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FUNCTIONAL OUTCOME OF WEBER OSTEOTOMY IN CHRONIC ANTERIOR GLENOHUMERAL DISLOCATION IN YOUNG PATIENTS

RESULTADO FUNCIONAL DA OSTEOTOMIA DE WEBER NA LUXAÇÃO GLENOUMERAL ANTERIOR CRÔNICA EM JOVENS

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ABSTRACT

Objective: This study aimed to evaluate the functional outcomes of humeral head derotational osteotomy according to the Weber technique as a therapeutic alternative for the treatment of chronic anterior shoulder dislocation in young patients. Methods: This prospective case series included patients younger than 50 years who underwent clinical and radiographic evaluation. Outcomes were assessed using plain radiographs, computed tomography (CT), the Visual Analog Scale (VAS) for pain, the 36-Item Short Form Health Survey (SF-36), and range of motion measurements. The mean age of the participants was 47.67 years. Results: The procedure resulted in a significant reduction in pain, with a mean decrease of 5.7 points on the VAS, as well as improvements of 30° in extension and 28° in external rotation ($p < 0.05$). The SF-36 demonstrated an average improvement of 27 points in overall quality of life and functional status, and 54 points in the pain domain. No cases of recurrent dislocation were observed. Conclusion: Weber humeral head derotational osteotomy provides satisfactory functional recovery, significant pain relief, and may be considered a viable treatment option for chronic anterior glenohumeral dislocation in young patients. ***Level of Evidence IV; Case Series.***

Keywords: Shoulder Dislocation; Shoulder Injuries; Osteotomy.

RESUMO

Objetivo: Este estudo teve como objetivo avaliar os resultados funcionais da osteotomia de desrotação da cabeça umeral segundo a técnica de Weber, como alternativa terapêutica para a luxação anterior crônica do ombro em pacientes jovens. Métodos: Trata-se de um estudo prospectivo de uma série de casos, incluindo pacientes com menos de 50 anos, avaliados por radiografias, tomografia, Escala Visual Analógica (EVA) para dor, escala SF-36 e avaliação da amplitude de movimento. A média de idade dos participantes foi de 47,67 anos. Resultados: Os resultados mostraram melhora significativa da dor (redução média de 5,7 pontos na escala EVA), além de ganho de 30° na extensão e 28° na rotação lateral ($p<0,05$). O escore do SF-36 indicou melhora média de 27 pontos na qualidade de vida e funcionalidade, e 54 pontos no domínio da dor. Nenhum caso apresentou recorrência. Conclusão: A osteotomia de Weber promove boa recuperação funcional, alívio da dor e pode ser considerada uma opção viável para o tratamento da luxação glenoumeral anterior crônica em pacientes jovens. ***Nível de Evidência IV; Série de Casos.***

Descritores: *Luxação do Ombro; Lesões do Ombro; Osteotomia.*

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INTRODUCTION

Chronic anterior shoulder dislocation is a rare condition defined as a glenohumeral dislocation that has not been reduced since the third week of the traumatic event[1]. Chronic anterior dislocation is less prevalent than posterior dislocation, which is related to the fact that it is more symptomatic (more loss of movement and pain) in its acute phase when compared to posterior dislocation[2]. In this context, patients with cognitive alterations (secondary to multiple trauma, neurological diseases, and alcoholism) may make initial diagnosis difficult and facilitate the progression to chronic dislocation[3,4].

Prolonged glenohumeral joint incongruence can lead to degenerative changes such as severe bony deformity in the humeral head (large Hill-Sachs lesion) and/or the glenoid associated with capsuloligamentous injury[1,5]. Associatedly, there is a shortening of the posterior capsule and a lengthening of the anterior one. In addition to the anatomical complexities inherent to the pathology, dislocation when not reduced presents continuous joint deterioration and functional loss. Therefore, therapeutic management is challenging and requires precise strategies to restore joint functionality and stability[6,7].

