



Above Knee Amputation Following Total Knee Arthroplasty: When Enough Is Enough



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ABSTRACT

In some cases, above knee amputation (AKA) for a chronically infected total knee arthroplasty is the only option. The purpose of this study was to assess patient satisfaction following AKA and to identify factors which may be indicative of successful outcome following AKA. A review was performed of 7 patients who underwent an AKA for a recurrent peri-prosthetic knee infection. Patient satisfaction was gauged through a modified questionnaire. All patients were satisfied with their AKA and 6 of 7 stated that they would have chosen an amputation earlier. Greater than 6 attempts at limb-salvage and failed gastrocnemius flap were identified by expert opinion as possible poor prognostic factors. Despite poor function, patients with chronically infected TKAs are satisfied following an AKA.

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Recalcitrant infection following total knee arthroplasty (TKA) is an extremely challenging problem for both patient and the surgeon. Options for treatment are limited and include chronic antibiotic suppression, repeat two-stage revisions with antibiotic impregnated cement spacers, soft-tissue transfers, resection arthroplasty and/or attempts at arthrodesis [1–5]. However, in cases where salvage efforts have proven to be ineffective, the final and definitive solution may be above-knee-amputation (AKA) [6].

The incidence of infection post-TKA is low, ranging from 0.69% to 1.26% [7] and the incidence of AKA after TKA is even lower, ranging from 0.03% to 0.18% in several series [8,9]. Surgeons are generally hesitant to perform AKA in this population of patients as it is widely reported that elderly patients with above knee amputation have poor functional status with limited ambulation due to high-energy expenditure when mobilizing [10].

Studies by Fedorka [11] and Sierra [6] which examined patient outcomes following AKA for management of failed TKA have found a similar, poor functional outcome. However, these studies focus heavily on patient function, including fitting for a prosthesis and ambulatory status, with less focus on patient reported satisfaction. We hypothesized that high levels of patient satisfaction may be present in certain complex situations, despite relatively poor functional outcome. In other words we questioned whether the situation of chronically infected TKA is so unpleasant to some patients that a treatment method with relatively

poor functional outcome, such as AKA, may still be highly satisfactory from their perspective. We theorized that perhaps there are certain identifiable criteria such as, number of previous salvage attempts, soft-tissue compromise, microbiology and number of medical comorbidities that could predict futility with regard to additional salvage attempts, yet yield patient reported satisfaction with an AKA.

Thus, the primary purpose of this study was to assess patient satisfaction following AKA for chronically infected TKA and secondarily, to identify the presence of any predictors of satisfactory outcome following this procedure.

Methods

A retrospective chart review of all patients receiving an AKA for treatment of an infected TKA between January 2000 and December 2013 was performed. All patients were treated by a single surgeon at a single site. Nine patients were identified, 7 of whom we were able to contact by telephone for follow-up.

An in-depth qualitative key informant interview was conducted with one of the patients (case 6) to identify issues of importance from the patient perspective when deciding to proceed with AKA. The interview was tape recorded and transcribed verbatim. A content analysis was then undertaken to identify emergent themes. Based on the emergent themes, we developed a post-AKA questionnaire that expanded on the questionnaire originally used by the Fedorka and Parvizi group's AKA following TKA study (see Appendix 1) from October 2010 [11]. To Fedorka's original work we added the following three questions:

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1. Are you satisfied with your above knee amputation? Yes or No?
2. Given the choice would you choose to have the amputation again? Yes or No?
3. Given the choice would you choose to do the amputation earlier? Yes or No?

Patients were also asked to complete the SF-12 patient questionnaire and mental and physical component scores were tabulated [12,13].

Of the seven patients, 5 were male and 2 were female. The average age at time of AKA was 62.4 years old (range 43–85 years). The average body mass index (BMI) was 38.5 kg/m² (range 24–57 kg/m²). The mean time between the initial TKA and the AKA was 7.7 years (range 5–14 years). Patients had an average of 6.9 procedures (range, 3–9) between primary TKA and AKA. The average follow-up time post-AKA was 15.3 months (range 6–36 months).

