Intraoperative vs Ultrasound Adductor Canal Nerve Block After Total Knee Arthroplasty

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Intraoperative adductor canal block is the gold standard for postoperative nerve blocks in TKA. Recent description of an intraoperative technique has proven to be safe but not been tested compared to the standard ultrasound guided block. In a randomized blinded control trial we found no difference regarding pain management and motor activity between both techniques.

Data:
Introduction Total knee arthroplasty (TKA) is a successful alternative to treat late-stage knee osteoarthritis (OA). Adductor canal blocks (ACB) have been proposed as an alternative of reducing opioid consumption and decreasing postoperative pain. Standard ACB block is performed under ultrasound guidance after surgery completion, still in the operating room (OR). Recent literature has shown the anatomic feasibility of intraoperative ACB via blunt suprapatellar dissection in standard medial parapatellar TKA approach. We sought to determine the effectiveness of standard ultrasound guidance ACB compared with intraoperative ACB following TKA. Materials and Methods Randomized controlled trial, recorded in Clinical Trials. Inclusion criteria were (I) age older than 50 years; (II) primary, unilateral TKA; and (III) indication of TKA due to late-stage OA. Sequence of randomization was blinded and we generated a closed envelop for each patient. The OR nurse prepared two seemingly identical syringes, giving one to the surgeon for intraoperative nerve block and the other to the anaesthetist for post-operative ultrasound guided nerve block. Patients could be randomly determined to two groups: intraoperative nerve block with bupivacaine (15 ml of 0.25% bupivacaine), and post-operative ultrasound saline solution (15ml of 0.9% NaCl) injection (intraoperative group); or intraoperative saline solution injection (15ml of 0.9% NaCl) and post-operative ultrasound guided bupivacaine (15 ml of 0.25% bupivacaine) nerve block (ultrasound group). We measured pain using a visual analog scale every 4 hours during the first 24 hours, PCA requests during the first 24 hours, length of stay and time up and go results at 24 hours post-surgery. Normally distributed data is expressed as mean (and standard deviation), while non-parametric data is shown as median (interquartile range). We studied the association of group assignment with all demographic data and outcome variables using chi-square or Fisher’s exact test in categorical variables, and Student’s T test or Wilcoxon’s ranked test for continuous outcomes. Results We prospectively enrolled 80 patients, 40 in the intraoperative group and 40 in the ultrasound-guided group. We found no difference regarding sex (76% vs 86% females respectively, p = 0.24), age (68.6 vs 67.6 years old respectively, p = 0.54) nor time of surgery (104 vs 101.2 minutes respectively, p = 0.57). Regarding our main outcome, morphine consumption did not differ between both groups, with a mean consumption of 11.5mg in 24 hours in the intraoperative group, and 12.9mg in 24 hours in the ultrasound-guided group (p = 0.72). Additionally, patients did not report a difference in post-operative pain, as the area under the VAS pain scale did not differ between both groups (32.5 vs 35.9 respectively, p = 0.67; figure 2B and 2C). The measurement of physical therapy performance using the time and go measurement found no differences among both groups (median of 79 vs 70 seconds; p = 0.73). Conclusions ACB has proven to deliver optimal analgesia for patients following TKA. The development of an intraoperative alternative could lead to a breakthrough for health centers that do not have access to this kind of procedure.

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Category: Knee - Arthroplasty

Trochlear Recreation Impacts Patient Outcomes Two Years Following Total Knee Arthroplasty

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Summary:
Failure to accurately restore the trochlea anatomy in total knee arthroplasty leads to poorer functional outcomes following total knee arthroplasty.

Data:
The variation in recreation of the trochlear when a standardised implant design is applied to variable patient anatomy and its impact on patient outcomes is not fully understood. The aim of this study was to analyse if a relationship existed between recreation of the trochlear and patient outcomes following total knee arthroplasty (TKA). Methods This was a retrospective cohort study of consecutive patients presenting for primary TKA who had pre and post-operative CT knee scans performed. Patients with minimum 2-year follow-up were included for analysis. Patient reported outcomes (PROMs) were evaluated. 3D implant and bone models from the preoperative CT scans were registered to the post-operative CT scan. Cross-sectional slices at increments of 10° from 0° to 30° of flexion on the femoral component were used to compare offset differences between the pre-operative bone and post-operative implant position at the medial and lateral peaks and the trough of the trochlear groove. Trochlea offset was graded into 5 groups (<2.5mm under-stuffing, 2.5 - 0.0mm under-stuffing, 0.0 - 2.5mm over-stuffing, 2.5 - 5.0mm over-stuffing and >5.0mm over-stuffing). Outcomes were compared between grades. Results Following exclusions and loss to follow-up a total of 232 were analysed. Mean BMI was 29 +/- 5.5, mean age was 74 +/- 7 and mean follow-up time was 41 +/- 13 months. 12.5% of patients were dissatisfied. Implant-bone offset differences were higher medial to lateral and superior (0° to 30°) to inferior at all 3 points. At the trochlea apex (<0 flexion), mean implant-bone offset differences were 5.12mm (medial condyle apex), 1.43mm (sulcus apex) and 1.42mm (upper lateral condyle apex). The mean offset differences at 30° flexion were -0.01mm medial condylar apex, -1.99mm sulcus base and -3.11mm lateral condylar apex. Pearson’s correlation indicated a significant correlation between medialisation of the trochlea with KOOS pain scores (-1.62 p = 0.030) and the mean lateral offset apex difference and several PROM scores (FJS -1.58 p = 0.016, KOOS pain -1.90 p = 0.004, Kujala -1.76 (p = 0.007) and KSS satisfaction -1.32 (p = 0.045). Grade 5 (n = 20) lateral condyle offset (mean 6.2mm of over-stuffing) was significantly correlated with a lower FJS, Kujala and KOOS scores . Patients below the KOOS patient acceptable symptom state (PASS) score (<84.5) had a groove mediialized by a mean of 2.4 +/- 1.0 mm compared to those with better pain scores had groove mediialized less, 1.8 +/- 1.0mm (p = 0.012). Analysis of implant position and patient characteristics between grades of lateral apex offset grades found no statistically significant differences between groups for all 3 planes of femoral tibial component positioning or tibia-femoral rotation, BMI, age, gender, time from surgery, pre or post-operative alignment or
the size of coronal or sagittal plane deformity correction. Conclusion Patient outcomes 2 years after TKA correlated with trochea recreation. The effect of medializing the trochea groove and increasing the height of the lateral trochea apex by more than 5mm from the native bone was associated with significantly poorer outcomes. These findings have implications for implant design and alignment philosophy.

Category: Knee - Arthroplasty

Differences In Functional, Radiological and Gait Outcomes Using Kinematic Versus Mechanical Alignment in TKA: A Randomized Controlled Trial

Abstract ID# 23187
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Summary:
Improved functional and gait parameters in kinematic alignment when compared to mechanical alignment in bilateral total knee arthroplasty

Data:
BACKGROUND: Neutral mechanical alignment (MA) has been traditionally used in total knee arthroplasty (TKA) to position femoral and tibial components perpendicular to the mechanical axis of the limb. However, many authors have researched the wide individual and racial variation in anatomy of arthritic knees. It is a subject of debate that if mechanical alignment is used in all knees, it may require extensive soft tissue balancing which in turn may lead to higher rates of dissatisfaction and suboptimal functional outcomes. In contrast to MA-TKA, Kinematic Alignment (KA) aims to match the post operative implant position to the highly variable pre-arthritic anatomy of the individual patient in accordance with the three kinematic axes of the knee. Quality research and comparative data between the two techniques are lacking, especially in Indian population. QUESTIONS/PURPOSE: The purpose of this randomized controlled trial is to determine and compare the functional and radiological outcomes, joint awareness and complications in TKA with Mechanical alignment (MA) and Kinematic alignment (KA). METHODS: We performed a prospective randomized controlled trial in 27 patients(54 knees). All recruited patients meeting the inclusion criteria underwent Bilateral simultaneous total knee replacement by highly experienced senior arthroplasty surgeons. One knee was randomized to Kinematic Alignment group and the second knee in the same patient simultaneously underwent Mechanically Aligned TKA to overcome bias associated with patient related factors. Pre operative, Intraoperative and post operative data was recorded meticulously. Primary outcome was assessed by the Forgotten Joint Score (FJS) with a minimum of 6 month follow up. Secondary Outcomes were assessed using intra operative parameters, limb preference, Knee Society Score, and radiographic parameters in long leg X-ray films. RESULTS: Clinical, Radiological and Gait Parameters were compared in the RCT. The mean Forgotten Joint score (FJS) at 6 month follow-up was 70.9 for the KA group and 66.88 for the MA group (p<0.04). A significantly more number of patients preferred the KA knee as compared to the the MA knee on the preference questionnaire for better appearance and ease of rehabilitation. KA technique resulted in significant net varus of the proximal tibia (MPTA 86.4°±2°) and valgus of the distal femur (LDFA= 87.2°±2.2°). The KSS scores and Overall Limb alignment (femoral-tibial alignment) showed no significant difference. Intra-operative parameters such as surgical time and blood loss showed similar outcomes. The KA technique resulted in a fewer number of soft tissue releases required for balancing, and the total bone resected in the KA group was lesser than the MA group. Gait Parameters showed significantly less Knee Adduction moment in the KA group as compared to the MA group. CONCLUSION: We found that KA and MA techniques achieved similar and comparable functional and radiological outcomes, with more people preferring the KA technique at early follow up. Kinematic alignment was not associated with increased complication rate or catastrophic failure at early (at 6 months) follow up. This RCT suggests that KA is an acceptable and alternative alignment to MA. Since KA inserts the tibial component in varus, aseptic loosening might be a potential long term concern. Multi-centre trials with a larger cohort and a longer follow-up should be done to rule out long term survivorship concerns.

