

**CURRENT CONCEPT REVIEW**

# Knee Fusion or Above-The-Knee Amputation after Failed Two-Stage Reimplantation Total Knee Arthroplasty

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*Research performed at Department of Orthopaedic Surgery, La Paz University Hospital, Madrid, Spain**Received: 11 January 2015**Accepted: 16 April 2015***Abstract**

Prosthetic joint infection (PJI) is a serious complication of total knee arthroplasty (TKA). Control of infection after a failed two-stage TKA is not always possible, and the resolution of infection may require an above-knee amputation (AKA) or a the-knee (KF).

The purpose of this review is to determine which treatment method (AKA or KF) yields better function and ambulatory status for patients after a failed two-stage reimplantation.

A PubMed search related to the resolution of infection by means of an above-the-knee amputation (AKA) or a knee fusion was performed until 10 January 2015. The key words were: infected TKA and above-the-knee amputation. Five hundred and sixty-six papers were found, of which ten were reviewed because they were focused on the topic of the article.

KF should be strongly considered as the treatment of choice for patients who have persistent infected TKA after a failed two-stage revision arthroplasty. Patients can walk at least inside the house, and activity of daily living independence is achieved by the patients with successful KF, although walking aids, including a shoe lift, are required. An intramedullary nail leads to better functional results than an external fixator. The functional outcome after AKA performed after TKA is poor. A substantial percentage of the patients never fit with a prosthesis, and those who are seldom obtain functional independence. Only 50% of patients are able to walk after AKA.

Patients receiving KF for treating recurrent PJI after TKA have better function and ambulatory status compared to patients receiving AKA. KF must be recommended as the treatment of choice for patients who have persistent infected TKA after a failed two-stage reimplantation procedure.

**Key words:** Above-the-knee amputation, Infection, Knee fusion, Total knee arthroplasty

**Introduction**

Periprosthetic joint infection (PJI) has become the most common cause of failure following total knee arthroplasty (TKA). Two-stage revision, with the placement of an intra-stage antibiotic-loaded spacer, has become the “gold” standard for periprosthetic joint infection eradication (1). In a patient with an uncontrollable PJI, salvage procedures are necessitated. Complete eradication of PJI can be achieved by resection of all components without reimplantation through knee

fusion (KF) or above-the-knee-amputation (AKA).

The decision of arthrodesis vs. AKA is still debated in literature, and consensus has not been reached so far (1,2). The purpose of this literature review is to determine what technique yields better functional outcome and ambulatory status: AKA or KF?

**Methods**

PubMed articles related to the treatment of failed two-stage reimplantation TKA were searched until 10

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January 2015. The key words were: infected TKA and above-the-knee amputation. Five hundred and sixty-six papers were found, of which ten were reviewed because they were focused on the topic of the article. Only one of the papers had a good level of evidence (systematic review), while the other nine had a low grade of evidence (case series) (1-10).

## Results

Sierra et al. reported an overall prevalence of amputation after TKA at their tertiary care center of 0.36%. According to Moyad et al., treatment options of PJI include resection arthroplasty with or without re-implantation, long term antibiotic suppressive therapy, KF and even AKA in rare circumstances (4). The majority of chronic infections can be solved with two stage resection, since this method has consistently provided the highest cure rates (>90% success).

Wu et al. performed a systematic review and determined that KF is the most likely to yield the highest expected utility (quality of life) after initially failing a two-stage revision (2). Therefore, KF should be strongly considered as the treatment of choice for patients who have persistent infected TKA after a failed two-stage reimplantation procedure. Wu et al. recognized that particular circumstances such as severe bone loss can preclude or limit the applicability of fusion as an option (2).

For Parvizi et al., while amputation may be unpopular with patients it provides a greater ability to reconstruct, with an external prosthesis, a functioning joint (1). However, for Chen et al. patients receiving knee fusions for treating recurrent PJIs after TKA have better function and ambulatory status compared to patients receiving AKA (6).

