ISSN: 2394-0026 (P)
ISSN: 2394-0034 (O)

Original Research Article

Management of fractures of both bones of forearm with dynamic compression plate with screw fixation

Meeravali SK[1*], Dasaraiah CV[2]

[1]Assistant Professor, Department of Orthopedics, Narayana Medical College and Hospital, Nellore, India
[2]Professor and Head, Department of Orthopedics, Siddhartha Medical College and Government General Hospital, Vijayawada, India
[*]Corresponding author email: research.nmch@rediffmail.com

How to cite this article: Meeravali SK, Dasaraiah CV**.** Management of fractures of both bones of forearm with dynamic compression plate with screw fixation. IAIM, 2015; 2(6): 145-150.

Available online at www.iaimjournal.com

Received on: 12-05-2015 **Accepted on:** 14-06-2015

Abstract

Background: Study was designed to analyze the effects of surgical management of fractures of both bones of forearm with dynamic compression plate with screw fixation.
Material and methods: From August 2008 to October 2010, data from 56 patients with fractures of both the radius and ulna were collected and evaluated retrospectively. Patients were managed with early surgical debridement, open reduction and internal fixation with a DCP. All patients had complete functional and radiographic assessments.
Results: Patient regained full range of movements within 6-8 weeks. At 12-14weeks check X-ray showed good radiological union. In this series out of 56 cases 42 (75%) cases are graded excellent, 7 (12.5%) cases are graded good, fair 5 (9%) cases and poor 2 (3.5%) cases.
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 technique of DCP fixation is a simple procedure which can be done by the junior orthopedic surgeon with an excellent result.

Key words

Open fractures, Radius, Ulna, Dynamic compression plate.

ISSN: 2394-0026 (P)
ISSN: 2394-0034 (O)

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 open diaphyseal fractures of both the radius and ulna.

Materials and methods

Study population

56 cases of fracture of both bones of forearm in adults were treated in Government General Hospital, Vijayawada from August 2008 to October 2010.

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

ISSN: 2394-0026 (P)
ISSN: 2394-0034 (O)

were on the left side. The duration of interval between injury and surgery was 2 days to 1 week.

Method of open reduction and internal fixation

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.

Side 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, butter fly 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 communited fragment and to prevent any angulation when the force was applied. Then after, using a 7/64 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. For Locking compression plate two screws were fixed on either side of the fracture to impose compression in an eccentric position. Remaining were in locking screwes. 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 communition was there the plate is fixed on the side of the communition 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.

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.

ISSN: 2394-0026 (P)
ISSN: 2394-0034 (O)

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 31-40years group, 10 (19%) cases in 41-50years group, 5 (9%)cases in 51years and above age group were recorded.

Side 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 communited 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**.

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.

Rotationl 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.

ISSN: 2394-0026 (P)
ISSN: 2394-0034 (O)

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.

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.

References

1. Duncan R, Geissler W, Freeland AE, Savoie FH. Immediate internal fixation of open fracture of the diaphysis of the forearm. J Orthop Trauma, 1992; 6: 25–31.
2. Naiman PT, Schein AJ, Siffert RS. Use of ASIF compression plates in selected shaft fractures of the upper extremity. A preliminary report. Clin Orthop, 1970; 71: 208–16.
3. Reilly TJ. Isolated and combined fractures of the diaphysis of the radius and ulna. Hand Clin, 2002; 18: 179–94.
4. Knight RA, Purvis GD. Fractures of both bones of the forearm in adults. J Bone Joint Surg Am, 1949; 31: 755–64.
5. Hicks JH. Fractures of the forearm treated by rigid fixation. J Bone Joint Surg Br, 1961; 43: 680–7.
6. Moore TM, Klein JP, Patzakis MJ, Harvery JP. Results of compression-plating of Galeazzi fractures. J Bone Joint Surg Am, 1985; 67: 1015–21.
7. Burwell HN, Charnley AD. Treatment of forearm fractures in adults with particular reference to plate fixation. J Bone Joint Surg Br, 1964; 46: 404–25.
8. Grace TG, Eversmann WW Jr. Forearm fractures: treatment by rigid fixation with early motion. J Bone Joint Surg Am, 1980; 62: 433–8.
9. Anderson LD, Sisk TD, Tooms RE, Parks WI III. Compressionplate fixation in acute diaphyseal fractures of the radius and ulna. J Bone Joint Surg Am, 1975; 57:2 87–97.
10. Gustilo RB, Anderson JT. Prevention of infection in the treatment of one thousand and twenty-five open fractures of long bones: Retrospective and prospective analysis. J Bone Joint Surg Am, 1976; 58: 453–8.

ISSN: 2394-0026 (P)
ISSN: 2394-0034 (O)

11. Dodge HS, Cady GW. Treatment of fractures of the radius and ulna with compression plates: A retrospective study of one hundred and nineteen fractures in seventy-eight patients. J Bone Joint Surg Am, 1972; 54: 1167–76.
12. Moed BR, Kellam JF, Foster RJ, Tile M, Hansen ST. Immediate internal fixation of open fractures of the diaphysis of the forearm. J Bone Joint Surg Am, 1986; 68: 1008–17.
13. Reilly TJ. Isolated and combined fractures of the diaphysis of the radius and ulna. Hand Clin, 2002; 18: 179–94.
14. Ross ER, Gourevitch D, Hastings GW, Wynn-Jones CE, Ali S. Retrospective analysis of plate fixation of diaphyseal fractures of the forearm bones. Injury, 1989; 20: 211–4.
15. Schemitsch EH, Richards RR. The effect of malunion on functional outcome after plate fixation of fractures of both bones of the forearm in adults. J Bone Joint Surg Am 1992; 74: 1068–78.

Source of support: Nil **Conflict of interest:** None declared.

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%