

Tibial Tray Design Factors Affecting Tibial Coverage after Total Knee Arthroplasty

Authors: **Luke Aram**¹, **Dave Wolfson**¹, **Patrick Curtis**¹, **Chadd Clary**²
 Affiliations: ¹DePuy Synthes, ²University of Denver

1. Introduction

Tray Rotation, Coverage, and Knee Function

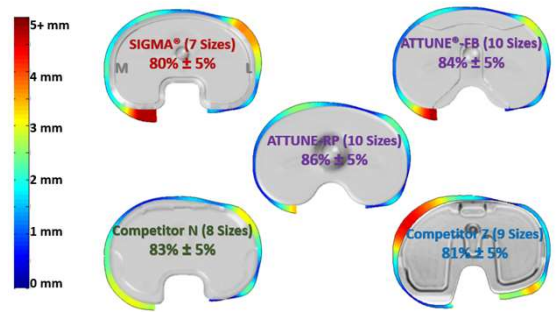
- **Tray rotation is key for optimizing patient kinematics**
 - Mal-rotation causes knee stiffness and patellofemoral tracking issues¹
 - Most surgical techniques advocate aligning to the medial third/border of the tibia tubercle^{2,3}
- **Others advocate maximizing coverage to avoid risk of loosening and subsidence⁴**
 - Increased coverage comes at the cost of proper rotation⁵



1. Bedard et al. CORR. 2011; 2. Insall, Surgery of the Knee; 3. Akagi et al. CORR. 2006; 4. Inceci et al. CORR. 2013; 5. Martin et al. CORR. 2013; DePuy Synthes 11134-19204

3. Results

Tibial Bone Coverage with the tray aligned to the medial third

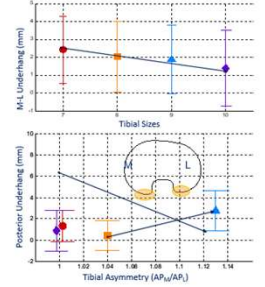


Fitzpatrick, C., Baskin, M., Clary, C., Maitland, L., and Rubenstein, P. 2012. Evaluating knee replacement mechanics during ACL, with PFD-controlled dynamic knee motion analysis. Computer Methods in Biomechanics and Biomedical Engineering. 17(4), pp. 380-389

4. Discussion

Tray Design Factors

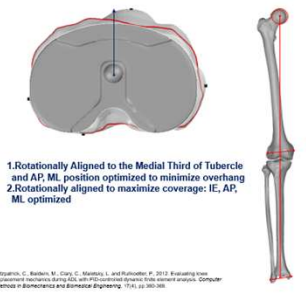
- **All trays evaluated provided excellent coverage across the population (85%-96% with coverage greater than 75%)**
- Increased number of sizes enhanced overall coverage, particularly along the medial and lateral borders
- Asymmetry of the tibial tray enhanced coverage of the posterior medial corner, but too much asymmetry reduced coverage laterally



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2. Methods

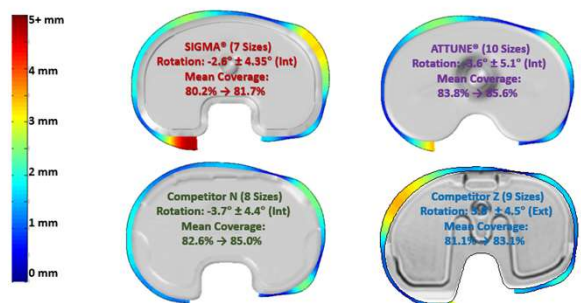
- **14,791 lower limbs in the study**
- Solid models generated from CT scans
- **Osteoarthritic – All candidates for TKR**
- **Continent of Origin: 85.2% NA, 10.6% Europe, 2.3% Asia, 1.4% Australia, 0.3% Middle East, 0.2% Africa**
- Virtual knee surgery performed using mechanical alignment technique



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3. Results (Cont.)

Tibial Bone Coverage with the tray aligned for best fit

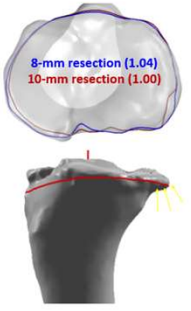


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5. Conclusion

How to Maximize Coverage

- **Setting tray rotation based on maximizing coverage should be balanced with evaluation of tibiofemoral kinematics**
- Variation in plateau shape due to patient anatomy is transferred to tray alignment ($\sigma \pm 4^\circ-5^\circ$)
- No significant advantage to asymmetric tibia shape across the range of scans studied
- Providing more sizes improved coverage
- **Rotating platform implants maximize coverage without deleterious affects of mal-rotation**



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