



Prognostic Factors of the Latarjet Procedure

Fatores prognósticos da cirurgia de Latarjet

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Abstract

Objective To investigate the factors that influence the functional results of patients submitted to the Latarjet procedure.

Methods Evaluation of 26 patients submitted to surgical treatment following the Latarjet technique due to traumatic recurrent anterior dislocation of the glenohumeral joint, with glenoidal bone loss greater than 20% and/or off-track injury. The minimum follow-up time was of 12 months. The Visual Analogue Scale (VAS), The Western Ontario Shoulder Instability Index (WOSI), and the Subjective Shoulder Value (SSV) scales, as well as objective data from the participants, were evaluated.

Results Most patients (84.62%) did not present recurrence of the dislocation, and 92.31% were satisfied. Regarding the functional analysis, the physical component score (PCS) and the mental component score (MCS) found were within the mean quality of life of the population. The physical symptoms, according to the WOSI, presented the best percentage (8.5%), while the worst result was observed regarding lifestyle (20%). On the VAS, pain was classified as moderate (3/10) by 15.38% of the patients (4/26). In relation to sports, patients who practice sports showed improvement in SSV parameters, which had an inverse relationship with the number of relapses. It was also observed that the shorter the time between the first dislocation and the surgery, the greater the patient's satisfaction.

Conclusion Early indication of surgical treatment of anterior glenohumeral instability may provide better subjective functional results to the patient.

Keywords

- ▶ shoulder dislocation/surgery
- ▶ shoulder/surgery
- ▶ joint instability
- ▶ Bankart injuries
- ▶ quality of life

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Resumo

Objetivo Investigar os fatores que influenciam os resultados funcionais dos pacientes submetidos ao procedimento de Latarjet.

Métodos Avaliação de 26 pacientes submetidos ao tratamento cirúrgico, seguindo a técnica de Latarjet, devido a luxação anterior recidivante traumática da articulação glenoumeral, com perda óssea glenoidal maior do que 20% e/ou lesão *off-track*. O tempo mínimo de seguimento foi de doze meses. Foram avaliadas as seguintes escalas: Escala Visual Analógica (EVA), The Western Ontario Shoulder Instability Index (WOSI), e Subjective Shoulder Value (SSV), além dos dados objetivos dos participantes.

Resultados A maioria dos pacientes (84,62%) não apresentou recidiva de luxação, e 92,31% ficaram satisfeitos. Em relação à análise funcional, a pontuação do componente físico (PCF) e a pontuação do componente mental (PCM) encontradas estavam dentro da média de qualidade de vida da população. Os sintomas físicos, pela escala WOSI, apresentaram a melhor porcentagem (8,5%), ao passo que o pior resultado foi observado com relação ao estilo de vida (20%). Na EVA, a dor foi classificada como moderada (3/10) por 15,38% dos pacientes (4/26). Em relação aos esportes, os pacientes que praticavam alguma atividade esportiva apresentaram melhora nos parâmetros da escala SSV, que tiveram relação inversa com o número de recidivas. Observou-se ainda que, quanto menor foi o tempo entre a primeira luxação e a realização da cirurgia, maior foi a satisfação do paciente.

Conclusão A indicação precoce do tratamento cirúrgico da instabilidade anterior glenoumeral pode proporcionar melhores resultados funcionais subjetivos ao paciente.

Palavras-chave

- ▶ luxação do ombro/cirurgia
- ▶ ombro/cirurgia
- ▶ instabilidade articular
- ▶ lesões de Bankart
- ▶ qualidade de vida

Introduction

Different surgical procedures have been proposed for the treatment of traumatic recurrent anterior dislocation of the shoulder. Capsulolabial repair was described by Bankart and modified by Rowe et al.,¹ and it can be performed through open or arthroscopic surgical procedures. In a cadaveric study, Itoi et al.² demonstrated that bone defects in the glenoid greater than 21% decrease the force needed to cause dislocation, and they recommended bone grafting to increase stability.

