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Original research

Comparison of mortality rates and functional results after transtibial and transfemoral amputations due to diabetes in elderly patients-a retrospective study

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HIGHLIGHTS

- Mortality rates after trantibial and transfemoral amputations are high.
- Duration between surgery and death was significantly shorter in transfemoral amputees.
- Transtibial amputees have better mobility capacity than transfemorals.

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ABSTRACT

Introduction: This study aimed to compare mortality rates and functional results of transtibial and transfemoral amputations in elderly patients with diabetes.
Methods: 87 amputees [54 (62.1%) transtibial and 33 (37.9%) transfemoral] were included. Mean ages were 70.7 and 69.3 years in transfemoral and transtibial groups, respectively. Mean follow up time was 41.8 months. Amputee Mobility Predictor scores (with and without prosthesis) and Barthel Daily Living Index were used for functional evaluation of the survivors.
Results: First year mortality rates were 29.6% and 30.3% in transtibial and transfemoral groups, respectively. Overall mortality rate of both groups was 65.5% (66.7% in transtibial and 63.6% in transfemoral group). There was no difference between mortality rates of two groups. Duration between surgery and death was significantly shorter in transfemoral group. The mean Amputee Mobility Predictor scores (with prosthesis) of the transtibial and transfemoral groups were 32.3 and 26.9 points, respectively. The average Amputee Mobility Predictor scores (without prosthesis) of the transtibial and transfemoral groups were 29.5 and 22.7 points respectively. The differences between two groups' scores were significant. The mean Barthel Daily Living Index scores of the transtibial and transfemoral groups were 82.5 and 80.2 points respectively. The difference was not significant.
Conclusions: High mortality rates and morbidities after major lower limb amputations emphasize the importance of preventive measures and foot care in patients with diabetes.

1. Introduction

Lower extremity amputations are leading causes of morbidity and mortality in patients with diabetes [1–3]. In addition to macrovascular complications, e.g. myocardial infarction, stroke and peripheral vascular diseases, microvascular complications such as retinopathy and nephropathy may also be seen in these patients [1–6]. As a result of these complications, Diabetes Mellitus (DM) is accepted as the cause more than 50% of nontraumatic amputations and the risk of amputation is increased 12–15 folds in people with diabetes.(3–6) The incidence has been estimated as between 37 and 188 per 100.000 people [7,8].

Several factors may affect the functional outcomes of amputees. Increased age and amputation level would increase morbidity

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[7–12]. It was claimed that increased level of amputation may also increase mortality [3–6]. Although there are several studies related with these issues, there is a lack of literature reporting the updated mortality rates of these two major amputations and functional outcomes despite the advanced rehabilitation techniques and increase in quality of prosthesis technology. This study aims to discuss functional results of transtibial and transfemoral amputations due to incurable wounds in elderly patients with diabetes. We tried to compare mortality rates of these two major amputations and investigate the comorbidities of these patients.

2. Patients and methods

Between 1997 and 2013, total of 181 transtibial and transfemoral amputations (in 115 males and 60 females, 6 bilateral cases) were performed by five different surgeons in two third level orthopaedic centers. Patients who were younger than 60 years old of age, had a different level of amputation or amputated due to etiologies other than diabetes were excluded from the study. The wounds due to diabetes were determined to be the causes of amputations in 92 (50.8%) extremities of 87 patients. The demographic information, co-morbidities, complications were investigated from patients' charts retrospectively. The patients were called by phone and survivors were invited to the outpatient clinic for evaluation of the functional status. Amputee Mobility Predictor (AMP) scores were used to evaluate the survivor unilateral amputees [13]. The AMP scores of the patients were checked with prosthesis (AMPpro) and without prosthesis (AMPnopro). In addition, Barthel Daily Living Index was used for functional evaluation of all patients [14]. If the patient was dead, the time of death after surgery and the questions in Barthel Daily Living Index were asked to the relatives by phone regarding their final status. The outcomes were assessed by an author (AS). The study has local Institutional Review Board approval and informed consent was obtained from all patients.

The statistical analysis was performed by using SPSS 15 (SPSS INC., Chicago, IL; USA). The independent sample T test was used to compare the means of the hospital stay and functional results of the two groups. The Kaplan-Meier survival analysis was used with the death defined as end point. Comparison of survival curves was done by using Log Rank test. We checked for first and fifth years survivorships. The Cox regression analysis was used to detect factors related with mortality and to calculate the corresponding hazard ratios. The Fisher's Exact Test was used in order to compare distribution of comorbidities in two groups. A p value lesser than 0.05 was accepted as significant.

