Influence of distal tibiofibular synostosis on ankle function

HOU Zhen-hai 侯振海*, ZHOU Ji-hong 周继红, YE Hong 叶虹, SHI Jian-guo 施建国, ZHENG Long-bao 郑隆宝, YAO Jun 姚军 and NI Zhi-ming 倪志明

Objective: To study the influence of distal tibiofibular synostosis on ankle function.

Methods: From October 1998 to October 2004, a total of 281 consecutive patients underwent operations because of ankle fractures or distal fractures of the tibia and fibula. Distal tibiofibular synostosis occurred after operation in 8 patients. The duration of follow-up averaged 20.6 months (14-44 months). The ankle function was assessed on the basis of functional rating system described by Mazur.1

Results: According to Mazur’s ankle evaluation system, 4 patients achieved an excellent result, 2 a good result and 2 a fair result. The dorsiflexion of the synostosis ankle reduced by 8.26 degrees as compared with that of the contralateral ankle, and there was little influence on the plantar flexion. All the patients had a normal gait.

Conclusion: The distal tibiofibular synostosis after the operation of ankle fractures or distal fractures of the tibia and fibula usually gives rise to few symptoms and needs no specific treatment.

Key words: Synostosis; Ankle; Fractures, bone

There has been rare report about the influence of distal synostosis between the tibia and the fibula after operations due to ankle fractures or distal fractures of the tibia and fibula. From October 1998 to October 2004, a total of 281 consecutive patients with ankle fractures or distal fractures of the tibia and fibula were treated surgically in our hospital. Distal tibiofibular synostosis occurred in 8 patients after operation. A retrospective analysis was undertaken to assess the influence of synostosis on ankle function.

METHODS

There were a total of 8 patients inflicted with distal tibiofibular synostosis in this series including 6 male patients and 2 female patients who had an average age of 43.5 years (range, 24-61 years). The injury was caused by traffic accidents in 4 cases, fall from a height in 2 cases and sports injury in 2 cases. For the primary injury location, there were 4 cases of ankle fractures and 4 cases of fractures of distal tibia and fibula. There were 3 open fractures and 5 closed fractures. Immediate debridement, open reduction and internal fixation were performed in 2 cases. For the other 6 cases the operation were delayed for an average of 6 days (range, 4-9 days). All patients received plate and screw fixation. Associated injuries included brain injury in 1 case and thoracoabdominal injury in 1 case. The duration of follow-up averaged 20.6 months (range, 14-44 months) after operation.

At the final follow-ups, the degrees of plantar flexion and dorsiflexion of the ankle were measured and the gait was analyzed. The ankle score was evaluated according to Mazur’s ankle evaluation system.1

RESULTS

These patients were hospitalized for an average of 16.2 days (range, 9-21 days). All fractures healed within 16 weeks. There were no wound complications. The distal tibiofibular synostosis was visible radiologically within 12 weeks after operation. The range of motion and score of the ankle were recorded for all patients (Table 1).

According to Mazur’s ankle evaluation system, 4 patients had an excellent result (>92 points), 2 a good result (87-92 points) and 2 a fair result (65-86 points).
The dorsiflexion of the synostosed ankle decreased by 8.26° compared with that of the contralateral ankle, and the difference was statistically significant ($P<0.01$). The plantar flexion of the synostosis ankle reduced by 3.25° compared with that of the contralateral ankle, and the difference was not statistically significant ($P>0.05$). All 8 patients had a normal gait.

### Table 1. Range of motion and score of the ankle in 8 patients

<table>
<thead>
<tr>
<th>Case</th>
<th>Operated ankle Plantar flexion (degrees)</th>
<th>Contralateral ankle Plantar flexion (degrees)</th>
<th>Operated ankle Dorsiflexion (degrees)</th>
<th>Contralateral ankle Dorsiflexion (degrees)</th>
<th>Operated ankle score (points)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>45</td>
<td>47</td>
<td>9</td>
<td>21</td>
<td>93</td>
</tr>
<tr>
<td>2</td>
<td>45</td>
<td>48</td>
<td>12</td>
<td>23</td>
<td>90</td>
</tr>
<tr>
<td>3</td>
<td>46</td>
<td>51</td>
<td>15</td>
<td>19</td>
<td>95</td>
</tr>
<tr>
<td>4</td>
<td>49</td>
<td>50</td>
<td>13</td>
<td>21</td>
<td>94</td>
</tr>
<tr>
<td>5</td>
<td>40</td>
<td>51</td>
<td>9</td>
<td>22</td>
<td>70</td>
</tr>
<tr>
<td>6</td>
<td>47</td>
<td>48</td>
<td>10</td>
<td>19</td>
<td>94</td>
</tr>
<tr>
<td>7</td>
<td>48</td>
<td>49</td>
<td>11</td>
<td>20</td>
<td>80</td>
</tr>
<tr>
<td>8</td>
<td>47</td>
<td>49</td>
<td>12</td>
<td>20</td>
<td>89</td>
</tr>
<tr>
<td>Mean</td>
<td>45.88</td>
<td>49.13</td>
<td>11.38</td>
<td>19.64</td>
<td>88.13</td>
</tr>
</tbody>
</table>

### DISCUSSION

Distal tibiofibular synostosis is an unusual complication, with scanty literature describing its influence on sportsmen or skeletally immature patients. It is rarely reported about the effect of distal tibiofibular synostosis on ankle function after operation of ankle fracture or distal tibia and fibula fractures. The treatment of distal tibiofibular synostosis (conservatively or surgically) remains controversial.

In this series, we propose the possible pathogenesis of the distal tibiofibular synostosis: 1) hematoma absorption and ossification following the laceration of the interosseous membrane between distal tibia and fibula (Fig 1), 2) the damage of interosseous membrane caused by the Kirschner wire or screws (Fig 2). Bai et al pointed out that the procedure of fixing distal tibiofibular joint by cancellous screws might induce synostosis between tibia and fibula. To take out the screws in time is helpful to avoid such complication. At last, soft tissue damage, periosteal stripping during operation is also responsible for synostosis. Minimally invasive technique should be adopted, and undue stripping and deep drilling should be avoided to lower the incidence of distal tibiofibular synostosis.

![Fig.1. A: A male patient of 35 years old with fractures of medial and lateral malleolus, 2 days after operation. B: Syndesmotic lag screws between the tibia and fibula removed 12 weeks after operation. C: The plate and screws removed 20 months after operation.](image-url)
In theory, the distal fibula has a 2.4 mm extorsion under the condition of weight bearing. This serves to deepen the ankle mortise and tighten the interosseous membrane which results in increased stabilization of the ankle. Therefore synostosis between the tibia and fibula will refrain the fibula from extorsion and accordingly restrict the dorsiflexion and plantar flexion of the ankle. In our patients, we found that the dorsiflexion and plantar flexion of the synostosed ankle reduced by 8.26° and 3.25° respectively compared with that of the contralateral ankle. The average score according to Mazur’s ankle evaluation system was 88.13. All 8 patients had a normal gait, and only 1 patient complained of ankle pain after long time walking (>30 minutes). We believe that distal tibiofibular synostosis after operation of ankle fracture or distal tibia and fibula fractures has few symptoms and needs no specific treatment.

REFERENCES


(Received August 15, 2008)
Edited by SONG Shuang-ming