In 1954, Latarjet³ described the transfer of the coracoid process with fixation in the anterior part of the glenoid, which causes two effects: the coracoid graft acting as a bone block, and the joint tendon with sling effect acting as a dynamic block. Traditionally, this procedure is performed through an open pathway, but some authors have recently advocated the arthroscopic pathway.^{4,5}

The Latarjet procedure results in lower recurrence rates than those of the Bankart open or arthroscopic repairs.⁶⁻⁸ In a systematic review, Bliven and Parr⁹ demonstrated better functional results and lower limitation of external rotation when compared to the Bankart surgery. However, it results in higher rates of complications, such as pseudarthrosis, complications regarding the synthesis material, and associated neurovascular lesions.¹⁰⁻¹²

In the evaluation of the return to sports, there are no differences between the Latarjet and Bankart surgeries, although there are few comparative studies on the subject.¹³⁻¹⁵

The aim of the present study is to investigate the factors that influence functional results in patients undergoing the Latarjet procedure. The hypothesis is that both the delay on the part of the patients to seek care and the delay to return to sports after the procedure directly affect their quality of life and satisfaction.

Patients and Methods

The present study was approved by the institutional Ethics in Research Committee. A waiver of the Informed Consent Form for the project was requested and approved.

The present is a retrospective cohort conducted from July 2014 to July 2018 with 41 patients who underwent surgical treatment for recurring anterior traumatic shoulder dislocation through the Latarjet open procedure, in a private tertiary-level hospital. The patients were operated on by two shoulder surgeons participating in the study as researchers, both of whom used the same technique.

The inclusion criteria were patients with traumatic recurrent anterior dislocation of the glenohumeral joint, aged > 18 years, who underwent the Latarjet open procedure, with off-track lesions with glenoidal bone loss > 20% (→ **Figure 1**) – assessed through the method in which the distances between the bare spot and the anterior and posterior edges of the glenoid are compared –, and with a minimum postoperative follow-up of 1 year. The exclusion criteria were patients with non-traumatic anterior dislocation of the glenohumeral joint, those under 18 years of age, with on-track lesions and

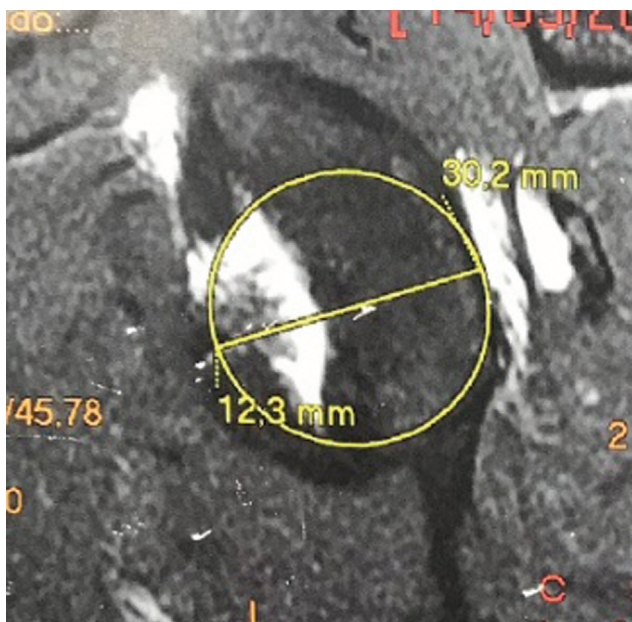


Fig. 1 Sagittal T2-weighted magnetic resonance imaging scan showing glenoid bone defect.

bone loss < 20%. In the postoperative period, the patients used a sling for four weeks. In the fourth week, physical therapy was started with light activities in the horizontal plane, with progressive gain of range of motion (ROM). In the third month, strengthening exercises were started. The return to normal activities occurred after 5 to 6 postoperative months.

After considering all the aforementioned criteria, the sample consisted of 26 patients who answered the questionnaire and participated in the research, and 3 patients had previously undergone the surgical procedure. The contact was made and the questionnaire was applied through phone calls. In total, 15 patients could not be contacted. The

COVID-19 pandemic hindered the in-person assessment of patients in 2020.

Surgical Technique

Patients were submitted to brachial plexus block for postoperative analgesia and general anesthesia. They were operated on in the beach chair position. The deltopectoral access was performed, the coracoid process was exposed, and the coracoacromial ligament and pectoralis minor muscle were transected, protecting the musculocutaneous and axillary nerves. The coracoid graft was measured, as well as a juxtaposition to the coracoclavicular ligaments with a 90° angulation and, in the medial direction to the lateral direction, with the detachment of the graft that still maintains a connection with the joint tendon. The graft was then prepared with the decortication of its lower face with the aid of a bone shaver blade. With the shoulder in external rotation, the subscapularis muscle was exposed, and its division was performed between the upper two thirds and the lower third with Mayo scissors. The anterior glenohumeral capsule was identified and incised transversely for glenoid exposure. The anteroinferior labial tissue of the glenoid was resected, and the fixation site of the graft on the anteroinferior face of the glenoid neck was prepared and scraped. The coracoid process was positioned between 3 and 5 o'clock, and the fixation was performed with 2 small-fragment cancellous screws (measuring 3.5 mm) in the anteroposterior direction, perpendicularly to the coracoid and parallel to the articular surface of the glenoid¹⁶ (→ **Figure 2**). The operated limb was placed in a simple Vealpeau sling. The dressing was changed on the first postoperative day, and the patients performed the subsequent changes daily in their homes until the day of removal of the stitches in the second postoperative week. The operated limb was immobilized with the sling for four weeks, and flexion and extension movements of the elbow were initiated on the first postoperative day. From the fourth week onwards, physiotherapy assisted by a professional was



Fig. 2 Radiographs showing fixation with cancellous screws in the Latarjet procedure: (A) anteroposterior view; (B) profile view; (C) axillary view.

initiated, aiming at anti-pain and anti-inflammatory measures, and gaining passive and self-passive ROM, limiting the external rotation to 30° until the eighth postoperative week. Full ROM was recovered after the twelfth week. Then, muscle strengthening of the shoulder girdle, rotator cuff, and proprioceptive activity was initiated. All impact activities were released after the sixth postoperative month, provided that a good position of the screws and coracoid graft consolidation were identified on the radiographs.

Data Collection

Through a form, we collected data regarding gender, age, dominance, affected side, occupation, comorbidities, smoking, sports practice, postoperative complications (infection, joint stiffness, implant loosening, recurrences), pain intensity by the Visual Analogue Scale (VAS), which had to be adapted by asking the patient the perception of pain from 1 to 10, the subjective perception of function by the Subjective Shoulder Value (SSV), and the functional score according to The Western Ontario Ontario Shoulder Instability Index (WOSI).

Statistical analysis

The statistical analysis was performed using the Student *t*-test. The Tukey test was used for the multiple comparison analysis using one-way analysis of variance (ANOVA) for the parametric data, and the Kruskal-Wallis test for the nonparametric data.

The correlation analysis was performed using the Spearman correlation for the nonparametric data.

For the multivariate analysis, the linear regression test was performed, considering as “response variables” each of the instruments used (the SSV, VAS, WOSI, SF-12V2 PCS and SF-12V2 MCS). After the bivariate analysis, the variables that presented *p*-values ≤ 0.3 were selected for the multivariate analysis.

In all analyses performed, the differences obtained were considered statistically significant when $p < 0.05$.

The statistical analyses were performed using the Prism (Graphpad Software, Inc., San Diego, CA, United States) software, version 5.0 for Windows, and the Stata (Statacorp LLC, College Station, TX, United States) software, version 14.0.

Results

The sample was exclusively composed of male patients, with a mean age of 26 (± 5.17) years, ranging from 18 to 35 years. In total, 69.23% stated that they performed some kind of sports activity, which was predominantly recreational. The parameters analyzed in **Table 1** showed no statistically significant differences among the sample ($p > 0.05$).

The mean time between the first dislocation and the surgical procedure was of 24 months, with an average occurrence of 10 dislocations. Most patients (84.62%) did not present episodes of recurrence of the dislocation. In total, 3 (11.54%) patients had recurrences only once, and only 1 (3.85%) patient, twice. However, recurrence was limited to

these cases, and no reoperation was required. Regarding the degree of satisfaction, when questioned during the phone calls, 92.31% of the patients reported they were satisfied, even some who presented recurrence (**Table 2**).

Functional Analysis

In the SSV, the sample scored an average of 90%. The 25th percentile (P25) was of 80%, and the 75th percentile (P75) was of 100%. Most patients scored between 80% and 100% on the SSV.

On the VAS, 76.92% (20/26) of the patients reported no pain (0/10); for 7.69% (2/26), the pain was mild (2/10); and, for 15.38% (4/26) of the patients, the pain was moderate (3/10).

According to the general data of the WOSI, the mean classification of the patients was of 18.70%, with a minimum of 2.38% (best score) and a maximum of 45.24% (worst score). Considering the 4 domains in isolation, the physical symptoms presented the best percentage (8.5%), while the worst result was observed regarding lifestyle (20%) (**Table 3**).

The evaluation through the SF-12V2, showed that the physical component score (PCS) and the mental component score (MCS) presented the following mean values: 55.93 (± 3.44) and 45.22 (± 5.96) respectively. Considering the standardized values for the general population, of 50 ± 10 , the PCS and MCS found are within the mean value regarding quality of life (**Table 4**). In this context, there was a positive correlation ($p < 0.0001$; $r = 0.7252$) between the VAS and the WOSI. Thus, the better the VAS results, the better the patient's quality of life on the WOSI.

We also observed that the scores were consistent with that of the PCS, with a negative correlation with the VAS and the WOSI ($p = 0.0066$; $r = -0.5189$; and $p = 0.0159$; $r = -0.4681$ respectively). Thus, the better the PCS results, the lower the VAS and WOSI scores, demonstrating better quality of life.

In relation to patients who practiced sports, the SSV parameters ($p = 0.0081$, $r = 0.5076$ - positive correlation) show improvement, while the correlation of VAS ($p = 0.0124$; $r = -0.4832$) and WOSI ($p = 0.0112$; $r = -0.4892$) scores was negative because, the better their value, the better the quality of life.

As for recurrences, they were inversely related to the SSV ($p = 0.0033$; $r = -0.5537$), suggesting a worse subjective functional evaluation by the patient.

The degree of patient satisfaction in relation to the surgical procedure was inversely proportional to the time between the first dislocation and the surgery, that is, the shorter the time, the greater the patient satisfaction ($p = 0.0499$; $r = -0.3884$) (**Table 5**).

Discussion

The most important finding of the present study was the correlation between the greater satisfaction of the patients and the decrease in the time between the dislocation and the surgical procedure, thus confirming the hypothesis that the time until the performance of the surgical procedure influences patient satisfaction.

Table 1 Characteristics of the study sample

Age (years)			
Mean (standard deviation)	26 (± 5.17)		
Minimum–maximum	18–35		
Gender	<i>Absolute frequency</i>	%	<i>p-value</i>
Male	26	100.00	1.0000 ^T
Female	0	0.00	
Total	26	100.00	
Comorbidities	<i>Absolute frequency</i>	%	<i>p-value</i>
Yes	1	3.85	1.0000 ^T
No	25	96.15	
Total	26	100.00	
Smoking	<i>Absolute frequency</i>	%	<i>p-value</i>
Yes	2	7.69	1.0000 ^T
No	24	92.31	
Total	26	100.00	
Practice of sports	<i>Absolute frequency</i>	%	<i>p-value</i>
Yes	18	69.23	1.0000 ^T
No	8	30.77	
Total	26	100.00	
Type of sports activity	<i>Absolute frequency</i>	%	<i>p-value</i>
Gym workout	3	16.67	0.8143 ^{TK}
Soccer	11	61.11	
Motorcycle riding	2	11.11	
Weightlifting and mountain biking	1	5.56	
Volleyball and soccer	1	5.56	
Total	18	100.00	
Competitive x recreational	<i>Absolute frequency</i>	%	<i>p-value</i>
Competitive	0	0.00	1.0000 ^T
Recreational	18	100.00	
Total	18	100.00	

Notes: ^T Student *t*-test, used to detect significant differences in the population. ^{TK} Tukey test for multiple comparisons using one-way analysis of variance.

Table 2 Characterization of the patients according to the occurrence of dislocations

Time between first dislocation and surgical procedure (months)			
Median	24		
P25–P75	18–48		
Minimum–maximum	6–96		
Number of dislocations before the surgical procedure			
Median	45		
P25–P75	12–65		
Minimum–maximum	2–150		
Recurrence	<i>Absolute frequency</i>	%	<i>p-value</i>
No	22	84.62	1.0000 ^{TK}

(Continued)

Table 2 (Continued)

Once	3	11.54	
Twice	1	3.85	
Total	26	100.00	
Reoperation	<i>F</i>	<i>%</i>	<i>p-value</i>
Yes	0	0.00	1.0000 ^T
No	26	100.00	
Total	26	100.00	
Satisfaction	<i>Absolute frequency</i>	<i>%</i>	<i>p-value</i>
Satisfied	24	92.31	1.0000 ^T
Not satisfied	2	7.69	
Total	26	100.00	
Did you undergo the Bankart procedure before the Latarjet procedure?	<i>Absolute frequency</i>	<i>%</i>	<i>p-value</i>
Yes	3	11.54	1.0000 ^T
No	23	88.46	
Total	26	100.00	

Abbreviations: P25, 25th percentile; P75, 75th percentile.

Notes: ^T Student *t*-test, used to detect significant differences among the population. ^{TK} Tukey test for multiple comparisons using one-way analysis of variance.

Table 3 Assessment of the quality of life of the study sample according to the Subjective Shoulder Value (SSV) instrument

SSV - score	<i>Absolute frequency</i>	<i>%</i>	<i>p-value</i>
100%	10	38.46	1.0000 ^{KW}
95%	2	7.69	
90%	6	23.08	
80%	4	15.38	
60%	1	3.85	
56%	1	3.85	
40%	2	7.69	
Total	26	100.00	
SSV (%) - general	Median	P25–P75	Minimum–maximum
	90	80–100	40 – 100

Abbreviations: P25, 25th percentile; P75, 75th percentile.

Note: ^{KW} Kruskal-Wallis test, used to detect significant differences among the population (nonparametric data).

The sample consisted predominantly of young men, with a mean age of 26 years, which is consistent with the literature, notably occurring in contact athletes who belong to the risk group.^{17,18} Among them, the mean time between the surgical procedure and the first dislocation was of 24 months, with a mean occurrence of 10 dislocations before the decision to undergo the procedure.

Meta-analysis studies^{10,19} report 25% to 31% of possible complications with the Latarjet procedure. On the other hand, when analyzing only recurrence, the rates range from 1% to 7.5%.^{7,13,20,21} The only complication in the present study was recurrence, which was reported in 4 of the 26 patients (15.39%). Since the present study was performed through telephone interviews, the patient may have had difficulty identifying other complications, or even un-

derstanding that the term *dislocation* refers to the total incongruity of the glenohumeral joint.

In the evaluation of the functional and quality of life scores, we observed on the SSV that more than 75% of the patients presented values higher than 80%, demonstrating a subjective high evaluation of the functional score. Regarding the VAS, the score of 76.92% of the sample was 0, that is, no pain, and the worst was 3, which corresponds to mild to moderate pain. In this sense, very satisfactory pain indexes were observed. When questioned about satisfaction, 92.31% of the sample reported that they were satisfied, compared to the work of da Silva et al.²² Hurley et al.⁴ also found values > 90%, even after 16 years of follow-up. Hovelius et al.²³ followed 118 shoulders, and reported satisfaction rates of 98% after 15 years. Schroder et al.,²⁴ in a the study with 49

Table 4 Assessment of the quality of life of the study sample according to the SF-12V2 instrument

Domains of the SF-12V2	Frequency of alternatives (%)					
	1	2	3	4	5	TOTAL (%)
Functional capacity	–	9.62	90.38	*	*	100.00
Physical aspect	–	3.85	–	3.85	92.30	100.00
Body pain	53.85	46.15	–	–	–	100.00
General health	7.70	76.92	15.38	–	–	100.00
Vitality	11.54	69.23	19.23	–	–	100.00
Social aspect	7.69	–	–	7.69	84.62	100.00
Emotional aspect	–	3.85	25.00	21.15	50.00	100.00
Mental health	11.54	34.61	11.54	19.23	23.08	100.00
Summary of the physical and mental components	Mean		Standar deviation		Minimum–maximum	
Physical component score	55.93		± 3.44		48.22–61.65	
Mental component score	45.22		± 5.96		32.20–58.83	

Abbreviation: SF-12V2.

Notes: * Alternatives not available in the domain. - Alternatives not selected by the patients.

Table 5 Correlation analysis (Spearman) between patient factors and quality of life assessment scores

	FINAL MCS	SSV	VAS	WOSI	AGE	PRACTICE OF SPORTS	NUMBER OF REDISLOCATIONS	DEGREE OF SATISFACTION
FINAL- PCS								
r value	–0.6260	0.1105	–0.5189	–0.4681	0.0302	0.2335	–0.1190	0.0963
p-value	0.0006*	0.5910	0.0066*	0.0159*	0.8835	0.2509	0.5627	0.6398
FINAL- MCS								
r value		–0.3983	0.5980	0.4660	–0.1412	–0.3670	0.0699	–0.0963
p-value		0.0439*	0.0013*	0.0164*	0.4915	0.0652	0.7346	0.6398
SSV								
r value	–0.3983		–0.4245	–0.5446	0.1149	0.5076	–0.5537	0.2798
p-value	0.0439*		0.0307*	0.0040*	0.5762	0.0081*	0.0033*	0.1663
VAS								
r value	0.5980	–0.4245		0.7252	–0.3255	–0.4832	0.2875	0.1569
p-value	0.0013*	0.0307*		0.0000*	0.1047	0.0124*	0.1544	0.4440
WOSI								
r value	0.4660	–0.5446	0.7252		–0.2988	–0.4892	0.3536	–0.2311
p-value	0.0164*	0.0040*	0.0000*		0.1382	0.0112*	0.0764	0.2560
AGE								
r value	–0.1412	0.1149	–0.3255	–0.2988		0.4684	–0.1034	–0.2994
p-value	0.4915	0.5762	0.1047	0.1382		0.0158*	0.6151	0.1373
PRACTICE OF SPORTS								
r value	–0.3670	0.5076	–0.4832	–0.4892	0.4684		–0.1595	–0.1925
p-value	0.0652	0.0081*	0.0124*	0.0112*	0.0158*		0.4364	0.3462
NUMBER OF RELAPSES								
r value	0.0699	–0.5537	0.2875	0.3536	–0.1034	–0.1595		0.1228
p-value	0.7346	0.0033*	0.1544	0.0764	0.6151	0.4364		0.5502

