VOLUME - 10, ISSUE - 04, APRIL- 2021 • PRINT ISSN No. 2277 - 8160 • DOI : 10.36106/gjra

Original Research Paper

Physical Medicine

FUNCTIONAL OUTCOME OF EARLY POST OPERATIVE PROSTHETIC FITTING IN TRANSTIBIAL AMPUTEES

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ABSTRACT

INTRODUCTION: Limb loss is one of the most physically and psychologically devastating event that can happen to a person. Successful rehabilitation following amputation is complex. Early post-operative prosthetic fitting and independent ambulation are major goals in the rehabilitation.

OBJECTIVES: In this study a low cost temporary prosthesis is provided to transtibial amputees in the early post-operative period which can be fabricated in very less time and needs little training for its application and can be re-used as the definitive prosthesis by changing the socket. Their functional outcome is assessed.

METHODS: All transtibial amputees attending the Dept of Physical Medicine and Rehabilitation, Govt Medical College, Thiruvanathapuram satisfying the inclusion criteria were provided with Early Post operative Prosthetic fitting. Functional outcome was assessed using Prosthesis Evaluation Questionnaire, one minute walk test and time to healing.

CONCLUSION: Early prosthetic fitting and gait training can prevent complications like deconditioning of muscles, knee flexion contractures and falls. The removable rigid dressing is a useful means to facilitate wound healing, because the system reduces edema and tissue tension. Gait training of the patient is easier. Psychological advantages are gained like better acceptance of the amputation and restoration of the body image.

KEYWORDS : Early Post Operative Prosthetic Fitting, Transtibial Amputee, Definitive Prosthesis.

INTRODUCTION

Limb loss is one of the most physically and psychologically devastating events that can happen to a person. Successful rehabilitation following amputation is complex. Early post-operative prosthetic fitting and independent ambulation are major goals in the rehabilitation The problems encountered in fitting and using the permanent below knee prosthesis in developing countries are the high price of prosthesis, delay in the manufacturing of prosthesis, inadequate fitting and lack of rehabilitation[1].In our scenario transtibial amputees have to wait for about 6 months to one year for a definitive prosthesis fitting. During this time either the patient is bedridden or dependent on walking aids like axillary crutches or walkers.

In this study we are providing a low cost temporary prosthesis in the early postoperative period which can be fabricated in very less time and needs little training and can be reused as definitive prosthesis by changing the socket.

An ideal stump is a prerequisite for prosthetic fitment. The wound must have healed, oedema reduced and limb should have conical shape. Residual limb oedema very common after surgery has to be managed by elastic pressure bandaging or rigid casting[2] with plaster of Paris. Plaster cast is assumed to improve wound healing. It prevents oedema instead of reducing it[3]. Patients regain walking ability sooner[4], knee flexion contracture can be prevented more effectively[5] and they suffer less general complications because of quicker mobilization. Immediate post operative Prosthetic fitting (IPOF)[6] is the application of rigid dressing along with a pylon and foot attachment given soon after surgery in the operating room or recovery room. Early Post operative Prosthetic fitting (EPOF) is similar to IPOF except that it is put on 5-7 days after surgery[7].Early fitting of prosthesis can be delayed up to 3-6weeks until oedema reduced and wound started to heal. In this study a low cost temporary prosthesis for transtibial amputations is provided which can be fabricated in 2 hrs. Temporary prosthesis is endoskeletal type with socket fabricated using synthetic cast (fibre glass casting tape)to which pylon is attached through an adaptor. Length of pylon can be adjusted and SACH foot is attached. The supracondylar cuff suspension is used or sleeve suspension or supracondylar suprapatellar suspension. The definitive prosthesis is given when size of residual limb stabilizes. The functional outcome is assessed.

OBJECTIVE

To study the functional outcome of early post operative prosthetic fitting in transtibial amputees using Prosthesis evaluation questionnaire, one minute walk test, time to definitive prosthesis and occurrence of complications.

PROSTHESIS EVALUATION QUESTIONNAIRE

Functional outcome was assessed using Prosthesis Evaluation Questionnaire by Interview method. The questions of the PEQ will be explained to the patients; they have to give the response as a value in between 0 and 100, with 0 being the worst response and 100 the best one. PEQ is an 82 item questionnaire comprising 9 scales which was developed to assess function and prosthesis related quality of life. Investigators suggest good 4 week and test-retest reliability. Miller and colleagues subsequently combined the ambulation and transfer items of PEQ to form a 13 item mobility scale (PEQ-MS) which is been used in this study. PEQ-MS is having convergent validity with timed walk tests and timed up and go test.

TIMED WALK TESTS

Timed walk tests over 2-, 6-, and 12-minute intervals have been developed in evaluating patients with pulmonary disease.[8] The distance covered is used as a measure of cardiopulmonary and musculoskeletal adaptation to pulmonary impairment. The 2-minute walk test is the most time efficient of the three test durations. and used in amputees.[9] In this study some of the amputees were having difficulty in walking for 2 minutes continuously during initial days of gait training, hence one minute walk test was done for these patients. This is probably best for documenting the patient's self-selected walking speed, because it minimizes fatigue.

RESIDUAL LIMB HEALING

Exact time to wound healing is difficult to analyze and standardize. Rehabilitation success has been measured with the use of numerous indicators including 1° and 2° healing rates, time to healing or rehab, associated mortality rates and whether higher level revision was required. Different criteria

are used to define these indicators. In this study the time from amputation to definitive prosthesis is assessed.

PHANTOM SENSATION AND PHANTOM PAIN

Phantom sensation is defined as the awareness of a non painful sensation in the amputated part of the limb. It occurs in nearly all acquired amputations[10] and is most prominent immediately after amputation. Phantom pain becomes less frequent, less intense, and shorter in duration over time. Persistent phantom pain occurs in approximately 5% of individuals with an amputation. Phantom pain is often described as burning, cramping, stabbing, or squeezing of the limb. The pain may be generalized but more commonly experienced in the distal parts of the missing limb. The cause and underlying physiology of phantom pain remain poorly understood but the incidence of phantom pain is associated with the presence of preamputation pain, phantom sensation, and residual limb pain. Its management include medications like tricyclic antidepressants, anticonvulsants, desensitization techniques, residual limb massage, transcutaneous electrical nerve stimulation (TENS), compressive stocking and encouraging prosthetic use.

MATERIALS & METHODS

STUDY DESIGN

Prospective cohort study

STUDY SETTING

The ward and Artificial Limb Fitting Centre under the department of Physical Medicine and Rehabilitation, Government Medical College, Thiruvananthapuram.

DURATION OF STUDY

1 year

STUDY POPULATION

All transtibial amputees with early post-operative prosthetic fitting admitted in Physical Medicine and Rehabilitation ward during 1 year.

INCLUSION CRITERIA

- Unilateral transtibial amputees with early post- operative prosthetic fitting
- Age between 18 and 80 years.
- Both males and females
- Medically and psychologically fit patients.
- Patients with normal consciousness and cognition.

EXCLUSION CRITERIA

- Age <18 and >80 years
- Bilateral transtibial amputees
- Patients with severe cardiopulmonary diseases, severe bilateral visual defects, illness affecting equilibrium, mental illness, or cognitive deficits
- Patients who have not given consent

SAMPLING SIZE

All consecutive cases admitted in PMR ward for a period of 1 year.

SAMPLING TECHNIQUE

Census type of study

DATA COLLECTION

Clinical examination and interview method.

