

## Management of Fracture Shaft of Radius and Ulna by Open Reduction & Internal Fixation with Dynamic Compression Plate

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### I. Introduction

Bone fractures are commonly encountered in today's industrial era. Various treatment modalities were introduced from time to time and each of them had some edge over the previous one. Fractures of the forearm bones may result in severe loss of function unless adequately treated. Excellent results for plate fixation in displaced diaphyseal fractures of both the radius and ulna have been reported by various authors, but only a few authors have focused on plate fixation in the management of open diaphyseal fractures of both the radius and ulna [1-10]. Diaphyseal fractures of the radius and ulna present specific problems in addition to the problems common to all fractures of the shafts of long bones. In addition to regaining length, apposition, and axial alignment, achieving normal rotational alignment is necessary if a good range of pronation and supination is to be restored. Because of these factors, open reduction and internal fixation for displaced diaphyseal fractures in the adult are generally accepted as the best method of treatment, even though closed reduction may be achieved. The muscle mass in the proximal forearm makes maintenance of closed reduction difficult. Fractures of the distal radius tend to angulate toward the ulna by the action of the pronator quadratus and the pull of the long forearm muscles. Although union may be achieved by closed methods, if angular and rotary malalignments are not completely corrected, some loss of function occurs and may make the overall result unsatisfactory. The purpose of the study was to evaluate the effects of open reduction and internal fixation with a dynamic compression plate (DCP) in diaphyseal fractures of both the radius and ulna.

### II. Materials And Methods

This is a prospective study carried out in ACSR Govt. Medical College, Nellore from December 2012 to December 2014, 56 cases of fracture both bones forearm in adults were attended in the casualty and OPD and were admitted in this hospital and were treated surgically. We collected records of the patients by asking the patients history and examining the patients. Essential investigations of all the patients were done. The patients were operated by open reduction and internal fixation with Stainless steel Dynamic compression plate by same 2 surgeons. Patients followed up at regular interval

#### Method of collection of data

##### Inclusion criteria

- Displaced diaphyseal fractures both bones in forearm.
- Male and female patients.
- Type I open fractures.

##### Exclusion criteria

- Fractures both bones of forearm in children.
- Fracture either of the ends of radius and ulna.
- Type II and III open fractures.

##### Sampling procedure

- History
- Clinical examination
- Radiological examination
- Investigations:
- Blood: Hb, BT, CT, TC, DC, ESR
- Blood: RBS, BU, and SC
- ECG: In all leads
- HIV, HBSAg

Assessment was done based on a proforma containing all necessary information regarding.

- Personal details age, sex, address and occupation
- Type of fracture
- Surgical procedure carried out
- Duration of hospital stay
- Initiation of mobilization
- Physiotherapy
- Development of surgical complications

The sex ratio was Males - 46 cases, Females - 10 cases. Out of 56 cases of fracture both bones forearm, 37 cases were on right side, 19 cases were on the left side. The duration of interval between injury and surgery was 2 days to 1 week.

**Procedure:**

**Fixation of Radius**

**Position:** Under brachial block or general anesthesia supine position, under the effect of tourniquet.

**Approach:** Thompsons approach or Henry's anterior approach to all the fractures of the radius for convenience and to avoid other complications.

**Incision:** A length of incision was varied with the type of fracture and length of the plate used average 6 inches.

**Size of incision:** Incision was centered directly over the fracture side to facilitate extension either proximally or distally as per circumstances. A cleavage developed between the brachioradialis and flexor carpiradialis for Henry's approach and Extensor carpi radialis brevis and extensor digitorum comminus for Thompsons approach.

**Reduction:** Fragment ends were identified cleaned from hematoma and soft tissue interposition, butterfly fragments are retained with their soft tissue attachments. Fracture was anatomically reduced by fitting the butterfly fragment.

**Fixation:** By using burns bone holder Dynamic Compression Plate or Locking Compression Plate was selected and placed over the fracture site. The plate was adjusted to the centre of the fracture site and hold the two fragments with BURNS forceps.

A third BURNS forceps was placed over the fracture to stabilize the communitated fragment and to prevent any angulation when the force was applied. Then after, using a drill bit and plate was fixed by inserting screws 4-6.

At every stage supination and pronation were checked. For dynamic compression plate two screws were fixed on either side of the fracture to impose compression in an eccentric position, remaining are in neutral position. Hemostasis was secured well, drain was kept, wound was closed in layers.

**Fixation of the ulna**

**Position:** Supinated and kept over the chest of the patient.

**Incision:** A long subcutaneous border of the ulna was incised by taking centre as the fracture side Approach: Fracture fragments were approach by developing a cleavage between the flexor and extensor carpi ulnaris muscles.

