Unicompartmental knee arthroplasty (UKA) is a minimally invasive treatment for unilateral osteoarthritis in the knee with increased long-term implant survivorship in contemporary prosthesis designs. Failure in UKA has been ascribed to progression of arthritis in retained compartments, polyethylene wear, and implant malpositioning leading to tibial bone collapse. This study was designed to isolate the effect of tibial component alignment on loading the proximal tibia. Sixteen composite tibias were implanted with a metal backed, mobile bearing tibial prosthesis in one of four different sagittal angles with respect to the anatomical axis of the tibia: 0, 5 and 10 degrees of posterior slope, and 5 degrees of anterior slope. Ten rosette strain gages were distributed on the medial cortex of the proximal tibia. Each bone was axially loaded to 1500 N using an electrodynamic materials testing machine through a UKA femoral component affixed to the actuator of the testing machine. In preliminary data, highest posterior strains were observed when tibias were implanted with extreme posterior slope. Strain observed in posterior measurement regions increased between 16 and 800 microstrain when components were implanted with 10 degrees of posterior slope as compared to other alignments. These findings correlate well with prior clinical studies which have suggested that posterior slope greater than 7 degrees significantly increases risk of posterior tibial collapse and reaffirm the need for careful tibial component alignment in UKA procedures.