

Original Research Article

Results of surgical treatment of distal humerus fractures in adults in Cotonou

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ABSTRACT

Background: Fractures of the distal humerus represent 1.3% of fractures in Cotonou. Their treatment is often surgical. The aim of this work was to assess the results of their osteosynthesis in a disadvantaged environment.

Methods: This retrospective study from 2001 to 2015 included 38 operated patients for distal humerus fracture with a minimum follow-up of 12 months. The average age was 33.6 years; the predominance was male (27 cases). The major etiology was traffic accidents (31 cases), According to the AO classification, the fractures were type A (10 cases), type B (02 cases) and type C (26 cases). The average time of surgery was 21 days. The Lecestre plate was the most used (29 cases). An iliac cortico-cancellous graft was used in 03 cases. The mean hospital stay was 20 days.

Results: The mean follow-up was 37 months. Functionally, the mean Mayo elbow performance score (MEPS) score was 66.3 points. The results were excellent (08 cases), good (13 cases), average (10 cases) and bad (7 cases). The patients were satisfied or very satisfied in 29 cases. Radiographically, the reduction was anatomical in 34 cases. Anatomical reductions were obtained with Lecestre plates. Consolidation was achieved in 36 cases within an average of 9 weeks. As complications we noted: radial nerve paresis (03 cases); secondary displacement (02 cases); superficial infection of the operating site (02 cases), wire migration or screw retraction (05 cases), non-union (03 cases), malunion in varus (04 cases) and osteitis of the proximal ulna (01 case).

Conclusions: Fractures of the distal humerus are infrequent. The anatomical and functional results despite little technical support provided and the long delay before surgery are quite good.

Keywords: Fracture, Distal humerus, Osteosynthesis, Results

INTRODUCTION

Distal humerus fractures are those that sit below the distal insertion of the brachii muscle. In Africa, these fractures are the prerogative of young subjects; they are often articular and threaten the elbow with stiffness.¹⁻⁴ Their treatment is often surgical and requires anatomical reduction, stable and solid osteosynthesis, and early rehabilitation, which guarantee a good functional prognosis for the elbow.^{4,5}

The different types of fractures are varied, ranging from the simplest to the most complex. Since the consensus of the SOFCOT round table in 1980, osteosynthesis by plates and screws has been recognized as the treatment of choice.⁶ The complexity of the fracture sometimes leads to immediately proposing an arthroplasty in the elderly.⁷

In Cotonou, these fractures, formerly of orthopedic treatment, are increasingly treated by osteosynthesis. The

aim of this work was to evaluate the results of their osteosynthesis in adults in our practice.

METHODS

This retrospective study was carried out in the trauma and orthopedics department of the Hubert Koutoukou MAGA National Teaching Hospital in Cotonou, Benin. It focused on patients treated surgically for fracture of the distal humerus over 15 years, between January 2001 and December 2015. We included patients who had undergone osteosynthesis of a fracture of the distal humerus, with a complete clinical and radiological record, with a minimum follow-up of 12 months, and who were available to be reviewed in consultation. We excluded patients under the age of 15, those with incomplete and/or unusable medical records, those who left against medical advice after their admission, those who were lost to follow-up after initial treatment.

The data were socio-demographic, clinical, therapeutic and evolutionary. The fractures were distributed according to the classification of Müller and Allgöwer (AO).⁸ The functional outcome evaluated according to the criteria of the Mayo elbow performance score (Table 1), it was excellent (90-100 points), good (89-75 points), average (60-74 points) or poor (less than 60 points).⁹ Likewise, patients' impressions were based on their level of satisfaction.

Table 1: Criteria of the Mayo elbow performance score.⁹

| Criteria | Score |
|------------------------------------|-------|
| Pain (45 points) | |
| None | 45 |
| Mild | 30 |
| Moderate | 15 |
| Severe | 5 |
| Range of motion (20 points) | |
| >100 flexion arc | 20 |
| 50-100 flexion arc | 15 |
| <50 flexion arc | 5 |
| Stability (10 points) | |
| Stable | 10 |
| Mild instability (<10 of laxity) | 5 |
| Gross instability (≥10 of laxity) | 0 |
| Daily function (25 points) | |
| Combing hair | 5 |
| Feeding oneself | 5 |
| Hygiene | 5 |
| Putting on shirt | 5 |
| Putting on shoes | 5 |
| Maximum possible (total) | 100 |

Data processing was performed using version 3.5.1 of Epi Info. Any p value less than or equal to 0.05 was considered statistically significant.

