Antegrade intramedullary nailing in humeral shaft fractures: results of 14 cases

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ABSTRACT

Introduction: Humeral shaft fractures represent around 3% of all fractures and mainly affect adults in a wide age range. Although the majority of diaphyseal humeral fractures are mostly treated conservatively, there are indications for primary or secondary operative treatment in some cases. The optimal surgical treatment is still a debate in the literature. The purpose of this study is to present a case series of humeral shaft fractures treated surgically with intramedullary nailing evaluating the clinical and radiological results with a minimum follow-up of 2 years.

Materials and methods: This is a retrospective study. From March 2016 to January 2021, 19 patients with humeral shaft fracture were operated in our department with antegrade intramedullary nailing. Pathological fractures were excluded. In all cases straight nail was used with one or two screws proximal and one screw distal. Additionally, in most cases was used long nail and short nail in only one case. Demographic data of the patients were recorded, as well as the time to union and possibly complications. The Disabilities of Arm, Shoulder and Hand (DASH) questionnaire and the American Shoulder and Elbow Score (ASES) were filled by all patients.

Results: Five patients were lost at the follow-up, so a total of fourteen (seven male and seven female) patients with a mean age of 58.2 years (24 to 81) were included in the study. Right humerus was operated in 10 patients while left humerus in 4 of them. Bone union was achieved in 12/14 patients (85.7%) with two patients experiencing a nonunion. The mean DASH score was 6.8 and the mean ASES was 78.4. There were no major complications. One patient complained for pain due to rotator cuff injury.

Conclusions: Antegrade nailing of humeral shaft fractures yields good clinical and radiological results and should be considered a valid therapeutic option in this type of fractures.

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INTRODUCTION

Fractures of humeral diaphysis represent around 3% of all fractures annually and 20% of all humerus fractures. The incidence rate of these fractures is approximately 13 to 15 per 100,000 persons annually and has a bimodal distribution. Treatment options depend on several factors such as age, medical comorbidities, number of fracture fragments and displacement's degree. Most of these fractures are treated conservatively with the use of Sarmiento functional bracing. However, surgical approach is indicated in open fractures, neurovascular injury, articular involvement, pathologic fractures, and symptomatic non-union or malunion in non-operatively treated fracture. The two dominant surgical techniques are open reduction internal fixation (ORIF) and antegrade intramedullary nailing (IMN), with the second one gaining more and more ground in recent years. In the retrograde nailing technique, a posterior approach is used while the patient is seated in lateral position. The antegrade technique is favorable in cases with proximal fractures while retrograde nailing gives better outcome and stability in distal fractures.

METHODS AND MATERIALS

From March 2016 to January 2021, 19 patients with humeral shaft fracture were operated in our department with antegrade intramedullary nailing. Pathological fractures were excluded. In all cases straight nail was used with one or two screws proximal and one screw distal. Additionally, in most cases was used long nail and short nail in only one case. The optimal patient's position for the antegrade nailing technique is the "beach chair" which was used in all operations. During the operation, x-ray imaging was available using the C-arm machine. After surgery, all subjects were immobilized for two weeks in a brace or cast. There was allowed a slight movement in elbow and shoulder after two and three weeks, respectively. Arm abduction was also allowed after three weeks. Demographic data of the patients were recorded, as well as the time to union and possibly complications. The Disabilities of Arm, Shoulder and Hand (DASH) questionnaire and the American Shoulder and Elbow Score (ASES) were filled by all patients.

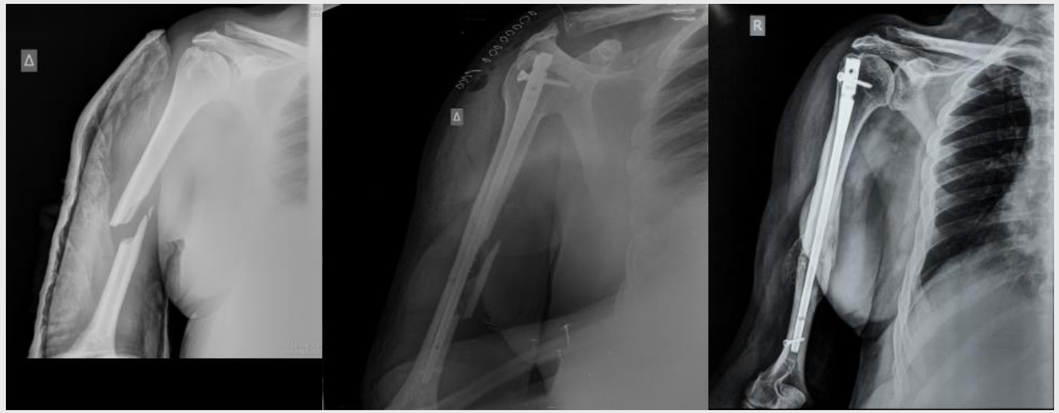

Image 1: 71-year-old male, pre-operative, acute post-operative and after 1 year of follow up.

RESULTS

Fourteen patients, 7 females (50%) and 7 males (50%) were recruited. The average patients' age at the time of surgery was 58.2 years (24 to 81). Two fragment fracture was observed in 13 (92.9%) cases and three fragment type in 1 (7.1%). According to AO classification fractures were always of type A and B. The follow-up period was one to six years after the operation. Traumatic mechanism was of low energy in 11 cases (78.6%) and of high energy in 3 (21.4%). The average DASH score of the operated side was 6.8 and the average ASES score was 78.4. From a total of fourteen patients bone union was achieved in 12 cases (85.7%) with two patients experiencing a nonunion. Fracture healing time on average was 4 to 5 months. No post-operative infection was observed in any patient and no metal work needed to be removed after fracture healing. Shoulder impingement was observed in one patient and restriction of shoulder movement (ROM) in other two, while restriction of elbow ROM in none. Moreover, one patient complained about pain due to rotator cuff injury. Radial nerve injury was observed in none of the patients. The mean surgical time was 72 minutes excluding the multi-trauma cases. The average length of hospital stay was 9,13 days, while two patients stayed 15 and 19 days, because they were polytrauma cases. From those who underwent only the IMN operation we are getting a mean of 6,5 days.

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DISCUSSION

Humeral shaft fractures represent a remarkable percentage of all fractures, so for that reason their treatment is a high interest issue in the scientific community. When conservative management is not an option and surgical treatment is necessary, orthopedic surgeons are faced with a dilemma as to which surgical method is optimal. Their two main options are ORIF and IMN. No single technique has been identified as the ideal one to prevent nonunion and complications and to optimize functional outcomes, since both have their advantages and disadvantages. There is no significant difference between the two methods regarding bone union, nerve damage, need for re-operation and post operative quality of life and upper extremity function. Nevertheless, better outcomes of IMN are described in many parameters such as time to bone union, intra-operative blood loss, duration of surgery and port-operative infection. Especially, we observed that there is significant decrease in all these parameters above. However high percentages of shoulder impingement after IMN operation are reported in the literature. The results of the current study confirm that patients treated with antegrade intramedullary nailing experienced favorable clinical and radiographic outcomes.

CONCLUSIONS

Intramedullary nailing (IMN) of humeral shaft fractures yields good results in our hands like those achieved in the literature. Bone union was achieved in 85,9% of patients in our study whereas there was only one complication of shoulder impingement reported. The majority of patients were satisfied with the result and returned to previous status in a mean time of 4.5 months. In conclusion, IMN is a valid surgical option for this type of fractures.