Relations of ankle alignment and MRI findings of ankle osteoarthritis

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Disclosure

NO CONFLICT DISCLOSE

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We have no potential conflicts with this presentation.
Compared with X-ray findings, magnetic resonance imaging (MRI) is gaining attention as a tool for examining the severity of osteoarthritis (OA).

However, there are few reports on the relationship between MRI and X-ray findings in ankle joints.

We assessed the ankle joint alignment to identify factors for predicting MRI findings from X-ray
Patients: 46 feet of 45 patients diagnosed with primary ankle OA of the varus type at our hospital.

Age: average 62.8 years.

sex: males, n = 16; females, n = 29

X-ray: Ankle joint alignment was assessed by measuring the tibial anterior surface (TAS) angle and tibial lateral surface (TLS) angle in X-ray images.
MRI: The localization of bone marrow edema (BME) was investigated by partitioning the articular surfaces at the talocrural, Chopart, and subtalar joints into 22 regions.

22 regions are numbered as shown (area1~11, area1’~11’).
We divided the patients into two groups (with and without BME) and compared the TAS and TLS angles between them.

T-test was used to determine the significant differences in the TAS and TLS angles of each of the 22 regions.

Moreover, for predicting the occurrence of BME, we divided the patients into two groups: training set and testing set.

The validity of the results was verified by measuring the cut-off values of the TAS and TLS angles from the receiver operating characteristic (ROC) curves, which indicated statistically significant differences.
Results

- TAS and TLS angles at the anteromedial part of the tibial canopy and medial malleolus joint surface were significantly lower in the BME group.

<table>
<thead>
<tr>
<th>Area</th>
<th>TAS angle</th>
<th>TLS angle</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Talus side</td>
<td>85.2</td>
<td>79.1</td>
<td>&lt;0.002</td>
</tr>
<tr>
<td>Tibial side</td>
<td>85.4</td>
<td>78.8</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Anteromedial</td>
<td>84.3</td>
<td>78.5</td>
<td>&lt;0.05</td>
</tr>
</tbody>
</table>

* N.S = not significant
The cut-off value was obtained from the ROC curve of the training set.

**ROC curve of the TAS angle**

- **TAS angle cut-off value ≤ 82°**

**ROC curve of the TLS angle**

- **TLS angle cut-off value ≤ 76°**
By applying the obtained cut-off values to the testing set, the occurrence of BME in the medial malleolus joint could be predicted.
In knee OA with high deformation, the frequency of BME occurrence is doubled. The wide occurrence of BME increases the inversion tendency of the knee.

The incidence of BME increases with the stage of OA progression.

The localization of BME is related to the cartilage defects. Increase in BME is a precursor of future chondropathy.

BME is a risk factor for pain exacerbation.

In a previous study of knee OA, BME was closely related to multiple factors such as the pathology, severity, and prognosis of OA.

Predicting the occurrence of BME can be a useful index for treatment planning.
Results of this study (Ankle OA)

TAS angle $\leq 82^\circ$ or TLS angle $\leq 76^\circ$

BME is occurring at a high rate.

These findings could be the basis of a new diagnostic tool to estimate disease severity.

Limitations of this study

1. **Limited number of samples.**
   - Fewer cases in early stages.
   - Not many cases of BME occurrence in the subtalar and Chopart joints.

2. **Study of MRI findings was limited to BME localization.**
   - Size and qualitative evaluation of BME was not performed.
   - Association with clinical symptoms (utilization of SAFE-Q).

3. **Foot alignment was not evaluated.**
   - Alignment evaluation was not performed around the hind foot and Chopart joints.
Conclusion

- BME occurrence was related to ankle alignment in ankle OA.
- BME occurrence can be predicted from the TAS and TLS angles. This may be used as a diagnostic tool for predicting the disease condition and prognosis.

References