Comparative Study on Functional and Radiological Outcome of Intraarticular Fracture Distal End of Radius Treated With External Fixator Vs Internal Fixation With Plating

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Abstract:

INTRODUCTION: Fracture distal end of radius contribute to about 16% of fractures seen on orthopedics casualty with bimodal age distribution. The cause of fracture for distal end of radius in elderly is trivial trauma because of osteoporotic bone and in the young cause of high velocity injuries. Aim: To analyze and compare the functional and radiological outcome of fracture intra articular distal radius treated with external fixation versus open reduction and internal fixation with volar locking compression plate. Materials and methods: This comparative study was conducted in Govt. Stanley Medical College from December 2019 to December 2020. About 40 patients with intraarticular distal radius fractures were selected and randomly divided into 2 groups. One treated with external fixator and other with plating. Results: After proper analysis and doing statistical comparison we got p-value of 0.701 for functional outcome and 0.560 for anatomical outcome which is insignificant. (significance is <0.05).

Conclusion: We conclude that there are no major differences in the functional outcome of both the techniques in treating comminuted intra articular distal radius fractures. Though there is no statistical difference in the functional outcome, volar locking compression plate is better in certain radiological parameters like volar tilt, radial inclination and radial length and also successful in achieving patient's satisfaction.

Keywords: Intraarticular distal radius fractures, locking compression plate, ligamentotaxis, volar approach to distal end of radius.

I. INTRODUCTION

Fracture distal end of radius contribute to about 16% of fractures seen on orthopedics casualty with bimodal age distribution. The cause of fracture for distal end of radius in elderly is trivial trauma because of osteoporotic bone and in the young cause of high velocity injuries ¹.

Abraham Colles (1814) ² described that there is good outcome for fracture distal end of radius, from his statement —Once the nature of injury is ascertained, it becomes very easy to explain the different phenomena attendant on it and come to a conclusion on method of treatment which will prove completely successful. Even as 1mm of articular incongruity will deprive the functional outcome ³ as reported by Fernandez and Tumble. Our aim of the study is to compare the functional and radiological outcome of unstable distal radius fractures treated with volar locking compression plate and closed reduction external fixator⁴,⁵,⁶,⁷.

II. AIM OF THE STUDY

To analyze and compare the functional and radiological outcome of fracture distal end of radius treated with closed reduction with external fixator versus open reduction and internal fixation with volar locking compression plate.

III. MATERIALS AND METHODS

Study design: Comparative study.
Study subjects: 40 cases will be studied.
Study setting: Department of Orthopaedic Surgery Govt. Stanley Medical College Hospital from December
2019 to December 2020.

**Inclusion Criteria:**
- Patients with the age group >18 years
- Patients with distal end radius fractures with intraarticular extension after RTA or slip on outstretched hand or assault
- Closed fractures
- Comminuted fractures with or without bone loss

**Exclusion Criteria:**
- Open/compound fractures
- Patients associated with head injuries and who are comatose
- Patient associated with ulnar diaphyseal fractures or carpal bone fractures
- Patient associated with neurovascular injuries

**Study Procedure:** A total of 40 patients will be taken for study as per inclusion criteria. Patients with intraarticular distal end of radius fractures were randomly selected into two different groups. One group was treated with fixed angled locking compression plate by volar approach and other by the application External fixator with or without K-wire augmentation. Careful evaluation of the features of impending or established compartment syndrome was done for ruling out those fractures from the study. Specialist opinion to rule out other injuries was got. All eligible patients fulfilling our inclusion criteria were subjected to further radiological evaluation.

