Role of dynamic compression plate in management of both bones forearm fractures

Vishal Ashokraj Pushkarna

Senior Resident, Department of Orthopaedics, M.P Shah Government Medical College & Guru Gobindsingh Government Hospital, Jamnagar, Gujarat, India.

Address for correspondence: Dr. Vishal Ashokraj Pushkarna, Department of Orthopaedics, M.P Shah Government Medical College & G.G Hospital, Jamnagar, Gujarat, India.

Email: vishalpusshkarna@hotmail.com

ABSTRACT

Background : Forearm 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. Continuing this process of revolution and based on many years of experience with compression plating and promising results obtained with so called internal fixation. This present study is designed to determine the effects of surgical treatment of both bones forearm and single bone forearm fracture by open reduction and internal fixation with Dynamic Compression Plate.

Materials & Methods : This is a prospective study of 30 patients with both bones forearm or single bone forearm fractures which were surgically treated with open reduction and internal fixation with DCP (Dynamic compression plate). Evaluation of patients was done on the basis of radiological union and functional assessment using Anderson et al scoring system.

Results : The mean age of the patient is 32.3 years (range 18-55) with 73% male preponderance. The mean follow up is 12 months (range 6-14 months). Out of 30 cases 54% middle third fractures, 13% proximal third and 33% lower third. Average union time was 8.46 weeks (range 8-12 weeks). The range of motion was determined by Anderson et al[1], scoring system. Our series had 80% of excellent, 17% satisfactory result and 3% failure.

Conclusion : Based on our experience and results we conclude that with the use of 3.5 mm DCP for acute diaphyseal fractures of forearm, rigid and anatomical fixation can be achieved. Radial bowing is very important for normal supination and pronation. This can be maintained very well with compression plates. A minimum of 6 cortices should be engaged in each fracture fragment. It is better to use longer plates like a bridge plate in case of comminuted oblique fractures. Radius and Ulna are approached separately to avoid extensive soft tissue dissection and resulting complication.

Keywords : Dynamic compression plate, fractures, forearm, both bones forearm, DCP

INTRODUCTION

The forearm, in combination with the proximal and distal radio-ulnar joints, allows pronation and supination movements that are important to all of us in the usual activities of daily living. It is essential to regain length, apposition, axial alignment and normal rotational alignment while treating diaphyseal fractures of the radius and the ulna to gain good range of pronation and supination.The chances for the occurrence of malunion and non-union are greater because of the difficulties in reducing and maintaining the reduction of two parallel bones in the presence of the pronating and supinating muscles, which have angulatory as well as rotatory influences[2].

Open reduction and internal fixation with plating is generally accepted as the best method of treatment for displaced diaphyseal fractures of the forearm in the adult[2]. The dynamic compression plate (DCP) first described by Bagby and Denham[3].Compression techniques have a lower incidence of non-union and are found to hasten rehabilitation, with less joint stiffness[4-5]

Surgical options include: Medullary fixation with nails, Open reduction and internal fixation with plate

MATERIALS & METHODS

A prospective study was conducted after obtaining institutional ethical committee approval. 30 patients with both bones forearm and single bone forearm fractures which were surgically treated with open reduction and internal fixation with DCP (Dynamic compression plate) included in the study. Patient with simple and open fracture with both bones and single bone forearm fracture were included.

Age less than 18 years & above 55 years, any type of pathological fracture, patients who are medically unfit for surgery are excluded from the study.

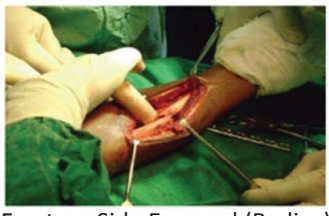
Surgical technique:

General anaesthesia was used in 6 cases and brachial block in 24 cases. Patient was given supine position on the

operating table. The arm is placed on an arm board with elbow straight and forearm in supination.