**Reductions:** Reduction of the fracture and fixation of the plate was done as in the case of radius after placing a plate posteriorly. When the communitation was there the plate is fixed on the side of the communitation in order stabilizes the fragments.

**After treatment**

Broad spectrum antibiotics were given. Elevation of the limb and active finger movements were advised. Drain removed after 48 hours. Check X-Ray was done. Sutures were removed on 10th post operative day. Post op mobilization started immediately after surgery according to the pain tolerance of the patients.

### **III. Results**

The present study consisted of 56 cases of fracture both bones forearm treated by open reduction and internal fixation using dynamic compression plates. 85% (48 cases) of the fractures were simple, 15% (8 cases) were compound. Male 46 (82%) and female 10 (18%) were included in the study. Fracture side ratio was observed as follows. Right in 37 (66%) cases and Left in 19 (34%) cases were recorded. Age groups distribution was as follows. 5 (8%) cases in 16-20 years group, 20 (36%) cases in 21-30 years group, 16 (28%) cases in 31-40 years group, 10 (19%) cases in 41-50 years group, 5 (9%) cases in 51 years and above age group were recorded. Site of fracture was observed as follows. Upper third in 8 (14%) cases, middle third in 34 (61%) cases, lower third in 14 (25%) cases were recorded. Mode of injury was observed as follows. 31 (56%) of Road Traffic Accidents, 13 (23%) cases of Fall on Outstretched hands, 8 (14%) cases of Assaults, and 4 (7%) cases of Sports injuries were recorded. OTA classification of diaphyseal fractures was recorded as per Table - 1. Fracture pattern were observed as follows. Transverse in 11(20%) cases, oblique in 22(39%) cases, segmental in 3(5%) cases, and comminuted in 20 (36%) cases were recorded.

**Functional grading of results :** Results were grouped as excellent, good, fair and poor.

**Excellent:**

- Case with clinically and radiologically well united.
- Full range of motion was obtained.
- No deformity.

**Good:**

- Clinical and radiological obtained.
- 25% of limitation of motion without disability.

**Fair:**

- Clinical and radiological union.
- 50% of movements are limited.

**Poor:**

- No clinical and radiological union.
- Limitation of movement. Persisting pain.
- Presence of deformity.

**Functional grading of results of all subjects were recorded as per Table - 2.**

### **IV. Discussion**

Open reduction and internal fixation is a treatment of choice for the majority of the fractures of the both bones forearm in adult. While reducing the fractures it is important to correct the angulation radial bowing and rotation deformities. The axis of rotation of the forearm bones extends from centre of the head of the radius to the insertion of the triangular fibro cartilage at the base of the styloid process of the ulna. If the relation of the forearm axis is altered by angulation the mechanism of the radio ulnar joint are deranged and permanent limitations of the rotation will occur. Rotational deformities will also limit the radio- ulnar movement. The supinator muscles are inserted proximally and the pronators are inserted distally. Consequently the fracture of midshaft of the radius takes place. The proximal fragment supinates and the distal fragment pronates which is seen in the X-Ray as a striking discrepancy in the width of the interosseous space between the proximal and distal fragments. Open reduction and internal fixation is always recommended in these cases as the maintenance of the reduction in plaster casing is difficult as there is every chance of displacement occurs. In this series out of 56 cases 49 (87.5%) cases are graded excellent and good, fair 5 (9%) cases and poor 2 (3.5%) cases. 7 cases were immobilized with above elbow slab and bandage, delayed union 1 case, infected nonunion 1 case. However, union rate and union time in our series were compatible with values in several other reports, including other series of closed fractures [5-8, 11-15]. This emphasizes the value of fixation with a DCP in achieving union of fractures of both the radius and ulna, even in open fractures. Good early reduction and rigid fixation restore forearm stability earlier and limit dead space produced as a result of shortening and malposition [8]; thus, such procedures permit earlier and more effective management of the soft-tissue injury, and subsequently improve wound care and avoid soft tissue complications. Operative intervention for the forearm fractures better to be carried out between 7 and 14 days from the time of injury. By that time the initial edema subsided much soft tissue damage gets healed. The operation can be performed on a routine list in the best available time as an elective procedure. The study is limited in the fact there is no control group and therefore it provides no basis for firm conclusions, or statistical analysis. However the study does demonstrate that the DCP appears to be an effective and reliable means of fixing both bone forearm fractures.