X-rays and CT scans were used for the radiological assessment of the post-operative fixation of fractures. Standard AP and lateral views were taken to assess fracture pattern to assess the parameters like radial height, palmar tilt, Radial inclination, displacement and involvement of radioulnar and distal carpal joints.
DORSAL ANGLE AND CARPAL ALIGNMENT

APPROACHES OF DISTAL RADIUS

1) The Modified Henry approach to the radius

2) Extended carpal tunnel approach

MODALITIES OF DISTAL RADIUS FIXATION

I) Volar LCP Fixation

II) Bridging External Fixator
POSTOPERATIVE PROTOCOL:

Patients were advised for gentle active finger movements with limb elevation for 3 days. The distal neuro vascularty was assessed regularly. IV antibiotics was given for 3 days followed by which it was converted to oral antibiotics till the suture removal. Patients were discharged on the 4-5th postoperative day and the suture removal done on the 11th post-operative day. Patient was advised about the weekly visit, the pin site cleaning and care and physiotherapy was done. During each visit proper pin site care, loosening of clamps or pins and fracture healing were checked by taking fresh X-ray. The external fixator was removed at 6-8 weeks after clinically and radiographically assessment of the fracture healing. Follow up X-rays were done at the recommended hospital visits on immediate post-operative 6 weeks, 3 months, 6 months and 9 months interval.

POSTOP RADIOLOGICAL EVALUATION:
The Standard anteroposterior and lateral views were taken to assess fracture pattern and to assess the parameters like radial height, radial inclination, palmar tilt and residual deformity.

Cases Illustrations: CASE 1: VOLAR LOCKING COMPRESSION PLATE

PRE-OP AND IMMEDIATE POST OP
12 WEEKS POST-OP

9 MONTHS AND 12 MONTHS POST OPERATIVE OF MOVEMENTS
CASE:1 EXTERNAL FIXATOR

PRE-OP

IMMEDIATE POST-OP

6 WEEKS POST OP AND IMPLANT EXIT
RANGE OF MOVEMENTS:

III. RESULTS

In our comparative study about 40 patients were included in the study, 20 in each group of which one patient from exfix group lost follow-up.

In our study, around 35% of patients are due to RTA and nearly 65% of patients had self-fall. The exact incidence and demography of distal end radius intra-articular fractures have not been cited yet in the literature. In our study, 32.5% of fractures are of AO type B and 67.5% fractures AO type C distal radius fractures. The average mean age of our study was 47 years.

Our study's male predisposition of 62.5%. The higher incidence among females could be attributed to a highly active work group with a higher involvement in high energy trauma and high velocity injuries of RTA.

Our study the non-dominant left-side predisposition was 37.5%. The frequency of trauma for dominant hand was more with 90% when compared to non-dominant hand which was 10%.

Total of 12 patients were diabetic, 2 patients had hypothyroidism, 9 patients had hypertension and 2 patients had COPD.

Our study the RTA trauma predisposition is 35% and self-fall with predisposition of 65%. Nearly 60% of study population underwent surgery after 5 days of injury.

In our study both the exfix and VLCP group had satisfactory outcome. However, the VLCP had slightly better radiological outcome.

However the functional outcome in terms of range of movements was better with VLCP group.

In our study the VLCP group had slightly better functional outcome when compared to EXFIX group.
None of the patients in the present in the study population presented with iatrogenic neurovascular injury or implant breakage during the period of follow-up period.

**TABLE 1: Comparison of age groups with VLCP and EXFIX (N=40)**

<table>
<thead>
<tr>
<th>Age group</th>
<th>Treatment</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>VLCP</td>
<td>EXFIX</td>
</tr>
<tr>
<td>&lt;30</td>
<td>2 (10%)</td>
<td>1 (5%)</td>
</tr>
<tr>
<td>31-40</td>
<td>4 (20%)</td>
<td>8 (40%)</td>
</tr>
<tr>
<td>41-50</td>
<td>6 (30%)</td>
<td>7 (35%)</td>
</tr>
<tr>
<td>51-60</td>
<td>5 (25%)</td>
<td>3 (15%)</td>
</tr>
<tr>
<td>&gt;60</td>
<td>3 (15%)</td>
<td>1 (5%)</td>
</tr>
<tr>
<td>Total</td>
<td>20 (100%)</td>
<td>20 (100%)</td>
</tr>
</tbody>
</table>

