



EVALUATION OF FRACTURE OF THE SHAFT OF THE HUMERUS TREATED BY OPEN REDUCTION & INTERNAL FIXATION WITH A.O. DCP

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ABSTRACT **INTRODUCTION:-**this study was conducted to evaluate of fracture of the shaft of the humerus treated by open reduction & internal fixation with A.O. DCP.

METHOD:-In this retrospective and prospective study was conducted on 50 patients , who attended the Department of Orthopedics and Rehabilitation Centre, Dr S.N. Medical College, Jodhpur, Rajasthan, from a period of Feb. 2013 to February 2018, to evaluate advantages and disadvantages, early and late complications, the infection rate and Epidemiology of the fractures of the shaft of the humerus treated with A.O.DCP.

RESULT:-In our study out of 50 patients 44 were males and 40 had fracture due to RTA and majority of the patients were in the age group of 21-40 years with around 3/4th of the cases had fracture of the middle 3rd of the shaft of the humerus. Primary radial nerve palsy was observed in 6 (12%) of the cases. 80% of the fracture has taken a time period of 2 1/2 to 3 months, to achieve the sound union. We have followed our patients from 6 months to 5 years with a mean of 1.78 years. For assessment of our results we took the Naiman's criteria 197118. In our series we achieved excellent results in 40 cases (80%), 7 cases (14%) had good results and only 3 cases (6%) had poor results.

CONCLUSION:- We concluded that disphyseal fractures of humerus are difficult to immobilize. It is well enstheathed by bulky muscles, whose constant contraction always makes the maintenance of reduction a difficult task , pull of gravity always tends to distract the fracture fragments. For these reason Open reduction and internal fixation is indicated. Fixation of the fracture fragments can be done either by plate and screw, interlocking IM nail or external fixators.

KEYWORDS : A.O. DCP, Naiman's criteria ,Diaphyseal fracture,

INTRODUCTION

Diaphyseal fracture of humerus is not uncommon in adults, the management of uncomplicated fracture of the shaft of the humerus is not a major problem in spite of the fact that humerus is a difficult bone to be immobilized rigidly,^{1,2} often this may lead to unseen complications like delayed union or non-union. Campbell (1923)^{3,4} studied that delayed and non union occur in a higher percentage of fractures of shaft of the humerus as compared to other long bones, He gave two reasons:-

1. The utter impossibility of complete immobilization by any type of external apparatus.
2. The difficulty in maintaining complete coaptation of fragments and preventing a definite space between them which may exist despite a good anatomic alignment.

For this reason Open reduction and internal fixation is indicated when:-

1. Satisfactory position and alignment cannot be achieved by conservative measures.
2. Associated injuries in the extremity require early mobilization.⁵
3. Fracture is segmental or pathological.
4. Fractures are associated with major vascular injuries.
5. A spiral fracture of the distal humerus in which radial nerve palsy develops after manipulation or application of a cast or splint.^{6,7}
6. Non union or delayed union.^{8,9}

AIMS AND OBJECTIVES

To evaluate advantages and disadvantages, early and late complications, the infection rate and Epidemiology of the fractures of the shaft of the humerus treated with A.O.DCP.

MATERIAL AND METHODS

This retrospective and prospective study was conducted on the patients of close fracture of the shaft of the humerus, treated by open reduction and internal fixation with A.O.DCP, who attended the Department of Orthopedics and Rehabilitation Research Centre, Dr S.N. Medical College, Jodhpur, Rajasthan, from a period of Feb. 2013 to February 2018.

For the retrospective study, minimum follow up of 6 months after definite treatment was needed upto maximum of 5 years. Patients with open fractures and who treated by IM nailing and patients who

reported to us after 3 weeks of injury were not included in this study.

For the retrospective study patients examined clinically for any deformity, pain, tenderness, activity, movements at shoulder and elbow and any neurological complications. Then radiologically advising Skiagram of the shaft of the humerus from elbow to the shoulder in anteroposterior and Lateral views, the details of which were duly recorded and if there was any complaints or complications they were treated accordingly.

OBSERVATION

The present series includes 50 random cases of closed fracture shaft of the humerus treated by A.O. DCP who attended the outpatient Department and/or fracture clinic of Department of Orthopaedics at Dr. S.N. Medical College & Hospital, Jodhpur in between February 2013 to February 2018.

