A Comparative Study of Treatment of Humeral Shaft Fractures using Interlocking Nail vs. AO Dynamic Compression Plate Fixation

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Abstract

Introduction: The treatment methods of the fractures of humerus are treated in many ways. Interlocking nails and plates have both stood the test of time but the present study looks at both methods scientifically.

Material and Methods: It was a prospective, comparative, study of two groups of patients of fractures of humerus treated with dynamic compression plate versus with interlocking nails.

Results: Fractures in both groups healed uneventfully without significant complications.

Conclusion: Both modes of treatment can be recommended for the treatment of fractures of the shaft of Humerus with minimal chances of complications.

Introduction

Fractures of shaft of humerus make up 3% of all fractures.[1-3] Typically these are the results of direct trauma to the arm which causes transverse or comminuted fractures. They also occur after falls in sports like base ball or wrestling, where rotational force leads to spiral fractures.[2] A fall on elbow with arm abducted leads to oblique and transverse fractures of the shaft of humerus. Fractures of the shaft of humerus in an elderly patient may be due to metastasis.[3] Fractures of middle and distal third of the shaft of humerus can injure the radial nerve.[4] Vascular injury results from humeral shaft fractures in a small percentage of cases.[3] Such fractures when dealt by quacks with poor and insufficient techniques result in malunion or nonunion leading to disability. Most acute humeral shaft fractures can be treated conservatively with plaster of Paris splints and casts. With increasing number of vehicles on the roads multiple factures are commoner than before necessitating need for internal fixation in many. Due to improved designs of implants and surgical techniques operative treatment of humeral shaft fractures has gained more acceptance.[1] Literature shows that interlocking nail is a preferred treatment option for fractures of shaft of humerus in selected cases like comminuted fractures, segmental fractures and in poly trauma patients to get early mobility, good alignment and control bending forces. Lim K.F 2001, published the results of retrospective study of 78 humeral shaft fractures and concluded that plating allows anatomical reposition of most fractures with little risk of infection, mechanical problems and failure of healing, however there is danger of radial nerve injury.[13] Lin J (2001) concluded from 48 patients of his study that humeral locking nailing after a less invasive surgical technique and more favourable treatment results than did plate fixation.[13]

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Chapman (2002) in his study, concluded that both procedures provide predictable methods for achieving fracture stabilization and ultimate healing.[13] Chen et al, reported that in their study they had noted that radial nerve palsy is found in patients of lower third of femoral shaft fractures treated with plating while with interlocking nailing the chronic shoulder pain noted in most of the patients.[10] Current practices of operative management of these fractures favor intra medullary nails over plates.[3,4] Very little effort has been made locally to document the benefits of each technique scientifically. This study was undertaken to compare use of both these techniques in a prospective manner.

Material and Methods

This is a prospective, randomized and comparative study of 40 cases of humeral shaft fractures in adults treated by open reduction and internal fixation with interlocking nails versus AO dynamic compression plate. All cases were managed in the department of orthopedic, Lahore General Hospital, Lahore including all patients who presented to emergency or outpatient department of the hospital. The number of cases was forty who were divided into two groups at random (allocating odd numbers to Group – A and even numbers to Group – B as they presented).

Group A

Twenty cases in this group were managed with dynamic compression plate (DCP).

Group B

Twenty cases were managed by static intramedullary interlocking nail (ILN).

Both groups of patients were operated as elective cases under general anesthesia. All cases of group B (nailing series) were operated under image intensifier control, while for plate fixation open reduction and internal fixation was done without radiological imaging. Each case was followed up for 12 months and duration of study was 24 months. Cases presenting with open, pathological, fractures older than two weeks and those with concomitant injury to ipsilateral elbow or shoulder were not included in this study. All cases were given same antibiotics and analgesics postoperatively. A similar monthly out – patients follow-up regimen was adopted for both the groups. After removal of stitches clinical and biplane radiological evaluation was done regularly. Six months after the operation a final evaluation of both groups was done.

