MRI evaluation with severity of the ankle osteoarthritis

Hiroyuki Mitsui, MD
Takaaki Hirano, MD
Yui Akiyama, MD
Wataru Endo, MD
Shingo Maeda, MD
Aya Uchino, MD
Hisateru Niki, MD

Dept. of Orthopaedic surgery, St. Marianna Univ. school of Med.
Disclosure

NO CONFLICT DISCLOSE

MRI evaluation with severity of the ankle osteoarthritis

Hiroyuki Mitsui, MD
Takaaki Hirano, MD
Yui Akiyama, MD
Wataru Endo, MD
Shingo Maeda, MD
Aya Uchino, MD
Hisateru Niki, MD

Our disclosures are in the Final AOFAS Mobile App. We have no potential conflicts with this presentation.
Introduction

- In ankle osteoarthritis (OA), Takakura-Tanaka classification is a simple and useful diagnostic tool.

- In addition, MRI has been noted the severity as determined tool in conjunction with the X-ray findings from the state of peripheral joint cartilage in OA area.

- We assessed MRI findings of ankle OA at each stage of Takakura-Tanaka classification to investigate the effects of bone and articular cartilage.
 Patients: 46 feet of 45 patients who had a diagnosis of primary ankle OA of the varus type in our hospital.

Age: average 62.8 years.

sex: Male 16, Female 29.

Takakura-Tanaka Classification (X-ray diagnosis):

MRI: Investigate the localization of Bone Marrow Edema (BME) partitioned articular surface by MRI in 22 regions at the Talocrural, Chopart, Subtalar joints.
22 regions are numbered as shown (area1~11, area 1’~11’), and compared the localization of BME by MRI and X-ray severity.
Results

- The occurrence of BME in each area.

<table>
<thead>
<tr>
<th>Area</th>
<th>Talocrural joint</th>
<th>Chopart joint</th>
<th>Subtalar joint</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>50</td>
<td>9</td>
<td>13</td>
</tr>
<tr>
<td>2</td>
<td>15</td>
<td>2</td>
<td>13</td>
</tr>
<tr>
<td>3</td>
<td>28</td>
<td>7</td>
<td>13</td>
</tr>
<tr>
<td>4</td>
<td>17</td>
<td>2</td>
<td>13</td>
</tr>
<tr>
<td>5</td>
<td>7</td>
<td>2</td>
<td>13</td>
</tr>
<tr>
<td>6</td>
<td>59</td>
<td>13</td>
<td>13</td>
</tr>
<tr>
<td>1'</td>
<td>54</td>
<td>13</td>
<td>13</td>
</tr>
<tr>
<td>2'</td>
<td>35</td>
<td>13</td>
<td>13</td>
</tr>
<tr>
<td>3'</td>
<td>30</td>
<td>13</td>
<td>13</td>
</tr>
<tr>
<td>4'</td>
<td>30</td>
<td>13</td>
<td>13</td>
</tr>
<tr>
<td>5'</td>
<td>61</td>
<td>13</td>
<td>13</td>
</tr>
<tr>
<td>6'</td>
<td>11</td>
<td>13</td>
<td>13</td>
</tr>
</tbody>
</table>

- +2SD 61%
- +1SD 41%
- Average 21%
Related Takakura-Tanaka classification and BME occurrence.

⇒ In area 1, 2, 5 and 1', 2', 5' are BME has occurred at a high rate.
⇒ In those areas, increasing trend of BME occurrence was seen as the Takakura-Tanaka classification progresses.

Cochran-Armitage Test

- Area 1: $P=0.00533$
- Area 2: $P=0.0108$
- Area 5: $P=0.00334$
- Area 1': $P=0.588$
- Area 2': $P=0.024$
- Area 5': $P=0.0391$
Relations of BME and cartilage damage.

- BME on knee OA associated with localization of cartilage deficiency.
- Progression of cartilage deficiency is a risk factor of BME pathogenesis.
- Appearance of BME is a precursor of future cartilage disorder.
- Incidence rate of BME which can be confirmed by MRI increases as the progression staging on knee OA.

BME will be associated with a long prognosis of Knee OA.

Similarly, in the ankle joint.

Result of this study (Ankle OA)

- Correlation of Takakura-Tanaka classification and frequency of BME occurrence.
- Load is concentrated at the anterior medial ankle surface as the stage progresses, BME in this location will appear at a high rate.
BME and pain

- Existence of BME more than 1cm is a risk factor for pain induction of knee OA.

- Frequency and degree of BME are associated with severity of pain.

- Growth factor which works in bone-marrow tissue presenting BME induces pain by promoting growth of sensory nerves.

BME is associated with pain.
✓ BME appearing cases are suggested that disease severity will be higher because of exacerbation of clinical symptoms such as pain.

✓ On the other hand, not BME appearing cases are also existed despite stage progresses on this study.

Future

Progression of OA can predict by assess disease severity more segmentally using BME findings on MRI if disease severity is equal on X-ray.
Limitations of this study

1, Fewer cases of early staging.
   - Takakura-Tanaka Stage1-3a is less than the cases of more than stage 3b.
   - Low data reliability of early stage.

2, Study of MRI findings have been limited to BME localization.
   - Evaluation of the size and the fine signal changes in BME.
   - Assessment of associated findings such as range of cartilage deficiency
   - Associated with clinical symptoms (utilization of SAFE-Q).
Conclusion

- The localization of BME was related to Takakura-Tanaka classification in ankle OA.

- We considered that the severity of ankle OA can be used with the MRI findings and Takakura-Tanaka classification together.

references