Maximum number of cases belong to adult age group i.e. between 21-40 years of age. Youngest patient was of 18 years of age and oldest of 73 years of age. Our mean age of present series as 35.88 years with SD 14.17. Incidence of fracture of the was more (88%) in males than in females (12%), Male to female ratio was 7:1. Out of 50 fracture in this series 28 (56%) were on right side and 22 (44%) were on left side. Bilateral involvement was not seen in any case.

Majority of the patients (80%) had fracture due to road traffic accidents, 10% were due to simple fall, 8% were due to direct blow on their arm and 2% due to fall from height. Around 3/4th of the cases had fracture of the middle 3rd of the shaft of the humerus. Only one had fracture in upper 3rd. In 7 (14%) cases fracture line was transverse, in 29 (58%) cases it was oblique, while comminuted fracture accounted for 12 (24%) and spiral fracture 2 (4%) cases.

Table 1:-primary Radial Nerve Palsy

Site of fracture	Type of fracture	No. of cases	Percentage
Lower 3 rd	Comminuted	01	02
Middle 3 rd	Comminuted	01	02
	Oblique	03	06
	Spiral	01	02

Out of 50 cases primary radial nerve palsy was observed in 6 (12%) of

the cases. Majority was belonged to oblique type fracture and site of the fracture was middle 3rd zone.

In 43 (86%) cases narrow DCP were used and 7 (14%) cases small fragment DCP were used because of narrowness of humeral shaft. Bone grafting was done in 11 (22%) cases out of which 3 (6%) were due to implant failure and non-union in which removal of implant and reapplication of A.O. DCP with bone grafting were done, and 8 (16%) primary bone grafting were done either due to severe comminution of fracture or those fractures in which operation was held after 21 days.

Full range of movements at shoulder was present in 94% of the cases whereas mild restriction of movement was present in 2 (4%) cases and only one case had 2% moderate restricting of movement. 80% cases had full range of movement at elbow. Out of 50 cases studied full range of supination and pronation was present in 86% of the cases. Only 2 cases had mild restriction of movement, moderate restriction was present, in 4 cases and severe restriction of movement in only one case (2%).

Table 2:-duration Of Sound Bony Union

Union time (in wks)	No. of cases	Percentage
6-8	07	14
8-12	40	80
>12	03	06

Above table shows the duration of sound union after application of plate, it also denotes that 80% of the fracture has taken a time period of 2 1/2 to 3 months, to achieve the sound union.

DISCUSSION

Disphyseal fractures of humerus are difficult to immobilize. This is the most mobile bone of the body because of its peculiar articulation with scapula. It is well ensheathed by bulky muscles, whose constant contraction always makes the maintenance of reduction a difficult task. Further, pull of gravity always tends to distract the fracture fragments. All these factors seriously question the advisability of conservative treatment being adopted universally. However, in certain fractures where such results cannot be obtained by non-operative methods, open reduction and rigid internal fixation is necessary. Fixation of the fracture fragments can be done either by plate and screw, interlocking IM nail or external fixators.

Age incidence:

Humerus shaft fracture is common in adult age group, patients age ranged between 18 to 73 years with the mean age 35.88 years. Majority of the patients belonged to 21 to 40 years age group. The findings can be explained by the fact that this age group is more mobile, and thus is exposed to greatest risk of being injured.

Sex incidence:

In present series there were 44 males and 6 females with male preponderance in a ratio of 7:1. The probable explanation can be given that in India males are more commonly injured, because they are engaged in outdoor activities and females are mostly house wives.

Mode of injury:

In present series 40 patients (80%) sustained fracture due to road traffic accident. Majority of victims are two wheeler riders or collision of two vehicles. It's probably explained by poor traffic sense, improper driving technique, restless driving, moreover the quality and maintenance of vehicles are bad.

Primary radial nerve palsy:

Primary radial nerve palsy was present in 6 cases (12%) in all cases site of fracture was in middle or lower third zone. K.P. Srivastava (1998)¹⁰ reported 9 cases of primary radial nerve palsy out of 45 fracture of humeral shaft, in which 4 these cases radial nerve was found to be entrapped at fracture site, one was pierced by bone spike, one was contused and crushed and rest 3 appeared normal.

