angle (HKA) on knee bicompartimental compressive loads during walking and guide surgical boundaries to HTO planning. We hypothesized that an increase in compressive load within the lateral TFC would have a direct relationship to post-HTO HKA but also to post-HTO JLO. Methods: 21 medial osteoarthritis patients (Smallest patient age, 50.9; oldest patient age, 71.8 years old; height, 1.8±0.1 m; mass, 99.6±18.4 kg; BMI, 30.8±4.6 kg/m2) underwent median opening wedge HTO for treatment of osteoarthritis. Gait biomechanical data was collected with patients walking at normal speed (motion data, ground reaction force and muscle activity).; Biomechanical and radiographic data were collected pre- and post-surgery to drive computer-simulated musculoskeletal models (Lerner et al., 2015). The radiographic data collected lateral distal femoral angle (LDFA), medial proximal tibial (MPTA) and HKA. JLO was the sum of LDFA and MPTA. Lower-limb muscle forces were computed using inverse dynamics and static optimization. Forces in the knee compartments were computed using Joint Reaction analyses (Steele et al. 2012). Computational pipeline determined the independent contribution of JLO and HKA on knee compartment loads during gait. Knee injury and osteoarthritis outcome score (KOOS) was also collected to evaluate surgery outcomes. Results: HKA was significantly more valgus after surgery (pre, 7±3.8° versus post, -2.4±1.6°; p<0.05). KOOS was significantly improved 12 months after surgery (pre 46.9±17.7; post 72.1±17.9m/s2; p<0.05). MPTA and JLO significantly after greater surgery (MPTA: pre 84.4±2.8°; post 93.1±2.3°; p<0.05 ) and JLO: pre 173.7±2.9°; post 182.0±2.9°; p<0.05). No difference in walking speed between pre, (1.1±0.13m/s2 versus post, 1.1±0.15m/s2; p<0.05). Given a weak correlation between HKA and JLO (r=0.37; p<0.05), multiple regression was used to decouple any confounding effect between these two variables. The isolated JLO effect (apex proximal) induced a 51.7N/r (r=0.71; p<0.05) peak compressive load change on lateral compartment at the first half of stance cycle. The isolated HKA effect (valgising) induced a 83.9N/cm (r=0.55; p<0.05) and -76.5 N/cm (r=0.63; p<0.05) compressive load change on lateral and medial compartments at early stance, respectively. Conclusion: The increased compressive loads within the lateral TFC was explained by both the valgising HKA and apex proximal JLO. The decrease in compressive load within the medial compartment was only due to the valgising HKA. These results demonstrated that post-surgical JLO had a significant independent effect on lateral compartment load. HTO planning should consider not just HKA but also JLO to optimize lateral compartment loads and the potential impact on survivorship. Further analysis is necessary to provide clearer guidelines on appropriate boundaries for JLO to avoid compromising HTO outcomes.

Category: Knee - Osteotomy

Is Implant Removal Necessary After Medial Open Wedge High Tibial Osteotomy?

Abstract ID# 21830
All Authors: Hyooboom Lee MD KOREA, REPUBLIC OF Sung Yup Hong MD KOREA, REPUBLIC OF Siyong Song MD, PhD KOREA, REPUBLIC OF

Summary: Implant removal after MOWHTO reduced implant-related pain and improved Lysholm score and Tegner score. Even after implant removal, gap filling is gradually increased. No correction loss was found 2 years postoperatively in all patients. This results suggest that implant removal after MOWHTO is a valuable operative intervention.