Category: Knee - Arthroplasty

Deviation From Native Knee Anatomy After Total Knee Arthroplasty Depends on the Technique Of Coronal Alignment Used: Simulation by a Navigation System

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Summary:
The different alignment techniques induce significant changes in the pre-arthrosis anatomy of the TKA patient.

Data:
Introduction The implantation of a TKA can significantly alter the native anatomy of the operated patient. To date, there are several philosophies regarding the anatomical goals of TKA implantation in the coronal plane. The classic goal of systematically restoring a neutral mechanical axis of the lower limb is currently being challenged by proponents of kinematic alignment, which is believed to individually restore the native alignment of the surgical patient; The aim of the present study was to analyze the modification of the native coronal alignment of a population of TKA patients according to different alignment goals. Methods Five hundred and twenty TKAs were analyzed. The following angles were measured using an image-free navigation system prior to prosthetic implantation: medial femorotibial mechanical angle without constraint and with maximum manual constraint to reduce deformity, medial distal femoral mechanical angle, medial proximal tibial mechanical angle. The native angles were derived from the osteoarthritic knee angles using a validated correction technique. Femoral and tibial angular data before TKA were pooled for the same patient and transformed into categorical data according to the frontal alignment phenotype. Data after TKA implantation were calculated by simulating five different coronal alignment techniques: mechanical alignment, restricted mechanical alignment, anatomical alignment, kinematic alignment and restricted kinematic alignment. Femoral and tibial angular data after TKA were pooled for the same patient and transformed into categorical data according to the frontal alignment phenotype as before. The overall phenotype, combining both femoral and tibial phenotypes, as well as the femoral and tibial phenotypes individually were compared before and after TKA. The primary endpoint was the binary endpoint of whether or not TKA restored the natural global phenotype. Secondary endpoints were the binary criterion of whether or not the natural femoral phenotype and the natural tibial phenotype were restored by TKA. Results The global phenotype was restored significantly differently by the five alignment techniques (figure 1), and there was a significant difference between each of the pairs of techniques, except for the pair mechanical alignment - restricted mechanical alignment. The femoral (figure 2) and tibial (figure 3) phenotypes were restored significantly differently by the five alignment techniques, and there was a significant difference between each pair of techniques for both phenotypes. Conclusion Apart from the kinematic alignment technique, the different alignment techniques induce significant changes in the pre-arthrosis anatomy of the TKA patient. The surgeon must be aware of these modifications. The clinical relevance of this alteration remains to be defined.

Category: Knee - Arthroplasty

Alignment Philosophy Influences Trochea Recreation In Total Knee Arthroplasty: A Comparative Study Using Image Based Robotic Technology

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Summary:
Choice of alignment philosophy in TKA lead to significant differences in trochea groove recreation using a standard femoral component. The findings of this study may explain why patellofemural aetiology is the most common cause for revision of kinematically aligned total knee arthroplasty.