IN VIVO KINEMATIC EVALUATION
OF A NEW DESIGN TOTAL KNEE ARTHROPLASTY
USING DYNAMIC RADIOSTEREOMETRIC ANALYSIS

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II ORTHOPEDIC AND TRAUMATOLOGIC CLINIC
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GIULIO MARIA MARCHEGGIANI MUCCIOLI MD, PhD and other co-authors have nothing to disclose
Purpose

• To assess, using model-based dynamic radiostereometric analysis (RSA), the biomechanical behaviour of a new design posterior-stabilized (PS) fixed-bearing (FB) total knee arthroplasty (TKA) in vivo while patients performing two common motor tasks.

• Hypothesis: model-based dynamic RSA is able to detect different behaviour of the implant under weight-bearing and non-weight-bearing conditions.
## Methods – Demographic data

<table>
<thead>
<tr>
<th>Metric</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>NUMBER OF PATIENTS</td>
<td>15</td>
</tr>
<tr>
<td>MEAN AGE</td>
<td>69 yo (65-72 range)</td>
</tr>
<tr>
<td>SEX</td>
<td>5 females, 10 males</td>
</tr>
<tr>
<td>LEGS</td>
<td>8 right legs, 7 left legs</td>
</tr>
<tr>
<td>FOLLOW UP</td>
<td>9 months</td>
</tr>
</tbody>
</table>
Methods

RSA DEVICE (BI-STAND DRX 2)

DATA PROCESSING

Two analyzed motor tasks

- Sit to stand (weightbearing)
- Rom (no weightbearing)
Statistical analysis

✓ Grood and Suntay

- INTERNAL/EXTERNAL ROTATIONS
- VARUS/VALGUS ROTATIONS
- ANTERIOR/POSTERIOR TRANSLATIONS

✓ Low Point Kinematics
(Freeman method)

(all kinematic parameters refer to the femur respect to the tibia)
Results

• The dynamic RSA evaluation showed a significant difference ($p<0.05$) between the biomechanical behaviour of the prosthesis during the two motor tasks

• When subjected to the patient weight (in the sit-to-stand) the low point of the medial compartment had a shorter motion ($5.7 \pm 0.2$ mm) than the lateral ($11.0 \pm 0.2$ mm)
Results

Medial pivot as in the normal knee
Results

• In the ROM task (no weightbearing), this difference was not present: the medial compartment had a displacement of 12.7±0.2 mm, while the lateral had 17.3±0.2 mm.
Conclusion

• Model-based was able to determine that the fixed-bearing posterior-stabilized TKA design evaluated in this study showed a medial pivoting movement under weight-bearing conditions

• Medial pivot was not present when load was not applied

• Under loading conditions what drives the pattern of movement is the prosthetic design itself.
References


THANK YOU

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