3. Results

Transtibial amputation was performed in 59 (64.1%) (five bilateral cases) and transfemoral in 33 (35.9%) extremities. In transfemoral group 23 patients were male and 10 were female. Mean age was 70.7 (range, 61–95) years at the time of amputation. Twenty of the patients had right and 13 had left extremity amputations. In transtibial group 33 patients were male and 21 were female. Mean age was 69.3 (range, 60–84) years at the time of amputation (Table 1). Thirty seven left sided and 22 right sided amputations were performed. Mean hospital stay was 10.1 (range, 2–62) days [9.8 (range, 2–33) days in transtibial group and 13.2 (range, 5–62) days in transfemoral group]. The difference between two groups was statistically significant. ($p = 0.024$).

The mortality rates were 29.6% and 30.3% in transtibial and transfemoral groups at the end of the first year, respectively. Five-year mortality rates were 66.7% in transtibial group and 63.6% in transfemoral group. Overall mortality rate was 65.5% for all amputees. There was no difference between mortality rates of two groups.($x^2 = 0.169$, $p = 0.681$ for first year and $x^2 = 0.156$, $p = 0.693$ for fifth year) (Figs. 1 and 2) The mean periods between amputation and death were 13.6 (range, 1–61) months in transtibial group and 7.1 (range, 1–40) months in transfemoral group. The difference was statistically significant.($p < 0.001$).

In three males and two females bilateral transtibial amputation was performed. Mean age of these five patients was 67.2 (range, 60–75) years, mean follow up was 34 (range, 17–40) months. Two of these patients died with a mean of 22 months after surgery.

Superficial infections occured in 10 (16.9%) extremities of the transtibial group and in 5 (15.2%) extremities of the transfemoral group during early postoperative follow ups. All patients were treated by antibiotics but debridement was needed in 7 (11.9%) extremities of transtibial group and 3 (9.1%) of the transfemoral group.

The comorbidities in transtibial group were chronic renal disease (CRD) in 3 patients, coronary artery disease (CAD) in 5 patients, chronic obstructive pulmonary disease (COPD) in 1 patient, chronic hepatic disease (CHD) in 1 patient. In transfemoral group 12 patients had CRD, 3 patients had CAD and 2 patients had COPD. The difference between two groups in terms of number of patients with CAD, COPD and CHD was not significant.($p = 0.979$, $p = 0.554$ and $p = 1$, respectively) In transfemoral group there were more patients with CRD.($p = 0.001$) In Cox regression analysis, CAD and COPD were found to be increasing mortality.($p < 0.001$) (Table 2).

The survivors of this cohort [30 patients- 18 transtibial, 12 transfemoral] were evaluated for functional status. Mean age of those patients was 72.3 (range, 65–89) years. There were 10 males and 8 females in transtibial group [mean age, 74.1 (range, 65–87) years]. Transfemoral group included 6 males and 6 females [mean age, 71.2 (range, 67–89) years]. The overall mean follow up time was 79.1 (range, 25–129) months. Average follow up times were 88.9 (range, 31–129) months in transtibial group and 69.5 (range, 25–104) months in transfemoral group. The mean AMPpro scores of the transtibial and transfemoral groups were 32.3 (range, 14–42) and 26.9 (range, 19–40) points, respectively. The average AMPnopro scores of the transtibial and transfemoral groups were 29.5 (range, 11–40) and 22.7 (range, 16–39) points, respectively. The differences between two groups' scores were statistically significant (Table 3).

The Barthel scores were determined by interview with relatives of the dead patients and the outpatient clinic evaluation of the survivors. The mean scores of the transtibial and transfemoral groups were 82.5 (range, 70–100) and 80.2 (range, 65–100) points, respectively. The difference between two groups was not statistically significant.($P = 0.21$) (Table 3).

4. Discussion

Peripheral vascular disease and diabetes mellitus are major causes of lower-limb amputations [3]. More than half of the non-traumatic amputations are related to the complications of diabetes. Additionally it has been shown that diabetes increases the risk of amputation for 12–17 times [4,5]. In our study as consistent with the literature, foot wounds due to diabetes (50.8%) were leading cause of major amputations.

In the literature the mortality rates were between 20.8 and 30.2% for transtibial amputations and 35.4–46.2% for transfemoral amputations at the end of first year [3,6,9–11]. In their study in which 2375 patients were included; Bates et al. had found that mortality rates were higher in the transfemoral amputation group than the transtibial group [3]. Carmona et al. reported survival rates after major lower limb amputation at the first year as 61.7%, at the second year as 47.9%, at the fifth year as 22.6% and at the tenth year as 13%. They claimed that 10.5% of patients died at the first days of hospitalization and transtibial amputation group had less mortality