ABSTRACT
The concepts in treatment of distal Radius fractures have changed in the last few years as our understanding of these fractures has improved. Fixation of these fractures using low profile locked implants from the volar side has gained popularity. The aim of this study was to assess the functional and radiological outcomes of intra-articular distal Radius fractures treated using volar locked plate. 54 adult patients underwent fixation of closed comminuted intra-articular fractures of distal Radius with volar locked plate. Patients were evaluated for subjective symptoms, radiological time to union, grip strength, quick DASH score and range of motion. The mean dorsiflexion was 70.2 degrees, palmar flexion was 52.2 degrees, radial deviation of 15.8 degrees and ulnar deviation of 20.3 degrees. Pronation and supination were 60.2 and 80.2 degrees. The mean grip strength of dominant wrist was 88.4 percent and non dominant wrist was 72.2 percent of the opposite normal wrist. The mean DASH score was 14.2. Commonest complication was malposition of implant. Volar locked plate fixation of distal Radius fractures gives good results. However careful attention to position of implant is necessary to avoid complications.

KEYWORDS: Distal Radius, fracture, volar locked plate, ORIF

INTRODUCTION
Anatomical reduction is paramount in treatment of distal Radius fractures. Any deviation from this criteria results in onset of post traumatic arthritis(1,2). Many devices are now available in the market which have smaller screw diameters with locking options providing subchondral support(3). These devices allow dorsally unstable fractures to be fixed from the volar side thus avoiding potential complications like tendon irritation and rupture. The purpose of this study was to assess the functional and radiological outcomes of fractures of the distal Radius treated by ORIF(open reduction and internal fixation) method using either the Variable angle or the juxta articular plate.
Materials and methods:
The study was conducted on a prospective basis in a teaching hospital. The ethics committee of the hospital approved the conduct of the study. All skeletally mature patients who had sustained closed fracture of the distal Radius and were treated with either the Variable angle (DepuySynthes, USA) or the juxta-articular plate (DepuySynthes, USA) were included in the study. Patients who had open fractures, had associated fractures of the same extremity and pre-existing arthritis or deformity were excluded from the study.

All patients underwent the procedure under general anesthesia or brachial plexus block. A trans-FCR approach was used for exposure(4). The Brachioradialis tendon was tenotomized to facilitate reduction of the radial styloid fragment. The pronator quadrates was elevated subperiosteally as an ulnar based flap. This was not sutured back as routine. The fixation of the fracture was done using either a juxta-articular or a variable angle device. The decision on which implant to use was made intra-operatively by the surgeon. The fragments were provisionally fixed with Kirschner wires followed by definitive fixation with the implant. Closure of the wound was done in dermal and cutaneous layers. A bulky dressing was applied postoperatively which was reduced on the second post operative day. Patients were given a removable splint. They were started on gently active range of motion exercises for the wrist and forearm. Fingers and the other joints of the ipsilateral upper extremity were also exercised. Following discharge, they were followed up at the outpatient’ clinic. During follow-up, the parameters documented were subjective symptoms like pain, tingling or numbness and weakness of hand. Objective evaluation consisted of measurement of range of motion of the wrist and forearm using a hand-held goniometer, measurement of grip strength using Jamar dynamometer according to the ASHT(American society of hand therapists) protocol(5). Quick DASH score was used to evaluate function(6). Biplanar radiographs were done at regular intervals to assess progress of union.

Results:
54 patients were included in the study. There were 45 men and 9 women. 30 patients had injury in the dominant hand and 24 had injury in non dominant hand. The mean age was 30.2 years (18 - 52 years). Mean follow-up was 1.9 years (1.2 to 3 years). The mean range of dorsiflexion was 70.23 degrees(Range 45 - 90), palmar flexion was 52.2 degrees(Range 30 - 90 degrees), Radial deviation was 15.8 degrees(10 - 30 degrees) and ulnar deviation was 20.3 degrees(10 - 35 degrees). The mean pronation was 60.2 degrees (range 20 to 80 degrees) and
mean supination was 80.2 degrees (30 to 90 degrees). The average grip strength of the cases with dominant hand involvement was 88.4 percent (60 to 100 percent) and the cases with non dominant hand involvement was 72.2 percent (40 to 90 percent). The mean time to union was 10.2 weeks (6 to 12 weeks). The mean DASH score was 14.2 (0 to 22.2). Commonest complication was implant malposition in 22 patients. The various kinds of malpositions are listed in Table 1.

Discussion:

The disappointing results of open reduction and internal fixation of volar plating of distal radius fractures have to be re-visited in the light of development of volar fixed angle plate technology(7). Rozenthal and Blazar (8) reported on 41 patients with average follow-up of 17 months who had undergone fixation of dorsally unstable fractures with volar locking plates. The mean DASH score was 14 and all patients achieved excellent to good results in the Gartland and Werley system. Orbay and Fernandez(9) used the volar approach to treat 29 patients with distal Radius fractures. At minimal follow-up time of 12 months, the average extension was 59 degrees, flexion was 57 degrees ulnar deviation was 27 degrees and radial deviation was 17 degrees, 80 degrees of pronation and 78 degrees of supination. The grip strength was 79 percent of the contralateral side. This result is comparable to the range of movements and grip strength in our study. The slightly decreased pronation obtained in our study could have been because of the fixation of the distal fragment in supinated position. The commonest complication was malposition of implants. In this the common mistake was to place the plate too radially resulting in prominence of the radial side of the wrist. This has been termed the volar radial tuberosity by Nelson et al(10). This also results in inability to place the screw on the styloid as it will past point the radial cortex of the styloid. We have sometimes cut the radial most hole in the plate and supplemented fixation with a styloidwire(Fig.1 - 4). Prominence of the screw tip beyond the dorsal cortex of the Radius shaft was seen in 10 patients. However none of the patients had any pain attributable to this or had any tendon ruptures. Two patients had intra-articularly placed screws. At the time of last follow up they had no pain.

In conclusion, open reduction and internal fixation of distal Radius fractures with Volar locked plates gives satisfactory results. Attention should be paid to proper position of plate so that it does not become unduly prominent. Screw length should be chosen appropriately so that there is not risk of tendon injury.
Table 1 – details of implant malposition

<table>
<thead>
<tr>
<th>Complication</th>
<th>Number of cases</th>
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<tbody>
<tr>
<td>Plate malposition - Radial</td>
<td>10</td>
</tr>
<tr>
<td>Past pointing of screws</td>
<td>10</td>
</tr>
<tr>
<td>Intra-articular screws</td>
<td>2</td>
</tr>
</tbody>
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References: