Ankle Joint Pressure Changes in High Tibial and Distal Femoral Osteotomies

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Introduction/Purpose: There is evidence from clinical studies and case reports that realignment of knee deformities for accompanying arthritis by high tibial- (HTO) and distal femoral osteotomies (DFO) inevitably changes the hindfoot alignment and ankle pressure characteristics.

Methods: Varus and valgus malalignment of the knee was simulated in 12 fresh-frozen human cadaver full-length legs by removal of 5° bony wedges below and above the knee, respectively. Three hundred Newton, representing half body weight were applied onto the femoral head for static axial compression. Intra-articular high-resolution ankle sensors captured pressure. Testing included four measurements: baseline malalignment (1), 5° (2) and 10° realigning osteotomy (3), and control baseline malalignment (4). For the more common HTO, testing was rerun with the subtalar joint fixed in varus and valgus position.

Results: Compared to the baseline measurement the opening HTO of 5° led to a mean center of force (COF) medialization of 0.1mm and a HTO of 10° to a mean lateralization of 0.5mm. The closing DFO of 5° and 10° both led to a COF mean medialization of 0.3mm. No COF migration or change of Pmax was significant.

With the subtalar joint fixed in varus position significant lateralizations of the COF was seen for the 5° HTO (2.5mm) and the 10° HTO (2.9mm). With the subtalar joint fixed in valgus position the 5° HTO led to a COF lateralization of 1.1mm (significant) and the 10° to a COF lateralization of 0.9mm (not significant). Pmax changes were not significant.
**Conclusion:** In this biomechanical study, realignment of coronal plane deformities around the knee by HTO and DFO altered ankle pressure characteristics. The COF migration after HTO was significant, when the subtalar joint was fixed.

**Clinical relevance**

When indicating a HTO for medial rather than DFO for lateral knee arthritis or deformities, the impact on ankle pressure characteristics should be considered, particularly when compensatory capacity of the subtalar joint is restricted.