

Re-Amputations and Mortality among Patients with Diabetic or Peripheral Vascular Complications

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Each year many patients, most of them elderly, are admitted to hospitals to undergo amputations secondary to peripheral vascular disease or diabetes. Unlike those undergoing trauma or cancer-related amputations, people with peripheral vascular disease and diabetes can experience a progression of the underlying disease process. Failure of the primary surgical wound from a lower limb amputation to heal, or development of further vascular compromise, can lead to a higher level amputation of the same limb and, in case of resistant infection, even death. Understanding the clinical course of patients undergoing dysvascular amputations is important from the surgical as well as rehabilitation perspective. Although the primary goal of amputation surgery is to remove diseased tissue, another important concern is preservation of limb length which has been associated with better ambulatory functioning.

Ebskov and Josephsen [1] investigated 2029 amputations for arteriosclerotic and diabetic gangrene with an observation period of up to 4 years. Ipsilateral re-amputations were carried out in 10.4% of all amputees within 1 month of the initial amputation. The percentage after 2 months was 14.8 and after 3 months 16.5. The percentage of re-amputation after 6 months was 18.8, constituting the majority of all ipsilateral re-amputations during the observation period. In fact, from the

7th to the 48th postoperative month only a further 4.3% of the amputee population was re-amputated. It seems most probable that, by far, the majority of ipsilateral re-amputations were due to postoperative complications that could not be controlled by conservative means. The greatest risk of death was encountered within 3 months following amputation, whereas the mortality rate 1 year after was 18.4%, and 4 years after amputation 22.5%.

Hubbard published the outcome following rehabilitation for 92 vascular amputees admitted to a geriatric center in Australia [2]. The average age of subjects at amputation was 71 years (SD 9.0, range 47–91 years). There were 40 below-knee amputees, 37 above-knee amputees, and 15 bilateral amputees – 11 bilateral BKA and 4 combination AKA/BKA. Three subjects died while inpatients in the center – all of them AKA, all females, and all in their ninth decade. Twenty-nine subjects (32%) died prior to completion of the study, and 18 (20%) within 2 years of amputation. Two subjects died prior to prosthetic fitting. Since 20% of amputees had died less than 2 years post-amputation, the study concluded that a very limited life-span can be expected for people with amputations who have a primary diagnosis of peripheral vascular disease.

Pernot and co-authors [3] in the Netherlands described 191 major lower limb amputations in 164 patients, among them 77 BKA, 52 AKA and 43 knee disarticulations. Twenty of them (10.5%) died during hospitalization.

Dillingham et al. [4] collected 3565 people who underwent lower limb amputations during the year 1996. Of these,

BKA = below-knee amputations
AKA = above-knee amputations

26% required subsequent amputation procedures within 12 months, and more than one-third died within 1 year of their index amputation. Although diabetic amputees were less likely to die within 12 months of the index amputation, they died at a significantly younger age than their non-diabetic counterparts. Progression to a higher level of limb loss occurred most frequently among persons with an initial foot or ankle amputation. Diabetic amputees were more likely than non-diabetic amputees to experience progression to a higher amputation level for all initial amputation levels. According to the authors, selecting the level for lower limb amputations in patients with peripheral vascular disease and diabetes is a complex process. The medical status of the patient, ankle brachial indices, transcutaneous partial pressure of oxygen measurements, the presence of a surgically correctable large artery obstruction, and the presence of capillary blood flow noted at the time of surgery are all important factors that influence selection of the optimal level at which to perform amputation.

Dillingham and Pezzin [5] estimated the differences in outcomes for dysvascular lower limb amputees across post-acute care settings and inpatient rehabilitation (n=344), skilled nursing facility (n=903), or home-care (n=1221). The total number of participants who had dysvascular lower limb amputation was 2468. One year mortality for all elderly amputees was 41%. Patients discharged to inpatient rehabilitation settings were significantly ($P < 0.001$) more likely to survive the first 12 months after amputation (75%) than those discharged to skilled nursing facilities (63%) or those sent for home care (51%).

Subsequent amputations were significantly ($P < 0.025$) less likely for amputees receiving inpatient rehabilitation (18%) than for those sent home (25%). Patients discharged directly to a skilled nursing facility were more likely to have had an amputation at the highest level such as above the knee than patients discharged to inpatient rehabilitation (48% vs. 34%, respectively). The results of this investigation suggest that inpatient rehabilitative care after dysvascular lower limb amputation is associated with decreased mortality and reduced subsequent amputations, compared to patients who were sent to a skilled nursing facility or directly home.

A relatively high mortality rate, very old age of the patients, and re-amputations can influence the decision whether or not to fit the patient with a prosthetic device. Tsur and team [6] found that with increased age the patient has difficulty wearing the prosthesis and walking quickly, and tires earlier while walking.

In this issue of *IMAJ*, Rosen et al. [7] describe their experience with mortality and reoperations during a 3 year follow-up of 188 consecutive patients who underwent 198 amputations for ischemic, infected or gangrenous foot. Based on their observations, both above-knee and below-knee amputations were associated with very high mortality rates. Mortality at 1 year was significantly higher among patients who underwent AKA compared to BKA (58% compared to 33%), reoperation rates at 60 days after surgery were marginally higher among BKA patients (26.7% compared to 16.9% for AKA patients), a higher level of amputation was more often required for BKA patients (15.8% vs. 3.6% for AKA patients), and AKA was found to be associated with a higher postoperative cardiovascular complication rate (33.7%

after AKA compared to 18.8% after BKA). The authors concluded that mortality can be expected in both early and late postoperative periods and it is most probably related to serious comorbidities such as renal and heart disease, as well as to reduced functional status and dementia. Resistant bacterial infections are associated with high rates of reoperation. The risk factors described can help surgeons and patients to better anticipate and possibly prevent severe complications.

Similar observations were published by other authors. Johannesson et al. [8] posited that in the general population aged 45 years or more, the incidence of vascular lower limb amputation at or proximal to the transmetatarsal level is eight times higher in diabetic than in non-diabetic individuals. One in four amputees may require contralateral amputation and/or re-amputation [8]. Brown and colleagues [9] observed that trans-tibial amputation is associated with a statistically higher morbidity and mortality than transmetatarsal amputations. Transmetatarsal and Chopart's amputations had high ambulatory levels and the longest durability, suggesting that these amputations may provide some ambulatory advantage [9]. According to Nerone et al. [10], assessing the peripheral vascular status in all diabetic patients is important since early referral to a vascular surgeon after minor foot amputation might delay or prevent major lower limb re-amputations.

Based on these reports it seems that in patients with diabetic or vascular complications the treatment of choice is based on meticulous debridement of the source of lower limb infections by "minor" amputations, combined with appropriate intravenous antibiotic administration

and early vascular procedures. This kind of treatment may yield a relatively high percentage of successful limb salvage and reduce the necessity for initial or secondary above- or below-knee amputation.

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“A fellow of mediocre talent will remain a mediocrity, whether he travels or not; but one of superior talent (which without impiety I cannot deny that I possess) will go to seed if he always remains in the same place”

Wolfgang Amadeus Mozart (1756-1791), Austrian musician and composer. He composed over 600 works, many acknowledged as pinnacles of symphonic, concertante, chamber, operatic, and choral music. He remains one of the most popular classical composers, and his influence on western music is profound