# Metal Backing Significantly Decreases Tibial Strains in Unicompartmental Knee Arthroplasty

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**Introduction:** Long-term survivability has increased for unicompartmental knee arthroplasty. With all-polyethylene tibial designs tibial subsidence has been a leading cause of failure. Metal backed implants, with congruent articulations, decrease stresses in the tibial polyethylene; however, their effect on tibial loading is not well understood. The purpose of this study was to compare strains induced on the proximal tibia in metal-backed and all-polyethylene UKA designs.

**Methods:** Two groups of composite tibiae were implanted with either a medial all-polyethylene fixed-bearing (Repiccii-II, Biomet) or metal-backed, mobile-bearing (Oxford, Biomet) UKA tibial components. A femoral component was fixed to the testing actuator of a servohydraulic materials testing machine and loads were applied at 3X BW in six different positions on the tibial component in both study groups. Surface shear strain measurements were quantified in twelve regions of the medial tibia 0-3cm distal to the implant using the photoelastic method.

**Results:** Implantation of an all-polyethylene tibial component resulted in significantly higher strain measurements in each of the six femoral component positions. Statistically significant increases in strain ranged from 57% to 223% ($p<0.05$). The largest increases in strain were measured in the posteriomedial tibia 0-1cm distal to the implant. Only one instance of decreased strain in the all-polyethylene group was noted, a 28% reduction in strain 2-3cm distal to the implant in the anteromedial tibia when the femur was located centrally ($p<0.05$).

**Conclusions:** This study demonstrates the important role that metal backing plays on loading distribution across the tibial cortex and reduction in overall strain values following UKA. These findings may correlate to the clinical scenario of early failure due to medial tibia collapse more commonly associated with all-polyethylene UKA designs.