TOOL

Semi structured questionnaire and prosthetic evaluation questionnaire

STATISTICAL TECHNIQUE

Mean SD proportion

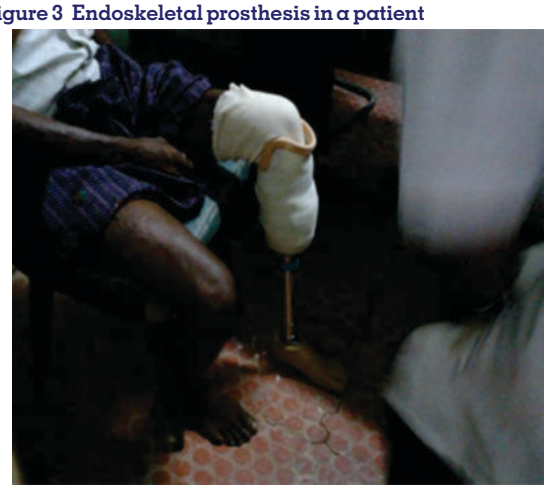
ETHICAL CONSIDERATIONS

The study was approved by both the Research and Human Ethical Committee of our institution. All subjects had signed an informed consent form (available in the local language also) to participate in the study.

Figure 1 Removable rigid dressingusing fibreglass synthetic tape

Figure 2 Endoskeletal prosthesis with suprcondylar suspension , pylon and sach foot

Figure 3 Endoskeletal prosthesis in a patient



OBSERVATIONS

19 patients were enrolled in the study of which 2 were female and 17 were male. The commonest cause of amputation in the study group was diabetes mellitus (36.8%), trauma (31.6%).

malignancy (21.1%) and POVD (10.5%). 57.9% had diabetes . 31.6% of hypertensive. 10.5 % POVD and 5% had dyslipidemia. 21.1 5% patients were having impaired sensation over the residual limb. 10.5 % patients had undergone skin grafting following amputation. This caused a delay in prothetic fitting and was a predisposing factor to ulcer formation during prosthetic fitting. Majority of patients had healed non-adherent scar. 26.3 % had scar adherence. 36.8 % of the patients had restriction of ROM at knee joint. After two months only 23.5% patient had restriction in ROM. Majority of patients had normal sensations over the opposite limb. 21.1% of patients had sensory dulling of the opposite limb due to diabetic peripheral neuropathy. 57.9% of patients were given the temporary prosthesis within 7-12 weeks of amputation. The rest (42.1%) of patients was fitted with the temporary prosthesis within 6 weeks of amputations.

Among 15 patients, 5 were given definitive prosthesis after 2 months. 11 patients were given after 3 months .one patient died. Rest 2 patients developed fracture and were not given definitive prosthesis. 64.7% of patients were having phantom sensation once in a week. Majority of the patients were having phantom pain which was assessed after one month of gait training. . Among 18 patients only 2 (11.1%) patients were not having any phantom pain. 44.4% of patient had phantom pain 2-3 times in a week. 38.9% had about once in a week and 5.6 % had several times every day.

One minute walk test was done during admission after giving the temporary prosthesis and also after one month. At admission the mean distance was 16.13 meters with a standard deviation of 6.927 and after one month the mean distance was 27.31meters with a standard deviation of 11.643. There is a significant increase in the distance walked by amputees in one minute after using the temporary prosthesis for one month.

Ambulatory scores of 17 patients were obtained using the motility scale in prosthesis evaluation questionnaire. The minimum score was 49.3 and maximum score was 68.7. Mean score was 58.4 with a standard deviation of 5.4. Higher the ambulatory score better the functional outcome.

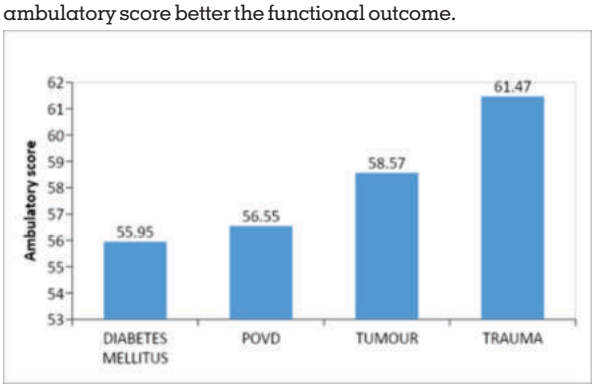


Figure4

Traumatic amputees are having the highest ambulatory scores and those with amputation following diabetic foot are having the least score. There is no significant correlation between etiology and ambulatory scores. The relatively high score in traumatic amputees is probably due to other factors like younger age, intact sensations and better proprioception in the residual limb and intact limb.

