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Study of open reduction and internal fixation with medial plating of fracture shaft humerus

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Abstract

Background: Humerus shaft Fracture Surgical management (Open reduction and internal fixation) is a choice of treatment for early mobilisation and rehabilitation. In this series ORIF with Medial side plating of Shaft Humerus was done.

Materials and Methods: A retrospective study of 30 Patients Operated with ORIF and medial side plating was carried out for fracture shaft of Humerus.

The patients were evaluated at a mean of 39 months (Range of 12 to 66 months) for union time and clinical outcomes.

Results: Mean time of Union was 24 weeks ranging from 16 weeks to 32 weeks. There was no case of non-Union in this study.

Conclusions: Medial side Plating of Fracture shaft humerus has given excellent results in this study.

Keywords: Medial plating, fracture humerus, radial nerve palsy, DCP, ORIF

Introduction

Humerus shaft fracture management is a subject of controversy. The problem of wound infection, Iatrogenic Radial nerve Palsy and non-unions, favouring conservative management. It is not justified to compare the result of conservative management with surgical results, because of different patient characteristics between the two groups.

Open reduction and internal fixation is indicated ^[1]. When satisfactory position and alignment cannot be achieved by conservative measures ^[2]. When associated injuries in the extremity require early mobilization, ^[3] when a fracture is pathologic ^[4], when fractures are associated with major vascular injuries ^[5], when a spiral fracture of the distal Humerus is of the (Holstein & Lewis type), in which Radial nerve palsy develops after manipulation or application of cast or splint ^[6], When treatment of associated injuries makes bed rest necessary. These groups of patients have a slower recovery and higher complications.

Results of Surgical management of ORIF of Humeral shaft fractures are less reported in the World Literature. The objective of this study was to present the outcome of ORIF with Medial plating and screw fixation for fracture shaft Humerus.

Material and Methods

Forty Patients with fracture shaft of Humerus with average age of 34 years (ranging from 21 to 47years) were treated with ORIF with Medial plating was done using AO principles, 10 patients were lost for follow up. The remaining 30 patients were reviewed at an average of 36 months of Follow Up.

This is a retrospective study done between February 2005 to October 2010. All the diaphyseal fractures were classified using AO System. A diaphyseal fracture was defined as one occurring between the superior border of the insertion of Pectoralis Major and the area immediately above the supracondylar ridge. They were also described according to their location in the proximal, middle, or distal thirds of the diaphysis.

The average age of these patients was 34 years. Majority of the patients were Males (28 cases), Females (2 cases). Mechanism of injury 28 cases were Road Traffic accidents, 2 cases were due to falling from heights, Right Humerus 14 cases and Left Humerus 16 cases.

Twenty-two Fractures occurred in the middle third of the shaft Humerus, seven cases over the

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distal third of the shaft Humerus. One case was segmental fracture involving the middle and distal third of shaft. Twenty-three fractures had no comminution. Five cases had minimal comminution, involving a small butterfly fragment. Two cases had significant comminution; 1 case was type 1 open (Gustilo) fracture. Pattern of Fractures: 26 were transverse and 4 were oblique fractures.

Five patients had primary Radial nerve palsy before surgery. None of the cases presented with vascular injuries. One was an open fracture of Gustilo type I. Eleven patients had polytrauma. In six cases Osteosynthesis was done after failed conservative management, of these 4 cases were delayed or non-union after conservative management, the other 2 cases were failure to maintain satisfactory alignment using POP casts.

A standard Antero-lateral (delto- pectoral) approach was used in all the cases. Radial nerve exploration was done in 5 cases that presented with primary Radial nerve palsy. All fractures were fixed with plate and screws on the medial surface of Humerus, Musculocutaneous nerve was identified and isolated in all the cases before medial surface plating.

In 27 cases 4.5 mm narrow dynamic compression plate was used. Three patients were fixed with 3.5 mm DCP. In all fractures, plating was done on the medial surface of the Humerus, including the 5 cases with primary Radial nerve palsy. Bone grafting was done in 4 cases of delayed /non-union of the fractures. In Polytrauma patients associated ipsilateral upper limb fractures occurred in 2 cases, contralateral upper limb fracture occurred in 1 case, fracture of Tibia/fibula occurred in 2 cases, fracture ribs, chest injuries, head injuries, blunt injury abdomen occurred in 6 cases.

