Medial Malleolus Fracture Fixation in the Setting of Concomitant Tibial Shaft Fractures

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Disclosure

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Tibial Shaft Fracture with Concomitant Medial Malleolus Fracture

The association between posterior malleolus fractures and concomitant tibial shaft (TS) fractures is well-studied, however less is known about medial malleolus (MM) fracture management in setting of concomitant TS fractures.

Treatment of TS fractures with plate or intramedullary nail in setting of MM fractures may pose obstacles to standard MM fixation due to hardware that can impede optimal screw placement for fixation.

Aim:
1. Report the presentation and management strategies used to treat MM fractures in the setting of concomitant TS fracture
Concomitant Medial Malleolus Fracture

Methods

Retrospective Review

7 patients with TS fracture and concomitant MM fractures identified.
## Concomitant Medial Malleolus Fracture

### Patients

<table>
<thead>
<tr>
<th></th>
<th>Age (y)</th>
<th>Height (cm)</th>
<th>Weight (kg)</th>
<th>Sex</th>
<th>Tobacco Use</th>
<th>Medical History</th>
<th>Mechanism of Injury</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>67.9</td>
<td>152.4</td>
<td>107</td>
<td>F</td>
<td>No</td>
<td>DM, CAD, Tobacco</td>
<td>Fall From standing (FFS)</td>
</tr>
<tr>
<td>2</td>
<td>22.4</td>
<td>167.6</td>
<td>83.9</td>
<td>M</td>
<td>No</td>
<td></td>
<td>Motor vehicle accident (MVA)</td>
</tr>
<tr>
<td>3</td>
<td>31.9</td>
<td>182.9</td>
<td>83</td>
<td>M</td>
<td>No</td>
<td></td>
<td>MVA</td>
</tr>
<tr>
<td>4</td>
<td>41.0</td>
<td>177.8</td>
<td>79</td>
<td>M</td>
<td>Yes</td>
<td>Tobacco</td>
<td>Pedestrian vs. vehicle</td>
</tr>
<tr>
<td>5</td>
<td>66.8</td>
<td>177.8</td>
<td>118.8</td>
<td>F</td>
<td>No</td>
<td>Tobacco</td>
<td>FFS</td>
</tr>
<tr>
<td>6</td>
<td>13.9</td>
<td>182.9</td>
<td>65.5</td>
<td>M</td>
<td>Yes</td>
<td></td>
<td>MVA</td>
</tr>
<tr>
<td>7</td>
<td>29.8</td>
<td>na</td>
<td>na</td>
<td>F</td>
<td>Yes</td>
<td></td>
<td>MVA</td>
</tr>
</tbody>
</table>

Mean: 39.1, 173.6, 89.5
## Concomitant Medial Malleolus Fracture

### Fracture Characteristics

<table>
<thead>
<tr>
<th></th>
<th>TS fracture</th>
<th>MM fracture</th>
<th>Displacement (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Closed</td>
<td>Segmental</td>
<td>29.4</td>
</tr>
<tr>
<td>2</td>
<td>Open</td>
<td>Transverse</td>
<td>21.9</td>
</tr>
<tr>
<td>3</td>
<td>Open</td>
<td>Transverse</td>
<td>14.4</td>
</tr>
<tr>
<td>4</td>
<td>Open</td>
<td>Transverse</td>
<td>18</td>
</tr>
<tr>
<td>5</td>
<td>Closed</td>
<td>Distal Spiral</td>
<td>14.3</td>
</tr>
<tr>
<td>6</td>
<td>Open</td>
<td>Transverse</td>
<td>17.4</td>
</tr>
<tr>
<td>7</td>
<td>Closed</td>
<td>Transverse</td>
<td>19.1</td>
</tr>
<tr>
<td>Mean</td>
<td></td>
<td></td>
<td>19.2</td>
</tr>
</tbody>
</table>
Concomitant Medial Malleolus Fracture

Simultaneous treatment of TS and MM fractures in 7/7 patients

MM Fractures anatomically reduced
Concomitant Medial Malleolus Fracture

Technique: Screw Fixation
Concomitant Medial Malleolus Fracture

Technique: Plate Fixation
## Concomitant Medial Malleolus Fracture

<table>
<thead>
<tr>
<th></th>
<th>Tibial Fixation</th>
<th>Medial Malleolus Fixation Method</th>
<th>Medial Malleolus # of Screws</th>
<th>Screw position relative to nail</th>
<th>Complications</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>IMN, distal 2 interlocks, 3 proximal</td>
<td>Screws</td>
<td>1</td>
<td>Anterior</td>
<td>none</td>
</tr>
<tr>
<td>2</td>
<td>IMN, 1 interlock at each end</td>
<td>Plate</td>
<td>1</td>
<td>Anterior + posterior</td>
<td>none</td>
</tr>
<tr>
<td>3</td>
<td>IMN, distal, 2 interlocks</td>
<td>Screws</td>
<td>2</td>
<td>Medial</td>
<td>none</td>
</tr>
<tr>
<td>4</td>
<td>IMN, 1 interlock dis</td>
<td>Plate</td>
<td>0</td>
<td>Anterior + Posterior</td>
<td>chronic pain</td>
</tr>
<tr>
<td>5</td>
<td>Blade plate (previous TKA)</td>
<td>Screws</td>
<td>2</td>
<td>n/a</td>
<td>superficial wound dehiscence, delayed union of tibia (5.9mos)</td>
</tr>
<tr>
<td>6</td>
<td>IMN, 1 interlock</td>
<td>Screws</td>
<td>2</td>
<td>Medial</td>
<td>none</td>
</tr>
<tr>
<td>7</td>
<td>IMN 1 interlock</td>
<td>Screws</td>
<td>2</td>
<td>Medial</td>
<td>none</td>
</tr>
</tbody>
</table>
Concomitant Medial Malleolus Fracture

Average time to union: 3.12 mos. (1.53-5.93 mos)

Complications in 2 patients
1) Superficial wound dehiscence and delayed union
2) Chronic pain
Concomitant Medial Malleolus Fracture

Discussion:

MM fixation screws for screw-only or plate fixation can be redirected to accommodate an intramedullary rod in setting of concomitant treatment of MM and TS fractures.

MM Plate and screw position:
- Distal to nail
- Screws angled anteriorly, posteriorly, or medially relative to TS hardware
Concomitant Medial Malleolus Fracture

Limitations

- Selection bias
- Heterogeneous sample
  - Patients
  - Fracture characteristics
- Incomplete follow-up

Future directions

- Long term outcomes
- Comparative studies
- Hybrid implants to address both fractures
References


