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Surgical management of fracture shaft of 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 pain free extremities. The early plating of humeral shaft fracture help to attain this goal and prevents "Fracture disease" by allowing early mobilisation.

Keywords: 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^[1, 2].

Materials and Methods

Twenty cases of fracture shaft of humerus admitted to the orthopedic department of Government District hospital Gulbarga Between Jan 2011 to Jan 2013: 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 casualty 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 40 cases there were only 10 females, and 30 males with ratio of 1:3. Age of the patient varied from 10 to 50 years, average being 28.4 of these 8 were between 10 and 20 years, 12 were between 20 and 30 years, 18 were between 30 and 40 years and two cases of 50 years.

Results

The end result of all the 40 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.

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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 six cases, all six cases had pain at fracture site, four patients had crepitus and two patients had discomfort at the fracture site. All three symptoms disappeared by 12 weeks all six cases.

Table 1: Age Group

Age Group (In Year)	4weeks	6 Weeks	8 Weeks	12 Weeks	Total Cases
10 - 20	2	4			6
21 - 30		6	2	2	10
31-40	2	18			20
41-50				4	4
	4	28	2	6	40

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. Thirty two cases wear healed within 3 month, four cases healed within 6 month, another four cases wear healed within 9 months.

Table 2: 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 Month	Total
10-20		4	4			8
21-30		6	4	2		12
31-40		6	4		4	18
41-50				2		2
		16	16	4	4	40

2. Range of movement at elbow and shoulder.

All cases had full range of movement at shoulder and elbow by 6 weeks. But 10 cases had full range by 12 weeks except two 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 fracture and range of movement

Site pf Fractuere	No of Cases	Rom Shoulder			Rom Elbow		
		3wks	6wks	12wks	3wks	6wks	12wks
Upper 1/3	4	Abd 60-70	Abd 100-101	Full range	F-20 E-20 short	Full range	Full range
Meddle 1/3	14	Abd70	Full range in all but two	20-30 short of full abd	F 20-30 short E-20-30 Short	Full range	Full range
Lower 1/3	22	Abd 90-100	Full range	Full range	F 30-40 E 30-40 short	Full range in all but in 4	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 40 case studies 14 had radial nerve palsy. Out of 14 cases two had all three nerves palsy and two case had transient radial nerve palsy lasting for three to four days which recovered before operation. Out of 10 cases in two case there was constriction around the nerve for which desheathing was done. Four 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. Out of these 14 cases full recovery occurred in 12 cases. In two cases 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 two 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 20 cases was 25

days. The eight cases to had polytrauma stayed longer. The rest 30 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: Average hospital stay from time of admission to time discharge

No of Cases	Head Injury	Associated Fractures Injury	Radial Nerve	Post-op Infection	Total No of Days
2	6	6	6	2	35
4		4	1	1	25
4			3		14
10				2	24
20	6	14	14	6	

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 hospitalization according to type of fracture, tabulated as follows:-

Table 5: Average duration of hospitalizations according to type of fracture

Type of Fracture	No of Cases	Pre-op Days	Post-op Days	Total Period (days)
Fresh Fracture	6	7	11	18
Fracture associated with other injury	4	10	13	23
Fracture with radial N palsy	8	9	15	24
Mal-Union	2	52	23	75

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

Table 6: Assessment of the end result

Age in Years	Excellent	Good	Fair	Poor	Total
10-20	8	-			8
21-30	10	2			12
31-40	12	4		2	18
41-50		-	2		2
Total	30	6	2	2	40

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

Discussion

In the present study of 40 cases the internal fixation was planned for cases where it was indicated. Out of 40 cases, 14 cases were having associated fractures i.e. polytrauma and 14 cases were having associated radial nerve palsy, another 8 cases mainly comminuted and failed to achieve reduction conservatively, one case with malunion in valgus and two 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 circumstances 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 severe injuries in the same extremity, stabilization of the humerus fracture may have similar beneficial effects on the extremity.

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 four cases of significant complication. Out of 40 cases, 34 cases united within 8 weeks and another six cases united with 12 weeks. Rate of union which is as good or better than reported for isolated closed fractures treated conservatively. The time of union in six 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 two cases 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 fracture.

In most reported series the results of medullary fixation have been inferior to those of either closed treatment or fixation by plate and screws. If the nail 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 nailing 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 40 cases only 14 cases had radial nerve palsy. Out of 10 cases two cases developed radial nerve palsy following closed reduction of fracture (Holstein and Lewis type fracture). Out of remaining 8 cases four cases showed little ischemic bend around the nerve for which neurolysis was done and constricting bend was released. Out of 4 cases one we did not explore but punctured the posterior compartment and drained the tense hematoma pressing on the nerve in the posterior compartment. In two 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 manipulation, 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. There was no problem with infection in present series, despite 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 6

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 two cases 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 immobilized 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 is necessary in regard to his training, his familiarity with proposed procedure and his surgical ability. A full set of proper instruments and implants should be available. In the present series of 40 cases, internal fixation using dynamic compression plates in 16 cases. The results are comparable with those reported with the use of non-operative methods. The results using ASIF type plates and DCP type plates were not with major differences but with little advantage using 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 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 are 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.

Conclusion

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, antinflammatory 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.

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