Treatment for chronic anterior shoulder dislocation is controversial. Conservative treatment may be performed when the patient is not in a clinical condition for surgical treatment. Other comorbidities such as epilepsy and uncontrolled alcoholism may prevent surgical treatment[8,9].

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The study was conducted at Universidade de Campinas, Faculdade de Ciencias Medicas.
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The decision on the type of surgical treatment is influenced by several factors such as age, time of dislocation, and size of the bone defect in the glenoid and humerus[10,11]. Elderly patients with chronic dislocation and large bone defects can be treated with arthroplasty. Currently, reverse arthroplasty is the implant of choice[12,13].

Treatment in young patients is challenging because many techniques are ineffective, especially in cases of large bone defects in the humeral region. Arthroplasty in this cohort of patients is limited due to the risk of early revisions and postoperative instability[12]. Shortening of the posterior capsule, failure of the anterior capsule, and internal rotators caused by chronic dislocation increase the risk of surgical failure in classic techniques such as open reduction, labral repair, and Latarjet surgery, and have a high rate of dislocations or subluxations after the procedure[14]. Treatment with bone graft in the posterolateral portion of the head can prevent recurrence. However, the need for extensive detachment of the supraspinatus and, in some cases, the infraspinatus to access the defect can determine postoperative functional impairment even when reinsertion is correctly performed[1,15].

The first cases of proximal humeral osteotomies date back to the end of the 19th century. Advances in internal fixation methods, particularly in plate and screw systems, have significantly increased postoperative bone stability about the results of osteotomies[16]. In 1984, Weber performed an osteotomy to retrovert the humeral head about the diaphysis for Hill-Sachs lesions that presented entrapment in the glenoid when the patient performed a lateral rotation of the shoulder. The original objective of the technique was to treat patients with traumatic glenohumeral instability. With the advent of labral repair (Bankart) and bone blocks (Bristow, Latarjet), it was progressively abandoned[17,18].

There is no consensus in the literature regarding the ideal procedure for the treatment of chronic anterior glenohumeral dislocation in young patients with large Hill-Sachs lesions. Thus, the technique developed by Weber becomes an option in the treatment of this challenging disease by retroverting the humeral head and avoiding the engagement of the Hill-Sachs defect in the glenoid.

The objective was to evaluate the functional and radiological results of a series of cases of young patients diagnosed with chronic anterior glenohumeral dislocation who underwent Weber humeral osteotomy.

MATERIALS AND METHODS

A prospective study was performed on a case series of patients with chronic anterior glenohumeral dislocation who underwent Weber osteotomy.

The inclusion criteria were patients aged between 18 and 50 years with a diagnosis of chronic dislocation for at least 3 months, who were compensated for any associated diseases (epilepsy, alcoholism). Patients with associated fractures, the presence of osteonecrosis of the humeral head, and patients with less than one year of postoperative follow-up were excluded.

All patients underwent pre- and postoperative radiological evaluation with true anteroposterior, lateral, and axillary radiographs. Computed tomography was performed only preoperatively. The Visual Analogue Pain Scale (VAS) was assessed to measure patients' pain complaints in the pre- and postoperative periods. Functional analysis was conducted using the SF-36 (Short Form Health Survey) and by recording the range of motion using a standard goniometer[19].

The procedure was performed with the patient in the beach chair position. A 15 cm deltopectoral access port was created. The subscapularis tendon was detached and repaired. The interposed scar tissue in the joint was then removed and the humeral head was reduced. The humeral head was fixed to the glenoid with a provisional 3 mm Kirschner. A 2.5 mm Kirschner wire was inserted into the humeral head from anterior to posterior and a second 2.5 mm Kirschner wire was inserted into the humeral shaft forming an approximate 30º medial inclination angle about the anterior. A proximal humeral locking plate (Hexagon R) with 4 holes and fixed in its proximal portion with 2 locked screws. An osteotomy is performed at the surgical neck and a 30-degree lateral rotation of the humeral diaphysis about the head using the 2 Kirschner wires as a reference (the wires remain parallel after the humeral rotation). The plate is fixed in its distal portion and then completed in its proximal portion (Figure 1). The entire procedure is guided by intraoperative radioscopy. The subscapularis tendon is inserted, followed by complete closure of the wound and immobilization with a sling. The immobilization is maintained until the fourth week when it is removed and the shoulder movement is regained.

