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Original Research Article

A Study of Diaphyseal Fractures of Forearm Bones with Nailing and Plating

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Abstract: Anatomical reduction and internal fixation of forearm fractures can facilitate restoration of function. Any axial or rotatory malalignment or any narrowing of interosseous space produces disproportionate loss of pronation and supination. In addition proximal and distal radioulnar joints do not function properly if there is significant shortening of either bone. This is not the case in other long bones where shortening or loss of axial and rotatory alignment does not compromise the result. The aim of study is to analyse our results in open reduction and internal fixation of fractures of forearm bones with DCP and Rush nailing in terms of rate of union, the functional outcome, rate of complications and comparison with the results of other authors. The study was conducted between February 2015-November 2016 in Shadan Institute of Medical Sciences, Hyderabad, and 25 patients sustained 48 fractures of forearm bones. They are treated by either plating or rush nailing. Patients were examined clinically and radiologically at periodical intervals of 4-6 weeks for a period ranging from 6-40 weeks. Inclusion criteria are closed and open fractures in adults in diaphyseal region, fractures in children when significantly displaced. Exclusion criteria are pathological fractures, incomplete or undisplaced fractures in adults and fractures in children with minimal displacement. After assessing 25 patients with 48 fractures 10 (40%) had excellent results, 13 (52%) had satisfactory results and 2 (8%) had unsatisfactory functional outcome. Open reduction and internal fixation should be done in fractures of forearm bones in adults. In our study there is not much difference in union rates of nailing or plating. However, plating provides better compression at fracture site and rigid fixation to permit early mobilisation. The majority of patients had excellent functional outcome with plating alone.

Keywords: Dynamic compression plate Rush nail, Interosseous space, pronation and supination, distal and proximal radioulnar joints

INTRODUCTION:

Open reduction and internal fixation with dynamic compression plate is a common procedure done for fractures of both bones forearm [1]. Even newer modalities of plate osteosynthesis such as locking plate and limited contact plate have been introduced, the DCP is still a choice for many surgeons [7]. Intramedullary fixation of ulna with Rush nail is commonly done in older patients, where bone is osteoporotic and in open fractures of forearm bones, hence we undertook a study of plate osteosynthesis for fractures of both bones forearm with DCP and Rush nails in Shadan Institute of Medical Sciences between February 2015 and November 2016.

AIMS OF STUDY:

To analyse our results in ORIF of forearm bone fractures with DCP and rush nailing in terms of Rate of Union, The functional outcome, Rate of complications and Comparison with the results of other authors. The cases selected for study are A1-A3, B1-B3 and C1-C3 and Gustillo's type I,II & III[1].

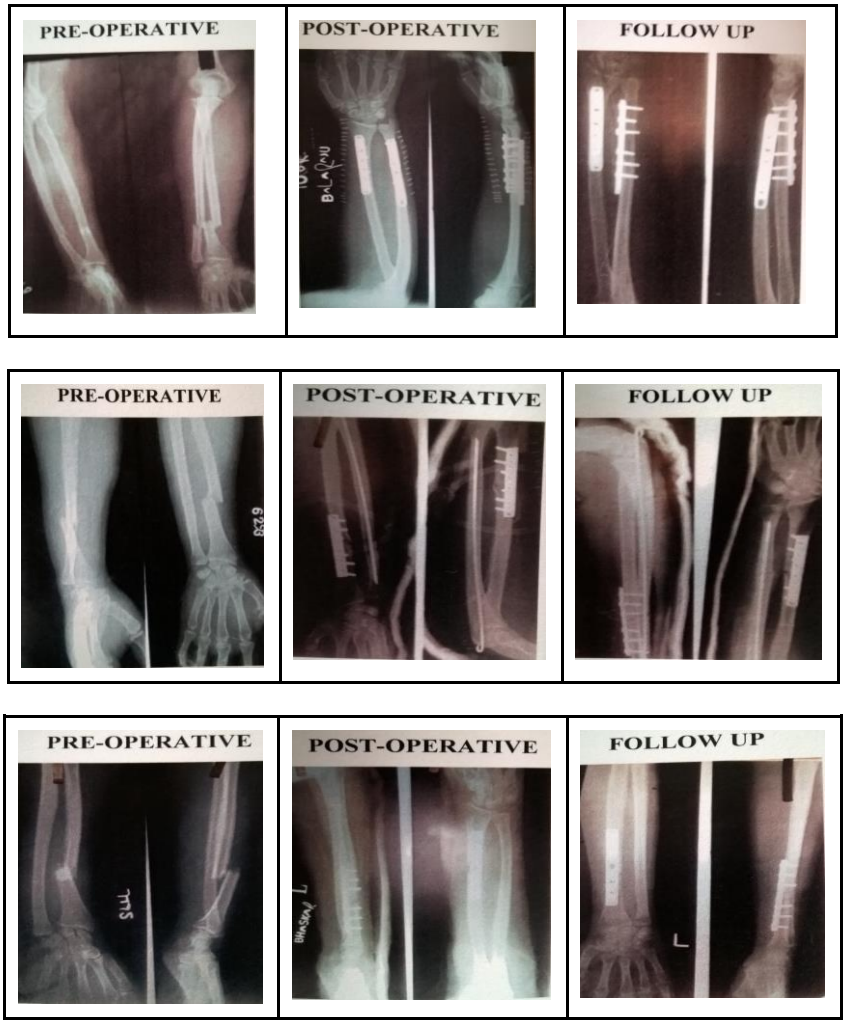
MATERIALS AND METHODS:

This is a study done between February 2015-November 2016 in Shadan Institute of Medical Sciences, Hyderabad, and 25 patients sustained 48 fractures of forearm bones. Inclusion criteria - Closed and open fractures in adults in Diaphyseal regions, fractures in children with gross displacements [2]. Exclusion criteria - Pathological fractures, fractures in children with minimal displacement and incomplete or undisplaced fractures in adults [3]. They are treated by either plating or Rush nailing. Patients were examined clinically and radiologically at periodical intervals of 4-

6 weeks for a period ranging from 6-40 weeks. The duration of follow up ranged from 20-40 weeks.

PROCEDURES AND SURGICAL APPROACH:

On admission emergency care was given with special attention to airway, breathing and circulation. For open fractures thoroughly debrided and fixed with Rush nail for radius and ulna followed by above elbow pop slab. The average interval between the injury and fixation of fractures is 24 hrs to 9 days including open and closed fractures. For grade I and grade II fractures after thorough debridement radius is fixed with DCP and ulna with Rush nail with high IV antibiotics pre and post operatively for 3-5 days [3]. All the cases were done with patients in supine position under tourniquet control and upper limb either over an arm board or across the chest under general or regional anaesthesia. For proximal 3rd fractures of radius we preferred Thompson's approach to avoid injury to posterior interosseous nerve and for fractures of middle and lower 3rd fractures of radius, the approach was Henry's / anterior[1]. All cases were immobilised in above elbow slab with elbow in 90 degrees and forearm position based on level of fractures. In all cases suture removal was done on 10th post op day. After s/r pop slab continued for 2-3 weeks then pop off done based on clinical and radiological signs of stickiness of the fractures.



RESULTS:

Analysis of results was done based on clinical and radiological assessment as per the ANDERSON's criteria.

Excellent : Union with less than 10 degrees loss of flexion - extension and less than 25 degrees loss of pronation and supination of forearm. Satisfactory : Union with less 20 degrees loss of flexion - extension and less than 50 degrees loss of supination and pronation of forearm. Unsatisfactory: Union with more than 30 degrees loss of flexion - extension and more 50 degrees loss of pronation supination of forearm. Failure: Nonunion with or without loss of function.

Patients were examined clinically and radiologically at periodic intervals of 4 - 6 weeks for a period ranging from 20-40 weeks [10]. There are 15 males and 10 females with 3:2 ratios. ORIF with DCP or Rush nails were done in all fractures. The average age incidence is 10 - 45 years, left side involved less commonly than right side. Mode of injury is fall on outstretched hands in 11 cases, RTA in 13 cases and assault in 1 case. Fractures of both bones are more common than single bone fracture. There were 23 both bone fractures, 1 isolated radius fracture, 1 isolated ulna fracture. In 10 cases with 18 fractures fixation with DCP of both bones was done, in 13 patients with 26 fractures Rush nailing for ulna and DCP for radius was done. 10 patients with 18 fractures treated by DCP alone for radius and ulna, of these patients 1 has delayed union of ulna and another had delayed union of both bones. 13 patients with 26 fractures treated by DCP for radius and Rush nail for ulna, 1 patient had delayed union of ulna, 2 patients with 4 fractures which were open, treated with Rush nails, both had superficial infection which was subsided by IV antibiotics and both were healed well without any further complications.

