Degree of Preoperative Subchondral Bone Marrow Lesion is Associated with Postoperative Outcome after Medial Opening Wedge High Tibial Osteotomy

Kim MS, Kim CK, Choi KY, In Y
Seoul St. Mary’s Hospital
The Catholic University of Korea
Conflict of interest

Kim MS, MD.
Kim CK, MD.
Choi KY, MD.
In Y, MD, Ph.D.

We have no financial conflict to disclose.
Subchondral Bone Marrow Lesions (BMLs)

- Growing necessity of Association between articular cartilage & BMLs
- Well known – Relation between BMLs & articular cartilage
- BMLs – Total and Unicompartmental knee arthroplasty
- Very little known about how subchondral BMLs influence the outcome after HTO
Purpose of the Study

- In HTO
- Investigation of association between
- The severity of subchondral bone marrow lesions at the time of HTO
- Patient reported pain and symptom preoperatively and postoperatively at 1, 2 year.
Materials and Methods

◆ Retrospective Review
  ➢ June, 2011 ~ May, 2016
  ➢ Single surgeon, Single institute
  ➢ 151 MOWHTOs

◆ Inclusion
  ➢ Minimum 2 Y follow up
  ➢ 50% < postop. weight bearing line (WBL) < 75%

◆ Exclusion
  ➢ Lateral and patellofemoral OA

◆ Final enrollment
  ➢ 136 MOWHTOs
Outcome Variables

◆ Demographic data
  ➢ Age, Sex, BMI, ASA score, Operation side

◆ Radiographic variables
  ➢ Degree of OA (K-L grade)
  ➢ Preop & postoperative varus deformity
    ✓ Mechanical hip-knee-ankle axis (HKA angle)
    ✓ Weight bearing line (WBL) ratio (%)

◆ Patient reported outcomes measures (PROMs)
  ➢ WOMAC score (Pain, Function, Total scores)

◆ The degree of BMLs
  ➢ The MRI Osteoarthritis Knee Score (MOAKS) criteria
The degree of BMLs

◆ MOAKS criteria
✓ The location & severity of BMLs
➢ 0 = no lesions
➢ 1 = lesion filling less than 1/3 of the bony lesion
➢ 2 = lesion filling between 1/3 and 2/3 of the lesion
➢ 3 = lesion filling more than 2/3 of the lesion
✓ Medial femur, Medial Tibia and Sum
# Results: Demographics

<table>
<thead>
<tr>
<th>Demographics</th>
<th>BMLs present (n=96)</th>
<th>No of BMLs (n=40)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age (years)</strong></td>
<td>55.9 ± 6.6</td>
<td>55.5 ± 7.1</td>
<td>0.746</td>
</tr>
<tr>
<td><strong>Gender (Female, %)</strong></td>
<td>84 (87.5%)</td>
<td>35 (87.5%)</td>
<td>1.000</td>
</tr>
<tr>
<td><strong>BMI (kg/m²)</strong></td>
<td>26.2 ± 3.8</td>
<td>25.8 ± 2.9</td>
<td>0.568</td>
</tr>
<tr>
<td><strong>Operation side (Lt, %)</strong></td>
<td>53 (55.2 %)</td>
<td>23 (57.5%)</td>
<td>0.806</td>
</tr>
<tr>
<td><strong>K-L Grade</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>42 (43.8%)</td>
<td>22 (55.0%)</td>
<td>0.327</td>
</tr>
<tr>
<td>3</td>
<td>39 (40.6%)</td>
<td>15 (37.5%)</td>
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</tr>
<tr>
<td>4</td>
<td>15 (15.6%)</td>
<td>3 (7.5%)</td>
<td></td>
</tr>
<tr>
<td><strong>ASA grade</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>49 (51.0%)</td>
<td>24 (60.0%)</td>
<td>0.695</td>
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<td>3</td>
<td>5 (5.2%)</td>
<td>1 (2.5%)</td>
<td></td>
</tr>
<tr>
<td><strong>Preoperative</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HKA angle</td>
<td>Varus 7.4 ± 2.8</td>
<td>Varus 7.5 ± 3.1</td>
<td>0.857</td>
</tr>
<tr>
<td>WBL ratio</td>
<td>18.1 ± 12.2</td>
<td>18.2 ± 13.8</td>
<td>0.966</td>
</tr>
<tr>
<td><strong>Postoperative</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HKA angle</td>
<td>Valgus 1.6 ± 1.7</td>
<td>Valgus 1.2 ± 1.5</td>
<td>0.178</td>
</tr>
<tr>
<td>WBL ratio</td>
<td>58.0 ± 6.4</td>
<td>57.2 ± 5.4</td>
<td>0.491</td>
</tr>
</tbody>
</table>
## Results: Demographics

