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A diabetic amputee with a post-operative complication of a non-healing ulcer - A case report

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ABSTRACT

The patient is a 58-year-old male diagnosed with type 2 diabetes mellitus 10 years back and is having loss of sensation in his bilateral lower limbs. Physical therapy intervention prescribed here focuses on functional exercises to help him gain independence. Diabetes mellitus is commonly known as a group of metabolic types of disorders. It eventually results in high blood glucose levels, excessive urge for urination, increased thirst, blurring of vision, tingling sensation, sweating as well as many more symptoms. Diabetes is responsible for increasing the chances of gangrene. Depending on the type of gangrene, amputation is usually advised. The foremost goal of rehabilitation is to enhance limb strength as well as flexibility and cardiovascular ability. The goal of our case study is to explain the importance of physiotherapy in the rehabilitation of a diabetic amputee to the reader.

Keywords: Rehabilitation, amputation, physiotherapy, Gait training.

1. INTRODUCTION

Gangrene or infection of the foot due to untreated or improperly treated wounds resulting in necrosis of tissue is common in diabetes mellitus (Trautner et al., 2002). Many times, it is due to occlusive vascular disease as well as neuropathy (Block and Whitehouse, 1963; Rodrigues et al., 2016). Amputation of lower limbs is one of the major issues which are resulting due to Diabetes Mellitus (Thorstenson, 2015). Amputation's goal is to remove and discard the infected tissue to ease the discomfort and pain and make it more useful for the patient. A below-knee amputation (BKA) is mostly preferred in diabetics as they assure good functional outcomes and an artificial leg can be used for the rehabilitation of a patient to restore his or her mobility (Aulivola et al., 2004). It is a transtibial amputation that involves the removal of the fibula, distal tibia, ankle joint, foot as well as the surrounding soft tissue structures (Adams and Lakra, 2021). Diabetes mellitus is defined as a group of metabolic disorders that ultimately results in high blood glucose levels, excessive urge for urination, increased thirst, blurring of vision, tingling sensation, sweating as well as many more symptoms (Kumar, 2015; Sadeeqa, 2018). The following is a case study of a 58-year-old male below-knee amputee

who has been diagnosed with Diabetes mellitus (type 2), 16 years back. Our case study focuses on the physical therapy assessment and intervention strategies for the rehabilitation of a diabetic person who has a below-knee amputation.

2. MATERIALS AND METHODS

Patient Information

A 58-year-old male patient who is a resident of the paratwada district is the owner of a shoe shop. He was diagnosed with type 2 diabetes mellitus at the age of 42 when he consulted a doctor at Amravati after noticing that there was a gradual loss of sensation in his lower limbs while walking. He has then prescribed the medications needed for diabetes. The patient was apparently alright 1 month ago when he observed a wound over his left foot initially of size 1 X 1 cm which was insidious in onset gradually progressing, associated with whitish discharge from the wound with no aggravating and relieving factors and also associated with pain over the bilateral lower limbs more over the calf region since 3 years, aggravates on walking. Claudication distance 500m. Present even at rest and relieves on medication. He underwent below-knee amputation and now comes with a non-healing ulcer over the stump.

He came with no history of pain in the abdomen, no history of fever, no H/O trauma, no H/O of bowel bladder complaints, no history of chest pain or breathlessness, and no history of blurring of vision. He also had split skin grafting of the left amputated stump on 28 Oct 2021. He is now undergoing physiotherapy rehabilitation. He doesn't have a family history of diabetes mellitus. The patient is an endomorph. He has no addictions to tobacco and smoking. He is a non-alcoholic. It is a depressing condition for the family members of the patient and they belong to the lower middle class.

Operative notes

After his below-knee amputation, the patient has undergone split skin grafting as well as wound and flap care is taken and now, he is undergoing rehabilitation. Third irrigation as well as debridement of the left foot wound was prescribed to the patient. A wound vacuum was applied during the surgical procedure.

