

International Journal of Orthopaedics Sciences

E-ISSN: 2395-1958

P-ISSN: 2706-6630

IJOS 2020; 6(3): 617-619

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www.orthopaper.com

Received: 06-05-2020

Accepted: 08-06-2020

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Role of bridging plate in Communitied distal end radius fracture: a prospective study

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DOI: <https://doi.org/10.22271/ortho.2020.v6.i3j.2259>

Abstract

Background: Fracture of distal end radius is very common cause of emergency visit. Management of communitied distal end radius always present as a challenge to the treating surgeon. In study it was proposed dorsal distracting plating as a method to treat this kind of fracture.

Method: The present study is of prospective variety on 10 consecutive patient of communitied distal end radius fracture. Post fixation, it was studied the range of motion (ROM), time taken in healing, any associated complication and Gartland and Warley score.

Result: It was observed clinically, average range of motion after dorsal bridge plating was wrist palmer flexion 56.4°, wrist extension 70.3°, pronation 76°, and supination 75°. There was neither any infection nor any complication was noted.

Conclusion: Dorsal distraction plating an effective technique in this kind of fracture but at a cost of another surgery i.e. implant removal.

Keywords: Distraction plating, range of motion, fracture, distal end radius

Introduction

In emergency set up fracture of distal end of radius is common source of call. It has been found to be approximately 17% of the cause of all fracture visits^[1]. This fracture has bimodal age of distribution. First peak occurs during the young age due to high energy trauma, fall from height, due to severity of injury, this fracture is associated with extensive communitied of metaphysis and articular part. Second peak occurs after 60 years of age due to poor bone mass where even minor fall can cause extensive injuries^[2].

Historically, this kind of fracture was treated with external fixator with or without k wires but unfortunately because of being associated with high complication rate, an estimated complication rate of about 52-63%, in which the most common is the inability to correct dorsal tilt and pin track infection^[3, 4]. With development of volar locking plate and fragment specific volar plate, it was thought that they will be a boom for management of this kind of fracture but due to fixed screw fixation angle it is not possible to capture all short fragments and due to strong proximal muscle force there is further collapse of carpus^[5].

To conquer these problems, we considered to use a dorsal plate in place of external fixator in tensile fashion over dorsal surface. It works on the principle of ligamentotaxis so it can reduce small intraarticular fragments and keep them distracted. It can be used for extended period of time till the union occurs so as to avoid complication of prolonged external fixator use. It is relatively easy to do operation in comparison of open reduction and internal fixation with volar plate.

Technique

After paint and drape with all aseptic precaution under imaged intensified television (IITV) guidance, we first checked reduction and a proximal incision was given 4-5 cm proximal to the proximal extent of the fracture on dorsal mid shaft region (figure no 1a). After careful dissection to reach the bone a blunt instrument was passed subcutaneously from proximal incision towards 2nd or 3rd metacarpal. After checking alignment a 10-15 holes 3.5mm dynamic compression plate was used. We gave 10-15° tilt in mid plate region to achieve volar tilt in radius. A second incision was given over 2nd or 3rd metacarpal as per previous check, plate was

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passed from distal to proximal below the extensor tendon and fix distally first with 2 or 3 screw then traction was given and fix proximally with 2 or 3 screw (figure no 1b). Intraarticular reduction was assessed if needed supplementary k wire was added.

Result

10 patients were operated from June 2016 to December 2018, consists of 6 females and 4 males with an average age of 53.7

yrs, range (46-65 yrs), right hand was involved in 4 cases and in 6 cases left hand was involved. A minimum follow up of 1 year was done (figure no 1c, d). Clinically, average ROM after dorsal bridge plating was wrist palmer flexion 56.4°, range (48-63°), wrist extension 70.3° (range 65-75), pronation 76° (68-78), supination 75° (70-80) (figure no 1e,f,g,h). No infections was observed in study group. Gartland and Warley scoring system was used which proved to be significant in all patients.

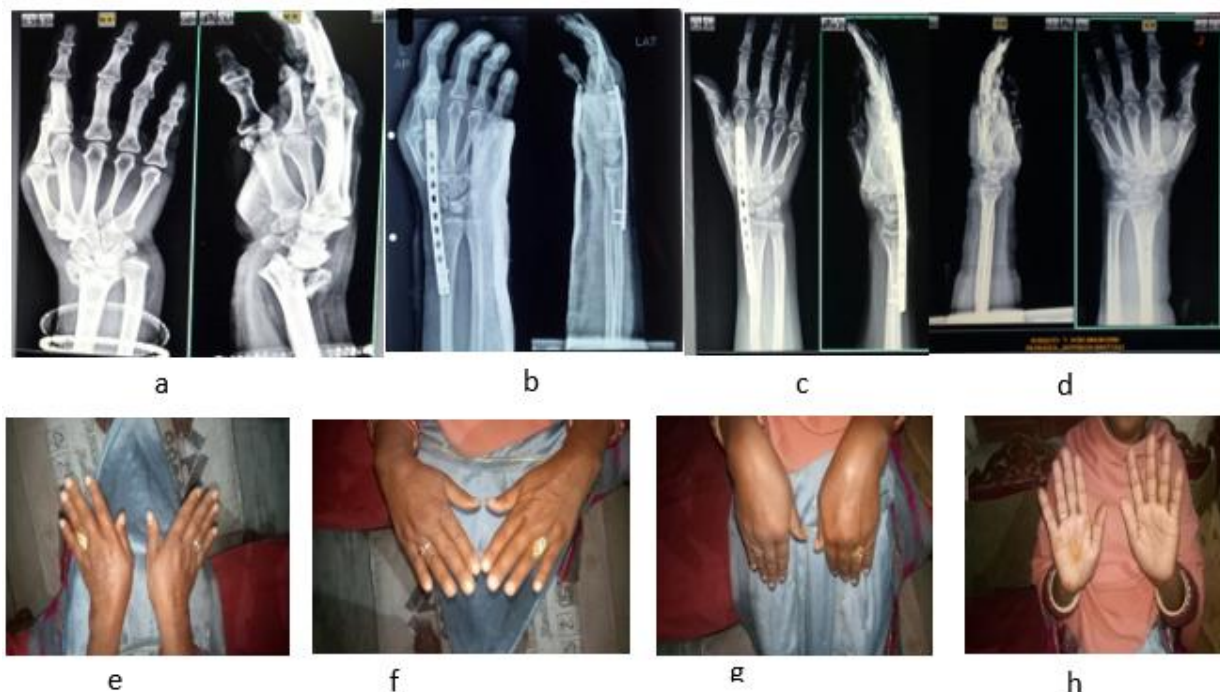


Fig 1: (a) Preoperative x- ray of patient showing fracture of distal end of radius, (b) Post-operative x- ray (c) Post-operative x- ray after 3 month of follow up (d) Post-operative x- ray after implant removal (e,f,g,h) Range of motion after implant removal.

Discussion

Burkhe & Singer 1998, were the first to describe the use of internal distracting plating for treatment of comminuted distal end radius fracture (6). Several authors have reported on the ability of external fixation to restore anatomy in distal radius fracture in the cadaveric study by Chabra *et al.* using acrylic rod demonstrated favourable results in plate over external fixator by showing resistance to loss of reduction in axial plane and maintenance of palmer tilt due to buttress effect of the plate [7]. Behrens *et al.* demonstrated that the rigidity of external fixator was directly proportional to how close the longitudinal fixator bar is to the bone and fracture. A bridge plate rest directly against the radius proximally and metacarpal distally, making it strong construct [8].

Use of dorsal bridging plate has many advantage such as it is more rigid in comparison of external fixator, it can be used for prolonged period till union occur and allow early use of limb in polytrauma patient. Disadvantage of this method could be, to regain mobility of wrist due to prolong immobilization, rupture/ adhesion of extensor tendon and need of another surgery for implant removal. In the present study, the current literature reviewed for dorsal distraction plating for distal end radius fracture in terms of wrist movement and complication in the study.

Marcheix *et al.* performed a randomised control trial of 103 patients, looking at the difference between percutaneous k wire fixations with volar locking plate fixation, all of the fractures treated with volar locking were classified as either AO A2, C2, C3 fracture. They found that at 26 weeks after

fixation patient had 53° flexion, 50° extension, 81° supination, 77° pronation which is comparable to present study but in our series most of our patients were either AO C2 or C3 type [9].

Gigs T.T., Helmerhorst *et al.* performed a study on 14 patients of comminuted distal end radius fracture treated with 2 column plate orthogonally found flexion extension arc 93° (45-155°), ulnar radial deviation 49° (25-80°), pronation supination arc 152° (120-160°) but in his series 1 patient required revision due to malposition and 1 required carpal tunnel released, none of the patients in present series required re operation [10]. Benson *et al.* in his study found that fragment specific volar plate gave excellent result in majority of patients without any major associated complication but on analysis we found that majority of patient were AO C1 type [11].

Sander *et al.* in his study showed that external fixator is a good option in treatment of distal end radius fracture [12] but various authors like Bartosh & Saldana said that external fixation alone often fail to reestablish the radiopalmer tilt [13]. Period of immobilization by external fixator is also a controversial topic, various authors like Jenkins *et al.* recommended maximum 4 weeks of fixation [14] whereas Conney emphasized for 10 weeks [15]. Sander *et al.* [12], Schuind *et al.* [16], Facob & Fernandes recommended 6 weeks of immobilization, 3 weeks in distraction mode and 3 weeks in neutral position to reduce the incidence of Sudek osteodystrophy [17].

Marc J *et al.* treated 33 patients, (mean age group 70 years) of comminuted distal end radius fracture with dorsal bridging plate technique, at final follow up, all fractures were healed

and radiograph demonstrated mean palmer tilt of 5° & mean positive ulnar variance of 0.6mm, mean radial inclination was 20°, mean value for wrist flexion and extension were 46° and 50° respectively^[18]. Digital stiffness was noted in 10 patients, one patient required tenolysis, one patient developed superficial radial neuritis, and another patient developed CRPS. Similar results were also observed in present study except complications, which might be due to less number of patient and younger mean age group.

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