# Rehabilitation of the Older Vascular Amputee: A Review of the Literature

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**Background:** A total of 75% of all lower extremity amputations occur in persons over the age of 65 years, with vascular disease being a significant cause for 90% of such amputations in older adults.The proportion of amputees aged 85 years or older is projected to increase from 20% to 35% in the next 40 years. For older dysvascular amputees with above knee amputation, less than one-third will become successful prosthetic users. Therefore, for older amputees, an alternative to prosthetic mobility needs to be considered.

**Objectives:** The aim of the present study was to review the literature on rehabilitation of older dysvascular amputees to understand the factors in this cohort affecting suitability for prosthetic rehabilitation. In the light of these findings, the management of mobility for those assessed as unsuited for a prosthetic limb was discussed.

**Criteria for selecting studies for this review:**

**Types of studies:** Original journal article (reviews and meta-analyses excluded.

**Types of participants:** People with amputations who are more than 65 years; vascular cause for the amputation; and amputation level of below knee, transtibial amputation (TTA), through-the-knee (TKA) or above knee (AKA), Transgenicular (TGA), Gritti Stokes amputation, transfemoral amputation (TFA), and bilateral amputations (table 1).

**Types of interventions and outcome measure:** Reference table 1

**Search strategy for identification of studies:** A search of the literature was carried out using the MEDLINE, EMBASE and CINAHL databases up to September 2010.

**Conclusion:**

Identifying patients who will undergo successful prosthetic rehabilitation is challenging as well as to predict whether prosthetic use will be continued and to what extent.Multidisciplinary teams are good at predicting successful prosthesis users, but less so at predicting non-users. Identifying patients likely to benefit, or not, from gait retraining is challenging because of the heterogeneity within the amputee literature. Studies use different outcome assessment tools and the definition of successful prosthetic use also varies. Formulation of a single amputee-specific mobility assessment tool and agreement on the definition of successful gait retraining would allow comparison between studies, and therefore allow more accurate patient selection. Given the challenges in selection of successful prosthetic rehabilitation candidates, further research into this area is required.

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**Table 1** Factors affecting successful prosthetic rehabilitation of the older vascular amputee

| Study author, year | Study design | Characteristics of study population | Outcome measure | Predictors of successful prosthetic use/fitting |
|---|---|---|---|---|
| Fletcher, 2002[2] | Retrospective cohort | • $n = 292$<br>• Age >65 years | Successful prosthetic fitting defined as dismissal from physical therapy (inpatient or outpatient) with a definitive prosthesis | • Younger age<br>• Lower level of amputation |
| Schoppen, 2003[6] | Prospective cohort | • $n = 46$<br>• Mean age at amputation 73.9 years (SD 7.9)<br>• 70% male | Graded classification of prosthetic use dichotomised into functional use (score = I-IV) and non-functional use (score = V-VIII) | • Better one leg balance on the unaffected limb |
| Callaghan 2008[17] | Prospective cohort | • $n = 166$<br>• Mean age 66.73 years (SD 10.3)<br>• 69.3% male | 1 and 6 months FU with:<br>FMA (indoor use; outdoor use; h/day; days/week)<br>LCI | FMA<br>• Believes treatment effective<br>• Perceives symptoms as not fluctuating<br>LCI<br>• Lack of distressing thoughts |
| Johannesson 2010[18] | Prospective cohort | • $n = 217$<br>• Transtibial amputation<br>• Mean age = 77 years<br>• 51.6% male | Functional status at 1 year follow up after amputation:<br>Good: Patient received prosthesis, wore it daily and walks alone indoor, walks with or without assistance outdoor.<br>Poor: Patient did not receive a prosthesis, or received it but did not wear it daily, unable to walk indoor without assistance; mostly used wheelchair | • No significant predictors for good function at 1 year follow up |
| O'Neill 2009[19] | Prospective cohort | • $n = 34$<br>• Mean age 60.69 years (SD 13.98)<br>• 82.4% male | LCI<br>SIGAM mobility grades<br><br>Self reported hours of use | • Better visual memory (figure recall)<br>• Immediate verbal memory<br>• Younger age<br>• Lower level of amputation<br>• Absence of pain<br>• Better verbal fluency |
| Erjavec 2008[20] | Prospective cohort | • $n = 63$<br>• Age 72.5 years (SD 9.1)<br>• Transfemoral amputation | Whether prosthesis fitted or not based on clinical decision | • Better results on exercise stress test<br>• Better results for 6-min walk time<br>• Higher FIM score<br>• Younger age |
| Traballesi 2007[21] | Retrospective cohort | • $n = 30$<br>• Age 65 years (SD 10)<br>• Bilateral above-knee amputees | Barthel Index<br>LCI | • Younger age<br>• Good stump quality |

**Table 1** *Continued*

| Study author, year | Study design | Characteristics of study population | Outcome measure | Predictors of successful prosthetic use/fitting |
|---|---|---|---|---|
| Traballesi 1998[22] | Prospective cohort | • $n = 144$<br>• Mean age 68.7 years (SD 10.2)<br>• 66% males<br>• Above-knee amputees | Barthel Index<br>Rivermead Mobility Index | • Younger age<br>• Absence of vascular impairment of residual limb |
| Kurichi 2007[15] | Retrospective cohort | $n = 2375$ | Prosthetic prescription within 1 year of amputation | • Younger age (<75)<br>• Higher cognitive and motor FIM score<br>• Lower level of amputation |
| Larner 2003[23] | Prospective design study | • $n = 43$<br>• Mean age 66.35 years (SD 14.99)<br>• Transfemoral/transtibial amputation | Use of prosthesis during rehabilitation | • Lower level of amputation<br>• Higher score on test of learning ability |
| Chin 2002[24] | Prospective cohort | $n = 17$ | Ability to walk 100 m with/without cane | • Higher $\%VO_2$ max<br>• Fewer comorbidities<br>• Good ability to stand on remaining leg<br>• Strong will to walk |
| Fletcher 2001[1] | A retrospective cohort | • $n = 199$<br>• Mean age at amputation 79.7 years | Successful prosthetic fitting defined as dismissal from physical therapy (inpatient or outpatient) with a definitive prosthesis | • Younger age<br>• Absence of dementia<br>• Lower level of amputation<br>• Absence of cerebrovascular disease |
| Hermodsson 1998[25] | Prospective cohort | • $n = 112$<br>• 51% male<br>• Age 76.6 years (SD 10.3)<br>• Unilateral transtibial amputation | Being prescribed a prosthesis<br><br>Functional use of prosthesis at 6 months FU | • Younger age<br>• Independent mobility outdoor prior amputation<br>• No using wheelchair before amputation<br>• Left leg amputation<br>• Male<br>• Independent mobility outdoor prior amputation |
| Siriwardena 1991[26] | Prospective cohort | • $n = 598$<br>• Age >50 years | Walking ability index with prosthesis at 6, 9 and 12 months follow up | • Younger age<br>• Absence of IHD at 6 months<br>• Absence of hemiplegia at 12 months<br>• Absence of bronchitis at 12 months<br>• Single amputee at 12 months |
| OConnell 1989[27] | Cohort study | • $n = 46$<br>• Dysvascular amputee and hemiplegiaMean age 63 years | Independent ambulation with prosthesis | • Mild hemiparesis<br>• Lower level of amputation<br>• Prior ability to ambulate before second disability |

%VO2, percentage of volume oxygen maximum; FIM, Functional Independence Measure; FMA, functional measure for amputees; FU, follow up; IHD, ischemic heart disease; LCI, Locomotor Capability Index; SIGAM, special interest group in amputation medicine.