The Characteristic Findings to Assess Meniscal Healing Status After Meniscal Repair on MRI-T2 Mapping

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MRI characteristics after meniscal repair

✓ A linear increased signal intensity extending to the surface can persist at the site of surgery for many years following successful meniscal repair in conventional MRI.\(^1,2\)

✓ Recently, MRI T2 mapping has developed to evaluate the qualitative condition of cartilage and meniscus to assess the degeneration.\(^3,4,5,6,7\)

✓ However, there is no report to assess the accuracy of T2 mapping for meniscal healing after arthroscopic repair.
✓ To examine the effectiveness of MRI T2 mapping for the assessment of meniscal healing after repair as confirmed by arthroscopy in comparison with conventional MRI.
Enrolled patients

- Meniscal repair
- 2\textsuperscript{nd} look arthroscopy
- T2 mapping @ both 1\textsuperscript{st} surgery and 2\textsuperscript{nd} look arthroscopy

Total 26 menisci of 24 patients
Mean age 23.3 years (14-43 years)
9 males/ 15 females
Methods

MRI T2 mapping

Achieva; Philips, Netherlands

Analysis: VirtualPlace (AZE Ltd., Japan)

- TR 2100 msec,
- TE 10, 20, 30, 40, 50, 60 msec
- field of view 16 cm,
- slice thickness 3 mm
- matrix 352 × 352
- Scan time 14 min
Accuracy assessment

Arthroscopy @ 2\textsuperscript{nd} look \iff MRI @ 2\textsuperscript{nd} look

<table>
<thead>
<tr>
<th>Complete Healed</th>
<th>Incomplete/Unhealed</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>16</strong> menisci</td>
<td><strong>10</strong> menisci</td>
</tr>
</tbody>
</table>

- Conventional Crues 3-stage classification
- T2 mapping
  1. change of T2 value (ΔT2)
  2. existence of the red colored line with the highest T2 value (65ms) in the primary injury
## Results

### conventional MRI

<table>
<thead>
<tr>
<th>Crues classification</th>
<th>healed</th>
<th>Incompletely/unhealed</th>
</tr>
</thead>
<tbody>
<tr>
<td>improved</td>
<td>8</td>
<td>3</td>
</tr>
<tr>
<td>no change</td>
<td>8</td>
<td>7</td>
</tr>
</tbody>
</table>

P=0.05

### T2 mapping- ΔT2

![Bar chart showing ΔT2 (msec) comparison between healed and incompletely/unhealed categories.](attachment:image.png)

- ΔT2 (msec) values:
  - Healed: -7.5 msec
  - Incompletely/unhealed: -2.7 msec

P=0.43
### Results

- **T2 mapping - ΔT2 ROC**

  - Sensitivity of 81.2%
  - Specificity of 80%
  - Odds ratio of 17.3
  - $P=0.001$

- **T2 mapping - red colored line**

  - Sensitivity of 81.3%
  - Specificity of 90%
  - Odds ratio of 39.0
  - $P=0.001$

<table>
<thead>
<tr>
<th>Status</th>
<th>Healed</th>
<th>Incompletely/Unhealed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Remained</td>
<td>5</td>
<td>9</td>
</tr>
<tr>
<td>Disappeared</td>
<td>11</td>
<td>1</td>
</tr>
</tbody>
</table>
Accuracy of assessment of repaired meniscal healing

➢ Conventional – stricter criterion for the fluid level intensity\textsuperscript{10}
  High specificity (88-92%), but low sensitivity (41-69%)

➢ Arthrography\textsuperscript{11,12}
  High sensitivity and specificity (88-89%, 78%)
  But invasive and risk of allergy to the contrast agent

➢ T2 mapping - current study
  High sensitivity and specificity (81%, 80-90%)
  No invasive examination
✓ No consensus in the setting of T2 mapping

✓ Small sample size

✓ Age variation of patients
✓ MRI T2 mapping differentiated the healing status after meniscal repair using the ΔT2 value and visual color mapping.

✓ A cutoff value of 5.2 msec decrease at the repaired area and disappearance of a colored line with a high T2 value were significant findings for arthroscopic meniscal healing assessment.
References


