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Case Report

Above Knee Amputation (AKA) Rehabilitation - Case Study

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ABSTRACT

An essential component of prosthetic training in amputees is to achieve full weight bearing through the prosthesis. The end-bearing nature of the intact femur in an individual with a Above knee (Trans-femoral**)** amputation offered a rare opportunity to examine this component. The purpose of this case study was to describe the Physiotherapeutic treatment considerations specific to the above-knee amputee. Treatment is determined by the assessment findings. The physiotherapy programme includes post-operative exercises, early weight-bearing, bed to chair transfers, bandaging techniques, the counteracting of contractures and gait training. Physiotherapy is a vital part of the rehabilitation of above-knee amputees. Principles of treatment are based on normal human locomotion, the individual patient's health status, biomechanical changes and expected stump functions. The above knee stump is generally problem free, functional and end-bearing, allowing for a high rehabilitation rate in independent ambulation.

Keywords: Rehabilitation, trans femoral amputation, case report.

INTRODUCTION

Above-knee amputation is most often performed for advanced soft-tissue sarcomas of the distal thigh and leg, or for primary bone sarcomas of the distal femur and proximal tibia. It is usually indicated because of major involvement of the main neurovascular bundle or the presence of an extensive involvement of the soft tissues. Above-knee amputations may be performed through the distal aspect of the femur (supracondylar), the middle section of the femur (diaphyseal), or just below the lesser trochanter (high above-knee). The surgical technique emphasis is on flap design and meticulous dissection, use of continuous epineural analgesia, myodesis of the major muscle groups to the distal femur, meticulous wound closure, and application of a rigid dressing. [1]

Amputation of lower limb causes a series of changes and concomitant adjustments which are related not only to the mutilated limb but also to the entire body. [2,3]

The sensorimotor system with its complex mechanisms includes the term of proprioception. This intricate process involves the transport of information to the central nervous system, relative to the sense of joint position in space, the feeling of power that develops in the joint (sense of force) through specialized sensory receptors, and kinesthesia, videlicet the sense of motion of the joint. [4,5]

Above knee amputations result in a loss of a significant number of mechanoreceptors of the knee and generally of the lower limb, [6] a fact that consequently leads to proprioceptive

deficits. The reduced proprioceptive ability is recorded as a reduced kinesthesia both in the stump and the contra lateral no amputated lower limb. [7]

The physiotherapists encounter patients with below-knee (BK) and above-knee (AK) amputations during lower limb rehabilitation. Although all recent lower limb amputation levels have common functional treatment goals such as: healing of the surgical suture, stump maturation prior to definitive prosthetic fitting, gait training, each stump level will present different ambulation and prosthetic fitting problems. These have to be dealt with on an individual basis. Therefore, the treatment planning for a recent above knee amputee has to be directly related to the amputee's physiological, functional and mechanical losses. [8]

CASE DESCRIPTION

This is a case of30 year, married, non-HTN, non-DM male patient who suffered a motor vehicle accident (MVA) resulting in bilateral Above Knee Amputation. He spent eight weeks in acute care unit for surgical interventions and wound care.

Social Hx

Patient is a Sports man. The toilet/bathroom is approximately 5 m from the Pt.'s room. Additionally, as of the injury, his brother drives him to the outpatient PT every day. Patient is highly motivated and cooperative, as he desires to return his daily activity.

Rehabilitation

Successful rehabilitation Program (of the patient who has undergone) with an Above Knee amputation requires a coordinated effort that should start at the time of the staging studies. The health-care team member must develop an honest relationship with the patient and family and include them in the decision-making process from the very beginning. Building upon this basis the patient will be better able to accept the amputation and set realistic goals for recovery. The patient should be educated about phantom limb Pain (PLP) that might occur following surgery. These sensations should be presented as a normal part of the recovery process. PLP is generally controlled by the judicious use of analgesics and the passage of time. The requirements of AKA are somewhat different from those of Below Knee amputation (BKA). Their energy requirements are almost 100% greater, and it is not unusual for the Trans-femoral amputee to require an assistive device (i.e. a cane) for community ambulation, and be less able to participate in sports than a patient who has undergone BKA. Younger and motivated patients can have a good functional outcome, but older patients can find the energy cost difficult to overcome.

The first stage of recovery is dedicated to proper wound healing and conditioning of the stump. Prevention of flexion contracture of the hip joint can be achieved with rigid dressing, prone positioning, a physical therapy program and, in most cases, a combination of all three modalities. The use of immediate postoperative prosthesis is more practical and better tolerated by these patients than by below-knee amputees. A temporary prosthesis provides the patient the advantage of training with a simple and adaptable device. It also becomes a backup to the permanent prosthesis, which is fabricated when the residual limb has stabilized in volume and matured to allow full-time wear. Two critical elements in manufacturing are selection of the knee joint mechanism and suspension system. Many designs, with varying degrees of durability, gait parameters, weight, and stability, are available. Selection of an appropriate product is dependent on patient-specific factors such as age, weight, type of daily activities, and desired sports activities, and requires close consultation with the prosthetist. [1]

Functional treatment goals such as: healing of the surgical suture, stump maturation prior to definitive prosthetic fitting, gait training.