Series

Of 54 cases of patients with a fracture of the distal humerus in the study period, we have selected 38 with 38 fractures. 03 patients have gone against medical advice, 05 records were incomplete, and 08 patients were lost to follow. The mean age of the patients at the time of the trauma was 33.6 years (16-71 years), patients aged 30-40 years were most common with 17 cases (Figure 1). Regarding sex, the predominance was male with 27 men and 11 women. As for the dominant side, 36 patients were right-handed and 02 left-handed.

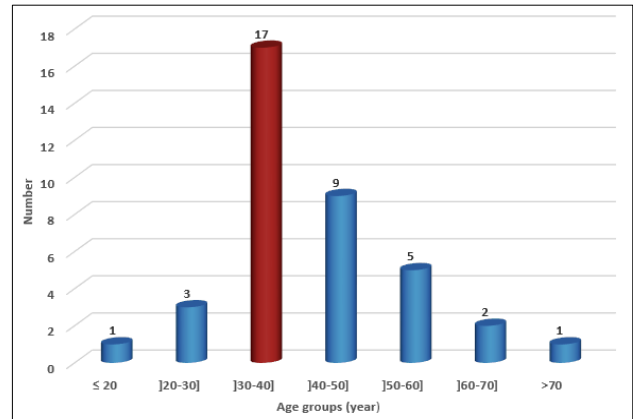


Figure 1: Distribution of patients by age (years).

The fracture

She sat 25 times on the left and 13 times on the right. The lesion was preferentially located on the non-dominant side. As etiologies, we found: road traffic accidents: 31 cases (81.6%), domestic accidents: 04 cases (10.5%), work accidents: 02 cases (5.3%), fights: 01 cases (2.6%). Regarding road traffic accidents, the victims were mainly motorcyclists (26 cases). According to the AO classification, type C fractures were the most frequent in 26 cases (68.4%) and type B fractures were the least frequent in 02 cases (5.3%) (Figure 2).

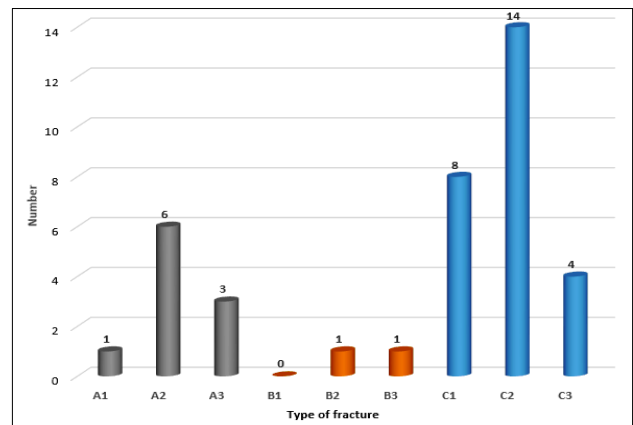


Figure 2: Distribution of fractures according to the AO classification.

As immediate complications, we have 02 cases of open fractures type 1 and 03 cases of open fractures type 2 according to Gustilo Anderson, one case of radial paralysis, two cases of ulnar paralysis, and one case of distal biceps tendon rupture. The associated bone lesions were noted: 04 fractures of the homolateral radius, 03 fractures of the homolateral ulna, and 03 leg fractures.

The treatment

The average time to surgery was 21 days (1-55 days). All of our patients were operated on under general anesthesia. The patients were installed in lateral decubitus contralateral to the fractured limb, shoulder in 90° abduction, elbow flexed 90° for a posterior approach and in dorsal decubitus for the lateral approaches. The approach was posterior trans-olecranon in 25 cases (65.8%), trans-tricipital in 02 cases (5.3%), lateral in 09 cases (23.7%) and medial in 02 cases (5.3%). In the case of a trans-olecranon approach, the synthesis of the olecranon is made by guying or screwing.

The Lecestre plate was the most used osteosynthesis material, 29 cases (76.3%). It was used alone or supplemented by a posterior or medial one-third tubular Plate, or even screwing to stabilize the medial column (Table 2). An iliac cortico-cancellous graft was used in 03 cases. An additional plaster immobilization having been carried out in 09 cases, for precarious assembly.

Physiotherapy was generally prescribed immediately after surgery, but it began within an average of 13 days (5-49 days).

