Abstract ID# 21831
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Summary: Balancing a TKA only by bone recuts is reliable and reproducible with a robotic arm under the control of a load sensor with NO soft tissue release, it improves clinical results at one year follow up

Data: Achieving a well balanced total knee arthroplasty (TKA) throughout the entire range of motion leads to improved patient outcomes and satisfaction. Sensor-assisted technology allows the surgeon to quantitatively assess and address imbalance through either soft tissue release or bone recuts. However soft tissue releases lead to unpredictable gap increments and over-releases. The primary objective of this study was to demonstrate the ability to achieve a quantitatively well balanced knee arthroplasty by combining a robotic arm (MAKO, Stryker, Kalamazoo, Michigan, USA) and an intra-operative load sensor (VeraSense, Stryker, Kalamazoo, Michigan, USA), while avoiding any soft tissue correction. During a consecutive and prospective serie of 56 robotic arm total knee arthroplasties, intra-operative load sensors, were used following the initial bone resections to quantitatively assess the knee’s state of balance through the range of motion with trial components in place. Load measurements were taken at 10 and 90 degrees of knee flexion. A balanced knee was defined as a force between the femur and the tibia between 22 and 200 Newton, with a difference between the lateral and medial side less than 66 Newton. Depending on these parameters, the thickness of the polyethylene insert and/or a bone recut(s) is made. The bone recuts are made with the interface of the robotic arm in the three planes of space, half-millimeter by half-millimeter with between each new recut a control by the load sensor. The initial load numbers were recorded as well as the numbers and type of subsequent corrections needed to achieve a quantitative well balanced TKA. Of the 56 robotic cases, only 23 (41%) were well-balanced after the initial bone cuts (restricted kinematic alignment adjusted after tensioning collateral ligaments during surgery). In 29 cases, one or two, and rarely three bone recut(s) were required to balance the knee. It should be explicitly noted that no soft tissue release were done for any of the 56 cases. The posterior cruciate ligament was always kept intact. At the end of the procedure 50 cases (89%) were well balanced in extension, 50 (89%) in flexion and 43 (76%) in flexion and in extension. Recuts improved Flexion/Extension unbalanced knee in 95% of cases. At one year follow up the functional IKSS score was 76.9 (+/-16) and the Forgotten Joint Score 69.3 (+/-28). According the FJS12-PASS and an ordinal logistic regression an unbalanced knee at 10° or 90° of flexion is associated with a bad clinical result. Based on this study, a well soft-tissue balanced TKA matters (imbalance TKA leads to poor clinical results) and balancing a TKA only by bone recuts is reliable and reproducible with a robotic arm under the control of a load sensor with NO soft tissue release. It works better if recut is only on tibial side (changing in femoral joint line issue). Robotic arm and load sensors will help us to collect more data and define the right boundaries of a well balanced and aligned TKA.

Category: Knee - Arthroplasty

Lower Limb Alignment Evaluation. Are We Getting This Wrong? We Walk On Our Heel Not Our Ankle

Abstract ID# 22387
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Summary: Navigation and Robotic technologies use the hip to ankle mechanical axis measurement to determine the alignment of a TKA. This study demonstrates that 80% of the time this will result in more valgus alignment of the lower limb.

Data: Introduction: Total Knee Arthroplasty surgeons have traditionally aimed for a neutral mechanical axis to enable equal load sharing through the TKA with the aim of prolonging implant survival. This is measured on a weight bearing long leg Xray with the mechanical axis determined by measuring the angle between the center of the femoral head / center of the tibial plateau and the center of the tibial plateau / center of the ankle. However we don’t walk on our ankle we walk on our heel which is typically in more valgus than the ankle Method Long leg X rays were performed on 543 patients one year after a Total Knee Replacement performed by a single surgeon using a Patient Specific Balanced TKA technique using Brainlab 3. A metal disc was taped to the center of the heel and the patient stood on a wooden box to enable the mechanical axis to be collected from hip to ankle and hip to heel Results The hip to heel mechanical axis ranged from 6.1 degrees more valgus to 4.1 degrees more varus compared to the hip to ankle mechanical axis. The hip to heel mechanical axis was more valgus 80% of the time with a mean 1.6 degrees more valgus (range 1degree – 6.1degrees), more varus in 9.5% (range 1degrees-4.1degrees) and 10.5% of patients had the same mechanical axis. There was a statistical difference between the hip to heel mechanical axis and the hip to ankle mechanical axis (p<0.001). Preop varus knees (>5 degrees) had a valgus TKA (>1degrees) in 18% of patients with a hip to ankle mechanical alignment. In comparison 39.2% had a valgus TKA with a hip to ankle alignment. Conclusion: Navigation and Robotic technologies use the hip to ankle mechanical axis measurement to determine the alignment of a TKA. This study demonstrates that 80% of the time this will result in more valgus alignment of the lower limb.

