



Paper #11

## **Tibial Stems in Revision Total Knee Arthroplasty: Is There an Anatomic Conflict?**

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**Introduction:** Proper alignment of the tibial component is crucial for implant function and long-term survivorship. In revision surgeries, the alignment of stemmed components depends upon the fit of the stem within the intramedullary canal. However, in the bowed tibia with valgus curvature, misalignment of the stem may occur. In this study we investigate the incidence and severity of valgus bowing of the tibial canal and its effect on the alignment of the stem and the position of the tray on the tibial metaphysis.

**Methods:** Thirty 3D reconstructed tibial models were classified according to the valgus bowing angle (angle between the proximal and distal canals). 13 tibiae were straight (0-1°), 10 mildly bowed (2-3°) and 7 moderately bowed (4-5°). CAD models of a popular design of tibial tray with 120 mm and 200 mm stem extensions were virtually implanted in each tibial model ensuring proper canal fit and fill. For each implantation, we measured the alignment of the stem and the mechanical axis and the position of the tray on the cut tibial surface.

**Results:** The angulation of the stem with respect to the mechanical axis was most pronounced with the 120mm stem ( $p < 0.0001$ ) and increased with the severity of tibial bowing from only  $0.27^\circ \pm 0.39^\circ$  valgus in straight tibiae to  $2.36^\circ \pm 0.48^\circ$  in cases of moderate bowing ( $p < 0.0001$ ). With the 200mm stem, these values were only  $0.15^\circ \pm 0.56^\circ$  varus and  $0.71^\circ \pm 0.39^\circ$  valgus, respectively ( $p < 0.0001$ ). Canal alignment displaced the tibial tray medially an average of 1.19 of 1.19 to 4.9 mm from the ideal position and posteriorly an average of  $6.89 \pm 2.72$  mm.

**Conclusion:** There was high prevalence of valgus anatomic bowing in our specimens (57 %). In these tibiae, relatively short stems can cause up to 3° of valgus malalignment. Use of canal-fitting stems also causes medial and posterior displacement of the tray.

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