Table 2: Distribution of patients according to the osteosynthesis material.

| Parameters | Number | Percentage |
|----------------------------------|-----------|--------------|
| Lecestre plaque | 05 | 13.2 |
| Lecestre plate+1/3 tubular plate | 21 | 55.3 |
| Lecestre plate+screwing | 03 | 7.9 |
| Y plate | 03 | 7.9 |
| 1/3 tubular plate±screwing | 02 | 5.3 |
| Screwing±pinning | 03 | 7.9 |
| Pinning | 01 | 2.6 |
| Total | 38 | 100.0 |

The mean hospital stay was 20 days (05-38 days). Patients with associated complications or lesions are those who have been in hospital for a long time.

RESULTS

All the patients were reviewed with a mean follow-up of 37 months (12-15 months).

Clinical results

Functionally, the mean MEPS score was 66.3 points (100-45 points). The results were excellent in 08 cases (21.1%), good in 13 cases (34.2%); average in 10 cases (26.3%) and bad in 7 cases (18.4%). The arc of mobility was the parameter most often decreased with an average extension deficit of 15°, all patients being able to perform most of the basic actions of life. We did not note any severe pain or frank elbow instability. As for the impression of satisfaction, the patients were very satisfied in 20 cases (52.6%), satisfied in 09 cases (23.7%), not very satisfied in 06 cases (15.8%), dissatisfied in 03 cases (7.9%).

Radiological results

The reduction was anatomical in 34 cases (89.5%) (Figure 3), satisfactory in 02 cases (5.3%) (Figure 4) and fair in 02 cases (5.3%). Anatomical reductions were obtained with Lecestre plates, satisfactory reductions with scalloped one-third tube plates, while passable reductions were obtained with pinning (open fracture) and a Y-plate. Consolidation is obtained in 36 cases (94.7%) within an average of 9 weeks (4-18 weeks).



Figure 3: Type B2 fracture treated by screwing.



Figure 4: Type C1 fracture treated with a third tubular plate and medial screwing.

Complications

As secondary complications, we noted: 03 cases of spontaneously resolving radial nerve paresis; 02 case of

secondary displacement (tolerable) requiring additional immobilization; 02 cases of superficial infection of the surgical site, controlled under local care and adapted antibiotic therapy; 05 cases of wire migration or screw retraction including 02 (5.3%) on the humerus and 03 (7.9%) on the olecranon. The late complications included: 03 cases of non-union (clinically well tolerated), including one olecranon (osteotomy line) and two humeral, 04 cases of malunion in varus (of which 02 would require surgical correction, not made by refusal of the patients); osteitis of the proximal ulna (on an osteotomy site) having undergone sequestrectomy and removal of the olecranon material at 4 months (the olecranon being consolidated).

DISCUSSION

Fractures of the distal humerus are infrequent. They represent 1.3% of fractures in hospitals in Cotonou and 0.5% of fractures in hospitals in England.^{9,10} Over 15 years, we recorded 64 fractures, for an annual incidence of 4.26 fractures. Ouzaa has collected 45 cases in 6.5 years in Morocco, while Sané in Senegal has collected 36 fractures in two years.^{3,11} In France, studies are often limited to elderly subjects and this incidence is slightly lower.¹²⁻¹⁵

The average age of our series is 33.6 years old (16-71 years). It is comparable to those of the African series with 32 years (18-66 years) for Sané in Senegal, and 35 years (15-65 years) for Ouzaa in Morocco.^{3,11} On the other hand, it is clearly lower than that of 56.1 years of Manueddu in Switzerland and of most of those of other western series.^{7,12,13,15,16} This gap can be explained by the youth of the African population in general; in Benin, more than 80% of the population is under 40 years old.¹⁷

The male predominance was found in our series (71.1%), in the Senegalese (77.8%) and Moroccan series (66.7%), while in the European series, the predominance is female with respectively, 53% in Switzerland and 85% in France.^{3,11,14,16}

The aetiologies are dominated by traffic accidents in our series (81.6%) and in the Senegalese series (42.1%), where the subjects are predominantly young and male.³ In Western series, where the subjects are elderly and generally female, it is the banal fall (domestic accident) that predominates.^{6,12-15,18} Judet noted two peaks in frequency, one between 20-40 years affecting mainly males after a high energy trauma and the other between 60-70 years, predominantly female.⁴

The predominance of involvement of the left side observed in our series (65.8%) is widely found in the literature, although some authors have found a predominance on the right.^{11,12,14,16,18}

In our series and in the majority of series, we note a predominance of type C fractures, however, Sané, in Dakar, finds a predominance of type A fractures.^{3,11,14,16,18}

Type B fractures are the least frequent in our series (3.5%) and in the literature.^{3,11,16}

The treatment of the fracture of the distal humerus is surgical.^{4,5} Orthopedic or functional treatments will only be applied in the event of an operative contraindication.⁴ All of our patients were treated surgically within an average of 21 days. The delay in the consultation, the stay in a peripheral center, the lack of financial means were mainly the causes of the delay of the surgery.