During the postoperative follow-up, radiographic control and clinical evaluation were performed as previously described at two weeks, one, three, six, and twelve months postoperatively. The fracture

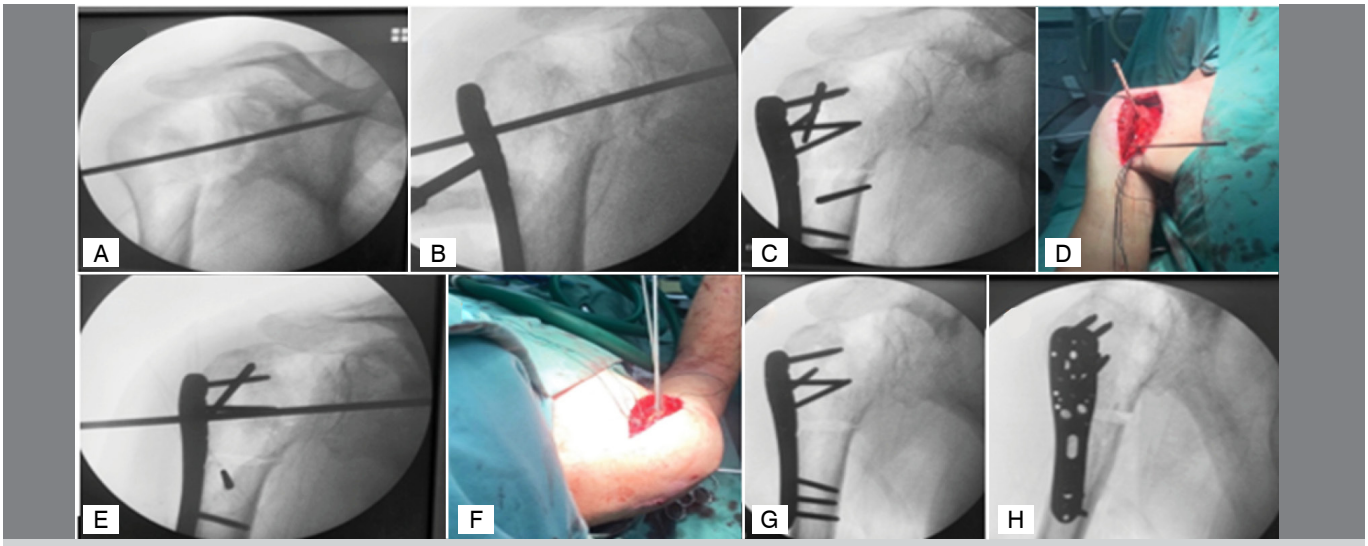


Figure 1. Reduction of the humeral head (A) and fixation in the glenoid with a temporary 3.0 mm wire; placement of the locked plate and fixation with proximal screws (B); placement of temporary k-wires with 30º between them (radiological image - C and clinical positioning - D) Osteotomy and external rotation of the arm of 300 (radiological image E clinical image F where parallelism between the k-wires is observed; fixation of the locked plate completed and removal of k-wires (radiograph in anteroposterior position G and lateral view H).

was deemed consolidated when the osteotomy sign was no longer visible in three radiographic views (Figure 2).
Non-categorical variables were tested using the Kolmogorov-Smirnov test to define sample normality, and the paired t-test was used to compare non-categorical variables in the pre-and postoperative periods. A significance level of $P < 0.05$ was considered. SPSS statistics software version 29 was used.
The project was approved by the research ethics committee under number CAAE:84493524.0.0000.5404.