Results

In forty patients 30 were male and 10 were female (male to female ratio was 3:1). The average age was 28 years (range 15 – 40). Out of 40 patients 30 had had road traffic accidents (75%), 05 (12.5%) had fall from height while remaining 05 (12.5%) had sports injury. Right side was involved in 25 (62.5%) cases while remaining 15 (37.5%) cases involved left side. All 40 cases had closed fractures. According to A.O classification 20 (50%) patients with simple fractures (type A), 14 (35%) with wedge fractures (type B) and remaining 06 (15%) with complex fractures (type C). Associated injuries occurred in 25 (62.5%) of these cases, 06 (15%) patients had head injury, five (12.5%) cases with abdominal injuries, 04 (10%) with chest injuries and remaining 10 (25%) cases reported with multiple fractures. Out of all patients 20 cases were operated in first seven days and other 20 were operated in second week. Hospital stay in group A patients ranged from 10 to 14 days (average 12 days) while in group B patients hospital stay was 9 – 13 days (average 11 days). Operating time in group A patients i.e. plate fixation was 70 – 80 minuts (average 75 minutes) while in patients treated with interlocking nail operating time was 65 – 75 minutes (average 70 minutes). Average blood loss in a single case treated with plating was about 200 cc while in patients treated with closed interlocking nail was 10 – 20cc.

Out of the patients managed with plating, 19 (95%) returned to their daily activities and even weight lifting and over head works in seven months i.e. had excellent results, only 1 patient (5%) returned to their work after 12 months due to postoperative radial nerve palsy while no patient had non union or poor results. On the other hand in case of interlocking nail 18 cases (90%) have excellent results i.e. assumed their routine activities in 06 months, 02 patients (10%) had good results i.e. return to work after 8 months and no patient had poor results. In the present study shoulder pain was in 10% (2) cases, due to damaged and unrepaired rotator cuff in one case and in second one due to failure of proximal locking mechanism leading to protrusion of nail above the humeral tuberosity. Symptoms resolved after 2 months of rotator cuff repair while in second case after the removal of the

nail patient achieved shoulder function. There is no statistically significant difference in both series and either of both methods of treatment, properly selected and performed should lead to successful results in a large majority of patients.

Discussion

Isolated low energy humeral shaft fractures can be treated satisfactorily cosnservativly.[1] But operative stabilization is often necessary for acute high energy humeral shaft fractures so that fracture alignment and better functional results can be achieved.[5] When compared it is still diffcult to declare as to which is the most suitable operative method for humeral fracture treatment.[6,7] Cox MA in studies about Russel Taylor nail reported 88% patients with excellent recovery of shoulder functions according to the Neer Score.[8] Postoperative pain was mostly due to proximal locking screws.[9] Crates and Whittle reported 90% of the patients treated with interlocking nail had satisfactory shoulder functions.[10] The most frequent criticism of antegrade humeral locking nailing has been its potentially deleterious effect on shoulder functions. Reimr et al (2001) also reported that 05 of 12 patients in whom a Siedel nails were inserted through a lateral deltoid incision had persistent shoulder stiffness. In the patients in the said study and our group the nails were inserted through anterior deltoid incision had restricted shoulder movements; however it sometimes took as many as six months for full shoulder functions to return.[11]

Nailing is considered to be a minimally invasive procedure with less complications as compared to plating. While some of surgeons still favor plating in selective cases like simple fractures, proximal and distal humeral fractures and fractures with neurovascular injuries.[14] Although plating is invasive and prone to radial nerve injury but careful exposure to radial nerve and proper fixation of the plating on fracture site yields high compression and rigid fixation than nailing.[15]

In present study the union rate in both group of patients was 100%, infection rate in both groups is zero and no permanent neurological deficit is noted. In interlocking nail series two patients have shoulder pain but relieve. One patient with plate fixation had arm pain but releived while one patient had radial nerve palsy which recovered spontaneously. Although our study is small in scale and short in duration for lack of a prolonged follow up yet the similar results produced point to the fact that both procedures are safe. There seems to be very little difference in morbidity of each and these both can be recommended for use in internal fixation when proper indications are kept in mind.

Conclusion

Interlocking nailing and AO Dynamic Compression Plating both are safe procedures for fixation of humeral fractures and can be expected to be low in morbidity giving rise to good functional rehabilitation.

Conflict of Interest and Declaration**:** The authors declare lack of conflict of interest in any manner. The present study was conducted after due approval of synopsis from PGMI / UHS in partial fulfillment of requirement for MS Orthopedics by MUK under supervision of Prof Irfan Mehboob.

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