In order to determine the functional outcomes of AKA after infected TKA, Fedorka et al. retrospectively reviewed 35 patients who underwent AKA after an infected TKA (5). The amputations were performed an average of 6 years after primary TKA. There were 19 females and 16 males with a mean age of 62 years. The minimum follow-up was 7 months (mean, 39 months). Two patients died secondary to cardiac arrest and 13 more died during the follow-up period of unrelated causes. Nine patients required irrigation and débridement for non-healing wounds after AKA and two patients had repeat AKA for bony overgrowth. Of the 14 patients fitted for prostheses, eight were functionally independent outside of the home. Patients fitted with a prosthesis had higher mean activities of daily living scores (58 versus 38) and also tended to be younger with fewer comorbidities than those who were not fitted with a prosthesis. Fedorka et al. found low functional status in living patients with an AKA after infection with only half of the patients walking after AKA (5). In the report of Sierra et al., the functional outcome after amputation performed above a TKA was poor (3). A substantial percentage of the patients were never fitted with a prosthesis, and those who were seldom obtained functional independence.

Taheri and Karimi evaluated gait performance of above-knee amputees while walking with 3R20 and 3R15 knee joints (7). The performance of the subjects

with above-knee amputation is noticeably poorer than normal subjects. Various types of components have been designed to compensate their performance. Among various prosthetic components, the knee joint has great influence on the function. Two types of knee joints (3R15, 3R20) have been used broadly for above-knee prostheses. The difference between the performances of the subjects with 3R20 and 3R15 knee joints was related to the walking speed, which improved while walking with 3R20 joint.

Watanabe et al. analyzed outcomes in patients who underwent KF (8). The authors evaluated 8 patients (mean age 72.9 years) who were followed for more than 3 years after KF. KF was achieved in 7 patients. The mean limb-length discrepancy was 5.4 cm. All patients could walk at least inside the house, and activity of daily living independence was achieved by the patients with successful KF, although walking aids, including a shoe lift causing little discomfort, were required.

Iacono et al. performed a retrospective comparison of intramedullary (IM) nailing and external fixation (EF) in patients undergoing KF after infected revision TKA (9). The study included 34 KFs divided in two groups: first group included 12 patients treated with EF and the second group of 22 patients dealt with IM nailing. The authors stated that reinfection after revision TKA can be effectively treated with KF. In presence of massive bone loss, they recommended KF with IM nail used as an endoprosthesis, without bone-on-bone fusion, to produce a stable and painless knee, while preserving the limb length. Use of an IM nail yielded better functional results than EF.

Schwarzkopf et al. assessed the success of KA after failed TKA. KF was achieved in 30/42 cases (75%) (10). No cases of implant failure were recorded. Postoperative complications occurred in 20 cases (46.5%). Repeat KF was performed in 4 cases, and 2 patients eventually required AKA.

## Discussion

This review has tried to determine what technique yields better functional outcome and ambulatory status: AKA or KF?. Most authors agreed on that AKA usually yields to a poor functional result although Parvizi et al. stated that AKA can provide a greater ability to reconstruct, with an external prosthesis, a functioning joint (1-3,5-7).

The rate of reported fusion after KF is 75%, and the rate of complications 46.5% (10). After KF, repeat KF can be needed and patients may eventually require AKA. Regarding the surgical technique to perform KF, IM nailing yields better results than EF (9).

Study design weakness prevents effective comparison of the efficacy of KF therapy with that of AKA for relief of pain and other outcomes. The consistency of evidence of the clinical studies is low because of many uncontrolled variables (1, 3-10). The only systematic review states that KF should be strongly considered as the treatment of choice for patients who have persistent infected TKA after a failed two-stage reimplantation procedure (2).

Patients undergoing KF for treating recurrent PJI

after TKA have better function and ambulatory status compared to patients receiving AKA. KF is achieved in 75% of patients. Postoperative complications occur in 46.5%. Repeat KF can be needed in some cases, and a small number of patients may eventually require an AKA.

In conclusion, KF must be recommended as the treatment of choice for patients who have persistent infected TKA after a failed two-stage reimplantation procedure. KF seems to yield better function and

ambulatory status compared to patients receiving AKA, for patients after a failed two-stage revision arthroplasty.

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