For Radius shaft Volar Henry's approach was taken & for Ulnar shaft Parallel and slightly volar to the subcutaneous crest of the ulna. Usually radius was fixed first, however the bone which was less comminuted and more stable was fixed first and later the other bone was fixed.[6]

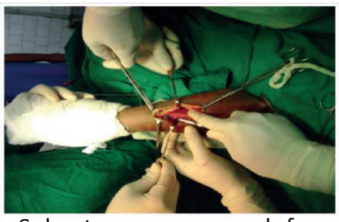
Draping



Fracture Side Exposed (Radius)

Plate Placement

Intra Op picture of radius fixation with 3.5mm DCP



Subcutaneous apporach for ulna

Bone exposed and reduced

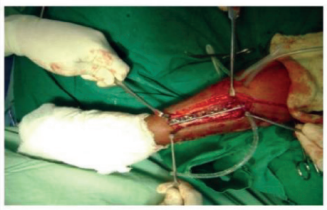


Plate placement

Wound Closure

Intra Op picture of ulna fixation with 3.5mm DCP and wound closure

Post operative treatment

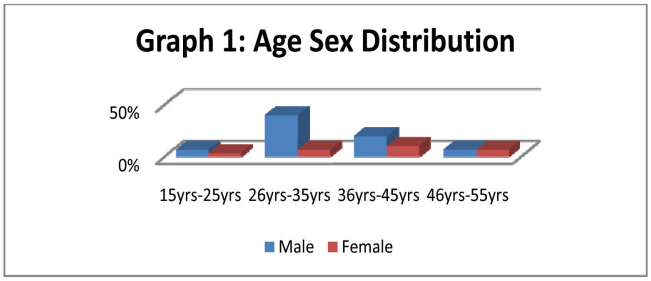
Crepe bandage was applied over the affected forearm and either pre-op Posterior slab was continued or arm pouch was given depending upon the requirement. Limb is elevated and active movement of the fingers and elbow joint is encouraged. Suction drain was removed after 48 hours and Wound was inspected. Check X ray AP and Lateral view was taken at that time.

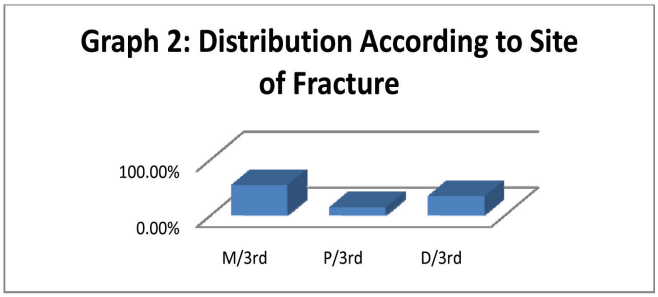
Antibiotics and analgesics were continued till the time of suture removal. This was done on 10-12 postoperative day. On discharge patient was advised physiotherapy of shoulder, elbow, wrist and finger movements. They were told not to lift heavy weight or exert the affected forearm.

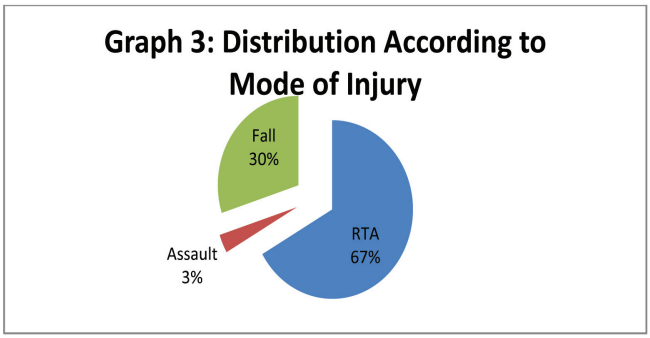
The patients were followed regularly at monthly interval for first three months then every three months depending upon the outcome. The patients were evaluated based on "Anderson et al"score system. Elbow movements and wrist movements were noted and the union was assessed radiological.

