To study the clinical and radiological outcome of patients with intraarticular or unstable lower end radius fractures treated with ligamentotaxis with external fixator and K wires

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DOI: https://doi.org/10.22271/ortho.2019.v5.i1b.1

Abstract

Introduction: Treatment for intraarticular lower end radius fractures has been conventionally with closed reduction with plaster /k wires / external fixator or open reduction internal fixation with plate. We thought that by combining external fixator with k wires better anatomical and thus functional results would be obtained.

Material and methods: A prospective follow up study was carried out on 50 fresh closed intraarticular or unstable lower end radius fractures from MIMER Medical College Talegaon from June 2014 to May 2018 after taking appropriate consents. Ligamentotaxis with external fixator was combined with k wires under C arm guidance. Patients were followed up at 3,6,9,12 weeks and 6 months clinically and radiographically.

Results: Average time for surgery was 34.2 min, radial shortening was less than 4 mm, and hospital stay was 2.3 days. Anatomical assessment was grade I or II in 96% patients. Good to excellent results by Lindstrom’s criteria was there in 78% patients.

Conclusion: Combining external fixator with k wire fixation gives well to excellent results in majority of patients with unstable intraarticular distal end radius fractures without significant complications and with a short hospital stay.

Keywords: Intraarticular, radius, external fixator, K wires

Introduction

Lower end radius fracture constitutes about 17% of all fractures in patients above 60 years of age. Treatment for these fractures has been conventionally with closed reduction with plaster/ K wires or open reduction internal fixation with plate [1]. Another option is closed reduction and ligamentotaxis with external fixator [2]. Accurate fracture reduction can results into healing of ligaments ruptured and fractures during the post-operative and post reduction immobilization period [3]. Inaccurate reduction and union can devastate hand function [4]. It is said that Ligaments, Retinaculae, Tendons, Periosteum that are barrier to open reduction of fracture fragments can help to achieve reduction of the fracture by ligamentotaxis and hence soft tissue ruptured, by technique of ligamentotaxis as compared to open reduction of fractures and plating techniques [5]. However some fragments which can re displace can be addressed by simultaneous closed k wires put during the same surgery [6]. Hence combining both techniques looks to be good option for treatment of these fractures, particularly unstable, comminuted or intraarticular fractures. Hence we carried out a study to assess the functional and radio logical outcome of this treatment method.

Materials and Methods

A postoperative follow up study was carried out at MIMER Medical College Talegaon Dabhade from June 2014 to May 2018. All patients were followed up for at least six months. Informed consent was obtained from patients and local ethical committee approval was taken from college. Only acute <10days old, fresh fractures and closed fractures were included in study. We excluded open fractures, pathological fractures, undisplaced or somewhat displaced
Fractures (which can be treated by closed reduction and k wiring) or plaster, patient aged <18 years and patients with medical contraindications to surgery and anaesthesia. We treated these patients by closed reduction under C-ARM and ligamentotaxis with AO Type static uniplanar external fixator and k wire augmentation. Patients were discharged after 48 to 72 hours and advised active exercises. They were followed up at 3, 6, 9 weeks postoperatively. Pain, pin loosening, swelling, infection, stiffness etc was assessed at 3 weeks and also dressing was done for pins then. At 6 weeks if tenderness was absent and bridging callus was seen on x-rays, k wire and external fixator was removed under sedation in operation theatre. If tenderness was present or there was doubt about union, fixator was removed but k wires were removed at nine weeks.

Thereafter all exercises including palmar flexion, dorsiflexion, abduction, adduction, pronation, and supination were started. Check x-rays were done at 6 weeks, 9 weeks, 12 weeks and 6 months. Radiological evaluation was done on basis of Lindstrom’s criteria and clinical evaluation was done on basis of modified Werley’s score. At final follow up, a questionnaire was filled up with a set of questions pertaining to pain, stiffness, function, satisfaction, disability of upper extremity etc. Incidence of complex regional pain syndrome if any was also noted.

Results
There were 21 males and 29 females in study. 70% patients were in the group 40 to 70 years. 20% were below 40 years while only 10% were above 70 years. Average time for surgery was 34.2 minutes. Average hospital stay was 2.3 days only.

Table 1: Distribution of patients with respect to radial shortening.

<table>
<thead>
<tr>
<th>Radial Shortening (in mm)</th>
<th>Number of Patients</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>9</td>
<td>18</td>
</tr>
<tr>
<td>1</td>
<td>14</td>
<td>28</td>
</tr>
<tr>
<td>2</td>
<td>8</td>
<td>16</td>
</tr>
<tr>
<td>3</td>
<td>16</td>
<td>32</td>
</tr>
<tr>
<td>4</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>Total</td>
<td>50</td>
<td>100</td>
</tr>
</tbody>
</table>

Shortening greater than 4 mm was not seen in our study. Dorsal angulation of 1-10 degrees was seen in 7 patients while dorsal angulation of 11-15 degrees was seen in 4 patients. In rest 39 patients normal or volar angle was achieved.

