

Original research article

Study of Functional Outcome of Intra-Articular Distal end Radius Fractures in Adults Treated by Distal Radius Locking Plate**Dr. Mahaveer Meena¹, Dr. Rajendra Prasad Ghosliya², Dr. Naveen.S³,
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Jhalawar**Corresponding Author: Dr. Naveen.S****Abstract**

Background: Fractures of distal part of radius are one of the most commonly occurring fractures and encountering problems in selecting treatment option. The purpose of this study to analyse the efficacy of distal end radius plate fixation of intra articular distal radius fractures in adults with special emphasis on technical difficulties and complications.

Materials and Methods: This study was conducted in the Department of Orthopaedics, Jhalawar Medical College Hospital. The study consists of 25 Patients with intra-articular distal radius fractures were included in this study. They were treated with distal end radius locking plate through volar approach. At each follow-up, patients were evaluated clinically and radiologically with appropriate X-rays.

Results: All patient were evaluated for radiological & functional outcome according “Sarmiento’s modification of Lindstorm’s criteria & Mayo Score” respectively. The mean time of union was 14 weeks with a range of 10 to 18 weeks with a 17 cases (68%) healing by 12 weeks. Rest of the 8 cases (32%) took a longer duration. No case of delayed union was reported. Longer duration to union is noted in patients of older age with relatively poor bone quality. Stiffness was noted in 12% cases (3 patients), 4%(1 patient) show malunion, 8% cases (2patients) had superficial infection which was controlled by dressing and antibiotics and 4%(1patient) had broken screw.

Conclusion: Early Primary fixation of the distal radius fractures by distal radius plate is essential for good functional outcome and to avoid complication of prolonged immobilization, which facilitates early return to regular activities. Patients with unstable, either a dorsally or volarly displaced intra-articular radius fracture had excellent to good radiological outcome when treated with distal radius plate.

Keywords: Intra articular distal radius fracture, Distal end radius locking plate, Sarmiento’s modification of Lindstorm’s criteria, Mayo Score

Introduction

In day-to-day practice of most orthopaedic surgeons, fractures of distal part of radius are one of the most commonly occurring fractures and encountering problems in selecting treatment option, accounting about 16% of all fractures in orthopaedic casualty and it has bimodal age distribution. Distal radius fractures are mostly insufficiency fractures in osteoporotic bone of elderly and following high velocity injuries in young patients¹.

Amazingly two hundred years before itself, Abraham Colles (1814)² described extra articular distal radius fractures are having good outcome from his statement - *The nature of the injury once ascertained, it will be a very easy matter to explain the different phenomena attendant on it and to point out a method of treatment which will prove completely successful*.

Until about 60 years ago, it was general notion that most distal radial fractures could be treated conservatively with satisfactory results. Only recently, it was clinically proved that intra-articular step-off and radial shortening corrected by surgery had improved patient outcome^{3,4}.

In general, anatomic reduction should be pursued in younger and high-demand elderly patients (because of longer healing time and to initiate early mobilization) with extra-articular fracture or intra-articular fractures. Low-demand elders with severely displaced intra articular fracture or median nerve compression require surgical management but otherwise the prime focus in this group should be on joint movement^{3,4}.

Unstable reducible extra-articular fractures are commonly treated with reduction and often supplemented with extra- or intra-focal pinning. Extra-articular fractures that are irreducible, intra articular fractures and fractures for demanding patients who require early mobilization, are commonly treated with plating (more often with palmar plating), intramedullary fixation, external fixation or pinning^{5,6,7,8}.

Close reduction and cast immobilization have been the principal mode of management of distal radius fractures but it often led to fracture malunion and subluxation /dislocation of distal radioulnar joint, hence resulting in poor functional, radiographic and cosmetic results⁹. The residual worse deformity of wrist adversely affected wrist motion and hand function, thereby interfering with the mechanical advantage of the extrinsic hand musculature¹⁰.

It also causes pain, limitation of forearm motion, and decreased grip strength as a result of arthrosis of the radio carpal and distal radio ulnar joints¹¹. Open reduction and volar plating was designed to ensure more consistent correction of displacement and maintenance of reduction. Metaphyseal defects can also be grafted, although not generally advocated in fresh fractures and good bone quality¹².

Aims and Objective:

The purpose of this study to analyze the efficacy of distal end radius plate fixation of intra articular distal radius fractures in adults with special emphasis on technical difficulties and complications.