## V. Conclusion

Our study has proven that open reduction and internal fixation of diaphyseal fractures of radius and ulna can be best done with dynamic compression plating technique which has given a good result. The complications of the procedure are negligible. The technique of DCP fixation is a simple procedure which can be done by the junior orthopedic surgeon with an excellent result. The soft tissue care is utmost important i.e. minimum periosteal stripping on the surface of the bone on which plate is applied. This maintains optimal vascularity at the fracture site. Proper preoperative planning, operative technique and postoperative rehabilitation program are key points for the excellent outcome.

### Conflict Of Interest

None of the authors has any conflict of interest.

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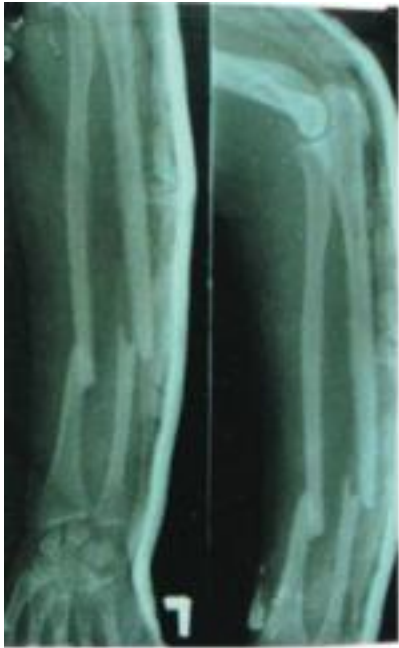
**Table – 1: OTA classification of diaphyseal fractures.**

Type –A	Type—B	Type – C
A1: Simple Diaphysial fracture	B1: Ulna Wedge radius intact	C1: Ulna complex simple radius
A2: Ulna simple radius intact	B2: Radius wedge ulna intact	C2: Radius complex ulna simple
A3: Radius and Ulna simple -33	B3: Wedge of radius and Ulna – 18	C3: Complex both -5

**Table – 2: Functional grading of results.**

Results	No. of cases	Percentage
Excellent	42	75%
Good	7	12.5%
Fair	5	9%
Poor	2	3.5%

**Cases:  
Case 1**



**Pre Op**



**Post op**



**Follow up**



**Supination**

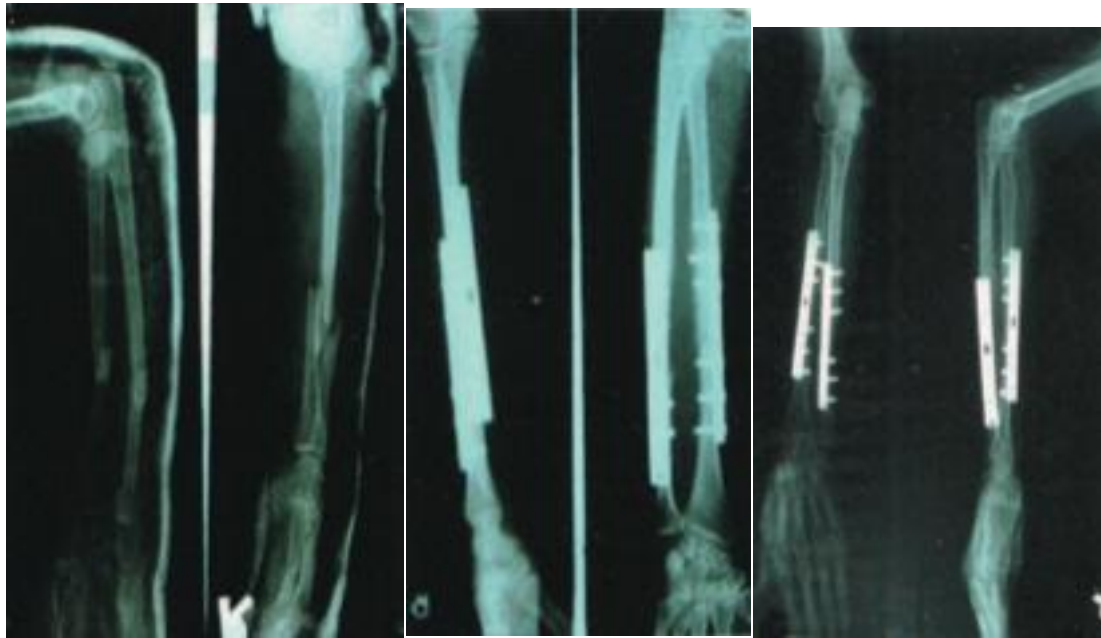


**Mid prone**



**Pronation**

**Case 2**



**Pre op**

**Post op**

**Follow up**



**Supination**

**Mid prone**

**Pronation**