The choice of the approach depends mainly on the type of fracture. Partial joint fractures or not, pose fewer problems; in our series and in the literature, they are treated by lateral or medial approach by screwing, pinning in or even by pre-molded plate.^{3-5,11} Type C fractures are generally treated by posterior approach.^{2-6,12-15} In our series, this approach was trans-olecranon in 65.8% of cases and trans-tricipital in 5.3% of cases. The trans-tricipital approach weakened the triceps, especially in cases of iterative or secondary arthrolysis, in our series a deficit of extension was more marked with this approach.⁴ The trans-olecranon approach has been widely found in the literature, it is mainly used for type C fractures, giving a good view on the humeral paddle.^{4,5}

Internal fixation of type C fractures uses at best two pre-molded plates with or without locking screws, the posterior Y-plate not having a good epiphyseal grip.^{4,6} In our series, three Y-plates were used, two resulted in pseudarthrosis, however they were clinically well tolerated.

The Lecestre plate adapted to the lateral column was preferentially used (29 cases, 76.3%), alone or associated with a third tubular plate, with a pin or with a screw on the medial column. It has the advantage of ensuring a satisfactory anatomical compromise, allowing anatomical reconstruction of the distal humerus using the plate as a stent.^{4,6} We associated the Lecestre plate with a third tubular plate in 21 cases (55.3%), to meet the need for a double-plate synthesis, mainly in C2 and C3 fractures; medial or dorsal pre-molded plates are not available.^{4,6} In 02 cases (5.3%), we used a third tubular plate, scalloped during the operation, on the lateral column; in fact, the costs of the surgery are entirely covered by the patients and they were financially limited (the Lecestre plate costs twice the price of a third tube plate). However, the current trend is towards the use of locking screw plates, ensuring stable mounting and early mobilization of the elbow.^{4,12} These plates are not available in our center.

Secondary complications: neurological (radial nerve), septic or mechanical by migration of screws or pins are comparable to those in the literature.^{4,11,15} The ulnar nerve has not been damaged by surgery in our practice, it is systematically identified and transposed. The late complications observed are non-union (7-9%) involving the olecranon (osteotomy) more often than the distal humerus.¹⁵ In our series, we observed 03 cases of non-

union (7.9%) of which 02 involved the humerus. Malunion are also observed, in our series, we counted 04 cases (10.6%).^{6,14} Periarticular ossifications are widely found in the literature, we did not observe any in our series.^{4,14,15} Chronic infections are rare and limited to the soft tissue, we noted 01 cases of olecranon osteitis which healed after surgery.¹⁵

Functionally, our results were excellent and good in 21 cases (54.3%). This result is less good than that of Sané in Dakar who had 63.9% excellent and good results.³ Note that in his series, type C fractures, with an unfortunate prognosis, represented only 36.1% against 68.4% in our series. Compared to the western series, our results are significantly worse than those of Elhage, Clavert and Ducrot, who find respectively 74%, 88.9% and 95% excellent and good results.^{12,13,18} The difference in these results with ours is certainly due to the delay in surgery under our conditions (21 days on average), to the lack of stability of some of our assemblies (third tubular plates, screws or pins), which delays rehabilitation; without forgetting that the lack of means of some of our patients delays or limits the physiotherapy. The supremacy of Ducrot's results is certainly due to the use of locking screw plates. However, our results are comparable to certain Western series, in particular those of Proust, and Caja which find respectively 59% and 50% excellent and good results.^{14,19} Note that for these different authors all the fractures were articular.

The small size of the study population and the retrospective nature of the study are its weaknesses. However, the exhaustive recruitment carried out allows descriptive statistics to be drawn.

CONCLUSION

Fractures of the distal humerus, the prerogative of young adults, are most often complex in our work environment, related to the violence of traffic accidents which is the predominant etiology. Type C is the most common. Surgical treatment remains difficult given the frequency of the complexity reported and the delay in treatment. A solid osteosynthesis allowing early physiotherapy is the best guarantee for an optimal recovery of the function of the elbow. In this study, we are still unfortunately subject to the limited means of our patients.

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Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

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