value; *HSL*, Hill-Sachs lesion; *RTS*, return to sport.

64%) and a higher recurrent dislocation rate (9%). They split their cohort of professional players after Bankart repair into 2 groups based on age and found significantly inferior results in younger players aged < 20 years (RTS rate, 46%), a finding that could not be observed after the LP procedure in our study. Inferior results of arthroscopic Bankart repair in younger patients, associated with or without competitive overhead sports, have previously been reported in several studies.[1,14] The RTS time after arthroscopic Bankart repair was longer (mean, 6.2 months) than that after the LP procedure (mean, 3.2-4.9 months).[19]

For contact and competitive sports participants, the LP procedure has been shown to provide good results that are comparable to our study's results.[6,17,18,20,21,25] Neyton et al[18] reported on rugby players with an RTS rate of 65%. Only 1 player did not return to rugby because of the shoulder. Professional players returned to training after a mean time of 3 months and returned to competition after 4 months. Patient satisfaction was high (mean SSV, 90%), and no recurrent dislocation was seen. Persistent apprehension was recorded in 14% of patients. These results were confirmed by Rossi et al,[21] who reported an RTS rate of 92%, RTS rate at the same level of 88%, and recurrent dislocation rate of 4%. In studies of soccer players, Cerciello et al[6] (88% semi-professional and professional players) and Stirma et al[25] (all professional players) found RTS rates of 96% and 100%, respectively, with a return to running and soccer after 2 months and 3 months, respectively. A short time to return to competition could also be demonstrated in a professional Australian Football League player, 2 months after Latarjet surgery.[16] In a comparative study, professional Australian Football League players showed a high RTS rate of 97% and a mean time to competition of 7.2 months with no recurrent dislocations after the Latarjet procedure, which were seen after arthroscopic Bankart repair in 19% of players.[20] There was no reduction of on-field performance in either treatment group.

The difference between handball and the aforementioned competitive collision sports of rugby, soccer, and Australian football is the overhead throwing activity in handball requiring the highest velocity and precision while being exposed to arm and body contact as well as blocking by the opposition players.[26] Our study found the presence of a large HSL in 67% of patients with residual pain. Of the patients with residual pain, 50% were backcourt players, who are exposed to frequent overhead throwing of highest velocity. Of those with large HSLs, 50% had multiple dislocations comprising >3 events. Frequent high-velocity overhead throwing, as well as a large HSL, seemed to be associated with residual pain and symptoms in our series.

There are a limited number of publications reporting on overhead throwing after Latarjet surgery. Gowd et al[9] recently published RTS outcomes after Latarjet surgery. Patients were included in a registry beforehand. Phone interviews were carried out to evaluate 60 patients with RTS questionnaires. The authors found a significantly decreased

likelihood of returning to the same level of sport with an increased amount of humeral bone loss (HSL, $P = .026$). Humeral bone loss was significantly associated with recurrent instability ($P = .038$). RTS to the same level or a better level was recorded in 60% of patients. The authors performed a subgroup analysis of throwing, identifying 28 patients with throwing activity. They found a rate of return to throwing without difficulties of 68%. Of these patients, 12 underwent Latarjet surgery on the throwing arm, with a return-to-throwing rate of 58% (n = 7). In our study, 73% of throwing shoulders returned to the same level without pain (8 of 11). Of the 3 throwing shoulders (27%) with pain or with no RTS, 2 shoulders were in backcourt players with pain, both of whom were aged > 30 years, and 2 shoulders had large HSLs. Our return-to-throwing results are better than those of Gowd et al; this observation may be associated with the following factors: first, Latarjet surgery was used as salvage surgery in their patients, with 58% of Latarjet cases being performed as revision procedures for failed arthroscopic Bankart repair compared with 10% in our cohort. Second, 52% of their patients had experienced >9 dislocations prior to Latarjet surgery whereas only 1 shoulder in our professional handball players (5%) had experienced >9 preoperative dislocations. Third, massive off-track HSLs were present in 9 cases but unknown in 24 cases and may have been more frequent given the percentage of patients with a high number of dislocations. An important finding similar to ours was the association of large HSLs with reduced throwing capacity, as well as pain and hindrance of normal shoulder function. Backcourt players with or without large HSLs may benefit from autologous bone block procedures with capsulolabral repair and optional autologous bone grafting of large HSLs. The Latarjet procedure with additional autologous bone grafting of large HSLs would be another option for additional treatment of very large HSLs; however, to date, there are no reports of combined procedures in these specific patients.

