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Minimum 5-Year Results for Saline Irrigation and Oral Antibiotics Therapy of Late-Infected Total Knee Arthroplasty

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Abstract

Purpose: The purpose of our study was to evaluate re-infection following syringe saline irrigation coupled with oral antibiotic management in acute presentation of late-infected total knee arthroplasty over a minimum follow-up period of five years.

Methods: From January 2014 to December 2017, 15 patients with acute presentation of late-infected total knee arthroplasty were treated with syringe saline irrigation and oral antibiotics. The medical records were reviewed to determine the effectiveness of syringe saline irrigation coupled with oral antibiotic management. We extended this to a minimum five of years for 14 patients except one who died.

Results: Among 10 patients whose infection was controlled by saline irrigation procedure, eight preserved their total knee prosthesis through an average follow-up of 6.9 years (range, 5.4-8.5 years). Two patients underwent two-stage revision arthroplasty due to re-infection.

Conclusions: Syringe saline irrigation coupled with oral antibiotic management can be used in special circumstances where surgical treatment can put a patient's life at risk or if a patient refuses surgery.

Level of evidence IV.

Keywords: Re-infection; Syringe saline irrigation; Antibiotic; Infected total knee arthroplasty; Special circumstances

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Introduction

Periprosthetic Joint Infection (PJI) after Total Knee Arthroplasty (TKA) is a serious and challenging complication posing substantial clinical and economic burden. Its reported incidence has decreased over time and has been reported to range from 1% to 5% [1-5]. It remains one of the leading causes of revision TKA [6].

The optimum treatment option for PJI remains controversial and depends on the timing of infection, the causative organism, the condition of the soft tissue and implant, and the general health of the patient. Among the treatment options, two-stage reimplantation is recommended as an optimal standardized protocol, with a success rate ranging from 80% to 90% [7-9]. However, some elderly patients with PJI may not be candidates for surgical treatments due to existing medical conditions and/or refusal of surgical intervention. As life expectancy in Korea rises [10], surgeons increasingly encounter elderly patients with PJI whose comorbidities make anesthesia and surgery life-threatening, or who decline surgery altogether. For these patients, a less invasive alternative is needed.

Syringe saline irrigation and oral antibiotic therapy makes it possible to avoid general or spinal anesthesia and to perform therapeutic joint irrigation without medical problems. It aims to reduce the bacterial load in the joint, as open irrigation does, while avoiding the risks of anesthesia and surgery. We previously reported the outcomes of syringe saline irrigation coupled with oral antibiotic management in acute presentation of late infected total knee arthroplasty at a minimum follow-up of two years (range, 29-66 months) [11]. Because re-infection after implant-retaining treatment may appear years after apparent control, longer follow-up is required to judge its durability.

The purpose of this study was to report clinical outcomes and radiographic outcomes at a

minimum of 5 years after syringe saline irrigation and oral antibiotic therapy for acute presentation of late-infected TKA. We hypothesized that most patients whose infection was controlled at 2 years would remain infection-free at 5 years.

Materials and Methods

The design and protocol of this retrospective study were approved by the institutional review board in our hospital, which waived the need for informed consent. Our previous study involved 15 patients who underwent syringe saline irrigation coupled with oral antibiotic management between January 2014 and December 2017, and all procedures were performed at a single center by the same surgeon. Infections were eradicated by a saline irrigation procedure in 10 of 15 patients. Four patients underwent two-stage reimplantation following saline irrigation procedure due to uncontrolled infections, and one patient died during two-stage revision arthroplasty due to medical problems.

The previous study had a final follow-up of a minimum two years, and we extended this to a minimum of five years for 14 patients except for one who died. Patient charts were reviewed to identify any complications associated with reoperation. Patients underwent clinical and radiographic follow-up at post-procedure two and six weeks; three, six, nine, and 12 months; and annually thereafter. During these follow-up evaluations, patients who did not return for their scheduled visits were contacted by telephone. Two nurses and one private doctor identified and visited non-responders. Clinical evaluations were performed using the Knee Society rating system [12]. Radiographic analysis included long-leg standing radiography from the pelvis to the ankle joint for evaluating the axis, weight-bearing anteroposterior view, non-weight bearing anteroposterior view, lateral view at 30° flexion, and skyline view of the patella. Each radiograph was assessed using the Knee Society evaluation system [13].

Results

The study included 14 patients (10 with controlled infection and four with two-stage reimplantation). The mean age at the time of syringe irrigation procedure was 72.2 years (range, 61-79 years), and there were two males and twelve females. The mean follow-up period was 6.9 years (range, 5.4-8.5 years). No patients were lost to follow-up.

Among 10 patients whose infection was controlled by a saline irrigation procedure, eight remained reoperation-free after a minimum five years of follow-up (non-re-infection group). Two patients underwent two-stage reimplantation due to re-infections. The mean time from a saline irrigation procedure to diagnosis of re-infection was 1.8 years (range: 1.5-2.0 years). Four patients who underwent two-stage reimplantation had no re-infection at final follow-up (Table 1).

In the non-re-infection group, the mean Knee Society knee score was 85.5 points at the final follow-up (range, 65 to 100 points) in the eight patients with a minimum follow-up of five years. The mean preoperative function score was 80.5 points (range, 60 to 100 points) at final follow-up. A non-progressive radiolucent line (radiographic demarcation ≥ 2 mm) was not observed during a series of final follow-ups.

Table 1: Outcome of infection control and survival.

Outcome	n/N	%
Infection controlled after saline irrigation	10/15	66.7
Infection-free at ≥ 5 years, among controlled patients	8/10	80
Overall infection-free survival at ≥ 5 years (intention-to-treat)	8/15	53.3
Two-stage reimplantation, any cause (intention-to-treat)	6/15	40
Death during subsequent revision	1/15	6.7

Discussion

The most important finding of the present study was an infection-free survival rate of 53.3% (8/15 patients) at a minimum 5 years after syringe saline irrigation and oral antibiotic therapy. Infection-free survival fell from 66.7% at a minimum of 2 years [11] to 53.3% at a minimum of 5 years. This decline shows that apparent early control does not guarantee eradication. Both re-infections occurred within about 2 years of irrigation, and no new failure appeared thereafter. This suggests that close surveillance is most important during the first 2 years, although our sample is too small to define a safe interval.

Despite various treatment options for periprosthetic infection, reinfection still occurs and remains a substantial challenge. The risk of reinfection after initial treatment of periprosthetic infection following TKA ranges from 20 to 47% [14,15]. The failure risk of two-stage reimplantation, the most popular protocol for treatment of periprosthetic infection, can be as high as 20% at the one-year follow-up [15,16]. Theoretically, a higher rate of treatment failure is expected for other treatment options with component retention compared with two-stage reimplantation. We found an infection-free survival of 66.7% at a minimum of two years [11] and of 53.3% at a minimum of five years after syringe saline irrigation and oral antibiotic therapy. Many surgeons attempt open irrigation and debridement with component retention as the initial treatment option due to its less invasive procedure and low morbidity. The syringe saline irrigation procedure negates the need for general or spinal anesthesia and achieves therapeutic joint irrigation without medical problems and complications associated with surgery. It is assumed that syringe saline irrigation would play a role similar to that of open irrigation and debridement, and the addition of oral antibiotics may improve the effectiveness of this procedure.

Treatment options for periprosthetic infection can be controversial and include irrigation and debridement combined with component retention [17,18], one- or two-stage reimplantation [19,20], and salvage treatments such as joint arthrodesis, amputation, and resection arthroplasty [21-23]. These options are chosen according to multiple factors including the characteristics of the microorganism, acuity of the infection, surgeon experience, and various patient conditions. The average life expectancy in Korea was reported to be around 82.9 years in 2018 [10], and the number of elderly patients with periprosthetic infection following TKA is likely to increase. In clinical practice, a clinician occasionally encounters elderly patients with periprosthetic infection after TKA who are poor candidates for these treatment options due to medical or other problems. Syringe saline irrigation and oral antibiotic therapy is not yet an accepted treatment option for periprosthetic infection after TKA, and the authors do not believe that this study provides sufficient evidence to suggest it as one of treatment options for periprosthetic infection. However, syringe saline irrigation and oral antibiotic therapy can be used in special circumstances in which a surgical treatment can put a patient's life at risk or if a patient refuses surgery.

This study has several limitations. First, it is a retrospective

case series of only 15 patients without a control group, so we cannot compare this procedure with other treatments. Second, all procedures were performed by one surgeon at one center, which limits generalizability. Third, the patients were selected for frailty or refusal of surgery, so selection bias is likely. Fourth, the small number of patients did not allow analysis of risk factors for failure, such as the causative organism, comorbidities, or the duration of antibiotic therapy. Fifth, the authors do not believe that this study provides sufficient evidence to recommend syringe saline irrigation and oral antibiotics as a standard treatment for PJI. Larger, multicenter studies with comparison groups are needed.

The use of syringe saline irrigation and oral antibiotic therapy for periprosthetic infection can be somewhat controversial. Nevertheless, this procedure can be considered if a patient refuses surgery or if a surgical treatment under anesthesia can put a patient's life at risk, and if a patient visits within one week after the onset of symptoms of infection in a previously well-functioning TKA.

In conclusion, following syringe saline irrigation and oral antibiotic therapy, 53.3% of patients were reoperation-free for infection recurrence at a minimum five years follow-up. This study demonstrated that syringe saline irrigation coupled with oral antibiotic management is a safe and effective procedure in some patients with acute presentation of late-infected total knee arthroplasty. These findings should aid orthopedic surgeons in determining the appropriate treatment option for elderly patients with significant medical morbidity for late-infected TKA.

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