Radius and Ulnar Shaft Fracture Management by Open Reduction and Internal Fixation with Dynamic Compression Plate: A Study Outcome

*Kenan MA,[1] Saha SK,[2] Jonayed SA[3]

The study was designed to analyze the result of diaphyseal fracture of both bones fracture of forearm managed by internal fixation device with dynamic compression plate fix with screw in district level. A prospective study was carried out from January 2014 to January 2016 in where 34 case of diaphyseal fracture of radius and ulna were included that treated in different Private Hospital of Kishoreganj district. All patients were treated by open reduction and internal fixation with dynamic compression plate. Age of the patient was ranging from 18 to 44 years. The patient were assessed for fracture union both clinically and radiologically, functional restoration and complication. Patient achieved full range of movement 12-16 weeks of operation. Radiologically showed union within 14 weeks of fracture. Excellent result gained in 25 (73.5%), Good 6 (17.7%), Fair 3(8.8%). One patient with delayed union but no poor outcome. This study has proven that diaphyseal fracture of radius and ulna managed with open reduction and internal fixation with dynamic compression plate is the best option of treatment in rural area also.

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Key words: Dynamic, compression, plate, bones, forearm, diaphyseal, fracture, open reduction and internal fixation.

Introduction

Fracture radius and ulna are very common in orthopaedics practice and can be treated by different methods. Closed reduction and cast immobilization often achieve good result in children where extremity function regains by strong remodeling. But in case of adult such remolding is unlikely, so optimal functional recovery can seldom be achieved with close reduction and cast immobilization.[1]

Regaining length, axial alignment, rotational alignment are necessary to restore good range of pronation and supination.[2] The chance of occurrence of malunion, also non union is the threat in this type of both bone forearm fracture. On the other hand presence of interosseus membrane in between radius and ulna considered this fracture equivalent to intrarticullar fracture where anatomical alignment is necessary. Considering these factors open reduction and internal fixation with dynamic compression plate is generally accepted as the best method of treatment option for displaced diaphyseal fracture of the forearm in adult. The value of compression in rigid internal fixation had been reported by various authors. Maintaining of alignment achieved by close reduction in proximal shaft fracture of forearm in both bones are difficult due to muscle mass, fracture in distal end of radius tends to angulate towards the ulna by the action of pronator quadratus and pool of long forearm muscles. Though reduction and union may occur in close method but angular and rotatory malalignment are not completely corrected. Some loss of function occurs and may make the result overall unsatisfactory.[3-8]

1. *Dr. Md. Abul Kenan, Assistant Professor, Department of Orthopaedics, Shaheed Sayed Nazrul Islam Medical College, Kishoreganj, Bangladesh. makenan.ortho@gmail.com
2. Dr. Sajal Kumar Saha, Associate Professor, Department of Paediatrics, Shaheed Syed Nazrul Islam Medical College, Kishoreganj
3. Dr. Shorif Ahmed Jonayed, Junior Consultant, (Ortho-Surgery), UHC, Nandail, Mymensingh

*For correspondence

So the intension of restoration of normal function of affected forearm of the patient at and earliest possible time and to avoid unsatisfactory outcome of conservative treatment of fracture radius and ulnar shaft in adult provucate me to treat the patients with both bones forearm fracture by open reduction and internal fixation with dynamic compression plate.

Methods

This is a prospective study carried out in different private hospital in Kishoreganj district from January 2014 to January 2016. 34 Case of both bones forearm fracture in adult were attended and admitted in private hospitals and were treated surgically. Procedure of operations were as principle of surgical methods of plate fixation technique. Relevant data was collected by asking the patient history and examination accordingly with structured form. Essential investigations of all the patients were done for anesthetic and surgical fitnesses were done. All the patients were operated and treated by open reduction and internal fixation with dynamic compression plate fix with screw. Patients were followed up at regular interval for management purpose and evaluation for functional outcome.

