Evaluation of hindfoot alignment change before and after total knee arthroplasty

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Disclaimer

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Suzuyo Ohashi

My disclosure is in the Final AOFAS Program Book. I have no potential conflicts with this presentation.
Introduction

- Total knee arthroplasty (TKA) alters the alignment of whole lower extremity. This change is observed mainly in femorotibial joint, while adjacent joints are also affected.

- Some authors have reported hindfoot malalignment associated with knee deformity, but what influence has TKA had on the hindfoot alignment is still unclear\(^1\)-\(^3\).

- There are some patients who complain of a hindfoot pain after TKA surgery. We hypothesize that the alteration of limb alignment after TKA is associated with hindfoot alignment, and this influence may cause a hindfoot pain.

- In this study, knee and hindfoot alignment were examined before surgery, immediately after surgery, and one year after surgery to evaluate the effect of TKA on hindfoot alignment.
Patients and Methods

Patients

28 feet of 27 patients who had undergone TKA at our institute due to osteoarthritis of the knee.

- 5 male, 22 female
- Mean age: 75.1 years (range, 61-83 years)
- All patients had a varus knee deformity

Radiographic technique

For all subjects, weightbearing whole lower extremity view and hindfoot alignment view (Fig. 1) were taken at before, one month after, and one year after surgery.

Fig. 1: Our method for positioning patient on the hindfoot alignment view platform. Patients stood on a radiolucent platform with equal weight on both feet. This platform was flat in the rear part and inclined by 30° in the front part, so that the forefoot of patients was planterflexed. The X-ray beam was oriented down 5° from the horizontal.
Materials and Methods

Radiographic evaluation

The images were evaluated for the FTA and the VVA.

- Femorotibial angle (FTA)
- Varus-valgus angle (VVA) (Fig. 2)

VVA is the angle between the axis of the tibia and the line connecting the inferolateral border of the posterior facet of the calcaneus and the superior edge of sustentaculum tali.

The mean VVA of healthy adult is $76.4 \pm 3.6^\circ$.

All cases were divided into two groups based on the preoperative VVA.

- Varus hindfoot group: $VVA \leq 76^\circ$ (11 feet)
- Valgus hindfoot group: $VVA > 76^\circ$ (17 feet)

Fig. 2: (A) A radiograph of the hindfoot alignment view (B) 3D-CT front view of a left calcaneus a: Superior edge of sustentaculum tali b: Inferolateral border of the posterior facet of the calcaneus
Fig. 3: The mean FTAs of valgus hindfoot and varus hindfoot group

No significant difference was found in preoperative FTA between the groups. The mean postoperative FTAs were corrected in both groups. No significant difference was found between the groups.
Results

Fig. 4: The mean VVA of valgus hindfoot group
In the valgus hindfoot group, the mean VVA significantly decreased with time.

Fig. 5: The mean VVA of varus hindfoot group
No significant change was observed in the varus hindfoot group.
Discussions

It is known that hindfoot has a compensate function, and its alignment is influenced by the overall mechanical axis of the leg\(^5\). However, little is known what the alignment of the hindfoot is when the knee is deformed with OA and whether this alignment changes after TKA.

In our study, hindfoot alignment was affected by TKA surgery especially in preoperatively valgus hindfoot group. In valgus hindfoot group, hindfoot valgus was gradually improved after TKA to be closer to neutral position, while varus hindfoot remained varus after TKA.

These findings imply that preoperatively valgus hindfoot is flexible and is able to adapt to alignment change, while preoperatively varus hindfoot loses their flexibility to compensate for alignment change. This rigid hindfoot may eventually become symptomatic, a long-term follow-up should be needed.
### Valgus Hindfoot Group

<table>
<thead>
<tr>
<th>Normal</th>
<th>Knee OA</th>
<th>After TKA</th>
</tr>
</thead>
<tbody>
<tr>
<td>flexible</td>
<td>hindfoot</td>
<td>rigid</td>
</tr>
<tr>
<td>compensatory function (+)</td>
<td>with knee OA</td>
<td>compensatory function (-)</td>
</tr>
<tr>
<td>valgus</td>
<td></td>
<td>varus</td>
</tr>
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Summary

- We evaluated the effect of TKA on hindfoot alignment using a new weightbearing hingfoot alignment view.

- In the group of preoperatively valgus hindfoot, hindfoot alignment gradually changed after TKA to be closer to neutral position, while no significant alignment changes were observed after TKA in the group of preoperatively varus hindfoot.

- It is likely that preoperatively valgus hindfoot is flexible and is able to adapt to alignment change, while preoperatively varus hindfoot loses their flexibility to compensate for alignment change.

References
5) Hayashi K et al. Foot Ankle Int. 2008 Apr;29(4):400-6.