The average number of co-morbidities in this cohort was 4.6 (range 2–7). The American Society of Anesthesia score [14] was used to analyze the overall medical condition of the patient with a score of 4 (severe systemic disease that is a constant threat to life) in 3 of 7 patients (42.8%), a score of 3 (severe systemic disease) in 1 of 7 patients (14.3%) and a score of 2 (mild systemic disease) in 3 of 7 patients (42.8%). The mean number of irrigation and debridement (I and D) procedures with polyethylene liner exchange prior to AKA was 3.6 (range 1–6), while placement of an antibiotic-laden cement spacer (static or dynamic) occurred on average 2.0 times (range 0–3) before proceeding to the AKA. Four of the seven patients (57.1%) lacked adequate soft tissue coverage and underwent gastrocnemius flap at some point prior to undergoing the AKA. Chart review of microbiology results revealed that 2 of 7 patients grew polymicrobial/mixed growth cultures from intra-operative samples, 2 patients had no growth of an organism, 1 patient grew

Staphylococcus epidermidis, 1 patient grew coagulase negative *Staphylococcus* plus fungal *Candida* and the final patient grew group B *Streptococcus* and *Stenotrophomonas maltophilia* (Table 1).

Before AKA, all patients lived in their own homes. Two of seven patients required assistance for activities of daily living (ADLs) [15] from family and friends, the remaining five did not require any outside assistance. Three of seven patients walked with a cane prior to AKA, three walked with a walker and one patient was unable to walk at all. Two patients ambulated only in their home, 3 patients were limited to less than 5 blocks of ambulation and one patient had no restriction on walking tolerance prior to AKA (Table 2).

Descriptive statistics were used to summarize patients' demographic and baseline characteristics. Categorical variables were reported as count and percentages and continuous variables as mean and 95 % confidence intervals. Although small numbers limited utility, the univariable comparison of characteristics between groups was done using Chi square test for categorical variables. Differences in mean alpha angles between groups were compared using Student's t-test. A P-value of 0.05 was considered for statistical significance and all tests were two-sided.

Results

Of this cohort of seven patients, six were fitted with a prosthesis limb post-amputation. One patient was unable to be fitted due to morbid obesity of the leg. This patient is presently wheelchair bound. Four of the five patients fitted with a prosthesis report wearing it greater than 1 hour per day. Two patients report wearing the prosthesis less than 1 hour/day, one of whom is primarily wheelchair bound. Three patients report being able to ambulate five city blocks or less with their

Table 1
Patients With Above Knee Amputation, Post Infected Total Knee Arthroplasty.

Case Number	Gender	Age at Time of AKA	Original Diagnosis	ASA Score	Number of Co-Morbidities	Co-Morbidities	BMI	Time b/w TKA and AKA (Years)	Follow-up Time (Months)	Total # of Procedures on the Knee Prior to AKA	Number of I and Ds	Number of Antibiotic Spacers	Previous Flap?	Microbiology
1	M	51	OA	3	3	Morbid obesity, HTN, DM	51	3	14	9	4	3	Yes – gastroc flap	Coagulase negative <i>Staphylococcus</i> and <i>Candida</i>
2	F	69	OA	2	5	Smoker, gastric ulcer, GERD, HTN, OSA,	31	5	13	9	6	2	Yes – gastroc flap	Polymicrobial
3	M	64	OA	4	6	Morbid obesity, MI, HTN, inc lipids, OSA, DM	57	7	12	5	3	2	No	<i>Staphylococcus epidermidis</i>
4	M	43	OA	4	7	Cardiac arrest from PE, GERD, OSA, asthma, obesity	42.4	7	14	9	5	3	No	No growth
5	M	67	Post traumatic OA	4	5	Hypothyroidism, cardiomyopathy, ventricular fibrillation, asthma, OSA	38.8	14	36	6	4	2	Yes – gastroc flap	Group b <i>Streptococcus</i> , <i>Stenotrophomonas maltophilia</i>
6	F	85	OA	2	4	HTN, osteoporosis, B12 deficiency, hip fracture	25.6	5	12	3	1	2	Yes – gastroc flap	No growth
7	M	56	post traumatic OA	2	2	Factor V leiden deficiency, hiatal hernia	24	13	6	7	2	0	No	Polymicrobial
Average		62.4		3.0	4.6		38.5	7.7	15.3	6.9	3.6	2.0		
Minimum		43		2	2		24	5	6	3	1	0		
Max		85		4	7		57	14	36	9	6	3		

AKA = above knee amputation, OA = osteoarthritis, ASA = American Society of Anaesthesiologists, HTN = hypertension, DM = diabetes mellitus, GERD = gastroesophageal reflux disease, OSA = obstructive sleep apnea, PE = pulmonary embolus, BMI = body mass index, TKA = total knee arthroplasty, I and D = irrigation and debridement.

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