Methods and Materials:

This study was carried out in the Department of Orthopaedics, Jhalawar Medical College Hospital.

The study comprised of 25 Patients with intra-articular distal radius fractures were included in this study. They were treated with distal end radius locking plate through volar approach.

Inclusion Criteria:

1. Intra-articular fractures of distal end radius
2. Adult 19 - 65 yrs age group
3. Closed Fractures
4. Grade I open fractures as per Gustilo-Andersons Classification

Exclusion Criteria:

1. Patients less than 19 years of age and more than 65 years of age.
2. Extra-articular fracture distal end radius
3. Open Grade II or Grade III Intra-articular fractures of distal end radius per Gustilo-Andersons Classification
4. Metabolic bone disorders or Pathological fractures
5. Underlying neuromuscular disorder
6. Patients unfit for surgery
7. Patient not willing to give Consent

Preoperative evaluation:

As soon as the patient arrived to emergency department the patients were initially evaluated with airway, breathing, circulation, disability, exposure (ABCDE) approach. Resuscitative measures if needed were taken which included IV fluids, continuous oxygen inhalation, fracture splintage done with A/E slab.

Detailed patient's history in relation to age, sex, mode of injury, and associated illness, X-ray of AP and lateral views of affected wrist with forearm were taken & Routine blood investigations were carried out.

Operative procedure:

Operation was done under supraclavicular block. After positioning painting and draping, the distal radius exposed using volar Henry approach. Patient's wrist was placed on the hand table and after painting with betadine and draping, wrist placed in supine and neutral position, a 5cm skin incision was made starting just distal to the proximal wrist crease and medial to the radial artery pulsation, incision deepened by dividing the deep fascia.

Flexor carpiradialis was retracted ulnar wards and radial artery with brachioradialis retracted radially exposing the pronator quadratus. Care should be taken not to injure the sensory branch of median nerve and radial artery. The wrist is pronated and pronator quadratus was divided and elevated from the radial side of radius exposing the distal radius fracture.

The fracture was then reduced by direct visualization of the fragments. The central lunate fragment which plays a key role in load transmission if found depressed should be elevated with a small osteotome and subarticular cancellous or peg bone grafting can be done if needed.

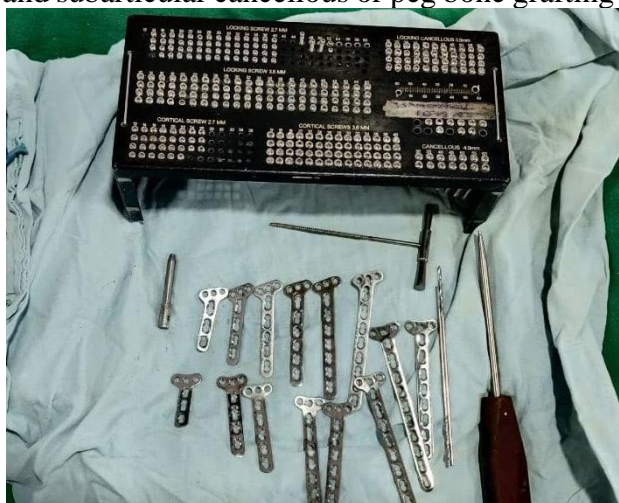


Figure 1: Distal Radial Locking Plates with Screws

Then the locking compression plate was placed on the smooth curved volar surface of distal radius and after correcting its placement just proximal to the imaginary watershed line (2mm from the radiocarpal joint surface), the plate is temporarily stabilized with a K wire or a unicortical screw in the sliding hole of the shaft. True AP, lateral views were taken under C-arm image intensifier and any fine adjustments if needed can possibly be done on the plate, so that the screws were aimed to be placed 2mm below joint line and should not penetrate into the articular area.

The distal screws were put which should be 2mm short from the dorsal cortex so that the screws would not irritate the extensor tendons. Finally, AP, lateral and oblique views should be taken to check the fracture reduction and distal screw penetration. After thorough wound wash and achieving haemostasis, wound closed in layers and sterile bandage applied.

