Robotic-arm assisted total knee arthroplasty is associated with improved early functional recovery and reduced time to hospital discharge compared with conventional jig-based total knee arthroplasty: a prospective cohort study

Publication

Goal of study
To compare early postoperative functional outcomes and time to hospital discharge between conventional jig-based total knee arthroplasty (TKA) and robotic-arm assisted TKA.

Materials and methods
- Prospective comparative cohort study
- 40 consecutive patients undergoing conventional jig-based TKA followed by 40 consecutive patients receiving robotic-arm assisted TKA
- No clinical differences in baseline characteristics between the two groups
- All surgical procedures were performed by a single surgeon
- Same surgical exposure (medial parapatellar approach)
- Same implant system (Triathlon PS)
- Standardized postoperative inpatient rehabilitation
- Inpatient functional outcomes and time to hospital discharge were collected in all study patients classification system

Materials and methods

<table>
<thead>
<tr>
<th>MASTI classification</th>
<th>Description of soft tissue preservation</th>
<th>Points</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grade A</td>
<td>Excellent</td>
<td>&gt;34</td>
<td>Iatrogenic injury to only 1 zone with relative soft tissue preservation of the other zones</td>
</tr>
<tr>
<td>Grade B</td>
<td>Average</td>
<td>25-33</td>
<td>Minimal iatrogenic injury to ≥2 zones with relative soft tissue preservation of the other zones</td>
</tr>
<tr>
<td>Grade C</td>
<td>Poor</td>
<td>&lt;24</td>
<td>Significant iatrogenic soft tissue injury to ≥3 zones</td>
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<tr>
<td>Grade D</td>
<td>Defunctioned knee</td>
<td>0</td>
<td>Injury to superficial MCL ± LCL ± extensor mechanism defunctioning the knee</td>
</tr>
</tbody>
</table>

Note: The proposed MASTI classification system is a reproducible grading scheme for describing iatrogenic bone and soft tissue injury in TKA

Results
When comparing robotic-arm assisted TKA to conventional instrumented, robotic-arm assisted TKA was associated with:

- Improved maximum knee flexion at discharge (p < 0.001) compared with conventional jig-based TKA
- Less post-operative pain (p < 0.001) and post-operative haemoglobin levels (p < 0.001)
- Less time to straight leg raise (p < 0.001)
- Less in-patient PT sessions (p < 0.001)
- Less time in hospital discharge (26% reduction in length of stay)

Conclusion
Robotic-arm assisted TKA was associated with decreased pain, improved early functional recovery and a reduced time to hospital discharge compared with conventional jig-based TKA.

Fig. 1
Intraoperative photographs showing soft tissue injury for each grade of MASTI classification system. Type 6 injuries were observed in this study: LCL, lateral collateral ligament; MCL, medial collateral ligament.

Table 1
Description of the MASTI Classification System.

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
<th>Points</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type 6</td>
<td>Uncontrolled soft tissue (≥3 point)</td>
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<tr>
<td>Type 5</td>
<td>Planned soft tissue release</td>
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<td></td>
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<tr>
<td>Type 4</td>
<td>Soft tissue retraction</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Type 3</td>
<td>Soft tissue laceration</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Type 2</td>
<td>Soft tissue laceration</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Type 1</td>
<td>Complete uncontrolled knee defunctioning due to iatrogenic MCL, LCL, or complete patella tendon injury</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: Description of the MASTI Classification System.

Table 1

Fig. 2
Boxplot showing pain scores as measured using the numerical rating scale in conventional jig-based total knee arthroplasty (TKA) versus robotic-arm assisted TKA.

No injuries were observed in the robotic-arm group (p < 0.001), and in the conventional group 6 injuries were observed in this study. LCL, lateral collateral ligament; MCL, medial collateral ligament.

Table 1

Note: Description of the MASTI Classification System.