A Comparison between Volar Plating and K-wire Fixation of Distal End Radius Fractures

Dinto Davis¹, M Raffic¹, Sachin Joseph¹

Abstract
Distal end radius fracture is a common fracture seen in the routine orthopedic practice. The optimal management of distal radius fractures remains controversial [1]. The aim of this study is to prospectively compare functional outcomes following volar plating and K-wire fixation of distal end radius fractures and investigate which method produced better outcomes. The functional outcome in terms of the range of movements, pain, and grip strength of the patients was assessed at 6 months in both groups by demerit score system of Gartland and Werley [2]. Functional outcome as per Gartland and Werley was 95% excellent to good results in plating group as compared to 75% in K-wire fixation group. The study emphasizes that open reduction and internal fixation with volar plating have excellent functional outcome when compared to K-wire fixation in distal radius fractures. When considering the cost, K-wire fixation is preferred over volar plating.

Keywords: Distal radius fracture, volar plating, k-wire, fixation.

Introduction
Fractures of the distal radius are the most common fractures of all. 30% of the patients treated in the emergency centers have an injury to the wrist, and majority of them have distal radius fractures [3]. Abraham Colle of Dublin, Ireland in the year 1814 was the first to describe what is now commonly known as Colles’ fracture; he had described it as a fracture involving distal corticocancellous junction of the radius with classical deformity [4, 5]. Until the mid-1900s, nearly all fractures of the distal radius were treated in a closed fashion, with or without reduction of alignment. Patient’s expectations of treatment were in line with the treatment tools available at the time, and certainly other public health issues outflanked the wrist in importance to a patient’s long-term productivity [6]. Management protocols for these fractures have undergone significant advancement over the preceding years. These can be treated conservatively using closed reduction and immobilization in a plaster cast, which may lead to early displacement; hence, skeletal fixation to maintain the reduction has been recommended [7, 8]. Methods such as external fixation used for ligamentotaxis, percutaneous fixation with K-wires or plate osteosynthesis or combination of all the above have been advocated to achieve adequate reduction and fixation of displaced distal radius fractures [9]. The aim of this study is to prospectively compare functional outcomes following volar plating and K-wire fixation of distal end radius fractures and investigate which method produced better outcomes.

Material and Methods
An observational study was done at the Department of Orthopaedics, in our hospital. The duration of the study was from July 1, 2016, to October 30, 2017, with total time period of 16 months. All patients with radiologically confirmed fractures of distal end radius were included in the study. We excluded those who were not willing for treatment, undisplaced fractures, those who have not attained skeletal maturity, open fractures of distal radius, and distal radius fracture...
associated with neurovascular deficit. All patients who satisfied the inclusion and exclusion criteria during the study period were included in the study until sample size was attained. The patients were allocated into two groups of 20 patients each. One group was treated by open reduction and volar plating (Group A), and the other group was treated by closed reduction percutaneous K-

### Outcome measurements

The functional outcome in terms of range of movements, pain, and grip strength of the patients were assessed at 6 months in both groups by Changulani et al. [10]. Demerit score system of Gartland and Werley (Fig. 1). The range of movement of the wrist and forearm was measured using a goniometer. Grip strength was assessed by a dynamometer. The intensity of pain was recorded on a visual analog scale from 0 to 10.

### Method of data collection

#### Table 1: Distal end radius fracture type

<table>
<thead>
<tr>
<th>Fernandez type</th>
<th>Group A</th>
<th>Group B</th>
</tr>
</thead>
<tbody>
<tr>
<td>II</td>
<td>14</td>
<td>17</td>
</tr>
<tr>
<td>III</td>
<td>6</td>
<td>3</td>
</tr>
<tr>
<td>Total</td>
<td>20</td>
<td>20</td>
</tr>
</tbody>
</table>

Kindly provide column head

#### Table 2: End results

<table>
<thead>
<tr>
<th>???</th>
<th>Group A</th>
<th>Group B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Excellent</td>
<td>15 (75%)</td>
<td>13 (65%)</td>
</tr>
<tr>
<td>Good</td>
<td>4 (20%)</td>
<td>2 (10%)</td>
</tr>
<tr>
<td>Fair</td>
<td>1 (5%)</td>
<td>5 (25%)</td>
</tr>
<tr>
<td>Poor</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>20</td>
<td>20</td>
</tr>
</tbody>
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Figure 1: Demerit scoring system of Gartland and Werley.

Graph 1: Male to Female ratio of fractures included in the study

Graph 2: End results of both Volar plating and k-wire fixation

Graph 3: No of patients in both fracture types undergone Volar plating and k-wire fixation
All patients who attend the outpatient/casualty of Orthopaedic Department at Sree Gokulam Medical College during the stipulated time period, having distal end radius fracture were included in the study. All fractures were classified according to Fernandez classification, and only Type 2 and 3 fracture patterns were included in the study (Table 1). Functional assessment was done at 6 months with the help of Gartland and Werley score system. Conclusions were drawn at the end of the study. After obtaining ethical clearance from the Institutional Ethics committee, the study was conducted among the study populations after obtaining written informed consent. Group A (Fig. 2 and 3) was operated through volar approach, under tourniquet control and the use of a volar T plate. Group B was treated by closed reduction and K-wire fixation (Fig. 4). Similar plaster splints, antibiotic (cephalosporins), and analgesic regimens were used in both groups. Stitches were removed in Group A after 10 days, and a gentle physiotherapy plan was instituted. K-wires were removed at 5–6 weeks in the other group and cast continued for 2 more weeks. A similar rehabilitation program consisting of assisted and active range of motion exercises was done in both the groups for 3 months.

**Results**

Mean age of patients in Groups A and B was 40.39 ± 11.39 and 42.73 ± 10.73 years. Minimum age in Group A and Group B was 29 and 32, respectively. In Group A Male:female ratio was 1:1.5 and Group B it was 1:1 (Graph 1). In Group A 15(75%) patients had an excellent outcome, 4 (20%) patients had good outcome, and 1 (5%) patient had fair outcome (Graph 2). While in Group B 13 (65%) patients had an excellent outcome, 2 (10%) patients had good outcome, and 5 (25%) patients had fair outcome (Table 2 and Graph 3).

**Discussion**

The fractures of the distal end of radius despite being the most common upper extremity fractures continue to pose a therapeutic challenge. The aim is to regain the normal range of movements and anatomical integrity without pain. Treatment modalities have undergone significant advancements due to improved imaging techniques, which have provided a better understanding of fractures and explained the effects of the different injury types on fracture formation and factors that lead to instability. Kiernan C in his study compared radiological outcomes in those treated with volar locking plate to those undergoing manipulation and K-wire fixation in the 20–65 years population. According to them, volar plating has superior advantage when compared with K-wire fixation. Beharrie et al., in 2004, published a study comparing these two methods. They showed a clear advantage of K-wire fixation over T-plate method.

**Conclusion**

The study emphasizes that open reduction and internal fixation with volar plating have better functional outcome when compared to K-wire fixation in distal...
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References


How to Cite this Article

Conflict of Interest: NIL
Source of Support: NIL