

**A prospective observational study of functional outcome of closed intraarticular fracture of distal end of radius in adults treated by open reduction and internal fixation by buttress plate.**

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**Conflicts of Interest:** Nil

**Abstract**

**Introduction:** Fractures of the distal end of the radius continue to pose a therapeutic challenge. Some of these fractures are caused by high energy trauma, resulting in intra-articular involvement and comminution. Treatment of such injuries is difficult. These fractures often are unstable, are difficult to reduce anatomically and are associated with complications of post-traumatic osteoarthritis after intra-articular fracture of the distal end of the radius. Fracture of the distal radius is one of the most common skeletal injuries treated by the orthopaedic surgeons. These injuries account for approximately one-sixth of all fractures treated in emergency room. Restoration of radial length, radial tilt angle and congruity of articular surface is important for good functional result. Failure to achieve and maintain near anatomic reduction can lead to degenerative arthritis, distal radio-ulnar and

metacarpal instability and ulnar impaction syndrome with resultant pain, decreased mobility, strength and function. Restoration of wrist function is the primary goal in the treatment of unstable distal radius fractures.

**Materials and methods:** The purpose of this study was to evaluate the functional outcome of surgical management of intra articular fractures of distal radius by Open Reduction and Internal Fixation with buttress plate. 80 adult patients with intra articular fractures of the distal end of radius who were available for follow up of at least 9 months post-operatively were included in this study. The study period was from October 2014 to June 2016. The patients were evaluated as per the history, mode of injury. Necessary radiological investigations and hematology profile was done on admission. ORIF with buttress plate was done. The immediate Post -operative X-ray was evaluated. All

the cases were again evaluated at 6 weeks, 3 months, 6 months interval and final evaluation was performed at 6 months using Demerit-point system of Gartland and Werley [8].

**Results:** Final evaluation in our series was done at 9 months follow up on the basis of demerit point system of Gartland and Werley [8]. The minimum duration of follow-up for final evaluation in our series was 6 months. The maximum duration was up to 10 months. In our series 4 patients had excellent results accounting for 20%, 9 patients had good results accounting for 45% 4 patients had fair results accounting for 20% and 3 patients had poor results accounting for 15%. Poor results were seen more in Frykman type VII injuries. Most common mode of injury was RTA. Males more commonly involved. Excellent and Good results were more commonly seen in patients of age group 20 to 40 years.

**Conclusion:** Excellent to good results were seen in 65% of patients by using buttress plate for fixation of intra articular fractures of distal end radius. Thus, open reduction and internal fixation by buttress plate provides better functional results in intra articular fractures of distal end of radius. So, this procedure can be used as alternative to other procedures in treating intra articular fractures of distal end of radius. Road traffic accidents and fall on outstretched hand were the commonest mode of injury. Males were affected more than female. Younger the patients better the results.

**Keywords:** Post Traumatic Osteo-Arthrosis, Intra-Articular Fracture, Buttress Plate, Pain, Instability, Ulnar Impaction Syndrome.

### **Introduction**

Fractures of the distal radius have been associated with colorful history since its first description by Pouteau in 1783 and later by Abraham Colle's in 1814[1]. Previously

it was considered as dislocation of wrist. Fractures of the distal end of the radius continue to pose a therapeutic challenge. Fracture of the distal radius is one of the most common skeletal injuries treated by orthopaedic surgeons. These injuries account to approximately one sixth of all fractures treated in emergency room [2]. Restoration of radial length, radial tilt angle and congruity of articular surface is important for good functional result [3]. Failure to achieve and maintain near anatomic reduction can lead to degenerative arthritis, distal radio-ulnar and metacarpal instability and ulnar impaction syndrome with resultant pain, decreased mobility, strength and function [4]. TWO important changes since the days of Colle's are (a) increase in incidence of high energy vehicular trauma. (b) greater demand for perfection by the patient. These factors change the mode of treatment. Recognition of fracture patterns and fixation of fracture securely and to maintain reduction is the key for successful management of more complex fractures of distal radius. Several classifications have evolved that recognizes some of these variables, however no classification system successfully incorporates all the attributes of an individual injury. This places burden on the surgeon to evaluate each fracture individually. Recent studies have emphasized that better methods of identifying and classifying distal radial fracture may direct the treating surgeon to alter the treatment and to adopt open reduction of these fractures in the proper circumstances [5]. Open reduction and internal fixation are indicated to address the unstable distal radius fractures and those with articular incongruity that cannot be anatomically reduced and maintained through external manipulation and ligamentotaxis, provided sufficient bone stock is present to permit early range of motion [6].

