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Surgical management of Fracture Humerus

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Abstract

Fracture shaft of the humerus is a major injury commonly resulting from Road Traffic Accident. It is associated with multiple fractures because of high velocity trauma of R T A. Although the close reduction is ideal, the O.R. + I.F. with plating is treatment of choice in certain indications. The DCP plating has an advantage over the ASIF type of plates in securing rigid fixation and early mobilisation with out any external splintage. Full attention to the training and familiarity with the proposed procedure will yield good operative results. Poor technique of fixation often results in poor results. The complication of infection can be prevented with aseptic precautions, pre-op preparation, pre-per and post-op antibiotics and above all meticulous dissection and minimum soft tissue damage. Early mobility of the limb is responsible for excellent results and is good for fracture and joints and for the patient. Early return to the jobs thus saves the patients from economic setbacks is possible by stable fixation which result in early healing. Exploration of radial nerve in cases with radial N. palsy, for relieving compression and neurolysis has certainly helped in early recovery. One of the aim in the management of patient with multiple injuries is to achieve an upright position with painfree extremities. The early plating of humeral shaft fracture help to attain this goal and prevents "Fracture disease" by allowing early mobilisation.

Key words: Humerus, Fracture

Introduction

There is an increase in incidence of high velocity injury to lower end of humerus. These cases with compound comminuted intercondylar fractures present a challenge to Orthopaedic surgeons.Controversies & challenges exist regarding management of compound comminuted intercondylar fracture distal end humerus. Dual locking anatomical or reconstruction plates have become a gold standard for open reduction & internal fixation of closed distal humerus fractures. But,severe contamination of bone fragments,bone loss,surrounding soft tissue devitalization & contamination prevents usage of reconstruction plates for these compound intra-articular fractures.

Materials and Methods

Twenty cases of fracture shaft of humerus admitted to the orthopedic department of Government District hospital Gulbarga and Basveshwar Teaching and General Hospital Gulbarga.

Between Sept 1997 to Sept 1999: cases have been taken up for this clinical study. All were fresh fractures except one case which was malunited fracture shaft of humerus (mid shaft, 8 weeks old.) All the cases were admitted either through causality department or out patient block. The cases taken up are traumatic in nature and caused mainly by Road Traffic accidents (R T A).

Among these 20 cases there were only 5 females, and 15 males with ratio of 1:3. Age of the patient varied from 10 to 50 years, average being 28.4. of these 4 were between 10 and 20 years, 6 were between 20 and 30 years, 9 were between 30 and 40 years and one case of 50 years.

Results

The end result of all the 20 cases evaluated by regular follow up at 3 weeks, 6 weeks and 12 weeks and there after for the date of discharge, revealed that all the fractures had healed. It was assessed after taking the following aspects in to consideration.

1. Clinical and radiological evidence of fracture union.
2. Range of movement at elbow and shoulder joint.
3. Post-operative infection.
4. Associated radial nerve palsy.
5. Time of return to duty.
6. Total period of hospitalization.
7. Assessment of end results.

The above aspects indicated were noted in all cases regularly at each follow up and compared with previous record to note the progress made by each patient.

1. Clinical and radiological evidence of fracture union.

The presence of plate and screw with stable or rigid fixation obviates much of the clinical evidence of fracture union and makes assessment to some extent impossible, unreal and difficult.

However effort were made to collect as much information as possible by clinical examination and they were recorded. Due importance was given to patient own statement regarding the residual pain at fracture site, a sense of discomfort or a feeling of yielding or crepitus, clinical examination to elicit bony tenderness at fracture site was performed. Form the following table it is noted that majority of cases showed clinical evidence of fracture union between 4 to 6 weeks. They delay noted in three case, all three cases had pain at fracture site, two patient had crepitus and one patient had discomfort at the fracture site. All three symptoms disappeared by 12 weeks all three cases.

TABLE -1

AGE GROUP (IN YEAR)	4 WEEKS	6 WEEKS	8 WEEKS	12 WEEKS	TOTAL CASES
10 - 20	1	2	-	-	3
21 - 30	-	3	1	1	5
31 - 40	1	9	-	-	10
41 - 50	-	-	-	2	2
	2	14	1	3	20

The time of union was mainly determined on the radiological evidence. The time of union was determined as the time, when whole or a part of fracture line disappeared radio logically. Union which occurred within 6 to 12 weeks of injury were termed. Primary union and fracture uniting after four month to one year wear termed delayed union. Sixteen cases wear healed within 3 month, two cases healed within 6 month, another two cases wear healed within 9 months.