Assessment

An assessment for physiotherapy treatment planning includes the following considerations (Holliday, 1981; Mensch and Ellis, 1982) -

- Reason or reasons for surgery
- General health of the patient
- Stump condition
- Proprioception and balance
- Condition of the remaining leg
- Pre-amputation ambulation

PHASE I (Post-Op Weeks 1 to 2) rehabilitation programme:

- Strengthening exercise for Upper limb (deltoid, triceps, biceps) with 2 kg dumbbells 30 repetition/ progress to 40 repetitions with 5 kg.
- Balance exercise on long sitting position by throw ball/ progress with 1 kg ball with different angle.
- Independent transfer from bed-chair and vice versa.
- Independent rolling 3 repetitions/ progress to 6 repetitions.
- Lower limb strengthening exercise for (hip flexors, hamstring, quadriceps and Glutei).
- Push up on sitting position 10 repetition.
- Abdominal exercise.
- **Tolerance exercises**

PHASE II (Post-Op Weeks 3 to 4) rehabilitation programme:

- Strengthening exercise for Upper limb (deltoid, triceps, biceps, trapezius) 80 repetitions with 8 kg/ progress to 10 kg.
- Balance exercise on sitting position with 2 kg ball with different angle.
- Push up exercise on sitting position.
- Sit to stand 10 times
- Hot pack for low back pain for 15 min.

PHASE III (Post-Op Weeks 5 to 6) rehabilitation programme:

- Teach patient how to donning and doffing prosthesis 5 times.
- Sit-stand teaching 10 times.
- Posture correction in sitting and standing using mirror as biofeedback.
- Standing balance exercises.
- Gait training by Zimmer frame 2-5 steps.
- Standing for 3-5 min.

PHASE IV (Post-Op Weeks 7 to 8) rehabilitation programme:

- Sit to stand 20 times/ progress 25 times.
- Balance exercise in sitting and standing position.
- Gait training exercise with Zimmer frame.
- Standing for 10 min.
- Gait training by parallel bar for 20 min.
- Balance exercise by parallel bar.

Fig-1-Upper limb strengthening by dumbbell

Fig-2- Push up exercise in sitting position

Fig-3- Upper limb strengthening with 10 kg

Fig-4- Hip Flexors Strengthening

Fig-5-Hip abductors strengthening

Fig-6- Gait training with Zimmer frame

Fig-7-Gait training in parallel bar

DISCUSSION

The intent of this case report was to present a patient with an AKA and complex medical problems who was successfully treated with a CAT-CAM prosthesis. We believe the temporally CAT-CAM prosthesis allowed him to bear weight sooner than a conventional prosthesis because of the flexible, yet stable, socket. The socket is flexible in its ability to accommodate changing residual limb volume and is stable in its ability to hold the residual limb. We believe the temporary CAT-CAM prosthesis with adjustable socket is the prosthetic device of choice for AK amputees with problematic weight fluctuations secondly to complex medical problems. Our patient was a good candidate for this prosthesis because of his weight fluctuations secondly to immunosuppressant corticosteroid use and because of his limitations with cardiac endurance. We believe the temporary CAT-

CAM prosthesis allowed our patient to achieve a high level of independence and mobility in a minimal amount of time because of its structural characteristics allowing for flexibility and stability. Training protocols for other prostheses would have been halted or delayed because of the patient's weight fluctuations. Our patient was a challenge to rehabilitate because of his complex medical history, and further follow-up may be required to assess the long-term benefits of obtaining a definitive prosthesis. Additional research is needed to assess the design of the CAT-CAM prosthesis used in our facility to substantiate our conclusions based on one individual. [9]

The proprioceptive sensation of the lower limb, with the active reproduction of a predetermined angle method, in a closed kinetic chain environment, using the healthy limb like an internal control group. This angle was selected because it is a representative angle within the functional range of 10^0 to 60^0 flexion of the knee, which is required forth normal gait, both for the stance phase and for the beginning of the swing phase. [10] It even seems that the activation of mechanoreceptors is greater in this angle. [11,12]

This fact suggests that albeit the study participants showed decreased value of proprioceptive sensation to a certain degree, they did not present a serious decrease of proprioceptive information of the lower limb and more specifically the knee joint, after an above-knee amputation and placement of a prosthesis, for at least one year. These results are in accordance with the findings of previous researchers, who did not record significant decrease as well, as regards the Joint Position Sense (JPS) after amputation and place men to fan artificial joint [13,14]

Similar results were recorded by Liao and Skinner in patients with below-knee amputations, who were evaluated for the sense of the joint position in space, and the kinesthetic perception of the knee joint. In that trial not a significant decrease of the proprioceptive information was recorded by measuring the patient' stability to reproduce a predetermined angle with the amputated limb, while even in that study decreased values of kinesthesia characterizing the amputated limb are detected as well. [14]

CONCLUSION

Clinical application from this case study suggests that a person with a primary above knee amputation can effectively enter and benefit from a temporary prosthesis program. The cosmetic appearance of the uncovered endoskeletal shank concerned the amputee more than the disproportionate knee axes. Therapeutic strategies to effect weight bearing should be emphasised in the first four weeks of gait training. Intentional tilting of an unstable platform with visual biofeedback for balance training demonstrated much better use of the prosthetic limb than attempting to maintain the horizontal attitude of the platform.

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