## Materials and methods

**Source of data:** Our study was conducted between the period October 2014 June 2016 in Yashoda Super-specialty hospital, Malakpet. 80 patients with intra-articular distal end of radius fractures were treated by open reduction and internal fixation with buttress plate.

### Methods of collection of data

**Patient selection:** In our series cases were selected from patient with fracture distal end of radius classifiable on the Frykman classification system. Radiographic assessment of wrist-injury was done by antero-posterior and lateral views, analysis of the articular involvement and extension of fragments in to diaphysis were done. All the patients selected for the study were admitted, examined according to the protocol, associated injuries if any were noted and clinical and laboratory investigations were done to get the fitness for surgery. ORIF by buttress plate was done in all patients within 5-7 days of initial trauma. Follow up and assessment at 6 weeks, 3 months, 6 months, final evaluation was performed at 6 months using demerit point system of Gartland and Werley [8].

### Inclusion Criteria

All the cases are selected on the basis of,

- a) Closed fractures
- b) Radiological findings confirming intra articular fracture of distal end radius, Frykman classification.
- c) Patients who are medically fit and willing for surgery.
- d) Age group of 20-70 years of both sexes.

### Exclusion Criteria

- a) Patients below the age of 20 years.
- b) Patients who are unfit for surgery due to associated medical problems.
- c) Patients with pathological fractures.
- d) Open fractures

- e) Grossly comminuted fractures not amenable for plate fixation.
- f) Patients who opt for methods of treatment other than Open Reduction and Internal Fixation with buttress plating

### Surgical Approaches and Technique

- a) Volar approach
- b) Dorsal approach

### Postoperative Protocol

After the surgery, the operated limb was supported with an anterior or posterior splint and was kept elevated for 3 days till the edema subsided. All the patients received antibiotics, analgesics and anti-inflammatory drugs to prevent infection and to relieve pain and swelling. Active movements of the fingers, elbow and shoulder were started on the first post operative day. On the 3rd postoperative day, the operated wound was inspected and active movements of fingers and wrist were encouraged and the range of movements depending upon the tolerance of pain by the patients. As the patient's tolerance to pain increased, they were motivated for more vigorous physiotherapy regime. Sutures were removed on 10-12th post operative day. The splints were discarded and were replaced by a crepe bandage and patients were advised to carryout normal activity within the crepe bandage and resistant major activities. Non-compliant patients were advised to wear the splints till the first follow-up.

### Complications

- Arthritic changes Points (range 0-5)
- Minimum 1
- Minimum with pain 3
- Moderate 2
- Moderate with pain 4
- Severe 3
- Severe with pain 5
- Nerve complications (median) 1-3

- Poor finger functions 1-2

The objective evaluation is based upon the following range of motion as being the Minimum for normal function; dorsiflexion, 45 degrees; palmar flexion, 30 degrees, radial deviation, 15 degrees; ulnar deviation, 15 degrees; pronation, 50 degrees and supination, 50 degrees.

**Result Point Range**

- Excellent 0-2
- Good 3-8
- Fair 9-20
- Poor 21 and above

All the patients were reviewed at the 6th week, 3<sup>rd</sup> month and 6<sup>th</sup> month postoperatively and were evaluated clinically and radiologically. Patients were enquired regarding pain, restriction of motion, disability and grip strength. Clinical examination regarding the movements at the wrist and fingers were done. Careful examination was done to rule out any infection. Radiological examination consisted of assessing the consolidation of the fracture collapse at the fracture site and any displacement of the implant. The final evaluation was done on the 6th month. The patients were evaluated according to standard objective and subjective criteria using demerit-point system of Gartland and Werley [8]. The longest follow-up in this series was 10 months.

