Clinical Outcome of IM-Guided Total Knee Arthroplasty with Inappropriate Femoral Resection in Coronal Plane

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Purpose: The purpose of this study was to evaluate clinical results and accuracy of femoral cutting in the coronal plane in total knee arthroplasty (TKA) using a fixed length intramedullary guide.

Materials and Methods: From 2005 to 2008, 101 patients (154 knees) underwent TKA (NexGen LPS implant). The minimal follow-up period was 3 years (mean, 4.4 years). The patients were divided into two groups (group 1, 94≤α angle<98; group 2, 94>α, 98≤α). Mechanical axis deviation (MAD), patellar tilting angle (PTA), Knee Society Knee Score (KSKS), and Knee Society Function Score (KSFS) were measured in both groups.

Results: There were 120 knees in group 1 and 34 knees in group 2. There was no significant intergroup difference in the postoperative MAD (group 1, 1.59°; group 2, 1.91°). The number of outliers with ≥2° MAD was 65 in group 1 and 24 in group 2. The mean PTA, KSKS, and KSFS were 10.17°, 96.0, and 96.6, respectively, in group 1 and 11.58°, 84.5, and 85.5, respectively, in group 2.

Conclusions: The percentage of coronal alignment outliers was relatively high (34 in 154 cases, 22%) after TKA using a fixed length intramedullary guide. However, there was no statistically significant intergroup difference in clinical results (KSKS, p=0.67; KSFS, p=0.56).

Keywords: Total knee arthroplasty, Intramedullary guide, Mechanical axis deviation, Alpha angle

Introduction

Traditionally, femoral and tibial cuts in total knee arthroplasty (TKA) have been made perpendicular to the mechanical axis of the knee using either an intramedullary (IM) or an extramedullary alignment guide system. However, there is no consensus on the differences and relative superiority of the two systems. Hungerford and Hungerford and Krackow suggested that the proximal tibia be cut in 3° of varus since tibial plateau is in 3° varus relative to the tibial axis and the distal femur in 3° of valgus with respect to the mechanical axis. Their method is advantageous for restoring the biomechanics of the knee. However, it has been of limited use because of the likelihood of damage to the lateral collateral ligament or the popliteus tendon caused by excessive varus cutting of the tibia or extensive resection of the lateral femoral condyle. On the other hand, in TKA using an IM alignment guide system, the use of a fixed length IM rod that cannot be adjusted to the length of the femur during surgery may cause a gap between the medullary canal and the rod, and thus affect the femoral component position. In particular, deep insertion of the rod for additional femoral bone resection in knees with flexion contracture often results in abnormal placement of the femoral component with angle under 94 or over 98. In this study, we investigated the relationship between inappropriate femoral resection in the coronal plane and clinical outcome in IM-guided TKA.
Materials and Methods

1. Materials
Of the patients who underwent TKA using the NexGen legacy posterior stabilised (LPS; Zimmer, Warsaw, IN, USA) and an IM alignment guide system for 6° of valgus correction, 101 patients (154 knees) who were available for ≥3 years of follow-up between April 2005 and May 2008 (mean, 4.4 years; range, 3 to 6.8 years) were included in this study. The exclusion criteria were ≥6° of valgus correction and <3 years of follow-up period. There were 5 males and 96 females with a mean age of 69.64 years (range, 53 to 85 years).

2. Surgical Technique
The knee joint was exposed through the medial capsular incision. The anterior and posterior cruciate ligaments were removed and soft tissue release was performed. After soft tissue balancing, distal femoral resection was performed using an intramedullary cutting guide, which was followed by the proximal tibial cut using an extramedullary guide. An intramedullary rod for distal femoral cut was inserted in 6° of valgus so that the cutting guide was positioned perpendicular to the mechanical axis of the femur. After resection of the anterior aspect of the distal femur, distal femoral cut and proximal tibial cut were performed using a device that allows for creation of a rectangular extension gap until medial-lateral and flexion-extension gaps were balanced. Other procedures were identical to those used in conventional TKA. All the operations were performed by the same surgeon. Patellar resurfacing was performed in only 10 patients (13 knees).

3. Clinical and Radiographic Assessments
On the clinical assessment, American Knee Society Knee Score (KSKS) and American Knee Society Functional Score (KSFS) were evaluated preoperatively and at the last follow-up.
On the radiographic assessment, mechanical axis deviation (MAD) that was defined as the angular difference between the anatomical axis (α angle).