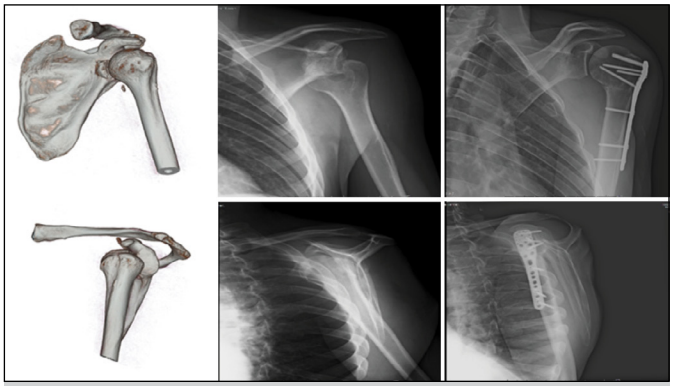


Figure 2. Tomography with 3D reconstruction and pre- and post-operative radiographs.

RESULTS

Three patients were included, all male, with a mean age of 47.67 + 8.73 years. The mean dislocation time was 3.6 + 0.57 months. There was osteotomy consolidation in all cases and none developed infection or postoperative neurological deficit.
The gain in the range of motion after the procedure occurred in all planes except abduction and adduction. Medial rotation was measured functionally. Two patients evolved postoperatively with rotation at the level of L5 (Figure 3) and one with rotation at the level of the greater trochanter (without improvement about the postoperative period). Flexion and elevation of the scapular plane were the movements with the greatest postoperative gain. (Table 1).
A significant improvement in postoperative pain was observed. There was an average decrease of 5.7 + 3.05 points in the VAS score (Table 2).



Figure 3. Postoperative evolution (internal rotation at L5 level) and 150º of flexion.

The SF-36 quality of life assessment score showed an improvement in all domains except vitality and mental health. The main improvement observed in the SF-36 was related to pain control with a mean increase of 53.66 + 37.28 points. The assessment of general health by the postoperative SF -36 was significant with an increase of 27.66 + 5.13 points. In the functional capacity domain, there was a mean increase of 26.67 + 16.07 points (Table 2).

Table 1. Pre- and postoperative range of motion.

Range of motion	preoperative (degrees)	Postoperative (degrees)	IC (degrees)	p-value*
Flexion	26.67 + 15.27	101.67 + 47.52	23.58 - 173.58	0.04
Lateral rotation	20.00 + 10.00	48.33 + 2.88	4.41 - 9.36	0.01
Extension	6.67 + 2.88	36.67 + 5.77	17.57 - 42.42	0.05
Abduction	23.33 + 15.27	51.67 + 33.29	21.86 - 78.53	0.06
Adduction	3.82 + 4.2	5.91 + 2.6	2.19-6.37	0.10

* Paired t-test.

Table 2. Visual analogue pain scale and SF-36 score pre- and postoperatively.

Score	preoperative (stitches)	postoperative (stitches)	IC (points)	p-value*
VAS	8.33 + 0.57	2.67 + 3.05	14.39 + 3.05	0.05
Sf-36 (general health)	30,00 + 10,00	57.67 + 9.81	14.9 - 40.4	0.05
Sf-36 (functional capacity)	18.33 + 17.55	45.00 + 26.45	13.20 - 66.59	0.05
Sf-36 (pain)	16.67 + 5.77	70.33 + 34.06	38.96 – 98.46	0.05
Sf-36 (vitality)	15.00 + 5.00	45.33 + 10.50	3, 48 - 64.15	0.06
Sf-36 (mental health)	18.33 + 2.88	28.67 + 11.84	11.93 - 32.59	0.09

* Paired t-test; SF-36 =Short Form Health Survey; VAS =Visual Analogue Pain Scale.