Operative Procedure

Standard Antero-lateral (Delto -pectoral approach) was used to fix the fractures. The delto pectoral groove was identified using cephalic vein as a guide and both the muscles are separated, cephalic vein was retracted medially with the pectoralis major. Deep fascia was incised the muscular interval between the biceps brachii and brachialis was developed, profunda brachii artery was identified and ligated. Radial nerve identification and exploration was done in 5 cases that presented with radial nerve palsy, which occurred in middle third fractures of Humerus. Two cases of Radial nerve were trapped between the bony fragments, in 3 cases contusion of the radial was seen, decompression of the radial nerve done. The plane between the medial half of Brachialis and Biceps are separated, Musculocutaneous nerve was identified and isolated. Fracture reduced DCP Plate & screws are fixed on the medial surface of the Humerus.

Evaluation

Post-operative evaluation of the patient was done and assessed as follows:

Time of union of the fractures (Radiological union), presence of pain, joint stiffness, healing of the surgical scar, Weakness. The average time for the fracture union was 24 weeks (range of 16-32 weeks) seven patients had residual pain, twenty-one patients had no pain in follow-up. Twenty-two patients had full range of movements of shoulder, elbow and forearm.

Range (10deg-95deg.) three patients had shoulder stiffness, with restriction of shoulder abduction was about 100 deg. five patients had elbow stiffness, all primary radial nerve palsy cases recovered well on follow up.

Twenty-seven patients had full muscle power when tested, were performing their duties normally. All the patients in the series were satisfied with the surgical outcome.



a.



b.

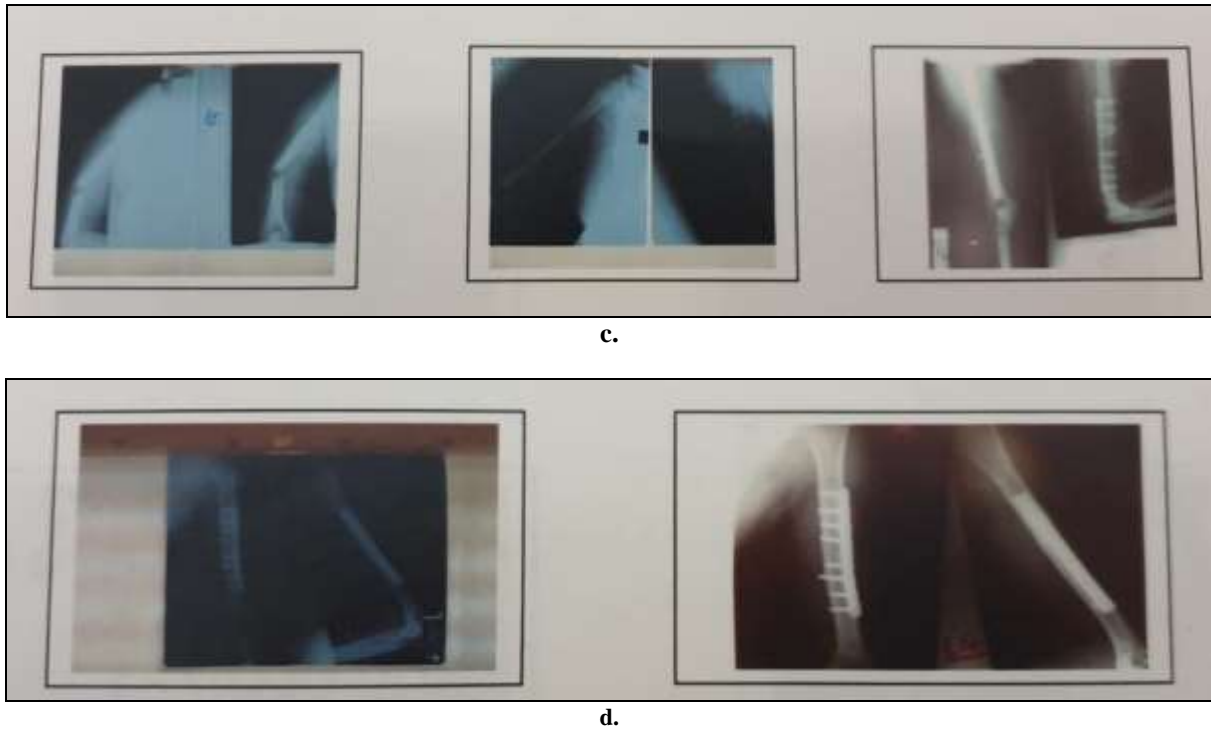


Fig 1: (a) Pre-Op showing fracture shaft of Humerus; post-Op showing ORIF with Plate & screws in-situ. (b) Pre-Op showing the fracture. Post-Op showing Medial plating of the Humerus. (c) Another Pre-Op and post- showing Fracture and Fixation with Plate & screws. (d) Pre-Op and post-Op showing Fracture and medial side fixation with DCP plate & screws.

