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Original Article

Short-to-Midterm Outcomes of Revision Total Knee Arthroplasty Patients With a Total Stabilizer Knee System

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ABSTRACT

Background: Revision total knee arthroplasty (TKA) can often be challenging. The use of a new revision system may aid in providing better stability, improved function, fit, and implant longevity. Therefore, we assessed: (1) survivorship, (2) clinical outcomes, (3) postoperative complications, and (4) radiographic outcomes of patients who underwent revision TKA using this system.

Methods: Patients from 2 hospitals who underwent revision TKA using a newer generation revision knee system between June 2008 and December 2013 for component instability or aseptic loosening were included. There were 93 patients, who had a mean age of 65 years (range, 41–84 years), and a mean follow-up of 4 years (range, 2–7 years). Survivorship was assessed using Kaplan-Meier analysis. Radiographic analysis was performed using the new Knee Society Roentgenographic Evaluation and Scoring System.

Results: Aseptic survivorship was 96% (95% confidence interval, 6.6–7.3), and all-cause survivorship was 94% (95% confidence interval, 6.4–7.2). There were 2 infections and 4 aseptic loosening cases. The mean Knee Society score was 86 points (range, 38–100 points) and the mean functional Knee Society score was 52 points (range, 15–90 points) at final follow-up. The mean postoperative extension and flexion were 2° (range, 0°–20°) and 106° (range, 20°–130°), respectively. There were 3 medical and 11 surgical complications. Excluding the aseptic and septic failures, there were no progressive radiolucencies or osteolysis at final follow-up.

Conclusion: At up to 7-year follow-up, this new revision system demonstrated excellent survivorship and good functional outcomes. Future studies should be prospective, comparative, and include larger cohorts for further assessment of this device.

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Revision total knee arthroplasties (TKAs) can be a challenging procedure for reconstructive surgeons. With an increasing demand for primary TKA, surgeons can expect a concomitant increase in demand for revision procedures (in 1 predictive study, an increase

of 601% by 2030) [1,2]. Currently, implant instability constitutes 10%–25% of the need for revisions in which factors such as ligament imbalance, component malposition, ligament failure, and insufficient extensor mechanism are often implicated [3–6]. In addition, recurrent implant instability is a frequent complication post-revision [7–11]. Therefore, it becomes important to investigate devices that may provide improved stability and survivorship after revision TKA.

The new revision system was designed to maximize stability, improve range-of-motion, and improve clinical outcomes in revision TKA patients. This new implant features a single femoral radius, a deep flexion radius, early cam engagement, flared

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posterior condyles, a special insert locking mechanism, and an anatomic patella-femoral track, which allows the implant to maintain a substantial contact area throughout the entire range-of-motion. Therefore, as a result of some of these features, this implant may help to facilitate quadriceps muscle efficiency, which may allow for a quicker return to function [12,13]. Moreover, increased implant conformity is postulated to enhance long-term component durability, decrease insert micromotion, and reduce implant wear [14–18]. These implant attributes might allow for greater longevity of the prostheses by reduction of the contact stresses and decrease in insert wear. The additional antirotation island and newer, stronger insert locking mechanism may mitigate the extent of micromotion and subsequently decrease backside wear of the insert.

There is currently a paucity of studies that evaluate the outcomes of this new total stabilizer knee system for patients who received these revision prostheses. Therefore, the purpose of this study was to evaluate (1) aseptic and all-cause survivorship, (2) clinical outcomes, (3) postoperative complications, and (4) radiographic analysis in patients receiving this implant for revision TKA.

Methods

Patient Selection

Two hospital databases were reviewed for patients who underwent revision TKA with the new total stabilizer knee system between June 2008 and December 2013 for component instability or aseptic loosening. There were 19 patients who were revised secondary to septic joint and were excluded from this study. This yielded 93 patients, who had a mean age of 65 years (range, 41–84 years), and a mean follow-up of 4 years (range, 2–7 years). All patients received revision TKA due to component instability or aseptic loosening. Institutional review board approval was granted by both institutions before commencement of this study. All procedures were performed by 2 fellowship-trained adult reconstructive surgeons (M. A. M. and A. L. M.). All patients had femoral, tibial, and polyethylene components revised; however, only 15 patients underwent revision of patellar components. All patients received both tibial and femoral stems of variable sizes. There were 43 tibial offsets and 33 femoral offsets used. A total of 33 patients required 5–10 mm tibial augments, and 88 patients required 5–10 mm femoral augments. All patients received highly constrained polyethylene liner (4 patients received 9 mm, 15 patients 11 mm, 17 patients 13 mm, 24 patients 16 mm, 24 patients 19 mm, 4 patients 22 mm, and 5 patients 25 mm liner).

