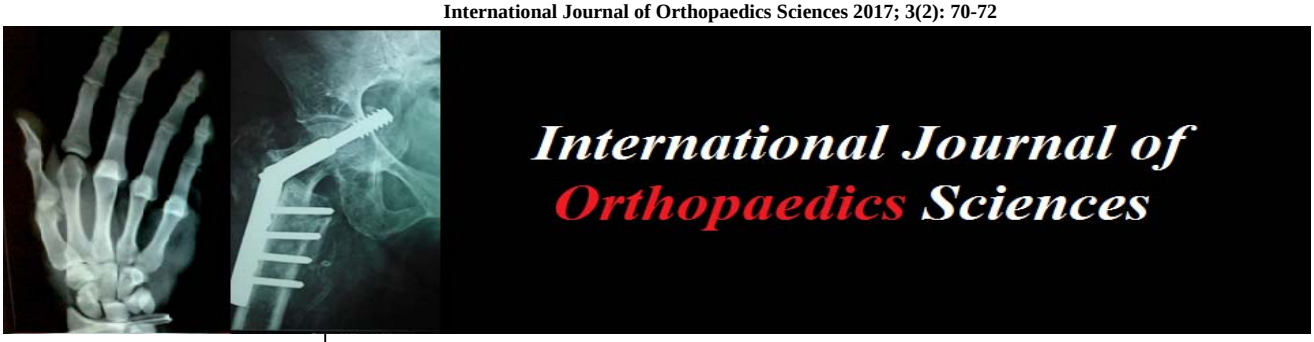

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Plate osteosynthesis for unstable distal radius fracture: A prospective, randomized study

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Abstract
Fractures of the distal radius are the most frequent fractures encounted by orthopaedic trauma surgeons accounting for 17.5% of all adult fractures. Although closed reduction with cast immobilization remains a reliable standard method of treatment for stable extra articular fractures and minimally displaced articular injuries, similar management for unstable articular disruption is prone for failure. The aim of our study was to evaluates the functional outcome of open reduction and plate fixation in the treatment of fracture distal end radius. This is a prospective study in which eighty (80) consecutives cases of fracture of distal radius, aged 18-70 years are taken into account. Patient were operated by volar distal radius locking plate and functional outcome assessed by demerit-point system of Gartland and Werley score. Final functional outcome in our study, 60 patients (75%) had excellent result, 13 had (16%) had good results, 5 patient (6%) had fair and 2(3%) had poor results. To conclude plate osteosynthesis is an excellent method in the treatment of distal radius fracture and functional outcome.

Keywords: Distal radius fracture, Gartland and Werley score, locking plate

1. Introduction
Fractures of the distal radius are the most frequent fractures encounted by orthopaedic trauma surgeons accounting for 17.5% of all adult fractures [1]. These Fractures were first described by Abraham Colles in 1814. Majority of these fractures (66%-77%) are caused by low energy trauma, mostly due to fall from standing height. Most of the fractures are extra articular and rest are pauci or complete intra articular. Different treatment options are available for treatment of these fractures like nonoperative by cast or splint, external fixation by ligamentotaxis, k wire fixation and plate osteosynthesis. The purpose of treatment of a distal radius fracture is to maintain normal length, strength, mobility and the function in hand and wrist. Restoration of radial length (distance from radial styloid process to the distal end of ulna), volar angulation, congruity of articular surface, and ulnar varience is important for good functional result. In spite of various new advances, close reduction and cast immobilization has been the mainstay of treatment of these fractures but malunion of fracture and subluxation/dislocation of distal radioulnar joint resulting in poor functional and cosmetic results is the usual outcome [2]. Volar locked plate osteosynthesis is considered as the "gold standard" in treatment of unstable distal radius fractures [3]. Failure to maintain an accurate anatomic reduction can lead to malunion, degenerative arthritis, distal radio-ulnar and metacarpal instability and ulnar impaction syndrome with resultant pain, decrease in mobility, grip strength and function.
The aim of our study was to evaluates the functional outcome of open reduction and plate fixation in the treatment of fracture distal end radius.

2. Materials and Methods
The study was conducted in the Department of Orthopaedics, Veer Surendra Sai Institute of Medical Sciences and Researches (VIMSAR), Burla, Odisha, for a period of two years from January 2015 to December 2016. This is a prospective study in which eighty (80) consecutives cases of fracture of distal radius, aged 18-70 years, irrespective of sex were subjected to ORIF with volar plating after obtaining written informed consent.

2.1 Inclusion criteria
1) Age >15 years of age
2) Close fracture
3) No associated fracture in ipsilateral limb
4) Patients who gave their consent to undergo the procedure.

2.2 Exclusion criteria
1) Age>75 years
2) Open fracture
3) Comorbid conditions such as head injury, or chest injury preventing surgical intervention

2.3 Surgical procedure
Under all available aseptic measure and brachial plexus block, pt. is on supine position, the arm is abducted to 90^0, supinated and placed on an arm table A tourniquet is applied to upper arm. The fracture is approached through modified Henry approach. fracture is reduced with the plate or manually. Screw are placed distal to plate first pronated supinated oliqueand lateral views are taken by image intensifier to prevent the intra articular screw penetration. Then proximal screw are given. Wond closed in layer and sterile dressing done. Intravenous antibiotic was given for 3 days and then changed tooral post op dressing was done on 3rd post of day and stich removed after 10 days. Range of motion of fingers started immediately but wrist started after 15 days. Patients were followed up at regular intervals clinically and radiologically. The patients were evaluated according to standard objective and subjective criteria using demerit-point system of Gartland and Werley.