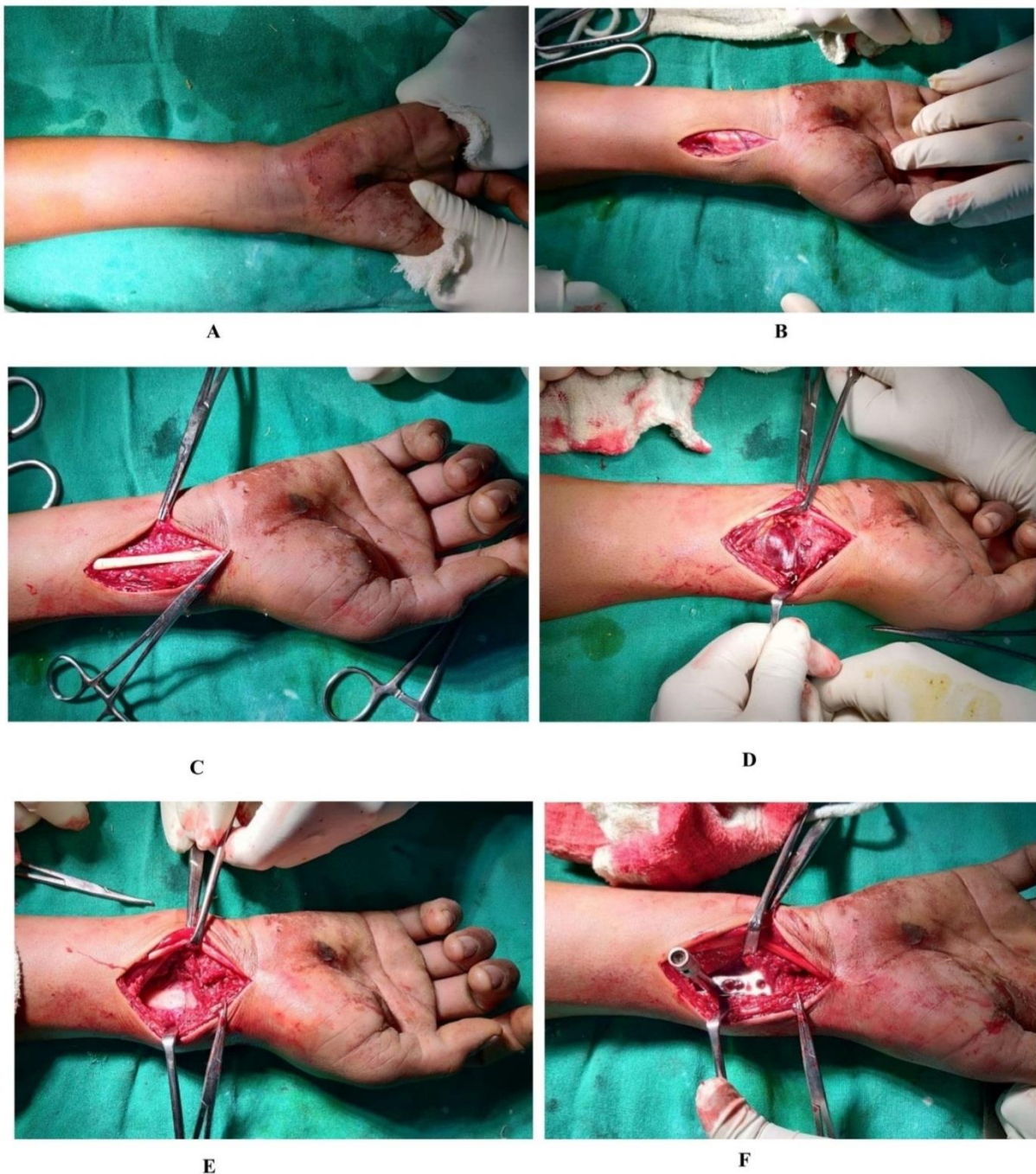


Figure 2: Images Of Surgical Steps In Volar Distal End Radius Plate

Post operative care and Rehabilitation:

Patients were encouraged limb elevation and active & passive finger mobilization exercises in immediate post op period. Distal neuro-vascularity was assessed regularly and intravenous antibiotics were given for 3 days and after that changed to oral antibiotics till suture removal. Post operatively the wrist was immobilized in a short arm POP for 4 weeks. Suture removal was done for all the cases between

10 to 14 days from post op. After suture removal the slab was removed and gentle active wrist mobilization exercises were started. Resisted exercises were started about 6 weeks after surgery. Patients were recommended for follow up at 4th, 8th, 12th, 24th week interval and routine x-rays were taken to assess the fracture healing.

Results :

All patient were evaluated for radiological & functional outcome according “Sarmiento’s modification of Lindstorm’s criteria & Mayo Score” respectively.

In this study, 28% cases (7patients) of AO type B fractures showing excellent results in radiological outcome followed by 16% cases (4patients) good, 4%cases (1patient) fair and None of the cases show poor results.