Implant Description

The implant used in this report was the Triathlon TS Knee System (Triathlon Total Knee System; Stryker Orthopaedics, Mahwah, NJ). This implant system incorporates the features from the primary Triathlon system with the addition of improved stability. These features include a single radius of femoral articulating component, a deep flexion radius, a flared posterior condyles, and an anatomic patella-femoral track. The sizes available are based on an anthropometric measurement study [19].

Study End Points

We performed a Kaplan-Meier analysis to assess device survivorship [20]. This was performed to analyze both aseptic and all-cause survivorship. Re-revision, for any reason was the end point for survivorship. Confidence intervals (CIs) of 95% were obtained for each survivorship analysis.

The clinical outcomes were assessed using the Knee Society Score (KSS) [21]. Both objective and functional scores were obtained from the preoperative and follow-up visit notes. Range-of-motion data were collected from preoperative and postoperative office visit notes. For all patients, a certified physical therapist obtained range of motion measurements using a goniometer at the final physical therapy visits.

The complications were reviewed and recorded as medical or surgical. Knee Society standardized TKA complication list was used to screen patients for complications [22].

Radiographic analysis of anteroposterior and lateral radiographs obtained during postoperative visits was performed by treating orthopedists using the Knee Society Roentgenographic Evaluation and Scoring System [23] for malposition, radiolucencies, and osteolysis.

Statistical Analysis

All data were entered into an Excel spreadsheet (Excel; Microsoft Corporation, Redmond, WA) after removing patient identifiers. The statistical analysis was primarily descriptive. All statistical analysis was performed using SPSS, version 24 (IBM Corporation, Armonk, NY).

Results

Survivorship

The aseptic survivorship of this cohort was 96% (95% CI, 6.8–7.3; Fig. 1). There were 4 cases of aseptic loosening. A 45-year-old male patient, who received a primary TKA in 2007, underwent a revision surgery in 2011 for femoral component loosening with a total knee stabilizer system. The patient developed femoral component loosening and required revision of femoral component and polyethylene insert. At the final follow-up of 58 months, the patient was doing well, and his objective KSS was 93 points. A 71-year-old female developed aseptic loosening of both femoral and tibial components and required re-revision surgery. Patient was doing well at 45 months follow-up and had no further complications. A 61-year-old male, who had a primary TKA in 2008 and underwent revision TKA using total knee stabilizer system in 2011 due to aseptic loosening, developed loosening of tibial component and flexion-extension instability and required re-revision surgery with

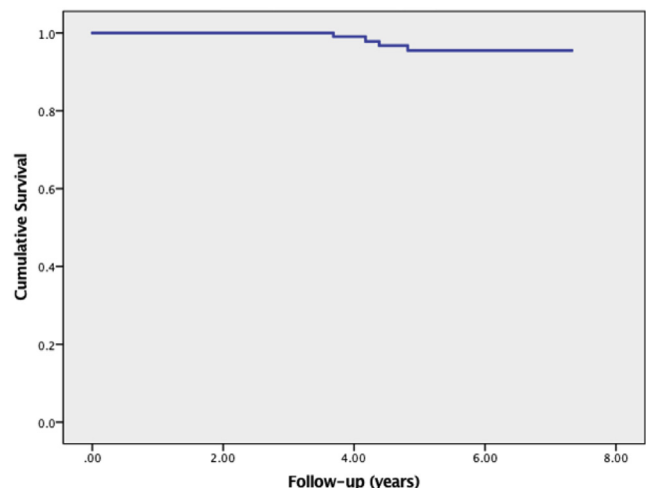


Fig. 1. The Kaplan-Meier aseptic survivorship for revision total knee arthroplasty (TKA) with a total stabilizer system.

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