Anterograde Percutaneous Treatment for Lesser Metatarsal Fractures: Technique and Clinical Results

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Introduction

- Metatarsal fractures are common injuries in the outpatient orthopaedic setting.
- Lesser metatarsal fractures, although often technically simple, can lead to an inordinate number of unsatisfied patients.
- The treatment recommended in the literature is the fixation with K-wire in a retrograde manner, with the opening of the fracture site and externalization of the K-wire on the plantar surface of the foot. The complications described for this type of treatment are painful plantar callosities and plantar plate injuries.
- The objective of our study was to evaluate the results obtained with anterograde percutaneous technique for fractures of the lesser metatarsal located on shaft or neck of the lesser metatarsals.
- To our knowledge, there are no prospective publications about this technique.
• Prospective study with 14 patients from 2003 to 2008, where we evaluated the topography of the fractures, mechanism of trauma, associated comorbidities and AOFAS score for postoperative clinical assessments.

### Methods

<table>
<thead>
<tr>
<th>Comorbidities</th>
<th>#</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diabetes</td>
<td>4</td>
<td>28</td>
</tr>
<tr>
<td>Hypertension</td>
<td>2</td>
<td>14</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Mechanism of trauma</th>
<th>#</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct impact</td>
<td>5</td>
<td>36</td>
</tr>
<tr>
<td>Low energy</td>
<td>6</td>
<td>43</td>
</tr>
<tr>
<td>High energy (motorcycle)</td>
<td>3</td>
<td>21</td>
</tr>
<tr>
<td>Total</td>
<td>14</td>
<td>100</td>
</tr>
</tbody>
</table>
Methods

Table 1. Surgical Management of Central Metatarsal Fractures

<table>
<thead>
<tr>
<th>Radiographs</th>
<th>Parameters</th>
</tr>
</thead>
<tbody>
<tr>
<td>AP</td>
<td>&gt;3 a 4 mm translation</td>
</tr>
<tr>
<td>Lateral</td>
<td>&gt; 10 degrees angulations</td>
</tr>
<tr>
<td>Metatarsal alignment</td>
<td>Modification of the metatarsal parabola (loss of length)</td>
</tr>
</tbody>
</table>

Table 2. Incidence and anatomic distribution of patients and fractures in this study

<table>
<thead>
<tr>
<th>Topography</th>
<th># Fractures</th>
<th>%</th>
<th># patients</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neck</td>
<td>20</td>
<td>77</td>
<td>11</td>
<td>79</td>
</tr>
<tr>
<td>Diaphysis</td>
<td>6</td>
<td>23</td>
<td>3</td>
<td>21</td>
</tr>
<tr>
<td>Total</td>
<td>26</td>
<td>100</td>
<td>14</td>
<td>100</td>
</tr>
</tbody>
</table>
Anterograde surgical technique. A. Whimbrel acute surgical instrument introduced percutaneously 10mm from the base of the fractured metatarsal. B. Kirshner wire with 15 degrees of angulation at its distal end. C. Preparing to enter the Kirshner wire intramedullary. D. Kirshner wire introduced percutaneously. E. Longitudinal traction and handling of the forefoot to reduce the fracture. F. Kirshner wire inserted after fracture reduction.
Surgical technique

A. Neck fracture of the fourth metatarsal with deviation greater than 3mm in the frontal plane. B. Deviation at the oblique view. C. Fracture dislocation in the sagittal plane with more than 10 degrees of angulation. D. Radiography in anteroposterior demonstrating fracture reduction and placement of intramedullary Kirshner wire. D. Demonstration of reduced and positioning the wire in oblique incidence of the foot. E. Demonstration of reduction and positioning the wire in lateral view.
Results

• The most common fractures location were metatarsal neck with 79%.
• Involvement of multiple metatarsals (53%) was more common than isolated fractures (47%).
• Low-energy trauma (79%) were more frequent than high-energy (21%)
• Female patients with diabetes had the worst functional postoperative results
• The AOFAS score assessed at 6 months postoperatively had an averaged of 98 points ranging from 85 to 100 points
• There were no postoperative complications related to the type of treatment instituted
Conclusion

The surgical technique was effective for the treatment of fractures of the lesser metatarsals with lower complication rate compared to other established techniques in the literature.