Variation of Valgus OA Knee Alignment Before and After TKA with Different Navigation Techniques

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ABSTRACT

INTRODUCTION:
The increasing number of total knee arthroplasty procedures performed each year worldwide is becoming a drain on many healthcare systems. For this reason it is paramount to make certain that the current techniques afford patients the best opportunity for a good outcome that has the maximum longevity for each and every patient. Some of the most common reasons for revision surgery in the first five years are aseptic loosening, malalignment and instability. One way to objectively determine kinematic alignment and stability outcomes during the surgical procedure is with the use of computer assisted surgical systems. Although, the use of these systems has determined that fewer outliers can be expected in full extension, no study has looked at the alignment that results in flexion. In flexion the main determinate of femorotibial alignment is the proper placement of the femoral component in the transverse plane. Improper rotation of the femoral component in the transverse plane with respect to the epicondylar axis or the AP axis has been associated with poor outcomes and early revision surgery. If a better surgical approach can result in fewer outliers in flexion then fewer dissatisfied patients or the prevention of early failures may result. This study retrospectively analyzed the kinematic patterns of 20 consecutive valgus computer navigated TKA patients using a distal femoral cut first algorithm and 20 consecutive valgus TKA cases were the tibia was cut first to determine any differences in postoperative kinematic profiles of the knees in flexion.

METHODS:
This study was first approved by the institutional review board for the two hospitals before it was undertaken. Twenty consecutive computer assisted TKAs were analyzed retrospectively where the distal femoral cut technique (DF) was performed first (Stryker Navigation, Kalamazoo, MI, USA) and then 20 consecutive valgus TKA cases with a tibial cut first (TF) algorithm (OrthoPilot, Aesculap, Tutlingen, Germany) were retrospectively identified for comparison. Each patient had a valgus deformity on long standing radiographs (range 5 to 28 degrees). Each surgery was performed using a vastus intermedius or medial parapatellar approach with the use of a computer navigation system. Each patient underwent a computer navigated TKA (DF:Triathlon, Stryker Orthopaedics, Mahwah, NJ,USA; TF:Columbus, Aesculap, Tutlingen, Germany). Each patient had their alignment profile recorded in full extension, 90 degrees and maximum flexion after the registration process and then again in these positions after implantation of the total knee components. The change in alignment before and after TKA in the operating room was then calculated and compared at full extension, 90 degrees and at maximum flexion. Any alignment of the knee greater than 3 degrees from neutral was considered an outlier. The deformity in 90 degrees of flexion was then compared to full extension both before and after TKA was performed and the DF and TF techniques compared to see if any differences resulted in the alignment profile.

RESULTS:
Both patient groups had similar average alignment profiles before TKA (DF 4.5±3.0 in full extension 4.8±3.1 in full extension). Each patient group patients who went into varus in flexion (Six of the 20 knees in both the DF and TF groups). The number of outliers in 90 degrees flexion where in the DF group was 5 and in the TF group was 1 (DF 4.5 ± 1.5 degrees and TF one patient with -7 degrees). All of these patients had acceptable alignment in full extension (DF -0.1 ± 0.8 degrees; TF 0.3±0.7 degrees) after their surgical implantation of their total knee implants. There were no statistical differences between the two groups in full extension or flexion but five times more outliers were recorded in the DF group in flexion.

DISCUSSION:
Most valgus osteoarthritic knees that succumb to TKA have been described as having a hypoplastic lateral femoral condyle. The kinematic profile in this study suggests that some valgus knees do not have a hypoplastic condyle and have minimal deformity in flexion suggesting wear only in the distal aspect of the femur or anterior aspect of the tibia. The data that is presented in this study suggests that valgus knees may be better approached utilizing a tibia cut first surgical navigation technique to better align the lower extremity in flexion. Cutting the tibia first resulted in fewer outliers (>3 degrees of deformity) in 90 degrees and maximum flexion. With 30% of the distal femoral cut first patients having alignment in flexion greater than 3 degrees and only 5% of the tibia cut first resulting in greater than 3 degrees, there seems to be a more consistent with far fewer outliers. With the current healthcare crunch and exponential increases in cost of total knee arthroplasty we need to focus on objective measures of performing procedures to improve the surgical techniques and outcomes on an individual patient basis.

REFERENCES: