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ORIGINAL ARTICLE

A CLINICAL STUDY OF MANAGEMENT OF FRACTURE BOTH BONES FOREARM WITH INTERNAL FIXATION BY TWO DIFFERENT METHODS

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ABSTRACT: BACKGROUND AND OBJECTIVES: 60 cases of fracture both bone forearm in adults were operated and fixed using two different instruments in Siddhartha Medical College/Government General Hospital, Vijayawada between May 2013 to April 2015. **METHODS:** Most of the cases were young adult male with age ranging between 20-75yrs. The functional outcome of two different modalities of surgical management of diaphyseal fracture of both bone forearm in adults are interpreted. 30 patients were operated with DCP, and 30 patients were operated with intramedullary nailing. **RESULTS:** By Anderson Scoring System out of 30 cases of DCP 66.67% were excellent, 33.33% were satisfactory. Out of 30 cases of Intramedullary nailing with Talwalker square nails 50% were excellent, 23.33% were satisfactory, 16.67% were unsatisfactory, 10% had failure results. **CONCLUSION:** Open reduction and internal fixation can be considered as the treatment of choice if there were no contraindications for this because it is important to maintain length, opposition, axial alignment and rotational alignment if a good range of movement of forearm is to be restored. This is achieved in the present study.

KEYWORDS: DCP, Intramedullary nailing, Both bones forearm.

INTRODUCTION: The forearm represents critical anatomical unit of the upper limb, permitting the effector organ of the upper limb the hand, to perform multi axial daily activities of living. Historically the treatment with wooden splints continued to be the standard practice for many years. Pop although introduced as long ago as 1852 in the treatment of fracture was not applied in the forearm injuries from the fear that rigid encasement of the limb might lead to ischemic paralysis. From 1929 onwards the plaster cast applied with due precaution became the routine method of management of forearm fractures. Closed management of forearm fractures has been met with frustration in adults and resulted in poor functional outcome, hence perfect fracture reduction and rigid fixation is mandatory and is achieved by surgical treatment. The number of forearm fractures is increasing faster than the predicted rate due to rapid industrialization, increased incidence of violence, road traffic accidents and various sports activities, increasing of fall and direct blow.

These fractures are relatively more common in children than adults, because of difference diaphyseal bone mechanics. Because of this, both bone fractures of forearm in adults are more likely to be high energy open fractures than those seen in children. Traditionally, both bone forearm fractures in adults. In general, complications are more common and prognosis is worse for displaced fractures and for open fractures. On an average, un-displaced fractures take six to eight weeks to heal, and displaced fractures take 3 to 5 months. Function may be most obviously affected with loss of pronation/ supination,[1] and as many as half of patients with both bone forearm fractures will have obvious loss of forearm pronation, which may or may not be functionally significant. Loss of forearm rotation is most likely when fractures occur in the middle third of the forearm.

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Synostosis between the radius and ulna is much more common in proximal than in distal forearm fractures. Internal or external fixation is usually indicated for open or very unstable fractures, accepting the risk that postsurgical infection may occur. To obtain and hold an accurate reduction usually necessitates open reduction and internal fixation with Dynamic Compression Plating, Limited contact Dynamic Compression Plating, Semi-tubular plating or closed reduction and internal fixation with Intramedullary nail. The present study is undertaken to provide satisfactory functional outcome using two different surgical modalities like Dynamic Compression Plating, and intramedullary nailing.

60 cases of fracture both bones forearm were selected after the inclusion and exclusion criteria, which were treated with any one of the surgical modalities described above in the department of Orthopedics, Siddhartha Medical College/ Government General Hospital, Vijayawada.

AIMS AND OBJECTIVES: AIM: To evaluate the results of the management of diaphyseal fractures both bones of forearm in adults by internal fixation using dynamic compression plate's vs intramedullary nails.

OBJECTIVE: This study was under taken in Department of Orthopedics, Government General Hospital, Vijayawada during period of May 2013 to April 2015. During this period we have treated diaphyseal fractures of both bones forearm in adults by open reduction and internal fixation with dynamic Compression Plates and Intramedullary nails.

A consensus prevails that the vast majority of diaphyseal fractures of both bones forearm causing loss of radial bowing and angulation resulting in restriction of supination and pronation if they are treated conservatively. This study has been taken to evaluate the results of the management of diaphyseal fractures of both bones forearm in adults by open reduction and internal fixation with Dynamic Compression Plates and Intramedullary nails.

MATERIALS AND METHODS: This series consists of 60 cases of fracture both bones forearm by open reduction and internal fixation with Dynamic Compression Plate, Intramedullary nailing by Talwalker square nail between May 2013 to April 2015 at Department of Orthopedics, Government General Hospital, Vijayawada. Out of all the above cases 30 were treated by open reduction and internal fixation with dynamic compression plate, and 30 cases were treated with closed or open reduction and internal fixation with IM nails.

Most of the patients presented to hospital within 24hrs of injury of forearm. Only 7 patients presented within a week after sustaining the injury. 90% of the patients presented with injured forearm supported with hand. While 10% patients came with their injured limb immobilized with POP. On admission of the patient, careful history was elicited from the patient or attendants to record the mechanism of injury. The patients were examined clinically for signs of fracture displacements, deformity, neuro vascular status associated injuries and vital signs.

Inclusion Criteria:

1. Patients- after growth completion.
2. All patients with both bones forearm fractures attending orthopaedic OPD.
3. Diaphyseal fractures of both bones of forearm.
4. Compound fractures (Type-1, Type-2).

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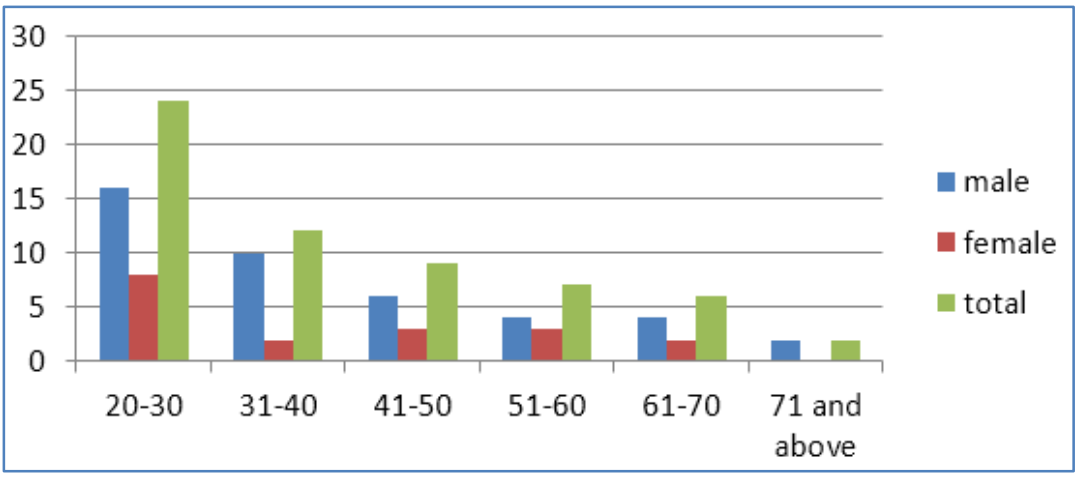
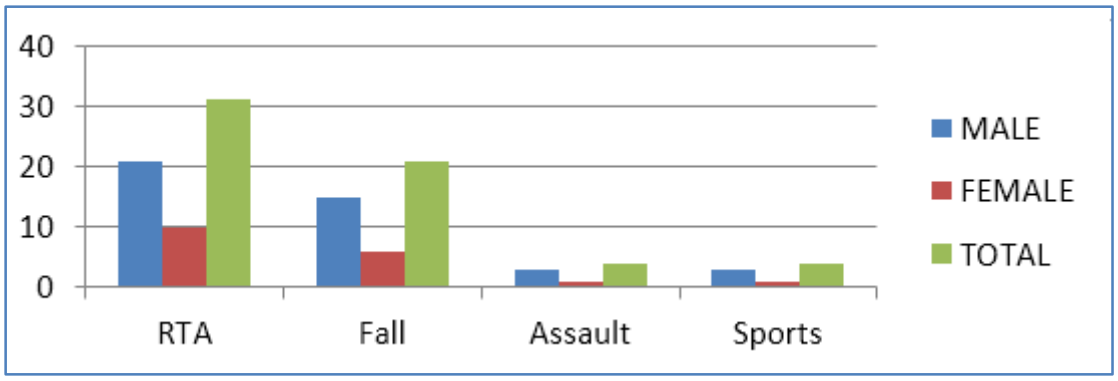
Exclusion Criteria:

1. Patients less than 20 years.
2. Crush injuries of both bones forearm.
3. Multiple fractures with head injuries.
4. Monteggia and Galeazzi fractures.
5. External fixation.
6. Metaphyseal fractures are excluded.

OBSERVATIONS: In our study, maximum cases were recorded in the age group of 20-30 (40%) and least was in the age group of 71 & above (3.33%).



In our study, maximum cases were reported in RTA (51.67%), followed by fall (35%), least was in assault (6.67%) and sports (6.67%). Significantly more number of injuries were reported in the right side (65%) compared to left side (35%). In our study, 26 cases (43.33%) had middle 3rd, followed by 18 cases (30%) had middle and lower 3rd fracture, 10 cases(16.67%) had lower 3rd fracture and lastly 6 cases(10%) had middle and upper 3rd fracture.



MODE OF INJURY: In our study, maximum fractures were of transverse type (47.5%), followed by oblique (28.33%) and least was in comminuted (29.17%). In our study, DCP implants were used for male 73.33% and female 26.67%, followed by IMN, implant used for male 66.7% and female 33.33%. In our study, a non-significant association was observed between implant used and weeks for union.

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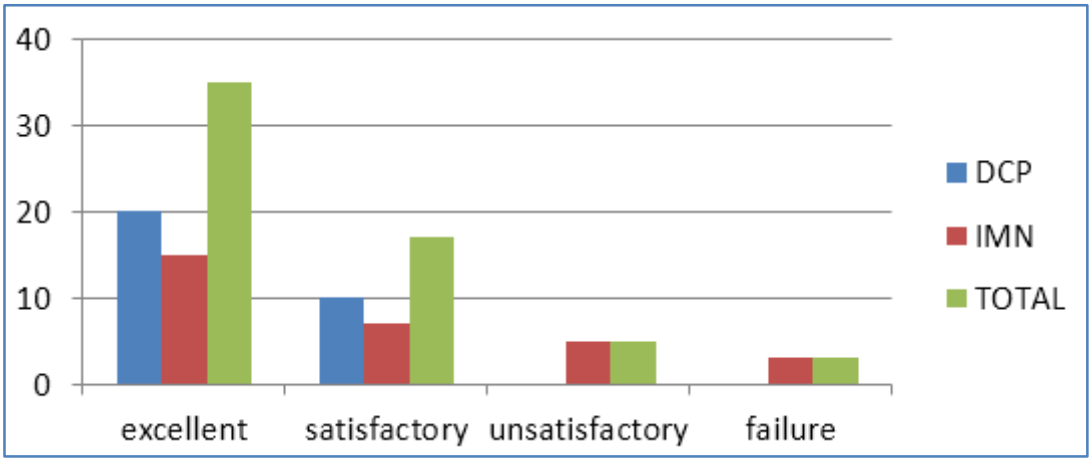
In our study, less than 13 weeks of union time seen in 20 cases of DCP and 15 cases of IMN, 13-17 weeks of union in DCP 10 cases and IMN 5 cases, more than 17 weeks seen 7 cases treated with IMN. Non-union occurred in 3 cases treated with IMN. In our study, 21 cases of DCP implants had the flexion and extension $<25^0$ and 9 cases $<50^0$ and 15 cases of IMN implant had flexion & extension $<25^0$, 8 cases $<50^0$ and 7 cases had $>50^0$. In our study, 20 cases of DCP implants had the supination and pronation $<10^0$ and 10 cases $<20^0$ and 15 cases of IMN implant had supination and pronation $<10^0$, 8 cases $<20^0$ and 7 cases had $>20^0$. In our study, excellent results were obtained through DCP implant (66.67%), satisfactory (33.33%) which was followed by IMN maximum excellent result (50%), satisfactory (23.3%) unsatisfactory and only cases was failure (10%). The maximum excellent results were obtained through DCP and IM nails 58.33%, satisfactory 28.33%, unsatisfactory 8.33% and failure 5%.



IMPLANT USED AND ANDERSON'S SCORING: RESULTS: The results were based on Anderson et al. scoring system and modified from Morrey BF, et al: Functional evaluation of elbow. 30 cases of DCP 66.67% were excellent, 33.33% were satisfactory. Out of 30 cases of Intramedullary nailing with talwalkar square nails 50 % were excellent,23.33% were satisfactory,16.67% were unsatisfactory,10% had failure results.

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 mid shaft 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. We had 60 patients of which 35 patients had excellent results (58.33%) with full, pain free, function of the extremity. We had 17 patients with

satisfactory result (28.33%); 5 patients with unsatisfactory result (8.33%) and 3 patients had union and failure (5%).

DISCUSSION: Functional forearm is very essential for an individual for social and economic thriving. Fractures of the forearm bones may result in severe loss of function unless adequately treated. The relationship of the radio humeral, radio ulnar, ulnohumeral, radio carpal, distal radio ulnar joint and maintence of interosseous space must be perfect, otherwise some functional impairment will result.[2] In addition to regaining length, opposition and axial alignment, achieving rotational alignment is necessary, if a good range of pronation and supination is to be restored.[3] Malunion and nonunion occur more frequently because of difficulty in reducing and maintaining reduction of two parallel bones in the presence of the pronating and supinating muscles that have angulatory as well as rotational influences,[4] because of these factors surgical management for displaced diaphyseal fractures in adult is generally accepted. In our series 60 patients were treated by two different surgical modalities. Open reduction internal with dynamic compression plating and closed or open intramedullary nailing using IM nails randomly. In our series 30 patients were treated with dynamic compression plate and screws, 30 patients with intramedullary nails.

In the present study the age distribution was between 20-75 years. The youngest patient was 20 years and the oldest was 75 years. The commonest age group was 22-30 years (40%). The mean age in our study was 33 years in male and females. In Chapman,[5] series, average age was 33 years and in Herbert Dodge series, the mean age was 24 years. Our series had a male preponderance with 70 male patients and 30 female patients. Where as in Chapman[5] series 78% were males and 22% were females. In H.Dodge,[6] study, 89% were males and 11% were females. In our series 51.67% cases had RTA, 35% cases had fall, 13.33% had miscellaneous (Direct blow). In Moed series, 70% were due to RTA, 14% were due to fall and 16% were due to miscellaneous causes. In our study the most commonly affected side was right side (65%) and left side incidence was 35%. In H.N. Burwell.,[7] study, 50% were right sided and 50% were left sided. Our series accounted 45% of transverse fracture of radius, 50% of transverse fracture of ulna, 30% of oblique fracture of radius, 26.67% oblique fracture of ulna, 25% of comminuted fracture of radius and 23.33% of comminuted fracture of ulna. Fracture occurred at all levels of shafts of radius and ulna middle 3rd was the commonest affected site (43.33%). Next commonest site was middle with lower 3rd (30%), lower 3rd with 16.67%, middle with upper 3rd 10%. In our series closed fracture both bone forearm was treated by two different surgical modalities randomly.

In our series, 30 cases were treated with Dynamic Compression Plate in which 22 patients (73.33%) were male and 8(26.67%) were female. In the 30 cases 20 had right forearm (75%) and 10(25%) had left forearm. Union of fractures in 20 patients (66.67%) occurred in less than 13 weeks and in 10 patients (33.33%), the union was found between 13-17 weeks. The flexion and extension restriction of range of movements in 21 patients (70%) was $<25^0$, in 9 patients (30%) was $<50^0$ and in no patient $>50^0$. The supination and pronation restriction range of movements in 20 patients (66.67%) was $<10^0$, in 9 patients (30%) was $<20^0$ and in no patient $>20^0$. By Anderson scoring system 20 patients (66.67%) had excellent result, 9 patients (30%) had satisfactory result and no patient had unsatisfactory result.

In our series 30 cases were treated with intramedullary nailing and which 20 patients (66.67%) were male and 10 patients (33.33%) were female. The union occurred in 15 patients (50%) was less than 13 weeks, 5 patients (16.67%) between 13-17 weeks and 7 patients (23.33%) had a

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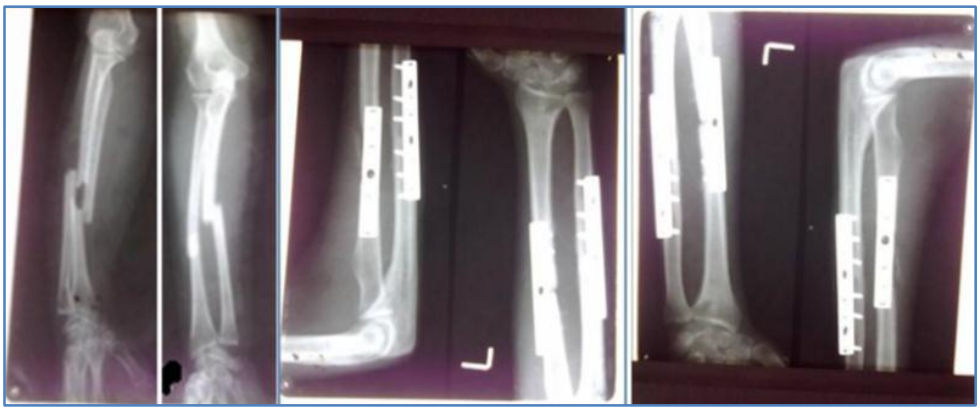
delayed union and 3 patients (10%) had non-union. The flexion and extension restriction range of movements in 15 patients (50%) was $<25^0$, in 8 patients (26.67%) was $<50^0$ and in 7 patients (23.33%) $>50^0$. The supination and pronation range of movements in 15 patients (50%) was $<10^0$, in 8 patients (26.6%) was $<20^0$ and in 7 patients (23.33%) $>20^0$. By Anderson scoring system 15 patients (50%) had excellent results, 7 patients (23.33%) had satisfactory results and 5 patients (16.67%) had unsatisfactory result, 3 patients had non-union (10%).

By compression the fracture united by primary bone healing if the fragments were rigidly fixed with their blood supply disturbed as little as possible, under these conditions resorption and bone formation occurred simultaneously in fractures treated by rigid fixation. When the fracture gap obliterated or greatly diminished by a compression plate the capillaries are able to grow into the medullary callus at an early stage in the healing process. Their integrity is protected by the rigidity of the fixation and thus the mesenchymal cells in a well oxygenated environment may readily differentiate directly into osteoblasts.

In our study we found that fixation with the square nails is not rigid enough to withstand the torsional, rotational and angulating forces of the muscles of the forearm. We had non-union, in our series of IM nailing because, distraction at the fracture site after nailing, decreased vascularity due to subcutaneous location of bones especially ulna.



CONCLUSION: Increased incidence of forearm fractures were probably due to increasing road traffic accidents and fall. Forearm fractures occurred more commonly in second and third decade. Predominance of males were seen in these fractures. Open reduction and internal fixation can be considered as the treatment of choice if there were no contract indications for this because it is important to maintain length, opposition, axial alignment and rotation alignment if a good range of movement of forearm is to be restored. This is achieved in the present study. DCP system gave optimum fixation and allowed immediate mobilization. Excellent results were achieved with it in terms of mobility and union without deformity. The intramedullary nailing of both bone forearm is a comparatively easy procedure with small incision and less periosteal stripping and soft tissue damage but rigid fixation cannot be obtained and external support is necessary for long period, compared to plating of forearm bones it is only useful as internal splint. Square nails are better than rush nails since a snugly fitting square nail obtain immobilization at the fracture site. Prophylactic antibiotics before surgery helped in reduction of rate of infection. Patients were comfortable and more secure socially without external immobilization after rigid fixation.

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In results of plating for fracture both bone forearm are better than intramedullary nailing of both bones. To conclude DCP offers excellent results in displaced diaphyseal fracture of fore arm bone in adults and to be considered as first line of management.

SUMMARY:

- Present study consists of 60 cases of diaphyseal fractures of forearm, treated surgically with follow up ranging from 4 months to 12 months.
- The age group ranged between 22 to 75 years commonest being 22-30 years. Predominance of males were seen in 42 cases out of 60 cases studied (70%). Right side was more common (65%) than left side (35%).
- RTA was the commonest mode of trauma (51.67%), followed by fall on out stretched hand (35%) followed by assault (6.67%) and sports (6.67%). Direct trauma was the main mechanism of injury in these cases.
- Middle 3rd was the commonest fracture site of both bones (43.33%) followed by junction of middle and lower 3rd (30%), followed by lower 3rd (16.67%), and middle and upper 3rd (10%).
- Transverse fracture was the commonest (47.5%) followed by oblique fracture (28.33%) followed by comminuted fracture (24.17%).
- By open reduction and internal fixation, 30 cases were treated with DCP. By closed reduction and medullary fixation with IM nails, 30 patients were treated.
- For open reduction, separate incisions were used for radius and ulna.
- Thompson's approach was used for upper half of radial fractures, Henry's approach for lower half of radial fractures, Henry's approach for lower half of radial fractures, ulna was exposed by direct approach.
- For closed reduction and medullary nailing radial styloid was used in 20 patients, lister's tubercle approach was used in 10 patients, olecranon approach was used to fix all ulna fractures.
- The results were based on Anderson et al. scoring system and Modified from Morrey BF et al: Functional evaluation of elbow.
- In the present study, with dynamic compression plating there were 20 patients (66.67%) with excellent results and 10 patients (33.33%) with satisfactory results.
- The union time of radius and ulna was almost the same.
- By Anderson's scoring system, with closed reduction and medullary nailing 15 patients (50%) showed excellent results, 7 patients (23.33%) satisfactory, in 5 patients (16.67%) unsatisfactory and failure in 3 patients (10%).
- The reason for non-union was distraction of fracture site after nailing in 3 cases had non-union. Medullary fixation with square nails 1 patient had superficial infection at ulnar portal. 1 patient with deep infection at ulnar portal with implant migration. One patient with delayed union and implant migration.

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