RESULTS OF TREATMENT OF PROXIMAL HUMERUS FRACTURES USING LOCKING PLATES

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ABSTRACT

Objective: To analyze the clinical results after proximal humerus fracture fixation using blocked plates and screws. Material and Methods: In the period from November 2003 to January 2008, the authors treated 33 patients with 34 fractures of the proximal humerus. The mean age was 57 years old (33 to 86 years), 14 males and 19 females. All patients were operated in the acute phase, within the first week after the trauma. The patients were treated with open reduction and internal fixation using locking plates. The surgical technique, implants, period of immobilization and rehabilitation protocol were the same for all the patients. Results: The mean follow-up period was 24 months (8 to 60 months). The functional evaluation was based in the UCLA score. Good and excellent results were present in 31 (91.2%) of the patients and 3 (8.8%) of them presented poor results. Conclusions: As a conclusion, the locking plate system of fixation was considered efficient for the treatment of proximal humerus fractures.

Keywords: Shoulder fractures. Humerus. Plates.

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INTRODUCTION

Proximal humerus fractures constitute approximately 4% to 10%[1-3] of all fractures, and the most frequent trauma mechanism is falls from own height. The conservative method of treatment for fractures with minor deviations is performed through immobilization with sling for a four-week period followed by physiotherapy for gain of movement. In fractures with deviations and unstable fractures, surgical treatment is indicated. There are different fracture fixation methods such as the use of plates and screws,[4-7] percutaneous fixation with metallic wires,[8] tension band,[9] external fixation,[10] fixed-angle plates,[11] proximal locking plates[12] and arthroplasty.[13,14]

All the fixation methods have their advantages and disadvantages. Percutaneous fixation with metallic wires offers a less invasive fixation, yet the fixation is not rigid, requiring absolute immobilization until fracture consolidation. The tension band system as well as screws are used more often when there is a fracture of the greater tubercle with or without other associated traces of a fracture, with the upside of less aggression to the bone. However, its fixation is not totally rigid.

External fixers can produce better healing of soft parts in cases of exposed fractures, but the contact with the outside environment predisposes infections, and there is a risk of neurological injury from the pins. Fixed-angle plates are restricted to simple fractures, without impairment of the greater tubercle, which is the blade insertion site.

Arthroplasty is the method of last resort and is generally employed in elderly patients with four-part fractures where there is fixation difficulty due to bone porosis.

Proximal locking plates allow rigid fixation and can be employed in more severe fractures. They allow the association of loops with non-absorbable sutures, permitting fixation of the tubercles and a more anatomical reduction of fragments. Passive mobility exercises for gain of movement can be started earlier.

This study is aimed at evaluating the outcome of the treatment of proximal humerus fractures with proximal locking plate (Philos, Synthes).

MATERIAL AND METHODS

In the period from November 2003 to January 2008, 33 patients were treated surgically for correction of proximal humerus frac-

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tures through open reduction and fixation with proximal locking plate (Philos, Synthes). One of the patients presented bilateral fracture due to the same trauma, totaling 34 fractures in this series. (Table 1)

Among these patients there were 14 men and 19 women, with 19 dominant side and 15 non-dominant side fractures. The mean age was 57 years, ranging from 33 to 86 years. The mean follow-up time was 24 months, ranging from eight to 60 months. The radiographic evaluation was conducted through radiographies with corrected frontal, lateral scapulary, and axillary views. Computed tomography was used when the radiographies did not allow correct evaluation of the fracture. The fracture inclusion criterion was done using Neer's classification.

The fractures were classified as 17 of type II (50%), 13 of type III (38.3%), and four of type IV (11.7%).

In the surgical technique, the patients were positioned in a beach chair under general anesthesia and troncular block. A dose of antibiotic dose was administered prophylactically in anesthesia induction. The surgical incision was of the delto pectoral kind, with direct access to the fracture. Debridement of the fracture site was followed by reduction and fixation with the plate and screws, under fluoroscopic control. The fractures with impairment of the tubercles were fixed to the plate using loops with non-absorbable sutures.

The patients remained immobilized with a simple sling for a period three week, but were already submitted to assisted passive gain of movements with the physiotherapist's help. After three weeks they were started on isometric strengthening and active gain of movements. The average duration of the rehabilitation was four months.

RESULTS

The patients of the study group were assessed by the UCLA score after a minimum period of eight months, with radiographic confirmation of consolidation. The mean follow-up period was 24 months. According to the UCLA score, we obtained 31 patients with excellent and good results (91.2%) and three poor results (8.8%). (Table 2) The patients with results considered poor exhibited pain, limited range of motion and dissatisfaction.

