

## Management of Humeral Shaft Fractures with Retrograde Intramedullary Nailing Versus Plating Osteosynthesis

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### Abstract

### Original Research Article

**Objectives:** To compare the anatomical and functional outcomes of the plating osteosynthesis and retrograde intramedullary nailing according to Hackethal in the management of humeral shaft fractures. Introduction: The humeral shaft fractures can be attributed to 1-5% of fractures of the humerus. Their diagnosis is easy. On the other hand, the modalities of their treatment are far from unanimous because all the therapeutic methods have defenders. **Materials and methods:** Our work is a retrospective study in the Department of Orthopaedic Surgery and Traumatology II, Mohamed V Military Hospital of Rabat, during a period of five years from January 2010 to January 2015, including 21 cases of humeral shaft fracture, 15 men and six women, three polytraumatized and one case of primary radial paralysis. Plating osteosynthesis was performed in 10 patients and 11 patients were treated by retrograde intramedullary nailing according to Hackethal. The results were evaluated with the modified Stewart and Hundley classification. **Results:** We had 16 very good outcomes, a good one and four were bad. The bad outcomes were three cases of pseudarthrosis and two cases of radial paralysis. For patients treated by plating osteosynthesis: Two radial postoperative paralyses and one case of nonunion. For patients treated by retrograde intramedullary nailing according to Hackethal: No radial paralysis; two cases of pseudarthrosis taken by plating osteosynthesis with cortico-cancellous graft. **Conclusion:** The choice between the therapeutic means is difficult. There is no method that can lead to unanimous support. The retrograde intramedullary nailing according to Hackethal could be this method.

**Keywords:** Fracture, Humeral shaft, plating osteosynthesis, Intramedullary nailing.

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## INTRODUCTION

The Humeral shaft fractures sit between the insertion of the pectoralis major muscle and the distal insertion of the anterior brachial muscle [1]. Their frequency is estimated at 2% of the fractures of adult [2]. Despite the importance of conservative treatment as a gold standard, 30% of these fractures require a surgical treatment that is controversial over the ideal method of surgical restraint [3]. The purpose of this study is to compare the anatomical and functional results of patients operated by retrograde intramedullary nailing according to Hackethal and plating osteosynthesis.

## MATERIALS AND METHODS

This is a retrospective study of 21 cases of humeral shaft fracture in the department of Orthopaedic Surgery and Traumatology II, Mohamed V Military Hospital of Rabat, , for a period of five years from 2010 to 2015. The inclusion criteria were patients

who received surgical treatment for humeral shaft fractures by retrograde intramedullary nailing according to Hackethal or plating osteosynthesis. Excluded from the study were: patients who had received orthopaedic or other therapeutic treatment, those who were lost to follow-up and pathological fractures.

The study methods were based on the use of medical records with collection of data on clinical examination, radiological, surgical and evolution data in these patients.

This study involved 15 men and six women with an average age of 39.9 years. The right side was affected in 76.19% of cases. Road accidents are the most frequent etiology (57% of cases). The Association for Osteosynthesis (AO) classification has been adopted. Type a fractures were the most common in 47% of cases. Initial radial paralysis was found in one patient. The average time between receipt and intervention was 48 hours. This allows the patient to be

conditioned. The procedure was performed 15 times under general anesthesia; the interscalenic block was performed in the remaining patients. Plating osteosynthesis was performed in 10 patients (48% of cases), (Figure 1) and retrograde intramedullary nailing according to Hackethal in 11 patients (52% of cases) (Figure 2). A 21-day post-operative Mayo Clinic immobilization was recommended for patients operated by retrograde intramedullary nailing, while rehabilitation was initiated as soon as the Redon drain was removed in patients treated with a plating osteosynthesis.

## RESULTS

The results were analyzed using the modified Stewart and Hundley classification. Patients treated with plating osteosynthesis (48% of cases), 70% of them had very good and good results. Patients treated with retrograde intramedullary nailing according to Hackethal (52% of cases), 90% of them had very good and good results. Post-operative complications were of two types: pseudarthrosis in three patients initially treated by pinning (two cases) and plating osteosynthesis (one case), this pseudarthrosis was treated by compression plate combined with a cortico-cancellous graft taken from the homolateral iliac crest. Radial paralysis was noted in two patients treated with plating osteosynthesis, whose recovery was complete in both of them.



**Fig-1: Humeral shaft fracture treated with a plating osteosynthesis**



**Fig-2: Humeral shaft fracture treated by retrograde intramedullary nailing according to Hackethal**

## DISCUSSION

The humeral shaft fractures are frequent, accounting for 2% of adult fractures [4]. The average age in our study is 39.9 years; this young age could be explained by the high rate of road accidents, which mainly concerns the youngest subjects [5]. The majority of the series report a male predominance ranging from 69.23% to 81% [6, 7], in our study we found the same phenomenon, where the male was reached in 71,42% of cases. All our patients have been admitted to the emergency department, the initial clinical examination allows the elimination of a major lesion involving a life-threatening prognosis. We have performed standard X-ray in all our patients with double incidence (face and profile) of the humerus as a whole, including proximal and distal epiphyses, in order to objectify a possible bifocal lesion and/or joint irradiation with radiographs of the elbow and homolateral shoulder.

Our rate of 4.76% post-traumatic radial paralysis is lower than the literature average of 10%. [1] Systematic exploration has been our therapeutic attitude towards these radial paralyses. No interruption of the radial nerve was found. The classic section of the radial nerve by a bone fragment is rare. Bèzes *et al.* [8] of 17 radial paralysis cases explored had only one rupture.

Plating osteosynthesis is a reliable, well-coded technique that was used in the treatment of 20.7% cases of adult humeral shaft fractures in the SOFCOT (French Society for Orthopaedic and Trauma Surgery) symposium 2003. The treatment with a plating osteosynthesis requires great technical rigour in order to minimize its complications [9]. In our study, the postoperative complications after plating osteosynthesis were: one case of pseudarthrosis and two cases of radial paralysis with total recovery in these two patients. According to the literature [10], the post-operative complications after plating osteosynthesis are: Pseudarthrosis (2.8%), post-operative radial paralysis (6.5%) and an infection rate of 2.4%. Iatrogenic radial paralysis complicates 6.5% of plating osteosynthesis [10] they are most often transient and reversible: all 14 cases reported by Bèzes *et al.*[8] have recovered. But although they are transient, they are a definite handicap for this method.

The retrograde intramedullary nailing, described by Hackethal [11] in 1961, is perfectly applicable to mediodiaphyseal fractures of the humerus. It is in this sector that the homogeneous filling process is most appropriate [12]. The postoperative complications recorded in our study were: two cases of pseudoarthrosis. According to the literature [13], the post-operative complications after retrograde intramedullary nailing are: pseudoarthrosis (14.5%), postoperative radial damage (1.2%) and infections (0.6%).

We had 70% good and very good outcomes in patients treated with plating osteosynthesis, which is similar to André's rate of 74% [14]. In our study we noted 90% very good and good outcomes in patients treated with retrograde intramedullary nailing according to Hackethal. According to C.B. Diémé [4], postoperative immobilization for 21 days in patients treated by pinning does not influence their functional results.

## CONCLUSION

The surgical treatment of humeral shaft fractures remains highly controversial in its indications and techniques. Retrograde intramedullary nailing according to Hackethal is a reliable, easy and low-cost method; it can be a compromise solution between orthopaedic methods and plating osteosynthesis.

## Contributions of the authors

All authors have read and approved the final version of the manuscript.

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