Clinical findings

A 58-year-old male complains about the loss of sensation in his lower limbs gradually. He complains of having a wound with blood and fluid oozing out but he couldn't feel it. He had a below-knee amputation. Figure 1 represents the front view of the Amputated Stump, Figure 2 represents the Amputated Stump with sutures, and Figure 3 shows the Lateral view of the Amputated Stump and Figure 4 shows the Lateral view of the Amputated Stump with sutures. There was a presence of a non-healing ulcer over the amputated stump. He was diagnosed with left lower limb gangrene. The patient was operated on for split skin grafting of the left amputated stump on 28 Oct 2021. The patient presents a history of diabetes for 16 years.

Figure 1 Amputated Stump front view

On Observation

The body builtis endomorph. The posture is normal. The range of motion is within normal limits when evaluated with a goniometer. Manual muscle testing was used to assess muscle power.

Pain Assessment

Pre-treatment VAS: 8/10 at rest, 9/10 on slight movement. The limb length measurement of the non-affected leg comes out as 36 inches and for the affected leg, it is 24 inches. Neurologic Examination was assessed where gradually diminishing sensations are identified. Reflexes are intact.

Figure 2 Amputated Stump with suture

Figure 3 Lateral view of Amputated Stump

Figure 4 Lateral view of Amputated Stump with sutures

Significant physical examination (PE) and important clinical findings

Range of motion

Table 1 provided about ranges of right lower limb movement and left lower limb movements before rehabilitation was given. Table 2 which is provided below is about manual muscle testing of lower limb muscles before treatment.

Table 1 List of different movements in pre-rehab condition

MOVEMENT	Pre-rehab ROM-right	Pre-rehab ROM-left
Hip flexion	0-100	0-49
Hip extension	0- 19	0
Hip abduction	0-41	0-22
Hip adduction	0-22	0-10
Knee flexion	0- 120	0
Knee extension	0	0
Ankle dorsiflexion	0-9	-
Ankle plantar flexion	0- 40	-

Table 2 Manual muscle testing

MUSCLES	PRE - TREATMENT
Quadriceps	3
Hamstring	3
Abductors thigh	2
Adductors thigh	2
Gluteus medius	3
Gluteus maximus	2

Provisional Diagnosis

ULCER OVER LEFT BELOW KNEE AMPUTATED STUMP

Final Diagnosis

OP/C/O SPLIT SKIN GRAFTING OVER LEFT BELOW KNEE AMPUTATED STUMP.

Diagnostic challenges

Patient is from a poor socio-economic background, so the patient's family is unable to pay the cost of his surgeries, medications, and treatment. Amputation of the lower limb is a depressing condition for the patient and his family as well.

Therapeutic intervention Medications

INJ CIPROFLOXACIN 100 ML IV TDS
INJ PANTOP 40 MG OD
INJ EMESET 4 MG IV TDS
INJ TRAMADOL IN DRIP TDS
INJ MIXTARD 28-0-14
TAB CIPROFLOXACIN 500 MG BD
TAB PANTOP 40 MG OD
TAB URGENDOL P BD
TAB ECOSPRIN 75 MG OD
TAB CLOPITAB 150 MG OD
TAB ROZOVAC A OD
TAB CORTEL M 50 MG OD
TAB EMESET 4 MG SOS
SYP DUPHALAC 30 ML HS

Physiotherapy Management

Week 1-2

Initially the scar management along with a proper dressing of the stump (Zade et al., 2021), Limb has been kept at elevation to prevent edema. Proper body positioning was prescribed to prevent contractures. The patient is instructed to change his body positioning every 2 hours to prevent bedsores. For the reduction of pain, TENS was applied. Exercises for bed mobility were prescribed- rolling, bridging, how to move up and down on thebed, balancing exercises in sitting on the edge, and arm push-ups. Ankle toe movement (ankle pump) Heelslides. Pelvic bridging with the assistance of an unaffected leg. Active assisted upper limb mobility exercises to maintain and enhance joint integrity. Adduction and abduction of the hip on the unaffected side. Pre-prosthetic training (Zade et al., 2021).

Week 2-4

Active accessory strengthening - quadriceps, active isometric tests- hamstring, adductors, abductors, and gluteal muscles10 repetitions, per set, twice a day, Hip flexor stretch series, Static quadriceps, Static hamstrings, Static glutes, Dynamic quadriceps, Ankle pump, Straight leg raise, Heel slides, Pursed lip breathing, Thoracic expansion exercises (Zade et al., 2021).