Blonna et al[5] performed a comparative, matched-cohort study of Latarjet surgery vs. arthroscopic Bankart surgery, which was cited by Gowd et al,[9] discussing possible evidence of reduced subjective shoulder perception after Latarjet surgery. They mainly reported on the outcome variables of RTS and SSV. The SSV of the reported Bristow-Latarjet procedure was low, with a mean value of 75% compared with 86% in the arthroscopic Bankart group, and was lower than the SSV reported for the Latarjet procedure in sports and in general in the literature.[6,18,20,25,29] It is difficult to compare the study by Blonna et al with our study because they reported on a different Latarjet technique and did not mention radiographic follow-up. Furthermore, they reported matching of the mean number of dislocations (15 for arthroscopic Bankart surgery and 19 for Latarjet surgery), with a range of 2-50 dislocations, and did not report on the distribution of large HSLs in both groups. The dislocation rate was 10% in the Bankart group compared with no recurrence in the Latarjet group, which was not significant because of lack of statistical power. A mismatch of HSLs in both groups may have contributed to these differences, in addition to bone block positioning, which was not rated and recorded. Early intervention with the Latarjet procedure in professional handball players with few preoperative dislocations (mean, 2.4) in our study may have led to better results compared with salvage revision operations with a high number of dislocations in the study by Gowd et al and patients with numerous dislocations (mean, 19) in the study by Blonna et al, likely to be associated with larger HSLs and more glenoid bone loss compared with non-critical bone loss of 10.5% on average in our study.[5,9] Neither a beneficial nor adverse effect (stiffness) could be shown with an additional capsulolabral repair in our series of athletes.

Cerciello et al[6] reported on professional goalkeepers as a subgroup of soccer players. Discomfort while throwing the ball was recorded in 1 of 6 throwing shoulders in goalkeepers (17%) and 4 players in the overall population (22%, 4 of 18 players). Whether this discomfort was associated with large HSLs was not reported.

Bliven and Parr[4] undertook a systematic review and meta-analysis comparing the Latarjet procedure and Bankart repair in athletes, screening 245 articles, 8 of which met the inclusion criteria. They found better Rowe scores and patient satisfaction, fewer recurrent dislocations, higher rates of return to work, sports, and throwing activities, and decreased loss of external rotation, all in favor of the Latarjet procedure when compared with Bankart repair.

The total rate of complications in our series was 20% (n = 4), all of which were of a minor nature, and this finding is comparable to other series of LP surgery with the modifications of Walch.[6,18,28] We recorded 1 recurrent dislocation (5%), 1 screw breakage (5%), and 2 minor revision operations for screw removal (10%), with no neurologic complications or instability revision surgery.

Our study has some limitations. First, the study had a retrospective design with a smaller number of shoulders in the ''affected throwing arm'' subgroup (n = 11). Second, the study lacked a control group. However, to our knowledge, this is the largest series after LP surgery in professional athletes performing overhead throwing with a longer follow-up period and the first study of clinical, radiographic, and RTS outcomes in professional handball players after standardized LP surgery performed by experts.

Conclusion

If performed correctly, the LP procedure sustainably and reliably provides stability, RTS, return to throwing, and satisfaction for most professional handball players. The time to RTS is short, and a high return to the same level of performance can be expected without increasing the risk of arthritic changes. Throwing shoulders of backcourt

players, large HSLs, and age > 30 years are associated with an increased risk of persistent symptoms. This information is useful to counsel these professional athletes. Additional or alternative procedures may be considered in athletes with these specific characteristics.

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