Patient-Reported Activity Levels After Successful Treatment of Infected Total Knee Arthroplasty

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Abstract: Infections of total knee replacement can be a devastating complication resulting in significant costs to society and healthcare. However, the physical impact to patients after successful treatment of these periprosthetic infections remains unknown. We performed a retrospective review of 96 patients who had successful treatment of their infected total knee replacements with a static antibiotic impregnated spacer, and quantified their functional status using the University of California Los Angeles (UCLA) activity scale and the Knee Society Scores (KSS). Patients reported residual pain and continued disability (KSS pain = 42.0, functional = 43.0) after successful treatment. The average UCLA activity score was 3.4, which correlated to patients returning to limited activities of daily living. Age, sex, and American Society of Anesthesiologist class had no significant impact on the UCLA or KSS scores. These results can be used to help manage patient expectations after successful treatment of these periprosthetic knee infections. **Keywords:** activity levels, treatment, infected total knee arthroplasty.

Deep prosthetic infection after total knee arthroplasty (TKA) is a catastrophic complication that can cause significant pain and morbidity to the patient. For chronic infections, the gold standard of treatment is a 2-stage reimplantation procedure with reported success rates up to 90% [1,2]. Although the incidence of infection after TKA is between 0.4% and 2% [3,4], the treatment and management of deep prosthetic infections cast a significant burden on healthcare and resources. Studies have shown that revision surgery for infections can cost in excess of $100 000 and are associated with up $60 000 in increased costs compared to revision for aseptic loosening [5,6].

However, there is limited information about the physical impact of prosthetic joint infection (PJI) on the patients that suffer from them. While failure of treatment can result in persistent infection, pain, joint dysfunction, sepsis, and even amputation [7], there is little knowledge on the sequelae of PJI when the infection is successfully controlled. Patients are often interested about the range of motion, pain, and level of activity assuming successful eradication of infection. In guiding patients with infection after TKA, anticipating function and residual pain is imperative to define reasonable expectations. Therefore, the purpose of this study is to evaluate the function and activity level of patients with infected TKA successfully treated with a 2-stage reimplantation procedure.

Materials and Methods

Between 2003 and 2008, 183 patients with infected TKA underwent successful 2-stage reimplantation procedures at our institution. There were 103 men and 80 women with an average age of 63.9 years (range, 36-92 years). The mean number of operations prior to resection arthroplasty was 1.7 (range, 1-8). 52 patients had a prior failed 2-stage reimplantation procedure. Successful treatment course and infection control was defined as no recurrence of infection for a minimum of 12 months, normalization of serum inflammatory markers (ie, sedimentation rate and C-reactive protein), and no chronic antibiotic suppression.

All patients underwent resection of their infected knee prosthesis and placement of a static antibiotic cement spacer. Postoperatively, each patient received culture specific intravenous antibiotics for a minimum of 6 weeks. After a period off from antibiotics and normalization of

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inflammatory markers (ie, CBC, sedimentation rate, C-reactive protein), the patients underwent reimplantation TKA using antibiotic impregnated cement.

The patients were followed up at regularly scheduled intervals (2 weeks, 6 weeks, 3 months, 1 year, 2 years). Clinical outcomes were measured using the Knee Society scoring system for pain and function [8]. For the purposes of this study, patients were surveyed by phone about their level of activity using the University of California Los Angeles (UCLA) activity score [9,10]. This scoring system is a validated tool for assessing patient and activity function following joint replacement surgery and has been shown to have the best reliability, highest completion rate, and no floor effect [11]. Finally, this study was approved and conducted according to the guidelines set forth by our institutional review board.

Statistical analysis comparing various host factors (sex, age, American Society of Anesthesiologist [ASA] class, and prior failed 2-stage procedure) to the patient's eventual KSS score and UCLA activity score was conducted using a 2-tailed Student *t* test (SPSS v16.0, Chicago, IL).