Of the patients with Neer type II fracture, 15 (88.2%) obtained excellent and good results, and two (11.8%) were classified as poor results. Of the patients with Neer type III fractures, 11 (84.6%) were considered excellent and good results and two (15.4%) were classified as poor results. In the group of patients with Neer type IV fractures, all the patients were considered excellent and good results. We did not observe further complications such as infection, neurovascular lesions, loosening of the plate, vicious consolidation or necrosis of the humeral head, although some patients did not have a follow--up period above two years.

Table 1. *Epidemiological data.*

Patient	Age	Gender	Neer	Dom.	Follow-up
1	42	F	3	Y	13
2	62	F	2	N	24
3	45	M	2	N	18
4	58	F	3	Y	49
5	52	M	2	Y	40
6	47	M	4	N	30
7	74	F	2	Y	42
8	43	M	2	N	28
9	64	M	4	Y	31
10	64	F	4	Y	39
11	65	M	2	Y	24
12	33	M	2	N	10
13	36	F	3	N	11
14	42	F	3	N	23
15	66	F	2	Y	12
16 bilateral	72	F	2/2	Y/N	60/60
17	75	F	3	Y	20
18	35	F	3	Y	8
19	70	M	2	Y	22
20	82	F	4	Y	53
21	57	M	3	N	18
22	43	M	2	N	11
23	54	F	2	N	13
24	69	F	2	Y	20
25	86	F	2	N	18
26	47	F	2	Y	11
27	47	F	3	Y	13
28	50	F	3	Y	12
29	58	M	3	Y	15
30	52	F	3	N	17
31	69	M	2	Y	13
32	59	M	3	N	24
33	57	M	3	N	14

F- female. M- male. Y- yes. N- no. Age in years. Follow-up in months

Table 2. *UCLA score.*

Patient	Pain	Function	Elevation	Strength	Satisfaction	Total
1	10	10	5	5	5	35
2	8	8	6	4	5	31
3	10	10	5	4	5	34
4	4	6	3	3	0	16
5	10	10	5	5	5	35
6	8	8	5	5	5	31
7	8	8	5	5	5	31
8	10	10	5	5	5	35
9	10	10	4	4	5	33
10	8	8	4	5	5	30
11	8	8	5	5	5	31
12	10	8	5	5	5	33
13	10	10	4	4	5	33
14	8	6	5	5	5	29
15	10	10	5	5	5	35
16 bilateral	6/6	6/6	4/4	4/4	0/0	20/20
17	10	8	5	5	5	33
18	8	10	5	5	5	33
19	8	8	5	5	5	33
20	8	10	5	5	5	34
21	8	8	5	5	5	33
22	10	8	5	5	5	34
23	8	8	5	5	5	33
24	8	8	5	5	5	33
25	8	8	4	5	5	31
26	10	10	4	5	5	34
27	10	10	5	5	5	35
28	10	10	5	5	5	35
29	10	10	5	4	5	34
30	10	10	5	5	5	35
31	10	10	5	5	5	35
32	10	10	5	4	5	34
33	10	10	5	5	5	35

DISCUSSION

Most proximal humerus fractures call for conservative treatment. Some unstable and complex fractures require surgical treatment. Several techniques and devices have been used for the fixation of these fractures. The main goal of treatment is the restitution of limb function. Open reduction, in spite of the morbidity of surgical access, allows a more anatomical reduction of the fracture. (Figures 1A and 1B) Rigid fixation with locking plate favors immediate assisted mobility, avoiding stiffness and pain as sequela of the fracture. Since the mean age of the patients that present this type of fracture is high, the surgeon generally comes across porotic bones and encounters difficulty in fixing the screws. The use of locking plates confers greater stability to the fixation of fractures. Rose et al.[1] encountered 75% of consolidation and excellent results in their casuistry, considering the fixations stable and performing early rehabilitation.

Our poor results occurred in three osteosyntheses. One patient presented fracture accommodation causing some screws to become prominent (patient 4). Plate removal was indicated, but due to the unfavorable clinical conditions, the procedure was not carried out and the patient died 11 months after surgery. The other two poor results occurred in the patient with bilateral fracture (patient 16). Complaints of pain and difficulty in movement of both shoulders marked the poor result. The patient had already been submitted to repair of the rotator cuff in both shoulders and already presented discreet pain prior to the fractures. (Figure 2) It is worth emphasizing that this patient was elderly and had difficulties performing the rehabilitation. A third patient (patient 13) with a score of 33 complained of sporadic pain.