Methods of Collection of Data

Inclusion criteria:

- Close diaphyseal fracture of radius and ulnar
- Both male and female patient
- Potentially open fracture

Exclusion criteria:

- Fracture of forearm bones children
- Fracture of proximal and distal end of radius and ulna
- Open fracture
- Pathological fracture

Sampling procedure:

- History and clinical examination
- Radiological examination
- Investigations
- Blood: TC, DC, ESR, Hb%
- RBS, S. creatinine.
- ECG: Patients above 40 years old
- HIV, Hbs-Ag.

Assessment was done based on a procedure containing necessary information regarding:

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

Out of 34 cases male 28 cases and female 06 cases. Fracture both bones forearm right sided was 22 case and 12 were left sided. Surgery was carried out between 5 days to 10 days of injury.

Procedure

Standard orthopaedic procedure was done in all patients by Henry Approach at volar aspect for radius and for ulna the incision between extensor carpi radialis and extensor carpi unlnaris. Surgery was done meticulously aided with tourniquet for bloodless field. Both radius and ulnar fracture were reduced and fixed with dynamic compression plate and screw.

After Treatment

Broad spectrum antibiotics were given in I/V route with other necessary medication. Active finger movements were advised as early as possible with affected limb elevation. Drain was removed after 48 hours of operation. Check x-ray done for post operative assessment, suture was removed on 10-12 post operative day. Average hospital stays were 10-16 days. Patients were discharged with advised for regular interval for functional assessment and evaluation.

Results

This series consist of 34 cases of fracture radius and ulna treated by open reduction and internal fixation using dynamic compression plate. 28 cases (82.3%) were simple and 6(17.7%) were compound fracture. Males were 28 (82.3%) and females were 6(17.7%) that was included in the study. Right sided fracture in 20 cases (58.8%) and left sided were 12 cases (41.2%). Site of the fracture observed that at upper third 3 cases (8.8%), medical third 24 cases (70.6%) and at lower third 7 cases (20.6%). Fracture pattern were obtained, oblique 19(55.8%), transverse 9(26.5%), compound 6(17.7%). Functional grading were done according to Anderson et al. for final outcome (Table – 1). Excellent result in case of 73.5% (25), good in 14.7%(5), fair in 11.8%(4). Fortunately no poor outcome is found in this series.[9]

Table I: Functional grading of results as per Anderson et al

Result	Union	Flexion and extension at wrist joint	Supination and pronation
Excellent	Present	<10° loss	<25% loss
Good	Present	<20° loss	<50% loss
Fair	Present	<30° loss	>50% loss
Poor	Nonunion with or without loss of motion		

Table II: Functional outcome of all cases

Results	No. of cases	%
Excellent	25	73.5
Good	5	14.7
Fair	4	11.8
Poor	00	00

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 rotational 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 styloid process of the ulna. If the forearm axis is altered by angulation the mechanism of the radio-ulnar joints 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 if the fracture of midshaft of the radius takes place, the proximal fragment supinates and the distal fragment pronates 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. In this series out of 34 cases, 25 cases (73.5%) cases are graded excellent, good result in 5 cases (14.7%), fair 4 (11.8%) cases and no cases is poor in the final outcome (Table – II). 1 cases of delayed union with superficial wound infection that was controlled with appropriate However, union rate and union time in this series were compatible with values in several other reports, including other series of closed fractures.[8-11] This emphasizes the value of fixation with dynamic compression plate 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. 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 foram fractures better to be carried out between 7 to 10 days from the

time of injury. By that time the initial edema subsided and soft tissue damage gets healed. The operation can be performed on a routine list in the best available time as an elective procedure. However the study demonstrate that the open reduction and internal fixation with dynamic compression plate appears to be an effective and reliable means of fixing both bones forearm fracture.[9-15]

Conclusion

The outcome of this 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 dynamic compression plate fixation is not so complicated. The soft tissue care, minimal periosteal stripping on the surface of the bone on which plate is applied, is important. This maintains optimal vascularity at the fracture site. Proper preoperative planning, meticulus operative technique and postoperative rehabilitation program are key points for the excellent outcome.

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