**TABLE 2: Comparison of gender with VLCP and EXFIX groups (N=40)**

<table>
<thead>
<tr>
<th>Gender</th>
<th>Treatment</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>VLCP</td>
<td>EXFIX</td>
</tr>
<tr>
<td>Male</td>
<td>13 (65%)</td>
<td>12 (60%)</td>
</tr>
<tr>
<td>Female</td>
<td>7 (35%)</td>
<td>8 (40%)</td>
</tr>
<tr>
<td>Total</td>
<td>20 (100%)</td>
<td>20 (100%)</td>
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</table>

**TABLE 3: Comparison of mode of injury in VLCP and EXFIX group (N=40)**

<table>
<thead>
<tr>
<th>Mode of injury</th>
<th>Treatment</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>VLCP</td>
<td>EXFIX</td>
</tr>
<tr>
<td>SF</td>
<td>14 (70%)</td>
<td>12 (60%)</td>
</tr>
<tr>
<td>RTA</td>
<td>6 (30%)</td>
<td>8 (40%)</td>
</tr>
<tr>
<td>Total</td>
<td>20 (100%)</td>
<td>20 (100%)</td>
</tr>
</tbody>
</table>
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IV. CONCLUSION

From our study, we conclude that Early Primary fixation of the distal end radius fractures with volar LCP is very essential for good functional outcome as to avoid complication of prolonged immobilization and stiffness.

With the above results, the fracture fixation with volar plate and screw system in the management of distal radius articular fractures, especially in type C (Complete intra articular fractures) is a superior method to maintain the reduction till union and prevent the collapse of the fracture fragments, even in grossly comminuted, unstable and osteoporotic bones; as compared with external fixator augmented with K – wires.

Ligamentotaxis by external fixation provided favorable results in younger age group and in partial intraarticular type of distal radius fractures and requires at least 4 cortical purchases on each side for effective stability.

We conclude finally that there are no major differences in the functional outcome of both the techniques in terms of pain, range of movements with no statistical difference in the functional outcome. However Volar locking compression plate plays a better role than the external fixator in radiological parameters like volar tilt, radial inclination and radial length and also successful in achieving patient’s satisfaction with limited number of minor complications and early return to work.

BIBLIOGRAPHY


TABLE 4: Comparison of mean functional outcome with VLCP and EXFIX group (N=40)

<table>
<thead>
<tr>
<th>Functional Outcome</th>
<th>Treatment</th>
<th>Unpaired t test P value</th>
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<tbody>
<tr>
<td></td>
<td>VLCP (N=20)</td>
<td>EXFIX (N=19)</td>
</tr>
<tr>
<td>Palm</td>
<td>74 ± 13.14</td>
<td>71.58 ± 10.15</td>
</tr>
<tr>
<td>Dors flx</td>
<td>72 ± 11.52</td>
<td>68.42 ± 8.98</td>
</tr>
<tr>
<td>Sup</td>
<td>73.00 ± 15.93</td>
<td>72.63 ± 9.34</td>
</tr>
<tr>
<td>Prontr</td>
<td>71 ± 12.091</td>
<td>79 ± 8.82</td>
</tr>
</tbody>
</table>

TABLE 5: Comparison of complication with VLCP and EXFIX group

<table>
<thead>
<tr>
<th>Complication</th>
<th>Treatment</th>
<th>Total</th>
<th>Chi square</th>
<th>P value</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>VLCP</td>
<td>EXFIX</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Delayed union</td>
<td>0 (0%)</td>
<td>1 (14.3%)</td>
<td>3.65</td>
<td>0.092</td>
</tr>
<tr>
<td>Pin site infection</td>
<td>0 (0%)</td>
<td>2 (28.6%)</td>
<td>2 (20%)</td>
<td></td>
</tr>
<tr>
<td>Stiffness</td>
<td>2 (66.7%)</td>
<td>4 (57.1%)</td>
<td>6 (60%)</td>
<td></td>
</tr>
<tr>
<td>Sup infection</td>
<td>1 (33.3%)</td>
<td>0 (0%)</td>
<td>1 (10%)</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>3 (100%)</td>
<td>7 (100%)</td>
<td>10 (100%)</td>
<td></td>
</tr>
</tbody>
</table>
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