<table>
<thead>
<tr>
<th>Demographics</th>
<th>Group 1 (MOAKS 0) (n=40)</th>
<th>Group 2 (MOAKS 1, 2) (n=32)</th>
<th>Group 3 (MOAKS 3, 4) (n=40)</th>
<th>Group 4 (MOAKS 5, 6) (n=24)</th>
<th>P-value</th>
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<td>Age (years)</td>
<td>55.5 ± 7.1</td>
<td>56.9 ± 6.6</td>
<td>54.4 ± 7.6</td>
<td>57.3 ± 4.1</td>
<td>0.266</td>
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<td>26.5 ± 4.1</td>
<td>26.2 ± 3.6</td>
<td>25.9 ± 3.7</td>
<td>0.855</td>
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<td>Operation side (Lt, %)</td>
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<td>14 (35.0%)</td>
<td>9 (37.5%)</td>
<td>0.266</td>
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<tr>
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<td>15 (37.5%)</td>
<td>9 (28.1%)</td>
<td>20 (50.0%)</td>
<td>10 (41.7%)</td>
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<td>3 (7.5%)</td>
<td>4 (12.5%)</td>
<td>6 (15.0%)</td>
<td>5 (20.8%)</td>
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<td><strong>Preoperative HKA angle</strong></td>
<td>Varus 7.5 ± 3.1</td>
<td>Varus 6.7 ± 2.5</td>
<td>Varus 6.8 ± 2.3</td>
<td>Varus 7.5 ± 2.1</td>
<td>0.441</td>
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<tr>
<td><strong>WBL ratio</strong></td>
<td>18.2 ± 13.8</td>
<td>20.9 ± 10.8</td>
<td>20.6 ± 11.0</td>
<td>15.0 ± 8.5</td>
<td>0.217</td>
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<tr>
<td><strong>Postoperative HKA angle</strong></td>
<td>Valgus 1.2 ± 1.5</td>
<td>Valgus 1.5 ± 1.6</td>
<td>Valgus 1.6 ± 1.7</td>
<td>Valgus 1.6 ± 1.7</td>
<td>0.604</td>
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<tr>
<td><strong>WBL ratio</strong></td>
<td>57.2 ± 5.4</td>
<td>57.2 ± 6.3</td>
<td>58.3 ± 6.1</td>
<td>58.4 ± 7.3</td>
<td>0.764</td>
</tr>
</tbody>
</table>
Results: WOMAC – Femur & Tibia

WOMAC Pain

- Femur
- Tibia

WOMAC Function

- Femur
- Tibia

Pain

- Preop
- POD 1Y
- POD 2Y

Function

- Preop
- POD 1Y
- POD 2Y

*; < 0.05
Results: WOMAC – BMLsum

WOMAC Pain

- Preop
- POD 1Y
- POD 2Y

*; < 0.05

WOMAC Function

- Preop
- POD 1Y
- POD 2Y

*; < 0.05
Conclusion

◆ **Nearly 70% of MOWHTO patients**

: Subchondral BMLs on preoperative MRI

◆ **Subchondral BMLs and PROMs**

✓ No association at postoperative 2 years

✓ **Degree of BMLs**

→ **Worse Pre & Postoperative 1 year**

**WOMAC (Pain, Function & Total)**
Reference