RESULTS

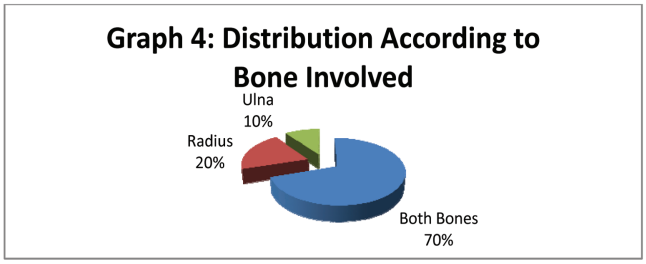
The mean age of the patient is 32.3 years (range 18-55) with 73% male preponderance. The mean follow up is 12 months (range 6-14 months). Out of 30 cases 54% middle third fractures, 13% proximal third and 33% lower third.[Graph 1 & 2]



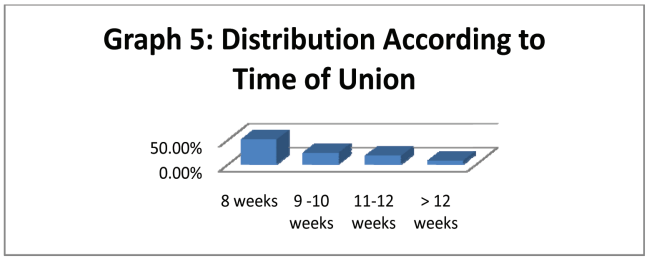


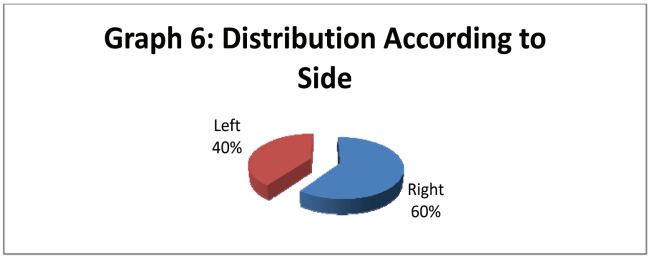


Out of 30 patients, the most frequent mode of injury is 'RTA' (n=20, 67%) followed by 'fall' (n=9, 30%) and 'assault' (n=1, 3%). (Graph: 3)

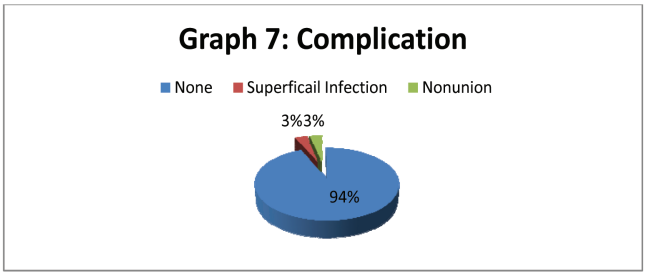


Out of 30 cases 70% having both bones fracture of forearm while 20% having radius and 10% having ulna. (Graph:4)





Average union time was 8.46 weeks (range 8-12 weeks) we had about 60% incidence of forearm fractures in right extremity which is comparable to other studies. [Graph 5&6]



84% cases have no complication while only one case having superficial infection and one case went into nonunion

Table 1: Anderson et al.3 criteria for assessment of functional outcome

Group	# Union	Loss of Supination / Pronation	Loss of Flexion/extension at elbow/writ	Complication
Excellent	Present	<25%	<10 degrees	No
Satisfactory	Present	>25%-<50%	<25 degrees	No
Unsatisfactory	Present	>50%	>25 degrees	No
Poor/failure	Absent	-	-	Non-Union

Our series had 80% of excellent, 17% satisfactory result and 3% failure. 67% of cases had road traffic accidents, 30% had fall, 3% with history of assault. In our series we had 1 case of Non Union, which was reported with bone grafting and re-plating. One case reported with superficial infection which was treated with Local infiltration of antibiotics followed by oral.

Clinical Photos :

Pre Operative Post Operative Follow Up

Supination Pronation Supination Pronation

DISCUSSION

The forearm, being a component of upper limb serves important movements that are important in activities of daily living. The forearm, allows pronation and supination which in turn helps hand, to perform multi axial movements. Fracture of the forearm bones may result in severe loss of function unless adequately treated. Hence good anatomical reduction and internal fixation of these fractures is necessary to restore function[7].