Category: Knee - Arthroplasty

Does the Severity of Preoperative Patellofemoral Joint Degeneration Influence the Clinical Outcome of Total Knee Arthroplasty without Patella Resurfacing?

Abstract ID# 22604
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Summary: It is recommended that patella resurfacing be applied in patients with severe Iwano Stage 3 or 4 patellofemoral osteoarthritis during TKA.

Data: Abstract Objective: To determine whether the preoperative degree of degeneration of the patellofemoral joint really affects the outcome of total knee arthroplasty (TKA) surgery without a patella button and thus to establish a parameter that might serve as guiding factor to decide whether or not to perform patellar resurfacing. Methods: Application of a retrospective-comparative design based on the basis of arthroplasty registry data that included patients with primary TKA with patellar resurfacing. Patients were allocated to the following groups based on preoperative radiographic stage of patellofemoral joint degeneration: a) mild patellofemoral osteoarthritis (Iwano Stage 1-2) and b) severe patellofemoral osteoarthritis (Iwano Stage 3-4). For patient-reported outcome measurement the Western Ontario and MacMaster Universities Osteoarthritis Index (WOMAC) score was taken once preoperative and once 1-year postoperative (0: best, 100 worst). In addition, implant survival was calculated from the arthroplasty registry data. Results: In 1209 primary TKA without patella resurfacing, 3-year survival was 97.4% and 92.5% in patients with preoperative mild and severe patellofemoral osteoarthritis, respectively (p=0.002). Five-year survival was 95.8% vs. 91.4% (p=0.033) and 10-year survival was 93.3% vs. 88.6% (p=0.033). Postoperative WOMAC total and WOMAC subscores did not differ significantly between groups, but potentially suffered from type 2 error. Conclusions: From the study findings it is concluded that patients with preoperative severe patellofemoral osteoarthritis have significantly higher risks for reoperation than do those with preoperative mild patellofemoral osteoarthritis – when treated with TKA without patella resurfacing. Hence, it is recommended that patella resurfacing be applied in patients with severe Iwano Stage 3 or 4 patellofemoral osteoarthritis during TKA.

Category: Knee - Arthroplasty

Varus Thrust May Influence Patient Clinical Outcome Measures After Total Knee Arthroplasty

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Introduction: The Varus thrust, a biomechanical marker characterized by a sudden lateral shift of the knee during walking, pre- and post-total knee arthroplasty, may influence clinical outcome measures after surgery.

Data: The presence of a Varus thrust, which is a biomechanical marker characterized by a sudden lateral shift of the knee during the loading phase of gait, has been largely studied in knee osteoarthritis patients. This dynamic marker is associated with faster disease onset and progression, poorer functional scores, and greater pain levels. While the varus thrust is of great interest in conservative management, little is known about its impact in total knee arthroplasty (TKA). Thus, the aim of this study was to assess if a varus thrust pre- and/or post-surgery influences clinical outcome measures post-TKA. Methods: This was a secondary data analysis from a TKA prospective study on nineteen patients (63.2% of women, mean age of 61 years). Varus thrust was objectively quantified during gait before and 1-year after surgery with a knee kinesiography exam (KneeKG® system, Emovi inc.). Knee Injury and Osteoarthritis Outcome Score (KOOS) was completed 1-year post-surgery. Scores on this questionnaire range from 0 (extreme symptoms) to 100 (no symptoms). T-tests for independent samples were performed between patients who present with a varus thrust post-surgery (i.e., >2.5°) and those who did not, on all five KOOS subscales. Additionally, comparisons on the KOOS were performed between patients who corrected their varus thrust with the surgery (i.e., varus thrust pre-surgery >2.5° and varus thrust post-surgery <2.5°) and those who developed one after surgery (i.e., varus thrust pre-<2.5° and varus thrust post->2.5°). Results: Five (26.3%) patients presented with a varus thrust post-TKA. They reported significantly (i.e., statistically and clinically) poorer KOOS scores on pain, function during daily living activities (ADL), sport-recreation, and quality of life (QOL) subscales compared to those who did not present a varus thrust post-TKA (respectively 53.0 vs 74.9, 59.0 vs 77.4, 16.0 vs 46.1, 37.6 vs 68.9; all p<0.05). Four patients (21.1%) had their pre-surgery varus thrust corrected with TKA while four others developed a varus thrust after surgery. Patients with varus thrust correction showed significantly (i.e., statistically and clinically) better KOOS scores post-TKA in terms of pain (80.0 vs 50.3), ADL (81.3 vs 56.5), and QOL (65.6 vs 31.3) compared to patients who developed a varus thrust (all p<0.05). Conclusions: The presence of a varus thrust post-TKA is characterized with poorer patient reported outcome measures. Furthermore, the evolution of this biomechanical marker with the surgery (i.e., correction or development) may influence pain, function, and quality of life one year after TKA. Results support the need to objectively assess the varus thrust pre-surgery and integrate this measure in surgical planning to achieve better clinical outcomes. Furthermore, assessing varus thrust post-TKA is clinically valuable since it can be corrected through rehabilitation programs including targeted conservative interventions.