Site of fractures:

In our series 76% sustained fracture in the middle zone, lower 3rd of the shaft of the humerus was involved in 22% of the cases, only in 2% fracture was present in upper 3rd, our findings are same as those of O'Shea (1993)¹², Mann & Neal (1965)², Klenerman (1996) and Sarmiento (1981)¹³. Bhalia¹⁴, Narang & Lobo (1982) out of 45 fractures of humeral shaft 30 (67%) in middle 3rd, 13 (29%) in lower 3rd, 2 (4%)

in proximal 3rd. Rammens, Ver Bruggen, Bross (1995) out of 30 fractures, 1 in proximal, 6 in proximal & middle 3rd, 12 in middle 3rd, 9 in middle & distal 3rd and 2 in distal 3rd.

Post operative complication:

Post operative radial nerve palsy was present in 3 cases only, but all those palsies recovered. Mohandas¹¹, Ravindra and Rosario (1982) reported 4 cases of radial nerve palsy out of 30 patients but all recovered. K. P. Srivastav¹⁰ reported transient post operative radial nerve palsy in 4 cases out of 45 patients.

8 cases infection was present at the time of stitch removal, in 7 cases it was superficial and subsided after 2 to 3 dressings and antibiotics. In remaining one case, the infection persisted and could not be control, later on, the plate became loose and ultimately plate was removed repeated dressings done and as infection subsided, the case was again posted for revision surgery because fracture was ununited, narrow DCP with bone grafting was done, at last fracture got united, but with restrictive movement at elbow and shoulder. N.D. Aggarwal (1983)¹¹ reported infection in form of chronic osteomyelitis in 3 (7.5 %) cases. Bell (1985) and Griend (1986) reported the infection rate of 2.56 % and 5.54 % in their series. K.P. Srivastava (1988)¹⁰ reported 2 cases out of 45 patients who had post operative infection, one patient had deep infection resulting in the loosening of the screws and plate.

2 cases proceeded to non-union because of metal failure, they were also posted for revision surgery after one year. The old plate was removed and a new plate was applied with bone grafting and later on fracture got united. The probable causes of non-union were, aged patients and patients with osteoporotic bone. James W. Pritchett (1985) & S.S. Yadav (1986) reported failure of union in 10% & 23.53% cases respectively.

Stiff elbow and forearm were present only in those cases who had Ipsilateral fracture forearm, non-union, infection, or belongs to polytrauma group or fracture was in lower zone. All these factors leads to stiff elbow. Mohandas, Ravindra & Rosana (1982)¹¹ all patients regained full range of movement at elbow and shoulder. K.P. Srivastava (1988)¹⁰ range of movement was restored in all except one case in shoulder and restriction range of movement in elbow in 2 cases only.

Radiological Union :-

Our series of 50 cases, normal bony union achieved in all cases. Most of the fractures i.e. 47 cases united within 3 months. Only 3 cases fracture has taken more time to unite and in all these cases revised surgery was performed because of non-union, infection and implant failure. But those fracture also united within 3-4 months after revision surgery. Jesse B., Jupiter (1990)¹⁰ reported 4 obese patients who had atrophic synovial non-union of the humeral shaft and were treated with a medial approach, application of a plate anteriorly, and bone grafting. All four non-union had healed with regained full function of the shoulder and elbow.

Michelle Gerwin¹⁷, Robert, Andrew (1996) reported 7 cases who had modified posterior approach as treatment for non-union, union was achieved in 6 patients. K.P. Srivastava (1988)¹⁰ has reported 23 fractures healed within 4 months, 19 within 6 months, 2 within 9 months and one fracture took more than 9 months to unite. Shovlevd (1977) obtained 100 % union with compression plate and bone graft. Plate fixation has given high rates of union (Bell et al 1985, Foster et al 1985, Vonder Griend, Tomasin & Ward 1986).

RESULTS

We have followed our patients from 6 months to 5 years with a mean of 1.78 years. For assessment of our results we took the Naiman's criteria 1971¹⁸. We divided our results into three groups excellent, good and poor, in our series we achieved excellent results in 40 cases (80%), 7 cases (14%) had good results and only 3 cases (6%) had poor results.

Table 3:-results

Grade	No. of cases	Percentage
Excellent	40	80%
Good	07	14%
Poor	03	06%

3 patients had poor results, out of these 3, one had post operative deep infection with non-union but later on united after control of infection and revision surgery. This fracture had taken longer time to unite with post operative stiff elbow shoulder and forearm. Remaining 2 cases had non-union with implant failure, ultimately united after revision surgery.

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