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Original research article

Analysis of management of fractures of distal radius with volar plating

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Abstract
Fractures of distal radius contribute to more than 15% of people attending orthopaedic emergency department. It has a bimodal distribution of occurrence comminuted high velocity injury in younger population to low velocity injuries due to fall occurring in osteopenic patients. The purpose of the study is to evaluate volar plating as a method of fixation for earlier return to activity and to study outcome of buttress plate with locking plate.

Keywords: distal-end of radius fracture, volar plating, locking plate, buttress plate

Introduction
Distal fractures of radius represent one-sixth of cases of emergency department and is both age and gender specific [1]. There is a difference in two peak incidences one an insufficiency fracture in elderly females and two traumatic high velocity injuries in young [2, 3]. The sharp increase in incidence in elderly may be due to reduced mineral density of bone and oestrogen withdrawal [4]. The majority of injuries in elderly are extraarticular and due to fall while in the younger population it is intra articular and due to motor vehicle accident and sporting injuries [5-8]. The purpose of study is to evaluate the outcome of volar plating as an option for distal radius fractures.

Aim
- To study the functional outcome of operative management of fractures of distal end of radius managed by open reduction internal fixation with volar plates.
- To study the effectiveness of clinical and radiological outcome and complications of distal end radius fractures treated with open reduction internal fixation.

To study the difference in outcome between two different plates buttress vs locking plate.

Subjects and Methods
A total of 30 adult patients with distal radial fractures fulfilling the inclusion criteria treated at Maharaja Institute of Medical sciences, Nellimarla, vizianagaram between august 2013 and august 2015 in the Department of Orthopaedics, were included in this study.

Inclusion Criteria
- Adults (aged between 20 to 70years), both male and female with unstable, comminuted extra or intra articular fractures of distal end radius.

Exclusion Criteria
- Cases of age > 80yrs and <18yrs.
- Patients presenting more than 2 weeks after injury.

Method: There were 12(40%) males and 18 (60%) females between the age group of 20-70 years with mean of 46.1 years. 21 (70%) patients had right side involvement (dominant wrist) and 9 (30%) had left side involvement. The decision to treatment of fracture with plating was based on the fracture configuration and the treating doctor‘s experience including the patients

in the decision making process.

Of the 30 cases, injury occurred due to road traffic accident in 12(40%) patients and fall on the out stretched in 18 (60%) patients. Of the 30 cases, 28(94%) of the fractures were of Closed Type and 2 (6%) were open type, which was Type I of Gustilo and Anderson Classification.

The interval from the date of injury to date of operation ranged from 1-6 days.

Anaesthesia

The operations were performed under supraclavicular block and in failed block condition general anaesthesia was the choice.

Position

The patient was placed supine on the operating table with the affected limb placed on a side arm board. Forearm &, hand were thoroughly scrubbed, painted with betadine and spirit and draped.

Landmarks

Two landmarks are taken, one is at the elbow, Palpate the biceps tendon, which is a long, taut structure just medial to the brachioradialis muscle. Second one at the wrist joint, palpate the styloid process of the radius.

Technique

The incision for volar fixation of the distal radius is typically performed through Henry approach. An incision is made between the flexor carpi radialis (FCR)tendon and the radial artery (figure1). This interval is developed, revealing the flexor pollicis longus(FPL) muscle at the proximal extent of the wound and the pronator quadratus muscle more distally. The radial artery is carefully retracted lateral, and the tendons of the FCR and FPL are retracted medially.

The pronator quadratus is divided at its most radial aspect, leaving a small cuff of muscle for later reattachment. Any elevation of the muscle of the FPL should be performed at its most radial aspect, as it receives its innervation from the anterior interosseous nerve on its ulnar side. After the pronator quadratus has been divided and elevated, the fracture is readily visualized, and reduction manoeuvres accomplished under direct vision.

After exposure and debridement of the fracture site, the fracture is reduced and provisionally fixed under fluoroscopy with K-wires, reduction forceps or temporary distractor.

The appropriate plate is selected following fracture reduction (figure2). The optimal placement of the distal screws is important: they must be inserted at the radial styloid, beneath the lunate facet, and near the sigmoid notch. More volar tilt can be achieved during distal screw placement when the wrist is volarly flexed as much as possible by an assistant. The final position of the plate was confirmed using fluoroscopy.

