International Journal of Orthopaedics Sciences

E-ISSN: 2395-1958
P-ISSN: 2706-6630
IJOS 2019; 5(4): 1010-1012

www.orthopaper.com
Received: 19-08-2019
Accepted: 24-09-2019

Abhishek Garg
Junior Resident, Department of Orthopaedics, PGIMS, Rohtak, Haryana, India

Rahul Sharma
Junior Resident, Department of Orthopaedics, PGIMS, Rohtak, Haryana, India

Mayank Jain
Junior Resident, Department of Orthopaedics, PGIMS, Rohtak, Haryana, India

Umesh Yadav
Assistant Professor, Department of Orthopaedics, PGIMS, Rohtak, Haryana, India

Mudit Nemani
Junior Resident, Department of Orthopaedics, PGIMS, Rohtak, Haryana, India

Abhishek Singh
Junior Resident, Department of Orthopaedics, PGIMS, Rohtak, Haryana, India

Corresponding Author:
Abhishek Garg
Junior Resident, Department of Orthopaedics, PGIMS, Rohtak, Haryana, India

Compression plating for diaphyseal forearm fractures and evaluation of functional outcomes

Abhishek Garg, Rahul Sharma, Mayank Jain, Umesh Yadav, Mudit Nemani and Abhishek Singh

DOI: https://doi.org/10.22271/ortho.2019.v5.i4q.3051

Abstract
Background: Compression plating maintains rotational alignment of the fracture and allows immediate mobilization after the fixation. The purpose of this study was to evaluate the functional outcomes of diaphyseal forearm fracture compression plating.
Material and Methods: The present retrospective study was conducted in the Department of Orthopaedics, PGIMS Rohtak and included 20 cases aged between 20-70 years, who were operated for diaphyseal both bone fractures over last 3 years with compression plating.
Results: The mean age was 40.55±12.62. The mean operating time was 95±10.15 min. Mean time of fracture union was 10.65±1.82 weeks. 1 patient had superficial infection which was managed with intravenous antibiotics. 100% union was achieved in all our cases. We had excellent functional outcome in 16 patients (80%) and satisfactory outcome in 5 (20%) without any failure case.
Conclusion: Open reduction and internal fixation with compression plates is the gold standard method of managing both bones forearm fractures with excellent functional results with least complications.

Keywords: both bone fractures, diaphyseal, compression plates

Introduction
Forearm fractures typically are a consequence of high-energy trauma and occasionally simple falls. The mechanism of injury is an axial load applied to the forearm through the hand after the trauma. Many authors in the past in their large case series have proved that open reduction and compression plate fixation is an effective method of treating adult patients with diaphyseal forearm fractures. Diaphyseal forearm fractures in adults were difficult to manage until the plate fixation techniques were developed by the Arbeitsgemeinschaft für Osteosynthesefragen (AO) group which dramatically improved the functional outcomes of these fractures [1, 3]. Internal fixation maintains axial and rotational alignment of the fracture while allowing immediate mobilization after the fixation. Historically, conservative management has resulted in unacceptable loss of forearm rotation and is reserved only for patients who cannot tolerate anesthesia and who are unfit for the surgery [4, 5]. The purpose of this study was to evaluate the functional outcomes of diaphyseal forearm fracture compression plating.

Material and Methods
The present retrospective study was conducted at the author's tertiary care hospital and included 20 cases aged between 20-70 years, who were operated for both bone forearm fractures over last 3 years with compression plating. Patients were retrospectively followed up with all their previous surgical records and radiographs. Patients were clinically examined and functional outcomes were noted. Patients with age more than 70 years, patients having elbow stiffness before surgery, having congenital or acquired deformity of injured limb before surgery, pathological fractures and open fractures were excluded from the study. Informed and written consent was taken from all the participants before enrolling in the study. On presentation full demographic profile of the patient, necessary investigations and radiographs were taken in two planes, anteroposterior view and lateral view, before planning for surgical fixation. Patient is laid supine on operating table with affected limb on arm board. For radius plating longitudinal incision is given over the volar aspect of the forearm.