Table 2: Movements after 12 weeks

<table>
<thead>
<tr>
<th>Movements</th>
<th>Normal Range (Degrees)</th>
<th>Average Results After 12 Weeks (Degrees)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dorsiflexion</td>
<td>75</td>
<td>68.5</td>
</tr>
<tr>
<td>Plantar Flexion</td>
<td>75</td>
<td>70</td>
</tr>
<tr>
<td>Radial Deviation</td>
<td>20</td>
<td>15</td>
</tr>
<tr>
<td>Ulnar Deviation</td>
<td>35</td>
<td>30</td>
</tr>
<tr>
<td>Supination</td>
<td>80</td>
<td>65</td>
</tr>
<tr>
<td>Pronation</td>
<td>75</td>
<td>70</td>
</tr>
</tbody>
</table>

There was mild to moderate deformity in 10 patients (out of 50) i.e. only 20 percent of patients, while rest had no deformity. There was mild to moderate loss of grip in 15 patients (i.e. 30%), while no loss of grip in 35 patients (i.e. 70%). Anatomical assessment was I or II in 48 (i.e. 96%) of patients, while it was III in 2 patients (4%). In no patients it was IV (0%).

Thus according to Lindstorm’s criteria for functional hand results, we got good to excellent results in 78% patients while fair results in 22% patients. In no patients we got poor results. As regards complications wrist pain was seen in 1 patient (2%), stiffness in 7 patients (14%), and pin tract infection or loosening in 4 patients (8%).

According to modified Gartland and Werley’s wrist grading system, we got excellent results in 12(24%) patients, good results in 26(52%) patients, fair results in 10(20%) patients and poor results in 2(4%) patients.

Discussion
The fracture of lower end radius is about 17% of all fractures in elderly. Most fractures can be managed by closed reduction and k wires or cast. However in unstable and comminuted distal end radius fractures, open reduction and plating is advised to restore anatomy and better results. In some patients small AO external fixator is advised as it restores anatomy by ligamentotaxis but its results are at the most equal to k wire fixation for unstable distal end radius fractures [4, 5]. In addition, open reduction and plating though advised, is more invasive procedure and is not without complications [5]. In addition plating technique requires more time for surgery and thus more anaesthesia and its complications. Also sometimes with extensive bone disruption, plate application is near to impossible [6].

According to literature for displaced intrarticular distal end radius fractures treated by ligamentotaxis, there are many short comings like gradual loss of initial distraction force, inability to correct dorsal tilt of distal fragment (due to stout volar radiocarpal ligaments), inability to reduce depressed lunar fragments without over distraction etc [7]. These problems can be overcome partially by combining with k wires. Also k wire allows to place wrist position in mild extension, which facilitates finger flexion and relaxes extensor tendons, which in turn prevents stiffness of fingers [7, 8].

Results of our study shows that in our patients average time for surgery was 34.2 minutes, average shortening was less than 4 mm, anatomical assessment was grade I or II in 96% of patients, good or excellent results according to Lindstrom’s criteria in 78% of patients and poor results in no patients. According to Modified Gartland and Werley’s wrist grading system, we got poor results in only 4% patients. Average hospital stay was only 2.3 days. There is enough literature which says that leaving fixator for too long a period (>7 weeks) leads to complications [7, 8]. Hence we remove the fixator at 6 weeks and leave k wires if there is inadequate union.

Results of our study are comparable to study by Rakesh Yalavarthi et al which gave excellent to good results in 88% patients [9], GS Edwards et al which gave 96% good results [10], Schuind et al which gave good results in 94% [11], Jenkins et al which gave good results in 93% [12], Vaughan PA et al which gave good results in 94% [13], D’ Anca et al which gave good results in 94% [14], Cooney et al which gave good results in 87% [15], Nagi ON et al which gave good results in 80% [16].
and Rajeev Shukla et al which gave 77.8% good results. However slightly less (78% good or excellent results) may be due to selection of only unstable / intra articular lower end radius fractures in our study, but never the less, the results are good in majority of patients.

Conclusion
Combining external fixator application with k wire fixation gives well to excellent results in majority of patients with unstable intra articular distal end radius fractures, without significant complications and with short hospital stay. However, our sample size was small (only 50 patients), it was a non-comparative study without control group and follow up period was short (only 6 months). Hence further studies will be necessary before final conclusion about this modality of treatment is reached.

References