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Original Research Paper

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PROXIMAL HUMERUS NONUNION: OPERATED WITH FIBULAR STRUT ALLOGRAFT AND LOCKING PLATE

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ABSTRACT

Background- The purpose of this study was to define a treatment protocol in which a non-vascularized endosteal fibular strut graft, a corticocancellous grafts and a locking plate construct are used for stabilization of the delayed and neglected proximal humerus fractures and to report its outcome.

Methods- 25 patients with delayed, neglected proximal humerus fractures were included in this study, All patients were treated with the debridement, decortication and shingling of the bone at the site of the fracture followed by using an endosteal fibular strut graft, corticocancellous bone grafts and stabilization with locking plate.

Results- The average DASH score changed from a pre-operative value of 72.23±4.19 to a post-operative value of 25.36±4.29 the final follow-up.. The p-value was observed to be significantly less than 0.01, i.e. $p < 0.05$. There was detection of a statistically significant difference between the means of the pre-operative and post-operative data groups. On similar lines, the average CMS changed from a pre-operative value 33.16±8.42 to a post-operative value of 64.29±7.29 at the final follow-up.

Conclusions- An endosteal fibular strut, subperiosteally placed cortico-cancellous grafts with a locking plate fixation helps in biological healing of neglected fractures of proximal humerus.

KEYWORDS : Proximal humeral fractures, CMS, DASH

INTRODUCTION

The incidence of proximal humeral fractures accounts for 5% to 8% of all fractures. In developing countries, ignorance and lack of accurate diagnosis lead to fractures being neglected for a long period of time. The proximal humerus fractures, after initial neglect, are extremely challenging to treat because they are often associated with shoulder and elbow joint stiffness, marked osteopenia and metaphyseal or diaphyseal bone defects. [1]

To date, there is no consensus on a standardized treatment or management protocol of neglected fractures of the humerus. Many surgeons agree that in neglected and nonunited fracture cases in young adults, salvage is possible and an attempt should be made to preserve the humeral head and native shoulder joint be means of novel fixation techniques. Various methods of bone grafting are described in the literature. The fibula is a long bone that can be useful as vascularized or non-vascularized graft in reconstruction of bony defects. Non-vascularized fibula should be considered a valuable alternative treatment option for patients with bone defects or segmental reconstructions. The use of fibular strut bone graft, the stability of fixation, stiffness of the plate and screw constructs are markedly improved. Patient outcomes *i.e.* safety and effectiveness of the procedure in allowing a patient to regain the ability to function and perform activities of daily living in a near pain-free state similar to their pre-fracture state, depend highly on the integrity and quality of the fracture union. The locking plate with autogenous grafting is accepted as the gold standard method which has yielded satisfactory results in nonunited fractures. [2-3]

MATERIAL AND METHODS

A informed consent was obtained from all patients who agreed to participate in this study. A total of 25 patients (9 female and 16 male) were included in this study at a multi specialty orthopaedic hospital and government medical college. Inclusion criteria were neglect of at least more than four weeks in seeking care at our institution with fractures of the proximal humerus.

Average patient age at the time of surgery was 56.23 years (range: 41 to 70 years). Proximal humerus fractures of delayed presentation and neglected are included in the study without extension into the head of the humerus.

All patients presented with closed fractures, and upon further evaluation revealed radiological findings like an atrophic type of non-union. The patients reported mild pain, displayed tenderness and abnormal mobility at the site of fracture, and complained of difficulty in performing basic activities of daily living.

RESULTS

Complete union of the fracture was successfully achieved in all patients at a mean follow-up time of 8.23 months (range: 6 to 11 months).

Table 1. Outcome

Outcome	Pre-operative	Post operative	p-value
DASH	72.23±4.19	25.36±4.29	0.01
CMS	33.16±8.42	64.29±7.29	0.01

The average DASH score changed from a pre-operative value of 72.23±4.19 to a post-operative value of 25.36±4.29 the final follow-up.. The p-value was observed to be significantly less than 0.01, *i.e.* $p < 0.05$. There was detection of a statistically significant difference between the means of the pre-operative and post-operative data groups. On similar lines, the average CMS changed from a pre-operative value 33.16±8.42 to a post-operative value of 64.29±7.29 at the final follow-up. There was detection of a statistically significant difference between the means of the preoperative and post-operative data groups.

DISCUSSION

The term neglected, in the context of seeking medical treatment, is generally defined as the passage of a time period of at least three weeks since the occurrence of an injury for which there is either no treatment sought or a lack of appropriate and adequate treatment administered. Neglected proximal humerus fractures pose a challenging problem to the treating orthopaedic surgeon as there is a dearth of published literature that provides a preferred treatment protocol or procedure option that has been successful in patients such cases[4].

Delayed and neglected fractures often lead to added

complications including stiffness of the shoulder and elbow joints, osteopenia or bone loss or both. In addition, the ends of the fractured bones may become atrophic, which could hinder the process of osteosynthesis and make fracture fixation challenging. Time based changes in the physical and biological properties of bones in the cases of neglected fractures make it difficult to select any particular treatment of choice since it is difficult to gauge whether any type of implant hardware will be able to sustain the loads at the fracture site without being subject to failure, especially during the healing process of first four to six weeks during which the patients are advised to start rehabilitation.[5]

A multitude of treatment methods are described in the literature for the treatment of failed fracture fixation cases (*i.e.* cases of nonunion or malunion) of the proximal humerus including intramedullary nailing, plate fixation with or without bone grafting and prosthetic replacement. [6]However, there are no standard protocols or recommended treatments for delayed and neglected fractures of the proximal humerus. Owing to their similarities to cases of delayed union, nonunion, some of those techniques can be successfully employed for the treatment of neglected fractures. The goal of this article was to propose a treatment protocol and evaluate its outcome on a small group of patients that met the inclusion criteria of neglected fracture cases of the proximal humerus.

Successful surgical management of any humeral nonunion or malunion case requires a stable internal fixation that enables early joint motion. An autologous bone graft is also advocated to promote the natural bone healing process in such cases.[7] Due to the continual advent of newer operative techniques and implant designs in the management of complex fracture cases, a stable internal fixation is now easily achievable even in the most complex of cases.

CONCLUSION

An endosteal fibular strut graft provides added stability of fixation with a locking plate for treatment of delayed and neglected fractures of the proximal humerus. Additionally, subperiosteally placed corticocancellous grafts at the fracture fixation site provide for a quick response time the biological healing of the bone. The treatment procedure defined in this study can be universally adopted for a successful outcome in cases of delayed and neglected fractures of the long bones.

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