The length of the incision depends on the extent of exposure needed. The landmarks for the skin incision are: Proximally: The biceps tendon which crosses the front of the elbow joint, medial to the brachioradialis muscle. The distal landmark is the radial styloid process. Interval is developed between the brachioradialis (mobile wad) and flexor carpi radialis muscles. The radial artery lies deep to the brachioradialis in the middle part of the forearm and between the tendons of brachioradialis and flexor carpi radialis distally. It can be identified by its two venae comitantes, which run alongside it. The superficial radial nerve runs under the brachioradialis muscle on the lateral aspect of the radial artery and should be retracted laterally. After fracture reduction, fixation is done using 3.5 mm Limited contact Dynamic compression plate. For ulna plating, the standard ulnar approach offers good exposure along the whole ulnar shaft. The length of the incision depends on the exposure needed. The skin incision follows the subcutaneous border of the ulna, along a line drawn between the tip of the olecranon process and the ulnar styloid process. The deep dissection should be carried out in the interval between the flexor carpi ulnaris and the extensor carpi ulnaris muscles. After fracture reduction, fixation is done using 3.5 mm Limited contact Dynamic compression plate. (Fig 1 and 2) The results were evaluated on the basis of fracture union, range of movements, muscle (grip) strength and complications. The functional outcome was assessed using the criteria of Anderson Scoring system. The patients were followed up clinicoradiologically for a period of six months. Statistical analysis was done with SPSS version 16 using descriptive statistical methods including the Pearson Chi squared test and student-t test. A p-value of <0.05 was considered as statistically significant.

Fig 1: Showing pre-operative and post-operative X-ray

Fig 2: Showing post-operative X-ray after compression plating

Results

The mean age was 40.55±12.62 with a range of 20-70 years. There were 13 males (65%) and 7 females (35%). Right side was involved in 12 patients (60%) while left side was involved in 8 patients (40%). 15 patients (75%) had Road side accident (RSA) as mode of trauma for their fracture and 5 patients (25%) had assault as the mechanism of injury for their fracture. The choice of implants was based on surgeons' preference and financial constraints of the patient. The mean operating time was 95±10.15 min. (Table 1) Mean time of fracture union was 10.65±1.82 weeks. 1 patient had superficial infection which was managed with intravenous antibiotics. No case of deep infection was noted in our study. No case of non-union was noted in this study. We achieved 100% union in all our cases. No case of neurovascular injury post injury was reported in the present study. The mean ranges of elbow, wrist joint and pronation–supination movements were 140.4, 141.45 and 140.56° respectively. We had excellent functional outcome in 16 patients (80%) and satisfactory outcome in 4 (20%) without any failure case. (Chart 1)

Table 1: Showing demographic profile and results

Parameter	Number
Mean Age	40.55±12.62
Sex	M = 13 F = 7
Side	R = 12 L = 8
Mode of Injury	RSA-15 Assault-5
Mean time of fracture healing (Weeks)	10.65±1.82
Mean operative time (min)	95±10.15

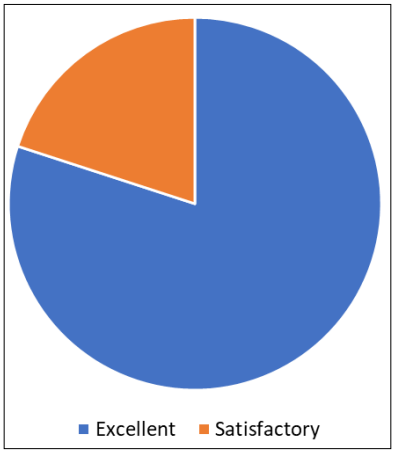

Chart 1: Showing functional results by Anderson Criteria

Discussion

Open reduction and plating (ORIF) has been the gold standard management method for the adult diaphyseal forearm fractures. After conservative treatment of these fractures, healing occurs, but malunion with subsequent decreased rotational movements of the forearm is common which is associated with poor functional outcomes in the patient [6, 7]. Loss of rotation decreases the function of the upper limb and also hampers the activities of daily living for the patients. The closed reduction and cast immobilisation for the forearm fractures should only be taken if there is a contraindication to the operative treatment or the patient is unfit for the surgery. The advantages of the compression plating are that the proper reduction can be achieved as it is done under direct vision maintain the correct alignment of the forearm. Bone grafting can be done if needed [8, 9]. Compression plating achieves a high rate of union, low complication rate and the good return

of rotation of the forearm. The excellent results of this mode of treatment have been reported in many series [10]. Anderson *et al.* [1] published the first large series on open and closed forearm fractures managed with compression plates in 1975 comprising of 330 diaphyseal fractures of the radius and ulna. They achieved more than 95% union rate in their study. In our study, we achieved comparable results as we obtained 100% union rate with compression plating. Chapman *et al.* [11] reported similar results in their study. Lindvall *et al.* [12] described 53 patients with 75 diaphyseal forearm fractures treated with standard length, 3.5-mm limited-contact dynamic compression plates. 97% percent was the union rate. Sadek *et al.* [4] in their study had excellent results in 87% cases and satisfactory results in 13% cases without any failure. The results are comparable to our study as we achieved excellent results in 80% cases and satisfactory results in 20% cases. The disadvantages are chances of infection which are present with every surgery, damage to the soft tissues, periosteal stripping, and drainage of fracture hematoma. For most of the fracture of diaphyseal both bones forearm in adults, ORIF is the treatment of choice. It is important to correct the angulation of the bones, rotation deformities and radial bowing while doing surgical fixation of these fractures. Permanent limitation of rotation can occur as a consequence if the forearm axis relationship is altered by angulation and the radio ulnar joint mechanism is altered. Limitation of our study is small number of cases and short term follow-up.

Conclusion

Compression plating is an effective treatment option for both bones forearm fractures. The functional outcomes are determined by using proper principles of compression plating. Plating offers excellent functional outcomes with minimal complications and should be the treatment of choice for these fractures in adults.

References

1. Anderson LD, Sisk D, Tooms RE, Park WI. III: Compression-plate fixation in acute diaphyseal fractures of the radius and ulna. J Bone Joint Surg Am. 1975;57(3):287-297.
2. Perren SM. Evolution of the internal fixation of long bone fractures: The scientific basis of biological internal fixation. Choosing a new balance between stability and biology. J Bone Joint Surg Br. 2002;84(8):1093-1110.
3. Bottlang M, Doornink J, Byrd GD, Fitzpatrick DC, Madey SM. A non-locking end screw can decrease fracture risk caused by locked plating in the osteoporotic diaphysis. J Bone Joint Surg Am. 2009;91(3):620-627.
4. Al-Sadek TA, Niklev D, Al-Sadek A. Diaphyseal Fractures of the Forearm in Adults, Plating or Intramedullary Nailing Is a Better Option for the Treatment? Open Access Maced J Med Sci. 2016 15;4(4):670-673.
5. Catalano LW III, Zlotolow DA, Hitchcock PB, Shah SN, Barron OA. Surgical exposures of the radius and ulna. J Am Acad Orthop Surg. 2011;19(7):430-438.
6. Arora R, Lutz M, Hennerbichler A, Krappinger D, Espen D, Gabl M. Complications following internal fixation of unstable distal radius fracture with a palmar locking-plate. Journal of orthopaedic trauma. 2007;21(5):316-22.
7. Kapoor H, Agarwal A, Dhaon BK. Displaced intra-articular fractures of distal radius: a comparative evaluation of results following closed reduction, external fixation and open reduction with internal fixation. Injury. 2000;31(2):75-9.
8. Court-Brown CM, Caesar B. Epidemiology of adult fractures: a review. Injury. 2006;37(8):691-7.
9. Saikia K, Bhuyan S, Bhattacharya T, Borgohain M, Jitesh P, Ahmed F. Internal fixation of fractures of both bones forearm: Comparison of locked compression and limited contact dynamic compression plate. Indian Journal of Orthopaedics. 2011;45(5):417-421.
10. Catalano LW III, Zlotolow DA, Hitchcock PB, Shah SN, Barron OA. Surgical exposures of the radius and ulna. J Am Acad Orthop Surg. 2011;19(7):430-438.
11. Chapman MW, Gordon JE, Zissimos AG. Compression-plate fixation of acute fractures of the diaphyses of the radius and ulna. J Bone Joint Surg Am. 1989;71(2):159-169.
12. Lindvall EM, Sagi HC. Selective screw placement in forearm compression plating: results of 75 consecutive fractures stabilized with 4 cortices of screw fixation on either side of the fracture. J Orthop Trauma. 2006;20:157-162.