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INTERNAL FIXATION OF FRACTURES OF THE SHAFT OF THE HUMERUS BY DYNAMIC COMPRESSION PLATE OR INTRAMEDULLARY NAIL: A PROSPECTIVE STUDY

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ABSTRACT The indications for surgical management of fractures of the shaft of the humerus are clear, selecting the right implant for internal fixation of humeral fractures has been a dilemma. We hereby present a prospective comparative study of humerus fracture internally fixed with dynamic compression plate or intramedullary nail. Though there was no significant difference between plating or nailing in terms of time to union, compression plating is the preferred method in the majority of fractures of the shaft of the humerus with better preservation of joint function and lesser need for secondary bone grafting for union

KEYWORDS : Fractures of the shaft of the humerus, intramedullary nailing, plating

INTRODUCTION

Most of the fractures of the shaft of the humerus are best treated nonoperatively. Numerous authors have highlighted the advantages of conservative, gravity-dependent treatment of these fractures by bracing in ambulatory patients preceded by short period of traction. Operative fracture stabilization carries risk of infection and radial nerve injury. Despite this, operative stabilization is warranted in Multiple-injury patients, segmental humeral fractures, fractures with concomitant ipsilateral forearm fractures and inability to maintain fracture alignment with nonoperative treatment. Fixation of a fracture of the humeral shaft in the multiple-injury patient is said to increase the mobility of the patient, simplify the difficult nursing care in the intensive care unit and permit full access to the patient for pulmonary physiotherapy. Selecting the right implant for internal fixation of humeral fractures remains controversial. We hereby present a prospective comparative study of humerus fracture internally fixed with dynamic compression plate or intramedullary nail.

MATERIALS & METHODS

Thirty consecutive patients operated with either compression plating or interlock nailing for acute fractures of shaft humerus during the period of 2013 to 2016 with minimum follow-up of one year were included in the present analysis. Eighteen patients each underwent open reduction and internal fixation with compression plating, and ante grade interlock nailing. All acute diaphyseal fractures included in our study were either closed or open Gustilo Grade I. The surgeries were performed between six hours to three weeks after the initial injury. Primary bone grafting was done when bone loss or comminution was present. The choice of the approach was based on fracture position and morphology. A 4.5 mm compression plate (DCP (n = 11) and limited contact DCP (n = 7)) was used in all patients. Interfragmentary compression by means of lag screws was used when required. Generally, a plate that permitted screw fixation to at least six cortices both in the proximal and in the distal fragment was used.

The ante grade interlock nailing was used in the study. Postoperatively all patients were initiated on active shoulder and elbow mobilization exercises. Periodic radiographic evaluation was carried out to look for union, to assess the need for additional procedures and to check for complications. All patients were evaluated on the basis of the outcome criteria. When any two different criteria fell into separate categories, the lower category was selected to classify the outcome.

Statistical analysis : The results were analyzed statistically using the SPSS 11.5 software with student's t test and nonparametric tests (Fisher's exact).

RESULT

We have evaluated our patients based on fracture healing, functional restoration of the limb and presence of complications and need for additional procedures. All patients in our study achieved union. The majority of our patients achieved union within one year of initiation of treatment; three fractures treated with nailing achieved union after one year. Nine of the fractures treated with compression plating and seven of those treated with interlock nailing achieved union within six months. The average time to union was 25.9 weeks (SD=7.28) in the plating group and 34.6 weeks (SD=20.34) in the nailing group (P =0.12), but the patients operated with interlock nailing underwent more number of secondary bone grafting procedures (six versus two) to obtain union though this difference was not statistically significant. .One patient treated with compression plating had an implant failure three months later and underwent implant removal, refixation with interlock nailing and had subsequent union. One patient, who was eventually lost to follow up after 1 month, operated with interlock nailing for a lower third fracture of the shaft had iatrogenic communition of the distal fragment during nailing and required open reduction, encerclage wiring and primary bone grafting and had superficial infection postoperatively. The range of motion of both the shoulder and elbow joints were compared from the opposite side . In comparison to plating, patients operated with interlock nailing had significant restriction of shoulder movement (P =0.03; Fisher's exact test). Radial nerve palsy was present in four patients after injury. Of the three patients who had undergone ORIF with compression plating with associated nerve injury, one had full recovery of function and one had partial but useless recovery of motor function and the third didn't recover. All these patients were found to have an intact nerve. One patient treated with interlock nailing had no recovery of preoperative radial nerve palsy and underwent tendon transfer to improve function. There were no cases of postoperative radial nerve palsy after interlock nailing. The overall results according to the outcome score are given in [Table - 4]. For statistical analysis, we have grouped results considered excellent and good (E+G) and compared them with those considered fair and poor (F+P). Patients operated with plating fared significantly better than those operated with interlock nailing when the overall results were analyzed (P =0.02; Fisher's exact test).

DISCUSSION

The indications for surgical management and internal fixation of fractures of the shaft of the humerus are clear. Compression plating has been regarded as the gold standard for operative treatment with high rates of fracture healing and consolidation and good outcome with no adverse effect of immediate full weight-bearing on fracture union or alignment. Advocates of intramedullary fixation have highlighted various disadvantages of open reduction and internal fixation with compression plating which requires extensive open surgery with stripping of soft tissues from bone, a longer operative time and less secure fixation, especially in the elderly with osteoporotic bone and if crutch walking is required. Intramedullary fixation is reported to involve a simpler technique with minimal exposure and shorter operative time with less blood loss. preservation of fracture hematoma, soft tissue and periosteum

around the fracture that occurs with closed unreamed nailing has been proposed for high rates of union and good results, with no risk of iatrogenic radial nerve palsy. Locked nailing is said to provide a rotationally stable fixation and avoid the tendency of various unlocked nails to back out. Impairment of shoulder function as a consequence of ante grade intramedullary fixation has been attributed to various reasons. Proximal migration of unlocked or dynamically locked nails with impingement at the acromion and consequent impairment of abduction and external rotation is said to require a secondary procedure for the protruding devices, after which the range of motion increases. The results of this study demonstrate that though there was no statistically significant difference in the time required for union, patients operated with interlock nail underwent more number of secondary bone grafting procedures than those operated with compression plating. Interlock nailing was associated with significant restriction in shoulder movement (*P* =0.03) and a reduction in overall results (P =0.02). These findings are comparable to other prospective studies.

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