Lower limb alignment control: is it more challenging in lateral compared to medial unicompartmental knee arthroplasty?

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Background: Unicompartmental knee arthroplasty (UKA) has been shown in recent studies to be a promising treatment for single compartment knee osteoarthritis. Restoration of lower limb alignment during knee arthroplasty is critical for pain relief, improved function, and implant survival. Controversies exist regarding the optimal postoperative leg alignment, while “overcorrection” may increase the risk of degenerative changes in the lateral compartment, “undercorrection” is associated with accelerated polyethylene wear, poor results, and early failures. The literature lacks studies that evaluate the limb alignment after lateral UKA or compare it alignment outcomes after medial UKA, making our understanding of this issue based on medial UKA studies. Unfortunately, since the geometry, mechanics, and ligamentous physiology are different between these two compartments, drawing conclusions for lateral UKAs based on medial UKA results may be imprecise and misleading. At present, computer assisted and robotic techniques are the most reliable available tools to control postoperative long limb alignment in UKA.

Methods: We retrospectively reviewed the IRB-approved, prospective surgical database of the senior author (ADP) for all consecutive patients who underwent UKA for isolated compartment osteoarthritis (OA) between January 1, 2008, and June 30, 2010. Inclusion criteria were patients who had a preoperative overall mechanical valgus alignment with isolated lateral compartment OA, or a preoperative overall mechanical varus alignment with isolated medial compartment OA and had undergone a robotic-assisted medial or lateral UKA (MAKO Tactile Guidance System [TGS], MAKO Surgical Corporation, Fort Lauderdale, Florida). For all patients, the mechanical limb alignment was measured pre and post-operatively in standing long limb anteroposterior hip-to-ankle radiographs. Intra-operatively, the “virtual” lower limb alignment was measured using a computer assisted navigation system. Between the two cohorts, we compared the percentage of over-correction and the difference between post-operative alignment and the “virtual” alignment measured by the navigation system.

Results: Application of our inclusion and exclusion criteria yielded 205 patients with 229 medial UKAs and 36 patients with 37 lateral UKAs for final analysis. There was no significant different regarding age, gender and BMI between the medial and lateral UKA cohorts. The percentage of overcorrection was significantly higher in the lateral UKA group (11%), when compared to the medial UKA group (4%), (p=0.0001). In the medial UKA group, the mean difference between the intraoperative “virtual” alignment provided by the navigation system, and the post-operative, radiographically measured mechanical axis, was 1.33°(±1.2°), and in more than 81% of the cases, the difference was within 2°. This was significantly lower than the mean 1.86° (±1.33°) difference in the lateral UKA group (p=0.019), where only 62% of the cases with “virtual post-operative alignment difference within 2°.

Conclusions: Our data demonstrated an increased risk of “overcorrection,” and greater difficulty in predicting postoperative alignment using computer navigation, when performing lateral UKAs compared to medial UKAs. During UKA, soft tissue re-tensioning (for both medial and lateral UKAs) gives a reference point for limb alignment, and takes an important role when defining the knee axis and implant sizing. Previous studies have shown an increased degree of laxity of the lateral compartment compared to...
the medial, this inherent laxity of the lateral soft tissue structures may be a mechanistic explanation for the increased risk of overcorrection and the greater difficulty in predicting postoperative alignment in lateral UKA