Radiological evidence of sound union is tabulated in relation to age groups at different intervals-

AGEIN YEARS	3 WEEK	6 WEEK	12 WEEK	6 WEEK	9 MONTHS	TOTAL
10-20	-	2	2	-	-	4
21-30	-	3	2	1	-	6
31-40	-	3	2	-	2	9
41-50	-	-	-	1	-	1
		8	8	2	2	20

2. Range of movement at elbow and shoulder.

All cases had full range of movement at shoulder and elbow by 6 weeks. But 5 cases had full range by 12 weeks except one case had restriction of shoulder joint by about 20 degrees as she had frozen shoulder. The following table shows the site of fracture and range of movement at regular follow up till 12 weeks.

TABLE -3

SITE OF FRACTUERE	NO.OF CASES	ROM SHOULDER			ROM ELBOW		
		3 WKS	6WKS	12EKS	3WKS	6WKS	12WKS
Upper 1/3	2	Abd 60-70	Abd 100-110	Full range	F-20 E-20 short	Full range	Full range
Meddlel/3	7	Abd 70	Full range in all But one	20 - 30 short of Full Abd	F,20-30 short E-20-30 short	Full range	Full range
Lower 1/3	11	Abd 90 - 100	Full range	Full range	F-30-40 E-30-40 short	Full range in all But In 2	Full range

3. Post -operative infection.

In present series no deep infection was noted in any of the cases. However there was superficial stitch infection or abscess noted in three cases, which is controlled by change to higher antibiotics and aseptic dressings with local antibacterial solution. Because of stitch infection and mild gaping of about half a cm. In these three cases hospitals stay by 2 to 4 days was increased in there patients.

4. Associated radial nerve palsy.

Out of 20 case studies 7 had radial nerve palsy. Out of 7 cases one had all three nerves palsy and one case had transient radial nerve palsy lasting for three to four days which recovered before operation. Out of 5 cases in one case there was constriction around the nerve for which desheathing was done. Two cases had whip lash injury like signs and when opened, on the posterior compartment blood gushed out and hematoma pressing the nerve was drained. Hence these cases were not explored for the radial nerve. In another of lower 1/3 short oblique fracture of shaft of humerus. We tried to reduce by closed manipulation but could not succeed in aligning the fragment and patients developed wrist drop the next day of close reduction (Holstein And Lewis type fracture). It was explored and the nerve was released and the fractured fixed with plate and screws. In one cases the nerve could not be traced probably because of an anamoly and hence the search was abandoned. In one case of triple nerve involvement with the comminuted fracture in the middle 1/3, the fracture was fixed with ASIF type plate and screw and the nerves were not explored.

Out of these 7 cases full recovery occurred in 6 cases. In one case there was totally no recovery. No post operative radial nerve palsy noted in any of the other cases.

5. Time of return to duty.

In present duty the priority was given for the patients to return early to their house hold duties and then to their work or job. Most patients returned to their house hold light duty by 6th week only. As most patients in this study were labourers by occupation they returned to their duties by 10 weeks. Initially they were advised to avoid lifting heavy objects by operated limb. After 12 weeks they were advised to do Heavy jobs as tolerated. In one case as wrist drop did not improve, the patients could not go the job. The average time period of return to work was 12 weeks.

6. Total period of Hospitalisation.

The average period of Hospitalisation in all 10 cases was 25 days. The four cases to had polytrauma stayed longer. The rest 15 cases though few with

radial nerve palsy stayed in hospital between 15 to 20 days. The average hospital stay from time of admission to time discharge were calculated and tabulated as

Table 4

No. OF CASES	HEAD INJURY	ASSOCIATED FRACTURES INJURY	RADIAL NERVE	POST-UP INFECTION	TOTAL No OF DAYS
1	3	3	3	1	35
2	-	4	1	1	25
2	-	-	3	-	14
5	-	-	-	1	24
10	3	7	7	3	-

The above table shows that the minimum stay is 14 days and the maximum stay is 35 days. In addition it shows the associated injuries (fraction), the radial nerve injury and the post-op infection cases. Average duration of hospitalisation according to type of fracture, tabulated as follows :-

TABLE:-5

TYPE OF FRACTURE	NO.OF CASES	PRE-OP DAYS	POST-OP DAYS	TOTAL PERIOD (DAYS)
FRESH FRACTURE	3	7	11	18
FRACTURE ASSOCITED WITH OTHER INJURIES	2	10	13	23
FRACTURE WITH RADIAL N. PALSY	4	9	15	24
MAL - UNION	1	52	23	75

Assesement of the end result.

As per the criteria selected for the asessment of results, the results of the present series were grouped under the above categories and tabulated based on page as follows

TABLE -6

AGE IN YEARS	EXCELLENT	GOOD	FAIR	POOR	TOTAL
10 - 20	4	-	-	-	4
21 - 30	5	1	-	-	6
31 - 40	6	2	-	1	9
41 - 50	-	-	1	-	1
TOTAL	15	3	1	1	20

75 % Excellent, 15% Good , 5% Fair, and 5% poor result were obtained in the present series.

Discussion

In the present study of 20 cases the internal fixation was planned for cases where it was indicated. Out of 20 cases, 7 cases were having associated fractures i.e. polytrauma and 7 cases were having associated radial nerve palsy, another 4 cases mainly ciominuted and failed to achieve reduction conservatively, one case with malunion in valgus and one case of open (compound) fracture. In several reported series as well as our patients, the presence of associated multiple injuries and radial nerve palsy were the most frequent indication for internal fixation of the humeral shaft.

Non-operative treatment for fractures of the humeral shaft in patients with multiple injuries is difficult and the incidence of non-union has been reported to be highest in these patients. Internal fixation under these cirumstances may relieve pain, protect adjacent soft tissue from further injury, prevent pain, called fracture disease and facilitate nursing and rehabilitation and early mobilisation. In the presence of other serve injuries in the same extremly, stabilization of the humerus fracture may have similar beneficial effects on the extremily .

The objections which have been made to humeral shaft plating are that it may lead to non-union or to radial nerve injury[1,2] or to infection or that fixation may fail with refracture through the screw holes.[3] The present study showed few problems with only two cases of significant complication.

Out of 20 cases, 17 cases united withing 8 weeks and another three cases united with 12 weeks. Rate of union which is as good or better than reported for isolated closed fractures treated conservatiely. The time of union in three cases is longer than that reported for conservative treatment [4] but the high energy of the initial violence, leading to considerable soft tissue damage and fracture comminution is an important consideration. And even though the fractures appeared to join slowly, the patients were often able to use the arm without external splintage from the second week after operation. This early use helped to prevent the osteoporosis, muscle atrophy, joint stiffness and limb oedema, in short the "Fracture Disease".[5] The excellent functional results with only one case of significant limitation of elbow movement, support the view that the internal fixation followed by early movement is better for the patient and for the healing of a fracuture.

The intramedullary nailing for fracture shaft humerus by using K - nail has few specific indication like pathological fracture secondary to malignant tumors, few non-uions and occassionaly a segmental fracture in which satisfactory position

cannot be obtained by closed methods. In most reported series the results of medullalry fixation have been inferior to those of either closed treatment or fixation by plate and screws. If the mail is not snugly fitting it fails to control rotation and results in non-union. When inserted from proximal end it often interferes with shoulder function. There is increased chance of distraction at fracture site with nailing. The distal end of nail must be nearly flush with posterior cortex otherwise the triceps may be irritated. Thus the plating is superior to mailing in the management of fracture shaft of humerus.

Whether a radial nerve palsy is an indication for exploration and internal fixation remains controversial. In the present series of 20 cases only 7 cases had radial nerve palsy. Out of 5 cases one case developed radial nerve palsy following closed reduction of fracture (Holstein and Lewis type fracture).

Out of remaining 4 cases two cases showed little ischemic bend around the verve for which neurolysis was done and constricting bend was released. Out of 2 caes one we did not explore but punctured the posterior copartment and drained the tense heamatoma pressing on the nerve in the posterior compaartment. In one case we could not trace the nerve, this patient had an axe injury and did not recover even after one year.

In several series the incidence of actual nerve laceration was low and there is high rate of recovery of nerve function after closed treatment. In the absence of other indications for open reduction and internal fixation, we believe that patients with an isolated radial nerve palsy should managed non-operatively. However there are 2 exceptions to this general non-operative policy. When open fractures of humeral shaft present a irrigation and debridement of the wound. Early exploration and internal fixation should certainly be considered for any patient in whom radial nerve palsy develops after mainpulation, because nerve entrapment occurs in the fragments as reported by Holstein and Lewis. Radial nerve injury at operation can be avoided if closed attention is paid to surgical technique. The radial nerve should be identified above and below the fracture and held away from dissection by gentle traction. in present series bnot a single lesion or palsy has occurred post operatively. There was no problem with infection in present series, depsite the treatment of open fractures with early internal fixation. Internal fixation per se does not increase the incidence of wound or bone infection. In present series only 3 cases had superficial stitch infection which was controlled with aseptic regular dressing and antibiotics and which was never a problem. Not a single case of deep infection leading to removal of implants and osteomyelitis occurred in the present series.

The failure of fixation at three weeks in one case was due to poor technique, with an inadequate hold in the proximal fragment with only 2 screws, one near the fracture site became loose with little angulation and immobilised externally by U-slab for 3 more weeks and resulted in union without complication. Many a times, it is the poor technique that results in poor results. Before attempting an open reduction and internal fixation self assessment by the surgeon in necessary in regard to his training, his familiarity with proposed procedure and his surgical ability. A full set of proper instruments and implants should made available.