Table 1: Age Incidence

Age in yrs	Frequency	Percent
<20	3	12
21-30	5	20
31-40	9	36
41-50	5	20
51-60	2	8
>60	1	4

Table-2: Involvement of side

Side	Frequency	Percent
Left	10	40
Right	15	60
Total	25	100

Table-3: Mode of Injury

Mode of injury	Frequency	Percent
RTA	13	52
Fall	11	44
Assault	1	4
Total	25	100

Table-4: Bones Fractured

Bones	Frequency	Percent
Both bones	23	92
Radius	1	4
Ulna	1	4

Table-5: Implant used

Implant	Frequency	Percent
DCP	10	40
DCP & Rush nail	13	52
Rush nail	2	8

After assessing 25 patients with 48 fractures 10 (40%) had excellent results, 13 (52%) had satisfactory results and 2 (8%) had unsatisfactory functional outcome. Among 10 cases treated with DCP alone 6 (60%) had excellent, 4 (40%) had satisfactory results. The mean clinical union time was 12.4 weeks (range 10-18 weeks). The mean radiological union time was 17.5 weeks (range 12-20 weeks). Among 13 cases treated with Rush nail and DCP 4 (30.7%) had excellent results, 7 (53.8%) had satisfactory results, 2 (15.3&) had unsatisfactory results. The mean clinical union time was 16.6 weeks (range 14-20 weeks). The mean

radiological union time was 19.6 weeks (range 18-22 weeks). Among 2 cases treated by Rush nail for both ulna and radius, had satisfactory results. The mean clinical union time was 19.5 weeks (range 18-21 weeks). The mean radiological union time was 24.5 weeks (range 24-25 weeks). There were no cases of Volkman's ischemic contracture, broken implant or finger drop / wrist drop.

DISCUSSION:

Management of Diaphyseal fracture of radius and ulna poses specific problems that are not encountered in treatment of other long bone fractures [8]. In addition to restoration of length and normal axial alignment, correct alignment has to be achieved if good range of pronation and supination are to be restored [8]. The maintenance of reduction is difficult because of forearm musculature and interosseous membrane which exerts angulatory as well as rotational forces [9].

There are mainly 3 areas of osteogenic potential in healing - the periosteal reaction, the endosteal or medullary callus and fracture haematoma [10]. Many authors have proved that closed reduction for forearm fractures in adults is a failure and that ORIF is better. Anderson reported 47.53% of both bones fractures, 20.63% of ulna fractures alone, 31.84% radius fractures alone. Both bones fractures are more common than single bone fractures.

When fractures of both bones at the same level we used DCP for both bones to control rotational alignment and for better stability [8]. But when fractures of radius and ulna at different levels we used DCP for radius and Rush nail for ulna as it is less time consuming, doesn't require extensive dissection with minimal risk of wound breakage and cross union[6]. Bone grafting done in 7 out of 25 (58%) which were comminuted of which 16% were primarily bone grafted [1]. Anderson *et al.;* reported 97.1% union and 2.9% nonunion. It is always preferable to have at least 6 cortices grip of screws on either side of the fracture [5]. The mean time taken for union with plating was 12.4 weeks ranging from 11-18 weeks and by combined nailing and plating was 16.6 weeks ranging from 14-20 weeks. The mean time taken for union with Rush nails was 19.5 weeks ranging from 18-21 weeks. Based on Anderson's criteria most of the cases treated with plating or nailing have an excellent or satisfactory outcomes. 40% excellent, 52% had satisfactory and 8% had unsatisfactory outcome. Among 10 patients treated by plating alone 60% had excellent, 40% had satisfactory. Among 13 patients treated by Rush nails and plating 30.7% had excellent results, 53.8% had satisfactory results and 15.3% had unsatisfactory results. 2 patients treated by Rush nails alone had satisfactory outcome, but the series is a short one to comment on utility of Rush nails for both bones forearm. According to Anderson plating series had 58.74% excellent, 30.94% satisfactory, 7.17% unsatisfactory and 3.14% failure results. ORIF with plating for both bones forearm is better choice as it gives good stability, compression of fracture and early mobilisation. The disadvantages are higher cost, longer surgery time and more risk of infection because of longer exposure [4].

CONCLUSION:

ORIF should be done in fractures of forearm both bones in adults. In our study there is not much difference in union rates of nailing or plating. However, plating provides better compression at fracture site and rigid fixation to permit early mobilisation. The majority of patients had excellent functional outcome with plating alone.

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