Results

The average time to reimplantation TKA was 3.4 months (range, 1.6-5.6 months), and the minimum follow-up was 24 months with an average of 48.6 months (range, 24-100 months). The mean interval between the phone survey and most recent clinical visit averaged 9 months (range, 0.5-18 months). Of the 183 patients, 20 patients died and 7 patients refused to participate in the study. Nineteen patients who required an additional static antibiotic spacer prior to definitive reimplantation, and 4 patients with infections managed with an articulating spacer were excluded from the study. Furthermore, 37 patients were lost to follow-up before 24 months, leaving 96 patients available for final analysis. At latest follow up, the mean KSS scores for pain and function were 42.0 (range, 5-93) and 43.0 (range, 0-100), respectively. The average patient reported UCLA activity score was 3.4 (range, 1-8), with the distribution skewed towards lower activity scores [Fig. 1A and B]. Patients with prior history of failed 2-stage reimplantation procedures had UCLA activity scores averaging 3.3 (range, 1-7) compared to 3.5 (range, 1-8) (P = .40) for patients without prior 2 stage procedures for infected TKA. There was a trend towards lower KSS scores in patients with prior failed 2 stage procedures. The mean KSS pain and function scores were 34.9 (range 12-68, P = .15) and 38.5 (range 0-80, P = .23), respectively.

Residual pain, stiffness, and gait dysfunction was common in patients following treatment of infected TKA. The average knee flexion was 88.3° (range, 76°-110°) and the average knee extension was 0° (range, 0°-10°). Only 1 patient reported an extension lag. None of

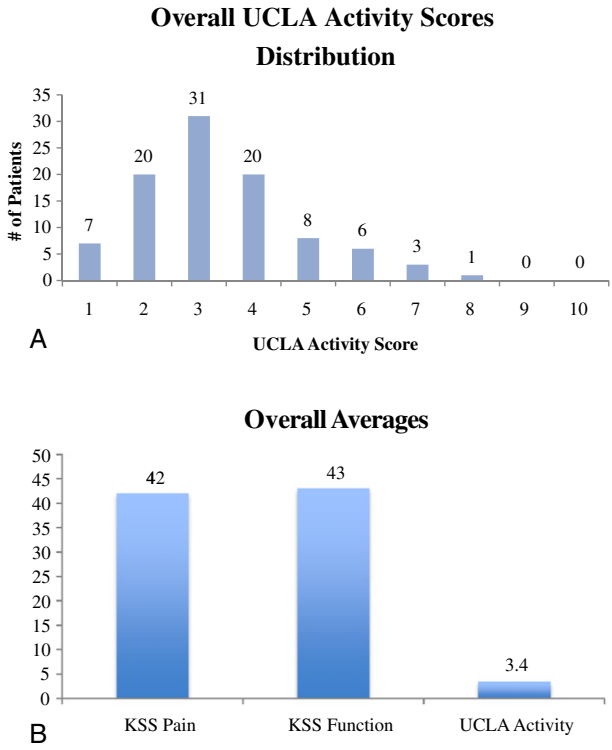

Fig. 1. A. UCLA Activity Score Frequency Distribution. This graph shows a distribution curve skewed towards the lower activity scores after successful treatment of infected total knee arthroplasty. B. Averages of UCLA Activity Score, Knee Society Pain and Function Score in All Patients. This bar graph shows the average scores of the UCLA activity score, and KSS pain and function scores for all patients. It shows poor outcomes in both KSS pain and function scores. The average UCLA activity score of 3.4 shows patients return to limited activities of daily living.

the patients was able to utilize stairs normally. At latest follow up, 2 patients reported no pain (2%), 24 patients reported mild pain (25%), and 70 patients reported moderate/severe pain (73%).

Gender did not have an effect on the eventual KSS score or the activity level. When stratified for sex, there was no statistical difference in the final KSS pain and function scores and the UCLA activity scores between men and women. The average KSS pain scored was 40.2 (range, 4-69) in male patients and 40.1 (range, 14-92) in female patients (P = .05), while the mean KSS function score was 41.3 (range, 0-100) in men and 40.1 (range, 0-100) in women (P = .98). Finally, the UCLA activity score averaged 3.3 (range, 1-8) in men and 3.4 (range, 1-7) in women (P = .74) [Fig. 2].

Age did not have a significant effect on the eventual KSS scores or the UCLA activity scores. Patients with age less than 65 years were compared to older patients in this study. At last follow-up, patients less than 65 had an UCLA activity score of 3.2 (range, 1-8) compared to 3.5 (range, 1-7) for patients older than 65 (P = .81). There was a trend but not statistically significant for patients older than 65 to have higher