Data: Objective: There have been few studies that evaluated clinical and radiographic assessments after implant removal following median opening wedge high tibial osteotomy (MOWHTO). The purpose of this study was to prospectively (1) determine whether implant removal provides pain relief and functional improvement, (2) to investigate the progression of osteotomy gap filling on serial plain radiographs, and (3) to evaluate whether alignment correction could be maintained after implant removal following MOWHTO. Materials and Methods: MOWHTOs were performed without bone graft between March 2014 and September 2017. The guidelines for implant removal were (1) all patients received a recommendation to undergo elective implant removal after gap filling of more than 80% was observed at > 1-year follow-up, (2) the patients who ask for implant removal due to implant-related pain even though gap filling of less than 80% are permitted to undergo implant removal when postoperative time reaches 1 year. Patients with a minimum follow-up period of 2 years after implant removal were included in the present study. Implant-related pain was defined as either tenderness over the implant site or discomfort at the implant site with daily activities. The severity of implant-related pain was estimated using a visual analog scale on which 0 meant no pain, 1 to 3 meant mild pain, 4 to 6 meant moderate pain, and 7 to 10 meant severe pain. Clinical and functional evaluations were performed using Lysholm score and Tegner score. The gap filling rate was measured as the length of the newly formed bone among the overall length of the osteotomy. Postoperative alignment correction and its maintenance were assessed using four radiologic parameters: the weight-bearing line (WBL) ratio, the hip-knee-ankle angle (HKA), the medial proximal tibial angle (MPTA) and the posterior tibial slope angle (PTSA). Results: Sixty patients underwent MOWHTO during this study period, but five patients failed to follow-up for more than 24 months after implant removal. A total of 55 patients were enrolled in this study. 51 (92.7%) patients exhibited implant-related pain at implant removal (mild in 43 patients, moderate in 8 patients). At 1 and 2 years after implant removal, mild pain was 6 (10.9%) patients and 5 (9.1%) patients, respectively. The other patients had no implant-related pain. After implant removal, the Lysholm score improved from 77.0±5.6 to 86.8±5.7 (P<0.05), and Tegner score improved from 3.3±1.2 to 3.9±1.3 (P<0.05). However, there was no statistically significant difference between 1 year and 2 years after implant removal. At implant removal, the mean gap filling rate was 84.4±8.9% (range, 60.1%–100%). At 1 and 2 years after implant removal, the mean gap filling rates increased to 93.7%±5.4% (75.7%-100%) and 97.4%±2.6% (95%-100%), respectively (P<0.001). For the WBL ratio, MAA, MPTA, and PTSA, no statistical differences were found between the follow-up radiographs performed at implant removal, 1 and 2 years after implant removal. Conclusion: Implant removal after MOWHTO provides reduced implant-related pain and improved functional scores. After implant removal, gap filling is gradually increased. No correction loss was found 2 years postoperatively in all patients.

Category: Knee - Osteotomy

The Compensatory Theory in Proximal and Distal Joint Alignment and Gait in Varus Knee Osteoarthritis Treated With High Tibial Osteotomy: A Systematic Review

Abstract ID# 23276
All Authors: Jessica Harvey MBChb, MRCS, MSc UNITED KINGDOM Momin Eltayeb MBChb, MRCSp, PGCertEd UNITED KINGDOM Elizabeth Moulder FRCS UNITED KINGDOM Ross Muir FRCS UNITED KINGDOM Hemant K Sharma FRCS(Orth) UNITED KINGDOM

Summary: A systematic review into the proximal and distal joint alignment and gait in varus knee deformity in the younger arthritic patient demonstrates an inverse compensatory relationship in the hindfoot which reverses following high tibial osteotomy and may impact perioperative planning.

Data: Background: Varus deformity is common in medial compartment knee osteoarthritis (OA). This coronal malalignment is compensated for by static and dynamic adjustments in the position of the adjacent joints, principally in the hindfoot & ankle. This condition can be treated in selected patients by high tibial osteotomy (HTO), stabilised with a fixed angle plate or circular frame, which may reverse these changes. The aim of this systematic review is to determine the evidence available for these compensatory mechanisms with the objectives being to improve deformity planning and optimise patient outcomes. Method: A systematic review with meta-analysis was designed using the PRISMA template to meet the research aim & objectives. Results: A total of 1,006 patients (1,020 knees), combined mean age 54.5 years, femur-camal ratio of 0.91, were extracted from 20 included studies. The methodologies of the majority of studies were at high risk of bias on the Newcastle-Ottawa Scale demonstrating significant heterogeneity. The combined mean change in the HKA axis was 7.7°; MPTA 7.4°; TT, 0.21°; T1 4.56° & AJLO 4° valgus. Conversely, preoperative hindfoot valgus compensation reverts towards neutral post-HTO. There is limited evidence available for a direct relationship between alignment and gait parameters. Conclusion: An inverse relationship between ankle and hindfoot alignment in varus deformity of the knee forms the basis of this compensation theory. In cases with significant hindfoot compensation, the reconstructive orthopaedic surgeon may consider angulation-translation HTO rather than the standard angulation-only approach, in order to optimise alignment.