

# REVIEW ON ROLE OF REHABILITATION TECHNOLOGY IN IMPROVING GAIT FOR BELOW KNEE AMPUTATION

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## Abstract

The removal by surgery of a limb (arm or leg) or other body part because of injury or disease, such as diabetes or cancer. Below-knee and above amputation are the most commonly performed major amputations. Below-knee amputations may be carried out using either a long posterior flap or skewed flaps. Successful use of prostheses after lower-limb amputation (LLA) depends on undergoing physiotherapy and rehabilitation both physically and psychologically. Lower extremity (LE) amputation patients who use prostheses have gait asymmetries and altered limb loading and movement strategies when ambulating. Subsequent secondary conditions are believed to be associated with gait deviations and lead to long-term complications that impact function and quality of life as a result.

**Keywords:** Amputation; Amputation; below knee amputation; gait pattern; gait training.

## INTRODUCTION

Below-knee or “BK” amputations, also known also transtibial amputations, represent the largest percentage of lower limb amputations. Thus, more than half of lower-limb amputations are below knee amputations at different levels (long, mid, and short), and consideration of these is thus important in education and training for the manufacturing of prosthetics and patient rehabilitation. These varying levels mean that persons with below knee amputations must be rehabilitated with specific regard to their amputation levels [1]. The types of prosthetics most commonly used are silicone, with urethane or elastomeric gels the fit directly to the stump and hold the prosthetic in place using ring or pin locks. BK prostheses[1]

Primary targeted muscle reinnervation are to prevent the development of symptomatic neuromas and phantom limb pain and amplify myoelectric signals for advanced bioprosthetic limbs[2]

Lower extremity (LE) amputation patients who use prostheses have gait asymmetries and altered limb loading and movement strategies when ambulating. Subsequent secondary conditions are believed to be associated with gait deviations and lead to long-term complications that impact function and quality of life determine the strength of evidence supporting gait training interventions and to formulate evidence statements to guide practice and research related to therapeutic gait training for lower extremity amputees[3].

flap technique was introduced by Burgess and Romano in 1967 and is the most commonly used method. The skew flap technique was described by Robinson in 1982. A randomized trial comparing the two techniques demonstrated equivalence in terms of healing, need for revision and success[3-18]

The study comprised 74 patients with below-knee stumps admitted for rehabilitation at the Department of Physical Therapy and Rehabilitation, Split University Hospital, Croatia, in 1994. They were fitted with a preliminary prosthesis, a donation from the Finish Red Cross. The rehabilitation was performed by a professional team and included regular bandaging of the stump, exercises to prevent knee and hip joint contracture, general fitness exercises, standing-up, falling and walking exercises, and electrostimulation of the thigh muscles. The time to reach each rehabilitation phase (walking with 2 crutches, walking with 1

crutch, walking with no crutches) was measured. The satisfaction of the patients with the prosthesis was also assessed at the end of rehabilitation[19-35]

prosthetic rehabilitation, advanced components and techniques are available and accessible. Correct, usable information about the available choices and processes can help the teams guide the patient and family appropriately. Great outcomes could be achieved if the surgical team intervenes and helps the patient and family make a reliable choice of a skilled and experienced service provider as well as an appropriate prosthetic solution.[35]

determine the rate at which gait recovery as measured by temporal distance factors (velocity and symmetry) occurs in unilateral lower limb amputees. A microcomputer footswitch system was used to record the gait patterns of twenty subjects, mean age 65.1 years. The initial measurement was taken when the subject was capable of walking 6 meters with an interim prosthesis within the parallel bars. The patient sample as a whole was analyzed and subjects were further divided into four groups, depending on ambulatory aid required at discharge.[5]

## DISCUSSION

Although the exact contribution of the visual feedback could not be isolated, the training was effective in improving the patient's walking performance. Biomechanical data suggest correcting trunk motion and increasing hip abductor strength (force-generating capacity) may be important in facilitating improvements at the pelvis and hip. Observed improvements in oxygen consumption were significantly larger than achieved through previously reported interventions.[7] We have shown that through-knee amputees rehabilitate better and rely on wheelchairs less than above-knee and Gritti-Stokes amputees. This is in agreement with the results of another recent study<sup>14</sup>. The through-knee amputee is more stable, especially when walking up or down slopes; presumably this is due at least in part to the wide bulbous end-bearing stump of this amputation which is associated with retention of proprioception and greater durability<sup>15</sup>. These features of the stump also enable early postoperative mobilization on a pneumatic postamputation mobility aid.[8]

## CONCLUSION

Early physical rehabilitation and replacement of the lost extremity with a preliminary prosthesis is an optimal intervention in below-knee amputations due to war-injury. Special attention should be paid to the psychological support to these patients during rehabilitation therapy. Longer rehabilitation time and dependence on crutches in the patients with amputations due to vascular diseases or diabetes-related complication could be explained by different factors. Older age and weaker general muscular fitness of these patients are the most important because increasing age, concurrent disease, and poor compliance have been shown as prognostic factors for a low functional level after rehabilitation

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