Pronator quadratus muscle was used at the time of closure, to cover, in part, the implant that were applied to the anterior surface of the radius. Once stable fixation was achieved and hemostasis secured, the wound was closed in layers (figure3) and sterile compression dressing was applied. The tourniquet was removed and capillary refilling was checked in the fingers. The operated limb was supported with an below elbow POP slab with the wrist in neutral position.

Fig 1: Plane between Flexor carpi radialis and radial artery.

Fig 2: Plate in position fixed with 3.5 mm screws.

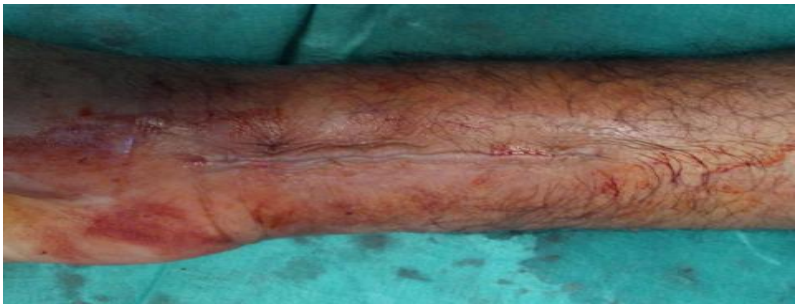

Fig 3: Subcuticular closure

Results

Incidence

The following are the observations made to the available data analysed as follows.

1. Age Distribution

We had three patients (10%) belonging to 21 to 30 Years of age group, fourteen patients (46.7%) belonging to 31 to 40 years, ten patients (33.3%) between 41 to 50 years and three patients (10%) with 51years and above age group category.

2. Gender Incidence

14 patients (46.7%) belong to Male category and 16 patients (53.3%) belong to Female category with the ratio Male: Female as 2: 3.

3. Side of Involvement

Out of 30 patients, Right side (dominant wrist) is involved in 24 patients (80%) and left side is involved in 6 patients (20%).

4. Mode of involvement

In the study there are12 patients (40%) who met road traffic accident and 18 patients (60%) with fall on outstretched hand.

5. Type of plate

Out of 30 cases, 18 cases (60%) Buttress Plate and 12 cases (40%) are fixed with Locking compression plate.

6. Range of Motion

30 (100%) patients had dorsiflexion within the normal functional range (minimum 45°), 30 (100%) had palmar flexion within the normal functional range (minimum 30°), 30 (100%) had pronation within the normal functional range (minimum 50°), 30 (100%) had supination within the normal functional range (minimum 50°), 24 (80%) have radial deviation within the normal functional range (minimum 15°) and 28 (93%) patients have ulnar deviation within the normal functional range (minimum 15°). 27(90%) patients have grip strength more than 60% compared to the opposite side. 3 (10%) have significant loss of grip strength (< 60% compared to the opposite side). 1(10%) patient has pain in the distal radioulnar joint. None of the patients had stiffness of the wrist.

7. Evaluation of Results

Using Gartland and Werley's demerit score system, 21 cases (80%) have excellent results, 6 cases (20%) have good results, 3 cases (10%) have fair results and no poor results in the study.

Statistical data analysis

No significant association between Anatomical parameters and type of plates.

Interpretation: As p-value (0.107) is more 0.05, there is no significant difference between type of plate and recovery.

Discussion: There is a changing trend in the occurrence of fractures from being mostly insufficiency fracture occurring due to fall on outstretched hand to high velocity intraarticular fractures in young population of about 40%, this has been observed in other studies also [5-7]. The good results obtained even with buttress plate similar to that of locking plate could be attributed to the occurrence of fractures in relatively young population. There was no significant difference in the type of plate. The good range of movement obtained in the post op period could be attributed to the selection of relatively younger group of patients, 90% of the study population being younger than 50 years of age and the ability to maintain good reduction with buttress plate as well as early physiotherapy protocols concentrating mainly on the wrist range of movements.

Conclusion

We would further like to follow up and extend the study to much elderly population in the upcoming years to see how they fare relative to younger group and also look at a larger sample size as we are dealing with a small sample size.

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