DISCUSSION

Chronic anterior glenohumeral dislocation is a rare disease[1]. The case series presented here was constructed after 5 years. Thus, the incidence of surgical treatment was less than 1 case per year. No patient developed postoperative subluxation or dislocation. The lower prevalence of recurrence found in osteotomy compared with traditional techniques may be associated with the fact that osteotomy not only avoids the engagement of the Hill-Sachs lesion in the glenoid but also tensions the anterior capsule and lengthens the posterior capsule. This re-tensioning improves the balance of forces acting on the humeral head, which is altered in chronic anterior dislocation.
Reverse arthroplasty indicated for chronic anterior shoulder dislocation has shown promising results, with significant improvement in pain complaints and range of motion. However, the studies evaluated only patients over 50 years of age. In addition, patients undergoing arthroplasty developed a higher complication rate (instability and need for revision) when compared to those undergoing arthroplasty due to rotator cuff arthropathy[20,21].
Although Latarjet surgery evolves with good functional recovery in patients with shoulder instability, it does not present the same way in cases of chronic anterior dislocation. The Latarjet technique has demonstrated a high rate of subluxations, surgical revisions, and early osteoarthritis, especially when subscapularis tenotomy is necessary during the surgical approach, which is often essential due to soft tissue contracture and the need to remove interposition tissues in chronic anterior dislocation[14,22,23].

Open reduction associated with soft tissue re-tensioning and bone grafting in the Hill-Sachs defect or open reduction associated with Bankart repair has a high complication rate, especially in young patients[8,24].

Clinical analysis based on the visual analog scale (VAS) demonstrated an improvement in pain after the surgical procedure. Previous studies, such as those by Rai et al. and Li and Jiang, also showed improvements in pain parameters, especially in the early postoperative period. However, in these studies, patients who presented subluxation returned to preoperative pain levels, a common phenomenon in techniques such as Latarjet in the treatment of chronic anterior dislocation. This suggests that, unlike what is observed in Weber osteotomy, the improvement in pain in traditional approaches may be transient and dependent on joint stability[14,25].

Functional and quality of life analysis of patients undergoing osteotomy revealed significant improvements in some postoperative parameters. Flexion and elevation in the scapular plane were the movements that evolved with the greatest gains. In the study by Rai et al, which used the Latarjet technique, a significant improvement in abduction was observed, increasing from 37.7° to 108.2°; however, the other movements were not evaluated, limiting the comparison between the techniques. In addition to functional gains, the quality of life of patients was positively impacted, as demonstrated by the increase in the score of the general health domain of the SF-36, which increased from 30.00 ± 10.00 to 57.67 ± 9.81 ($p < 0.005$). The study by Li and Jiang also demonstrated statistically significant improvements in lateral rotation and functionality, although using scores other than the SF-36, such as ASES, UCLA, and Constant. However, the positive evolution in these studies was observed only in patients without episodes of new dislocation or subluxation. Since new dislocation is a complication frequently associated with the Latarjet technique, it is possible that the functional and range of motion gains reported in these studies would be smaller with a longer postoperative follow-up[14].

The main limitation of the study was the small number of cases evaluated. However, considering that the disease has a low prevalence and that classical techniques for the treatment of chronic anterior shoulder dislocation have significant recurrence rates, the proposal of Weber osteotomy for the treatment of this disease is of great value.

Weber osteotomy appears as a promising technique in the treatment of chronic anterior glenohumeral dislocation and constitutes an alternative for chronic anterior shoulder dislocation. Prospective multicenter studies are needed to confirm the efficacy of this procedure, strengthening its applicability in clinical practice.

CONCLUSION

Weber´s retroversion osteotomy of the humeral head evolved with good functional recovery, and improvement of pain associated with an absence of recurrence of chronic anterior glenohumeral dislocation and can be considered an option for the treatment of this complex condition.

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CONTRIBUTIONS OF THE AUTHORS

Each author made a personal and significant contribution to this article. SFBM, CSS, CMA: Investigation, Data curation; KFK, CSP: Investigation (surgical procedures); MGG: Conceptualization, Writing – review & editing.

DATA AVAILABILITY DECLARATION

The data underlying the research text are contained within the manuscript.

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