In this study, 24% cases(6patients) of AO type C fractures showing excellent results in radiological outcome followed by 16% cases (4patients) good, 8% cases (2patients) fair outcome& 4% cases (1patients) case of poor outcome was seen.

Table 1: Radiological Outcome

RESULTS	NO. OF PATIENTS	PERCENTAGE
EXCELLENT	13	52%
GOOD	8	32%
FAIR	3	12%
POOR	1	4%

In this study, 52% cases(13patients) showing excellent results in combined radiological outcome followed by 32%cases (8patients) good, 12% cases (3patients) fair& 4% cases (1patients) poor outcome was seen.

In this study, 24%cases (6 patients) show very good functional outcome followed by, 12%cases (3patients) with good &12%cases (3patients) with satisfactory and none of cases show bad outcome in AO Type B.

In this study, 16%cases (4 patients) show very good functional outcome followed by, 20%cases (5patients) with good, 12%cases (3patients) with satisfactory &4%cases (1patients) with poor outcome in AO Type C.

Table 2: Functional Outcome

RESULTS	NO. OF PATIENTS	PERCENTAGE
VERY GOOD	10	40%
GOOD	8	32%
SATISFACTORY	6	24%
BAD	1	4%

In our study, 40% cases (10 patients) show very good functional outcome followed by 32% cases (8 patients) with good, 24% cases (6 patients) with satisfactory & 4% cases (1 patient) bad outcome.

All the patients had good union. The mean time of union was 14 weeks with a range of 10 to 18 weeks with a 17 cases (68%) healing by 12 weeks. Rest of the 8 cases (32%) took a longer duration. No case of delayed union was reported. Longer duration to union is noted in patients of older age with relatively poor bone quality.

Discussion:

The rise of intra articular distal radius fractures and its various presentations of complexity in even younger individuals are predominantly due to high energy trauma especially road traffic accidents. In our study, around 17 (68%) of patients are due to RTA and 8 patients (32%). In our study 12 of 25 cases (48%) are type B and 13 of 25 pt. (52%) are type C distal radius fractures.

The average mean age of our study is comparable to the one by Jupiter et al and Anakwe et al who had an average age of 43 and 48 years respectively. Our study had a male predominance with 21 of 25 cases

Our study's male predisposition of 84%. The higher incidence among the males could be attributed to a highly active work group with a higher involvement in high energy trauma and high velocity injuries of RTA

In our study right side was involved in 13 of the 25 study cases. Our study's Right-side predisposition of 52% is comparable to John k Bradway et al and Walz et al which was 50% and 48% respectively. The relatively more predisposition could be attributed to a less-protective.

In our study RTA formed the reason of trauma in 17 of the 25 study cases. Our study's RTA trauma predisposition is 68%. is comparable to Jupiter et al which was 67%.

The key aspects of the treatment are distal radius articular surface's anatomical reduction and achieving good distal radio ulnar congruity with an early mobilization for early rehabilitation 40% associated with very good results based on Mayowrist score and are comparable to other studies as tabulated below.

Table 3 : COMPARISION OF RANGE OF MOVEMENTS

	Palmar flexion	Dorsiflexion	Supination	Pronation
Jupiter et al	66	58	78	72
Orbay J et al	47	44	76	77
F Fitoussi & SP Chow	52	52	88	68
Anakwe et al	64	62	78	62
Our study	67	70	67	71

Table 4: COMPARISION OF FUNCTIONAL EVALUATION

	Very good	Good	Satisfactory	Bad
Jupiter et al	63	20	17	-
Dennison et al	80	20	-	-
John K Bradway et al	44	12	44	-
Anakwe et al	24	60	16	-
Our study	40	36	20	4

Conclusion:

From our study, we conclude that, Early Primary fixation of the distal radius fractures by distal radius plate is essential for good functional outcome and to avoid complication of prolonged immobilization, which facilitates early return to regular activities.

Patients with unstable, either a dorsally or volarly displaced intraarticular radius fracture had excellent to good radiological outcome when treated with distal radius plate.

Fracture fixation with volar plate and screw system in the management of distal radius articular fractures, especially in type C (Complete intraarticular fractures) is a superior method to maintain the reduction till union and prevent the collapse of the fracture fragments, even in grossly comminuted, unstable and osteoporotic bones.



Figure.3: Case 1



Figure.4: Case 2



Figure.5: Case 3

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