In the present series of 20 cases, internal fixation using dynamic compression plates in 8 cases. The results are comparable with those reported with the sue of non-operative methods. The results using ASIF type plates and DCP type plates were not with major differences but with little advantage suing DCP over ASIF types of plates. That is

1. Fixation is more rigid.
2. Gap between the fragments is reduced or narrowed.
3. External immobilisation is not required.

4. Early mobilisation of elbow and shoulder with early return of function.

The major disadvantage of DCP is the callus forming in slow without an extraperiosteal callus, thus difficulty in commenting on radiological union early as compared to ASIF type comenting on radiological union early as compared to ASIF type plates. Another serious complication has been refracture after removal of plate which is not studied in present series as no implant removed till the end of the present study.

The complications of internal fixation that tare most frequently mentioned are infection, non-union, injury to radial nerve prolonged disability and the need for additional procedures to gain union. Careful exposure and protection of radial nerve and rigorous application of techniques and principles of AO plating appear to minimize these complications. While closed treatment remains the method of choice for most fractures of humeral shaft, acceptable results can be achieved with internal fixation, even for difficult fracture.

Summary

Twenty cases of fracture shaft of humerus were studied in the present series from May 1989 to May 1991. The cases were due to trauma cased mainly by RTA.

Among the 20 cases there were 5 females and 15 males, the F:M ratio being 1:3. The average are incidence was 28.4, indicating the young people are more prone for accidents. The youngest patient was 10 years of age and the oldest being 50 years of the 20 caes all were fresh fracture except one which was malunited fracture shaft of humerus. Seven cases were having polytrauma with fracture in other parts of the body. Seven cases were having associated radial nerve palsy. After primary treatment the X-ray of the fractured humerus was taken in full in both antero - posterior and latheral views.

This revealed the site of local of fracture 20 case as-

Upper	1/3	-	2	cases
Middle	1/3	-	7	cases
Lower	1/3	-	11	cases

The value of conservative management has been discussed in the literature. The indications for open reduction and internal fixation of fractures shaft of humerus have been analysed and its utility in the management of 20 cases have been evaluated. In the present series the indications being the following:-

1. Unstable and failed closed reduction.
2. Comminuted with displaced butterfly fragment.
3. Fractures associated with radial nerve injury.
4. Patients with multiple injuries.
5. Fractures in the lower end of shaft humerus.

After pre-op management and planning from surgeon's point view the necessary instruments and variety of implants were kept ready. DCP plates mostly 6 holed, narrow and cortical screws. In 10 cases DCP type plates were used in the present series. The anterolateral approach used in upper 1/3 and proximal part of middle 1/3 fractures. The posterior Henry's approach used in lower 1/3 and middle 1/3 fractures. For butterfly fragment an interfragmentry compression screw with lag effect as advocated by A.O. was used and augmented by a buttress plate. the schauwecker technique for self compression plate used in Dynamic compression plating (DCP).

The post-operative course of all the cases was smooth and not caused any major problems. The average post -op period in the hospital was 14 days, during when anti-biotics, antiflamatory drugs, general building up drugs in the form of B-complexes and calcium preparation were given. The U-slab in all and cock's up splint in radial nerve palsy cases was given. In most cases the stitches

were removed on 12th post-op days and wounds found healed with primary intention. Infection. Infection was not a problem. Not a single case of deep infection or osteomyelitis occurred in the present series.

At the time of discharge patients were adviced to do the active movements of shoulder and elbow with elastocrepe bandage on and imtermitent cuff and collar sling. The ROM was checked at the time of discharge.

The follow up of the patients was regular and were assessed for progress in ROM, radiological union and recovery of radial nerve palsy. All cases had full rage of movement at shoulder and elbow by 6 weeks except 5 cases who had full range at 12 weeks. The rate of union was good and by 6 weeks half the cases were united and remaining united by 12 weeks except 4 cases each uniting at 6 and 9 months.

Out of 7 cases of radial nerve palsy, all were recovered by 12 weeks, one case took 6 months and one case did not recover at all.

In the present series priority was given for the patients to return early to their household duties and then to their jobs. Most patients were shown fast return to the household duties as early as 6 weeks. As most of patients were laboudrers they returned to their job by 10 weeks, with lifting of heavy objects. only after 12 weeks. The hospital stay also less. The minimum number of days one case stayed was being 14 days and maximum being 75 days (This was cases of malunion), the average number of days being 25 days.

The results in present series were :- 75% Excellent, 15% Good, 5% Fair, and 5% poor. The literature has been reviewed in detail on the available techniques for the treatment of fractures of shaft of the humerus.

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