(Continued)

Table 5 (Continued)

	FINAL MCS	SSV	VAS	WOSI	AGE	PRACTICE OF SPORTS	NUMBER OF REDISLOCATIONS	DEGREE OF SATISFACTION
DEGREE OF SATISFACTION								
r value	-0.0963	0.2798	0.1569	-0.2311	-0.2994	-0.1925	0.1228	
p-value	0.6398	0.1663	0.4440	0.2560	0.1373	0.3462	0.5502	
TIME (FROM FIRST DISLOCATION TO SURGICAL PROCEDURE)								
r value	0.1409	0.2224	0.0131	0.2189	0.2304	0.3363	-0.2624	-0.3884
p-value	0.4925	0.2748	0.9493	0.2828	0.2574	0.0930	0.1953	0.0499*

Abbreviations: MCS, mental component score; PCS, physical component score; SSV, Subjective Shoulder Value; VAS, Visual Analogue Scale; WOSI, The Western Ontario Shoulder Instability Index.

Note: * Significant difference according to the Spearman correlation ($p < 0.05$).

patients and a longer follow-up, of 26.4 years, found a rate of ~70% of good or excellent results. Silva et al.²⁵ reported good and excellent results in 82.7% of the cases.

The SF-12V2 enables the evaluation and comparison with value standardized for the general population: 50 ± 10 . Therefore, we can state that the sample of the present study was within this value, for the mean PCS found was of 55.93, and the mean MCS was of 45.22. These values also demonstrate that, with the Latarjet procedure, the patient can return to levels similar to those of an individual who never presented dislocation.

In the analysis of the correlation of the different variables, coherence was observed regarding the subjective scores. Therefore, the SSV proved to be inversely related to both the VAS and the WOSI, confirming that the closer the subjective evaluation of the operated shoulder is in relation to a healthy shoulder, the lower the sensation of pain and functional limitation.

The number of recurrences worsened the SSV scores according to the Spearman correlation ($p = 0.0033$; $r = 0.5537$), suggesting that recurrence leads to worse functional results. In addition, the higher number of preoperative dislocations influenced the poor results on the VAS in the multivariate analysis. With each dislocation, there may be an increase in injuries to static and dynamic stabilizers, as well as in the size of the Hill-Sachs and Bankart lesions.

On the other hand, the practice of sports proved to be beneficial for quality of life, presenting, through the Spearman correlation, the best results on the SSV with ($p = 0.008$), the VAS, and the WOSI, which was reiterated in the multivariate analysis of the VAS. The importance of the return to sports was reinforced by Warth et al.,²⁶ who reported that one of the major preoperative concerns of the patients involved the ability to return to sports.

The analysis of the Spearman correlation showed that patient satisfaction was inversely proportional to the time between the first dislocation and surgery. Thus, surgical indication in the shortest possible time may be beneficial to the patient in terms of subjective results.

The present study has limitations because it is retrospective and was performed by telephone. Thus, there may be a bias regarding the transmission of information and compli-

cations related to the physical examination, such as the limitation in ROM, which was not evaluated. The sample of 26 patients is small and limits the statistical evaluation. The follow-up of 12 months is also considered relatively short for surgical treatments and recurrent shoulder instability.

Conclusion

A longer time between the first dislocation and the surgical procedure, a greater number of dislocations, and a higher rate of recurrence negatively influence quality of life.

The early indication of surgical treatment for anterior glenohumeral instability may provide better subjective functional results to the patient.

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Conflict of Interests

The authors have no conflict of interests to declare.

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