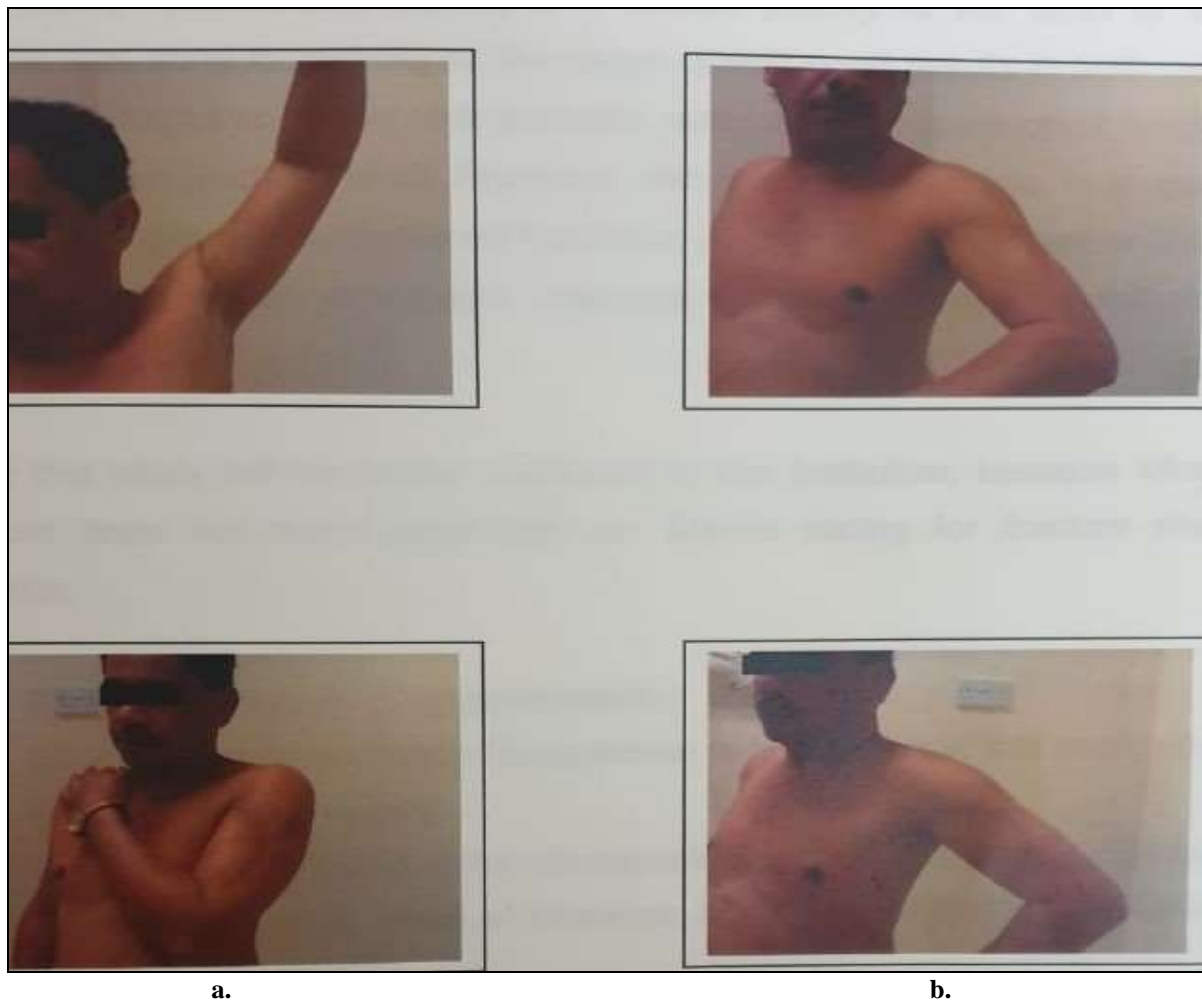


Fig 2(a): Patient showing good range of movements (Abduction). (b) Patient showing good range of movements (Flexion & adduction).