Items	Point
Residual deformity (0–3 points)	
Prominent ulnar styloid	1
Palmar tilt deformity	2
Radial deviation deformity	2 or 3
Subjective evaluation (0–6 points)	
Excellent: no pain, disability, or limitation of motion	0
Good: occasional pain, some limitation of motion, and weakness of wrist	2
Fair: pain, limitation of motion	4
Poor: pain, activities markedly restricted	6
Objective evaluation (0–5 points)	
Loss of extension (<45°)	5
Loss of ulnar deviation (<15°)	3
Loss of supination (<50°)	2
Loss of flexion (<30°)	1
Loss of radial deviation (<15°)	1
Loss of circumduction	1
Pain in distal radioulnar joint	1
Grip strength: 60% or less than on the opposite side	1
Loss of pronation	2
Complications (0–5 points)	
Arthritic change	
Minimum	1
Minimum with pain	3
Moderate	2
Moderate with pain	4
Severe	3
Severe with pain	5
Nerve complications (median nerve)	1 or 3
Poor finger function due to cast	1 or 2
Final results	
Excellent	0–2
Good	3–8
Fair	9–20
Poor	≥21

**Results**

In our series 4 patients had excellent results accounting for 20%, 6 patients had good results accounting for 45%, 4 patients had fair results accounting for 20% and 3 patients had poor results accounting for 15%. The maximum duration was up to 10 months. Final evaluation in our series was done at 6 months follow up on the basis of demerit point system of Gartland and Werleys[8]. The minimum duration of follow-up for final evaluation in our series was 6 months.

Results	No. Of patients	%
Excellent	16	20
Good	36	45
Fair	16	20
Poor	12	15

Results	Frykman type								Total
	I	II	III	IV	V	VI	VII	VIII	
Excellent	-	-	12	-	-	-	4	-	16
Good	-	-	16	4	8	4	4	-	36
Fair	-	-	4	-	4	-	4	4	16
Poor	-	-	-	-	4	-	8	-	12

**Discussion**

This study was undertaken to assess the functional outcome of operative intra articular fracture distal end radius by open reduction and internal management of fixation by buttress plate. The best method of obtaining and maintaining an accurate anatomy remains topic of considerable controversy. However recent critical evaluation of fracture pattern and results of treatment have demonstrated the need for surgical intervention.

In our study, Frykman's classification was used for classification of the fracture. In this study we have used buttress plates for intra articular fractures of distal radius. The number of male patients were more than female patients and were best handled by open reduction and internal fixation by buttress fragments but also have compressed and crushed juxta-articular fragments which is of no supportive value.

A buttress purchasing instrument provides a good hold on proximal fragments and lays a very important role by contributing to the stability. In our study 80 patients were treated with buttress plates for intra-articular fractures of distal end of radius, followed up for a minimum of 6 months, were analyzed according to the criteria of demerit point system of Gartland and Werleys[8]. 16 patients had excellent results (20%), 36 patients had good results (45%), 16 patients had fair results (20%) and 12 patients had poor results (15%). A study was conducted by John K. Bradway and William P. Cooney on 16 patients with comminuted intraarticular fractures of distal radius, with a mean follow up of 5.7 years. The evaluation was based

on the criteria of Garland and Werley[8] and also by Green and O'Brien scoring system. They had 56% of their patients rated excellent, 25% good and 19% fair[7,9,10,11]. They had no poor results. This high percentage of excellent and good results compared to our study may be due to fact that the follow up was of longer duration and they had better patient's compliance.

**Conclusion**

Excellent to good results were seen in 65% of patients by using buttress plate for fixation of intra articular fractures of distal end radius. Thus, open reduction and internal fixation by buttress plate provides better functional results in intra articular fractures of distal end of radius. So, this procedure can be used as alternative to other procedures in treating intra articular fractures of distal end radius. Road traffic accidents and fall on outstretched hand were the commonest mode of injury. Males were affected more than female, younger the patients better the results.

The results in our study show that excellent and good results were achieved in 65% i.e., in 52 patients and fair and poor results were seen in 35% i.e., in 28 patients. This means that the use of buttress plates gives relatively better results in intraarticular fractures of distal radius. This does not mean that buttress plating is gold standard in the treatment of intra-articular fractures of distal radius. This is only an alternative method in treating these injuries. So, we recommend buttress plating in intra-articular fractures of distal radius which gives acceptable results.

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