Week 5-8

Walking aids are selected and taught as per the need and comfort of the patient, To prevent the fall, ambulation training is given with the assistance of a walker, and Parallel bar gait training, The exercises which were prescribed, are of proprioceptive type. At the beginning, the patient is instructed to do the ambulatory exercises in a 100-meter hallway. With each passing day and time, the distance is gradually increased for ambulatory exercises and progressed to stair climbing donning and doffing training, and Weight shift training (Zade et al., 2021).

3. RESULTS

Pain Assessment

Pre-treatment VAS: 8/10 at rest, 9/10 on slight movement. Post-treatment VAS: 3/10 at rest, 4/10 on slight movement. Table 3 provided below is about ranges of right lower limb movement and left lower limb movements before and after the rehabilitation was given. Table 4 shows about manual muscle testing of lower limb muscles before and after the treatment was given.

Table 3 Range of motion

MOVEMENT	Pre-rehab ROM-right	Pre-rehab ROM-left	Post-rehab ROM-right	Post-rehab ROM-left
Hip flexion	0-100	0-49	0-120	0-66
Hip extension	0- 19	0	0-31	0-10
Hip abduction	0-41	0-22	0-49	0-28
Hip adduction	0-22	0-10	0-29	0-19
Knee flexion	0- 120	0	0-130	0-6
Knee extension	0	0	0	0
Ankle dorsiflexion	0-9	-	0-47	-
Ankle plantarflexion	0- 40	-	0-14	-

Table 4 Manual muscle testing

MUSCLES	PRE-TREATMENT	POST- TREATMENT
Quadriceps	3	4
Hamstring	3	4
Abductors thigh	2	3
Adductors thigh	2	3
Gluteus medius	3	4
Gluteus maximus	2	3

4. DISCUSSION

Objectives of physiotherapy during the phase of recovery are Muscle strengthening exercises, gait training as well as balance exercises, and functional training programs (Zade et al., 2021). A VAC (vacuum-assisted closure wound therapy) unit was administered to create negative pressure so that it will assist in the process of healing (Bussmann et al., 2004; Fortington et al., 2012).

A study by Katlehol Imakatso, and Victoria Madden showed that mirror therapy is also one of the effective methods used for pain management in the healthy hands of amputees. They were instructed to put both of their hands in front of the mirror with the temples facing towards each other (Goyal et al., 2020; Bhamra and Naqvi, 2021). Medico-physical aid for the pre as well as post-rehabilitation of the below-knee amputation has resulted in a successful and fast recovery. Physiotherapy plays a vital role in enhancing the strength of muscles and in improving balance (Phansopkar and Naqvi, 2020).

The case study of a 58-year-old male who is a below-knee amputee who was diagnosed with diabetes mellitus type 2, 16 years back now is presented here. This case study includes the assessment and intervention strategies that were used. The assessment consists of body function and structure impairments assessed through proper assessment of the respiratory system, cardiovascular system, reflex testing, posture and balance assessment, ROM, and manual muscle testing. The therapeutic interventions include medications and physiotherapy management. The physiotherapy management consists of week-wise rehabilitation protocol, breathing exercises, strengthening and stretching exercises especially to reduce contractures.

5. CONCLUSION

This is a classic case of a diabetic amputee who has suffered a gradual loss of sensation in his bilateral lower limbs. He had non-healing diabetic ulcers along with discharges from wounds. His left lower limb was amputated below knee level. Strengthening, pre - rehabilitation therapies and dynamic equilibrium are prescribed. Preparation for prosthesis fitting is also prescribed. Early walking aids are used. Though it is a depressing condition for the patient as well as the family members, it's a relief that by designing proper physiotherapy management the quality of life can be improved and independence level can be enhanced.

Limitation

The patient had difficulty in weight bearing as he was operated on surgically and had undergone below-knee amputation as well as split skin grafting. He was conscious, cooperative, and oriented while performing prescribed exercises.

Informed Consent

Written & Oral informed consent was obtained from all individual participants included in the study. Additional informed consent was obtained from all individual participants for whom identifying information is included in this manuscript.

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Conflicts of interest

The authors declare that there are no conflicts of interests.

Data and materials availability

All data associated with this study are present in the paper.

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