Category: Knee - Arthroplasty

Robotic Handpiece-Assisted Total Knee Arthroplasty - Analysis of the Learning Curve for Operative Time and Alignment Accuracy

Abstract ID# 22689
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Summary: Imageless robotic handpiece-assisted total knee arthroplasty is associated with a learning curve for operative time that might be longer than reported in current literature and implementation of the intra-operative plan is accurate for implant placement and limb alignment except for the tibial component’s sagittal slope.

Data: The adoption of any new step in surgery is associated with a learning curve and potentially associated with extra complications. The aim of this study was to determine the learning curve necessary to minimize the time of surgery and to evaluate the accuracy of component and limb alignment after imageless, robotic handpiece-assisted TKA. Materials and methods: In a prospective case-control study, the first 100 consecutive robotic-assisted (RA) TKAs performed by a single surgeon were analysed and compared to 100 conventional total knee arthroplasties operated in the same period. Operative times, implant and limb alignment (comparing intra-operative plan with post-operative alignment) and robot-related complications were evaluated. Cumulative summation (CUSUM) analyses were used to assess learning curves for operative time and implant alignment in RA TKA. Results: 4 RA TKA cases had to be completed with conventional instrumentation due to challenges faced in the RA system workflow, including registration errors. The learning curve for operative time when using the imageless robotic system for TKA was completed after 16 cases. Complete normalization of operative times, equaling conventional TKA time was not seen even after 100 cases. The learning curve did not influence the accuracy of component or limb alignment. The coronal HKA, LDF, MPTA and sagittal femoral component placement showed an average deviation of 0.90 (SD 2.1), 0.40 (SD 1.4), 0.60 (SD 1.1) and 0.50 (SD 2.7) from the intra-operative plan. The post-operative tibial component sagittal placement showed a significant deviation of 1.60 (SD 2.4) from the intra-operative plan. No minor or major robot-related complications were observed. Conclusion: Imageless robotic handpiece-assisted TKA is associated with a learning curve for operative time that might be longer than reported in current literature. Implementation of the intra-operative plan was accurate for implant placement and limb alignment except for the tibial component’s sagittal slope.

Category: Knee - Arthroplasty

Comparison of Early Postoperative Pain Between Same-Day Bilateral and Staggered Bilateral Total Knee Arthroplasties In Centrally Sensitized Patients

Abstract ID# 22925
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Summary: If medical comorbidity is not a matter, performing same-day bilateral TKA is more advantageous in postoperative pain control in CS patients.

Data: Introduction: The purpose of this study was to compare the early postoperative pain patterns in both knees after same-day and staggered bilateral total knee arthroplasty (TKA) in Central sensitization (CS) patients. Methods: Thirty-six patients in each group corresponding to CS were compared. For staggered bilateral TKA, only those with a one-week interval were included. CS was assessed using a Central Sensitization Inventory preoperatively. Postoperative pain was investigated 1st, 3rd, 5th, and 7th postoperative day using pain visual analogue scale (VAS) in resting, walking, night, and 24 hours average. The amounts of patient-controlled analgesia (PCA) were also investigated. The first and second knees in staggered bilateral TKA were compared with the knee on the first and second operating side in simultaneous bilateral TKA. Results: There was no significant difference in pain VAS between the first knee of staggered TKA and the knee of the same surgical site in same-day TKA (all p>0.05). However, all pain VAS scores were higher in the second knee of the staggered TKA compared to the same side in same-day TKA (all p<0.05). The amount of PCA usage was also significantly more in 2nd knee of staggered bilateral TKA patients even compared to patients with simultaneous TKA. Conclusions: When staggered bilateral TKA was performed in CS patients, early postoperative pain in the 2nd knee was more severe than the pain amount of the same side knee in same-day bilateral TKA. If medical comorbidity is not a matter, performing same-day bilateral TKA is more advantageous in postoperative pain control in CS patients.