Statistical Analysis

This study was done in Sohar regional Hospital Sohar City, Sultanate of Oman. This hospital is located on the Dubai-Muscat international express highway, receiving many road traffic accidents/trauma cases that are treated in this hospital. Forty patients with fracture shaft of humerus were taken for study with open reduction internal fixation, DCP plating, and screw fixation was performed for shaft humerus using AO principles. Ten patients were lost for follow up, remaining 30 patients were reviewed after an average of 36 months of follow up.

Average age of the patient was 34 years. Majority of the patients were 28 males and 2 females patients. Mechanism of injury 28 cases were road traffic accidents; 2 cases were due to fall from height. Right side 14 cases, left side 16 cases.

Twenty two fractures occurred in middle third of shaft of Humerus, Seven cases occurred over the distal third of Humerus, 1 case was a segmental fracture, involving the middle and distal thirds of the shaft of Humerus. Twenty-three fractures had no comminution, 5 cases had minimal comminution. Two cases had significant comminution; 1 case was a TYPE I Gustilo fracture in the midshaft.

Twenty-six were transverse fractures, four were oblique fractures, 5 patients had primary radial nerve palsy before surgery. In 11 patients polytrauma, in 6 cases osteosynthesis was performed after failed conservative management, of these 4 were delayed or non-union after conservative management with plaster casts.

Antero-lateral (delto pectoral) approach was used in all the cases. The radial nerve was identified in 9 cases, which presented with primary radial nerve palsy. Musculocutaneous nerve was isolated in all the cases before plating on the medial surface of shaft Humerus. In 28 cases 4.5mm narrow dynamic compression plate, in 2 cases 3.5mm dynamic compression plate was used. In all the cases the plate was fixed on the medial surface of the Humerus, including the cases with radial nerve palsy.

Bone grafting was used in 4 cases of delayed union/non-union. Associated ipsilateral upper limb fractures occurred in 2 cases, contralateral upper limb fractures occurred in 1 case. Fracture of tibia/fibula occurred in 2 cases. Fracture ribs, chest injuries, head injuries, blunt injury abdomen occurred in 6 cases.

Results

The average hospitalization was seven days, all patients had an uneventful post-operative course. Non-union of the fracture was seen in one case, this case was fixed and supplemented with iliac bone graft which united well in the follow up. None of the cases presented with secondary radial nerve palsy. Two cases had infection of the surgical wound which was superficial in nature treated with a course of appropriate anti-biotics, the surgical wound healed well.

The post-operative evaluation of the patient was done and assessed as follows; time of union of the fractures (radiological union), presence of pain, joint stiffness, healing of the surgical scar, weakness. The average time for fracture union was 24 weeks (range 16-32 week). 22 patients had full range of movements of shoulder, elbow and forearm, range between 10 deg. to 95 deg. Three patients had shoulder stiffness, with restriction of shoulder abduction (about 100 deg) 5 patients had elbow stiffness, all primary radial nerve palsy cases recovered well on follow up.

Twenty-seven patients had full muscle power of the shoulder and elbow joints, were performing their activities of daily

living normally. All the patients in this series were satisfied with the surgical outcome.

Discussion

Indications for open reduction and internal fixation of fracture shaft humerus are, Fracture characteristics and presence of associated injuries, Open fractures, displaced fractures, fractures located proximally or distally which are more difficult to manage conservatively. Delayed or non-union of the fracture and pathological fractures. Associated injuries include ipsilateral forearm fractures, polytrauma and presence of neuro vascular deficits. Poly trauma was the most frequent indication for internal fixation of the shaft Humerus.

In this series of study 17 out of 30 (57%) who were operated had polytrauma, open fractures, neural deficits. It is difficult to manage conservatively fracture of the shaft Humerus in patients with polytrauma. Hence surgical treatment will allow faster soft tissue recovery, relieve pain, and facilitate nursing as well as rehabilitation of the patients. The average age of the patient was thirty-four years ranging from 21-47 years. Males 28, females 2 mechanism of injury road traffic accidents 28, others 2. Radial Nerve Injury- 5 cases.

According to Klenerman conservative treatment of fracture shaft of humerus is acceptable if there is less than 20 deg. of anterior bowing and 30 deg. of medial angulation and not more than 3 cm of shortening also. In this study open reduction and internal fixation was done for displaced fractures that had no cortical contact at the fracture site, more than 20 deg. anterior bowing, more than 30 deg. medial angulation and 3 cm shortening.

Another indication for open reduction internal fixation is delayed union/non-union of the fracture. Foster in his study has concluded that fracture that do not unite by 4 months are said to be delayed union, fractures that do not unite by 8 months is considered as non-union. In this study six patients were plated for delayed union/non-union, after conservative management failed. Patients were operated on an average of 3 months after the initial injury. In this study that open reduction internal fixation with plate and screws are indicated in those cases that do not show Radiological evidence of consolidation after 3 months from the time of trauma.

Fractures located very proximally or distally treated conservatively in a plaster cast may cause post traumatic stiffness of the shoulder and elbow. Thus, fixation with plate and screws will allow for earlier rehabilitation and good range of movements. Several studies reported that 90% recovery of the radial nerve palsy within a few months regardless of the method of treatment. Others quoted a low incidence of actual nerve lacerations and good recovery after conservative treatment. Many concluded that isolated Radial nerve palsy in humeral shaft fractures can be managed conservatively. The efficacy of Radial nerve decompression by open reduction and internal fixation is still unknown. One series reported 7 out of 23 initial Radial nerve palsies did not recover completely. In this study there were 5 cases of primary Radial nerve palsy, the recovery was 100% on follow up.

Hence open reduction internal fixation with DCP plate and screws is recommended for fracture shaft Humerus with Radial nerve palsy. Also, decompression of the nerve will happen after fixation with plate and screws in fractures with displacement, allowing for good recovery of the Radial nerve palsy. Exploration of the Radial nerve is advised in these cases as the radial nerve may be trapped underneath the bony fragment. In this study all the initial Radial nerve palsies were explored through Antero-lateral approach, because all the

primary Radial nerve palsies occurred over the middle third of the shaft of the Humerus. In 2 case the Radial nerve was trapped between the bony fragments. In 3 cases there was contusion of the Radial nerve was observed.

All the patients in this study were operated with antero-lateral approach (Delto-pectoral) approach. This approach is indicated for upper middle and lower third fractures of the shaft in patients with polytrauma because patient can be comfortably put in supine position.

The radial nerve traverses down the spiral groove, gives a branch to Brachialis muscle (lateral half) traverses under the lateral half of the brachialis muscle, enters the lateral inter-muscular septum to lie anteriorly. The Musculocutaneous nerve penetrates the Coracobrachialis muscle and passes obliquely between the Biceps Brachii and the Brachialis, to the lateral side of the arm a little above the elbow must be identified, isolated, and protected.

In our study the plate was fixed medially, the Musculocutaneous nerve was isolated and protected, plate was fixed on the medial surface of the Humerus. Excellent union of the fracture was seen in all the fractures fixed with medial plating. There was not much of a difference in plating the Humerus medially or anterolaterally. The choice of implant is 4.5mm broad dynamic compression plate because it can withstand torsional forces better than a narrow 4.5mm Dynamic compression plate. AO in the recent series of study says 4.5mm narrow dynamic compression plate gives good results. In this Asian population the dimension of the Humerus is considerably similar in males and in females. In this study majority of cases were fixed using 4.5mm narrow Dynamic compression plate (28 out of 30).

Conclusion

Open reduction and internal fixation for fracture shaft Humerus gives good results provided correct indications and principles of AO fixation are followed. In this study Anterolateral approach and medial side plating of the shaft of Humerus was done, giving good results in all the cases. Fixation of the fracture shaft Humerus with plate and screws is a good indication in polytrauma, displaced fractures, open fractures, proximal or distal fractures, delayed or non-union, fractures associated with neurological deficits.

Hence this study is further continued in this institution because world literature does not throw much light on Medial plating for fracture shaft Humerus. Medial plating has given good results; Musculocutaneous Nerve compromise was not seen in this study after fixing the plate Medially. Hence medial plating of the Humerus is one of the good methods in fixing fracture shaft Humerus.

Conflict of Interest

There are no Conflict of interests

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