Anatomical reduction for intraarticular calcaneal fracture by using medial and sinus tarsi approach

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Naohiro Hio

My disclosure is in the Final AOFAS Program Book. I have no potential conflicts with this presentation.
According to the results regarding an analysis of the factors associated with patients who require subtalar arthrodesis after a calcaneal fracture, Radney et al.\textsuperscript{1}) reported such factors to include less reduction of the posterior talocalcaneal facet, as well as the height, alignment and shape of calcaneus. As a result, performing as much anatomical reduction as possible is considered to be essential for this fracture treatment.

The purpose of this presentation is that the aim of maximizing the anatomical reduction by using the medial and the sinus tarsi approach in order to eliminate as much as possible this kind of disability.
**Introduction**

- Materials and Methods
- Results
- Discussion
- Conclusion

### Cases
108 feet of 102 patients

### Sex (Male / Female)
92 / 16 feet

### Age
Mean 50.4 years

### The Average Duration of Follow-up
23.9 months

### Sanders Classification

<table>
<thead>
<tr>
<th>Type</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type II</td>
<td>52 feet</td>
</tr>
<tr>
<td>Type III</td>
<td>38 feet</td>
</tr>
<tr>
<td>Type IV</td>
<td>18 feet</td>
</tr>
</tbody>
</table>

### Operative Indications in This Method

1. Medial rotation of the fragment of the sustentaculum tali
2. Large displacement of the fragment of the tuberosity
3. >2mm displacement of the posterior facet

### Evaluations


- A'/A , A''/A : the percentage of the width (%)
- B'/B , B''/B : the percentage of the height (%)
- C' , C'' : the gap of articular surface (mm)

### Clinical Evaluation

Creighton-Nebraska scale

### Graphic Evaluation

Image assessment with CT showed improvements, as compared to the normal side.
**Materials and Methods**

**Medial Approach**

A vertical incision on the medial fracture line. The displacements of the fragments of the sustentaculum and the tuberosity are all reduced when using the medial approach. See next slide for details.

**Sinus Tarsi Approach**

A curved incision on the sinus tarsi. The displacement of the fragments of the posterior facet is reduced when using the sinus tarsi approach.
The surgical technique utilized the medial approach to identify the displaced fragments of the sustentaculum and the tuberosity, and manipulatively reduce the displacement by repeatedly dorsiflexing and plantarflexing ankles while keeping the hindfoot in the varus position.

Different from the method by McReynolds\textsuperscript{3}) and Stephenson\textsuperscript{4}), we reduce manipulatively the displaced fragments of the sustentaculum and the tuberosity.
## Sanders classification

<table>
<thead>
<tr>
<th>Type</th>
<th>C-N score (the percentage of ‘excellent’ and ‘good’)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type II</td>
<td>86%</td>
</tr>
<tr>
<td>Type III</td>
<td>83%</td>
</tr>
<tr>
<td>Type IV</td>
<td>56%</td>
</tr>
</tbody>
</table>

## graphic evaluations

<table>
<thead>
<tr>
<th></th>
<th>Pre op.</th>
<th>Post op.</th>
</tr>
</thead>
<tbody>
<tr>
<td>the average of the width</td>
<td>123%</td>
<td>106%</td>
</tr>
<tr>
<td>the average of the height</td>
<td>87%</td>
<td>95%</td>
</tr>
<tr>
<td>the average of the gap of articular surface</td>
<td>6mm</td>
<td>0.7mm</td>
</tr>
</tbody>
</table>

## Complications

- plantar nerve injury ; 10 foots
- restriction on great toe’s flexion ; 2 foots
- skin necrosis ; 1 foot
- pseudoaneurysm of a tibialis posterior artery ; 1 foot
The medial rotation of the fragment of the sustentaculum cause the less reduction of the calcaneal height, width and the displacement of the fragment of the tuberosity, and it also cause the wedge shaped deformity of the posterior facet.

Therefore the reduction of the medial fracture line is important for anatomical reduction.
<advantage of this method>

1) It is possible to obtain a maximum anatomical reduction by this method, and it is possible to also prevent disability results.

2) The results are good not only in case of Sanders Type II, III but also Type IV.

<limitation>

1) This method is less invasive, but not minimum invasive surgery.

2) When using the medial approach, it is necessary to pay extremely close attention to the plantar nerve and vascular.
<Conclusions>

1) We performed the operations for 108 foots of intraarticular calcaneal fracture by the medial and sinus tarsi approach.

2) This is excellent technique makes it possible to achieve maximum anatomical reductions. When using the medial approach, however, it is necessary to pay attention to the plantar nerve and vascular.

<References>

2) Sanders RW et al., Operative treatment in 120 displaced intraarticular calcaneal fractures. Results using a prognostic computed tomography scan classification. Clin Orthop Relat Res. 1993;290:87-95
3) McReynolds IS, Trauma to the Os Calcis and Heel Cord. In Disorder of the Foot. 1982:1497-1542
4) Stephenson JR, Treatment of displaced intra-articular fractures of the calcaneus using medial and lateral approaches, internal fixation, and early motion. JBJS Am 1987;69:115-130