We evaluated our results and compared them with those obtained by various other studies. Our analysis is as follows.

- In our study, the age of these patients ranged from 15-55 years and an average age of 32.3 years. Our findings are comparable to the study made by, Michael W.Chapman et al, (1989) series which showed average age as 33years[8].
- Our series had male preponderance with (73%) male patients and (27%) female patients which is comparable to previous studies like Michael Chapman noted about 78% males and 22% females[8],William in his series had 67% of males and 33% of females[9] & Talwalkar in his series had 80% males and 20% females[10]
- In our series 67% of cases had road traffic accidents, 30% had fall, 3% with history of assault compared to Talwalkar series had 26.6% of his cases to road traffic accident, 16.6% due to industrial accident, 50% due to fall and 6.6% due to direct blow[10].
- Our series had 54% of fractures in middle third, 13% in proximal third and 33% in lower third compared to H.S. Dodge and G.W. Cady documented 71.5% fracture both bones n middle third, 21.5% in distal third and 7% in proximal third[11]

- Our present series had average union time of 8.46 weeks with the range of 8 to 12 weeks while Anderson's et al showed union time of around 7.4 weeks with range of 5 to 10 weeks, 97% of the cases united[12].
- The range of motion was determined by Anderson et al, scoring system. Our series had 80% of excellent ,17% satisfactory result and 3.% failure compaired to Chapman et al reported 36 (86%) cases as excellent, 3 (7%) satisfactory, 1 (2%) unsatisfactory and 2 (5%) failure[8] and Anderson et al reported about 54 (50.9%) cases as excellent, 37 (34.9%) satisfactory, 12 (11.3%) unsatisfactory and 2 (2.9%) failure[12].

CONCLUSION

With rigid/anatomical internal fixation, dynamic compression plate is a good fixation for displaced diaphyseal fractures of the forearm bones. Adherence to AO principles, strict asepsis, proper post operative rehabilitation and patient education are more important to obtain excellent results.

REFERENCES

1. L.D.Anderson,Sisk.D,Tooms.RE and ParkW.I Compression plate fixation in acute diaphyseal fractures of the radius and ulna J. Bone Joint Surg. Am., Apr1975; 57: 287.
2. Knight RA, Purvis GD. Fractures of both bone forearm in Adults. J Bone Joint Surg Am 1949;31:755-64.
3. Leung F, Chow SP. Locking compression plate in the treatment of forearm fractures: A prospective study. J OrthopSurg (Hon Kong) 2006;14:291-4.
4. GW Bagby. Compression boneplating: historical considerations. J Bone Joint Surg Am 1977;59:625-631.
5. Chapman MW, Gorden JE, Zissimos AG. Compression plate fixation of acute fractures of the diaphyses of the radius and ulna. J Bone Joint Surg Am 1989;71:159-69.
6. Hertel R, Pisan M, Lambert S, Ballmer FT. Plate osteosynthesis of diaphyseal fracture of the radius and ulna. Injury 1996;27:545-8.
7. Smith H, Sage F.E. Medullary fixation of forearm fractures. J.B.J.S 1957; 39A: 91.
8. Chapman MW, Gordon JE, and Zissimos AO Compression-plate fixation of acute fractures of the diaphyses of the radius and ulna. J. Bone Joint Surg.Am Feb 1989; 71: 159 - 169.
9. William j. Larsen; human embryology 1 edition; page 281-286.
10. K. Talwalkar. Treatment of simple fractures of radius and ulna with internal fixation without external support. Singapore medical journal 1967; Vol 8, No 3: 2-32.
11. Dodge, Herbert S and Gerald W. Cady, Treatment of fractures of the radius and ulna with compression plates. J Bone Joint Surg 1972; 54-A(6): 1167-1176.
12. Rigidfixation with early motion. J Bone &. Joint surg 1980.68-A: 43-438.

How to cite this article : Pushkarna Vishal. Role of dynamic compression plate in management of both bones forearm fractures. Perspectives in Medical Research 2019; 7(1):24-27.

Sources of Support : Nil,Conflict of interest:None declared.