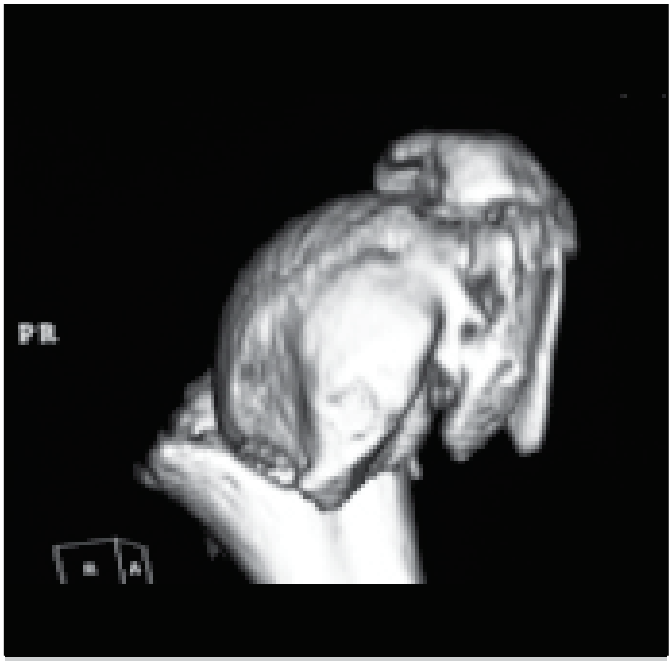

Figure 1A. *Tomography with 3D reconstruction of Neer type III fracture.*

Figure 1B. *Fluoroscopic control during the intraoperative period.*

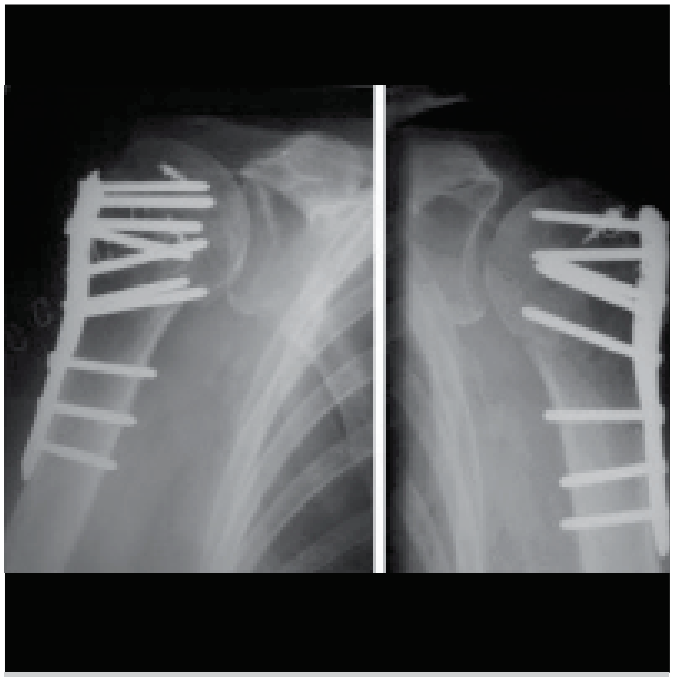

Figure 2. *Osteosynthesis and previous cuff repair.*

She was a young and active patient. In this patient the plate was well located, yet one of the screws was long and prominent, but outside the articular contact area. There was complete improvement after plate removal.

To avoid complications with the implant, some technical precautions should be observed in using this fixation method. It is important to position the plate at the correct height since the plate positioned "high" can provoke mechanical impact in the acromion when the shoulder is abducted. Another technicality is the length of the screws positioned in the humeral head. In the original surgical technique there is the suggestion that these screws should reach the subchondral bone for better fixation on porotic bones. Our preference is for the use of shorter screws, thus avoiding the possibility of collapse and accommodation of the fracture, with prominence of the screws in the joint, since these screws are fixed to the plate. In relation to the severity of fractures, our results showed that the use of this fixation method is efficacious even in severe fractures. Good and excellent results were found in 88.2% of the patients with Neer type II simple fractures, and in 100% of the patients with Neer type IV severe fractures. However, it is necessary to observe that the group with severe fractures was small, with only four patients, and this can be considered a bias when we compare these groups.

CONCLUSION

The proximal humerus fracture fixation method through the use of locking plates was considered efficient in this series of patients. We obtained 91.2% of excellent and good results, without further complications.

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