3. Results
The present study comprised of 80 patients of distal radius fractures. Female patients predominated male patients (51 females to 29 males), Female to male ratio 1.7:1. The average age of patients is 54.4 years with the range being 20–75 years. Dominant hand was most commonly affected (61.6%).Most of the fracture occurs due to fall on outstretched hand (46 cases), followed by RTA (20cases), fall from height (6cases) and direct injury in 8 cases. The mean follow‑ up period was 18.2 month (12-24 month). Complication like malunion in 2 cases, infection in 2 cases, and stiffness of finger and restriction of wrist movement in 5 cases. Mean range of flexion of wrist 55^0, extension 59^0, forearm supination 96^0 and forearm pronation 80^0 at final follow-up. Final functional outcome in our study, 60 patients (75%) had excellent result, 13 had (16%) had good results, 5 patient (6%) had fair and 2(3%) had poor results.

Patient information	
Total no of patients	80
Mean age(yrs)	54.4
Female	51
Male	29
Follow-up(month)	12-24

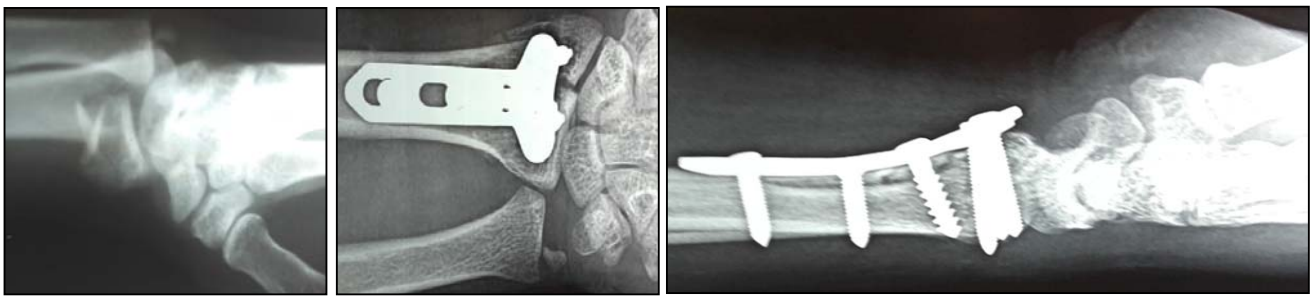

Fig 1: A) Pre op X-ray B) Fracture distal radius AP view C) LAT view

A B C

Fig 2: A) Pre op X-ray distal radius fracture with AP and LAT view B) Post op AP view C) LAT view

4. Discussion
Distal end radius fractures are the most frequently seen upper extremity fractures. As far as the treatments of these fractures are concerned, it is one of the most challenging types. The main objective of treatment is to re‑establish anatomic integrity and function. It has undergone changes owing to the advances in technology. Although closed reduction with cast immobilization remains a reliable standard method of treatment for stable extra articular fractures and minimally displaced articular injuries, similar management for unstable articular disruption is prone for failure. The best method of obtaining and maintaining an accurate anatomy remains a 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, the distal radial fracture was more common in the 4th and 6th decade with an average of 54.4 years. It is comparable with other similar studies by Orthoman *et al*. [4]. Right side was involved in 65 patients and the left side was involved in 15 patients in our study [4, 5].

John K. Bradway and William P Cooney [7] 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 Werleyand also by Green and O'Brien scoring system. 56% of their patients were rated excellent, 25% good and 19% fair. They had no poor results.

Fitoussi F *et al*. (1997) in their study of 34 patients with intra-articular fractures of the distal radius treated with opereduction and internal fixation with buttress plate and screws, concluded that the potential for restoration of normal alignment and stability of fixation are the main advantages of internal fixation with plates [8].

Ruch and Papadonikolakis in 2006 studied results of 34 patients of distal radius fractures treated with open reduction and internal fixation of a multifragmentary intra articular distal radius fractures with a non locking volar or dorsal plate. 20 patients were treated with dorsal plating and 14 patients with a volar plating. They concluded that volar plating resulted in a significantly better Gartland and Werley score compared withdorsal plate [9].

Orbay and Fernandez [6] reported that 31 dorsally displaced fractures of the distal radius (preoperative dorsal tilt, 30^{O}) were treated with volar fixation using a distal volar radius plate. No secondary displacement occurred, the mean postoperative volar tilt was 5^{O}, and the functional results were 19 excellent and 12 good. The advantage of plating includes decreased rate of complication when compared with other treatment modality due to its strength and stability of construct that allows early wrist motion and enhances hand and finger functions. Rizzo *et al.* [11] compared the complications in locked volar plating versus pinning and external fixation in the treatment of unstable intra‐articular distal radius fractures and gave similar findings as ours. They also concluded that volar locked plating is a boon for unstable fractures because of its stiffer construct and lower rates of complications [9, 12]. Fracture of distal end of radius with or without involvement of articular surface when treated with volar plate fixation have significantly better outcome over other methods such as cast immobilization and K‐ wire fixation in terms of restoration of anatomy and function. This is due to better stabilization of fracture fragments which allows early mobilization of joints around together with muscle strengthening exercises.

5. Conclusion

Although different methods of treatment exists for management of distal radius fracture, volar plating provides stable fixation of radius with excellent radiographic and functional results and minimal complications. So, we conclude that volar plating of distal radius fracture is a better option for treatment of these fractures.

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