The ambulatory scores in amputees who were given prosthesis within 6 weeks are relatively higher than the same in amputees who were given the prosthesis within 7-12 weeks. But the difference is not significant.

Out of 19 patients 8 patient were without any complications. 7 patients developed ulcer at the residual limb end following usage of temporary prosthesis. 2 patients had breakage of the prosthesis. 2 patients developed fracture. One person developed rupture of tendoachilles when standing was attempted with the prosthesis for which repair was done from orthopedics department following which he was bedridden for 2-3 months. After that patient attempted standing and developed a tibial condylar fracture. The other patient, who was bedridden for few months even before amputation, had a fall at the bathroom following which developed fracture femur.

CONCLUSION

1. The removable rigid dressing is a useful means to facilitate wound healing, because the system reduces edema and tissue tension.
2. Residual limb maturation is faster with rigid dressings when compared with soft dressings
3. Early prosthetic fitting and gait training can prevent complications like deconditioning of muscles, knee flexion contractures, falls.
4. Reduced access for wound inspection, frequent changing of cast and immobilization of knee joint are the disadvantages of IPOP which can be overcome in a removable rigid dressing.
5. Gait training of the patient is easier.
6. Psychological advantages like better acceptance of the amputation and restoration of the body image.
7. Traumatic amputees are having better ambulatory scores than those with amputations due to diabetes mellitus or vascular insufficiency.
8. Phantom sensations or phantom pain does not have any influence on the functional outcome of transtibial amputees.
9. Attending personal and aftercare for patients after EPOP is less when compared to IPOP.

REMARKS ON STUDY

Rehabilitation of amputees is a team work. There should be active involvement of rehabilitation physicians, prosthetist and physiotherapist in the management of amputees.

In all elective cases of amputations the patient should be seen by a physiatrist even before surgery, so that they can be educated regarding the exercises, ambulatory aids, and various prosthetic options. The patient is able to absorb and comply with a therapy programme during the preoperative period and hence a better outcome.

Though there is evidence in the literature regarding better outcome with rigid dressings and immediate post operative prosthetic fitting a more recent and comprehensive survey in 2001 shows a decline in the usage of the same probably because it requires a skilled team for its fabrication. Early prosthetic fitting is a practical solution to this problem if it can be given within 6 weeks of amputation. Till then preferably the patient can be given a removable rigid dressing and weight bearing can be started once most of the edema is gone and the pain has also subsided. Within 2-3 months the residual limb matures and a definite prosthesis can be given using the same endoskeletal kit. Only the socket needs to be changed and thus it is cost effective also. Hence it is suggested that in developing countries, simple, inexpensive temporary prostheses are essential.

Delay in prosthetic fitment result in less daily use of the prosthesis, based on a study done in our center. Fabrication of BK prosthesis using the present endoskeletal transtibial kit requires only 2 hours to complete the fitting. Hence prosthetic fitment can be made without delay resulting in a better rehabilitation outcome. The artificial limb fitting center should be modernized with newer machines, adequate funding and cheaper and effective prosthetic kits so that timely delivery of

prosthesis can be achieved.

A proper disposal system should be encouraged in the artificial limb fitting center so that occupational hazards can be minimized and an eco-friendly atmosphere can be established.

The current literature is lacking sufficient studies regarding EPOP. Future randomized trials on Transtibial amputees dressing and management strategies are clearly needed to collect the evidence needed to best guide clinicians with the decision.

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