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Rehabilitation after amputation of the lower limb in the course of Diabetic Foot Syndrome

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Abstract

One of the most popular civilization diseases is type II diabetes. Abnormal glucose metabolism leads to life-threatening complications within the nervous and vascular systems. Irregularities of these systems in case of some patients lead to the development of the Diabetic Foot Syndrome. The resulting imprints, wounds, abrasions and calluses are a good environment for the development of bacteria, which is why there is a high risk of wound infection leading to the appearance of a difficult to heal ulcer. In life-threatening conditions, doctors decide to amputate the limb. In order to regain dexperity and independence, the patient after the limb amputation should start rehabilitation as soon as possible.

Key words: diabetes, physiotherapy, prosthetics, amputation

Introduction

Type II diabetes affects a growing number of people due to the development of civilization, reduced levels of physical activity and an abnormal diet. Recent research has reported that it is one of the most common metabolic disorders of the 21st century. The essence of this disease is primarily the malfunctioning of carbohydrate metabolism, resulting from impaired insulin secretion or insulin resistance. The main reason for the development of type II diabetes is considered an abnormal lifestyle. The main cause is obesity, high levels of stress, high supply of simple sugars in meals and low level of physical activity. Diabetes results in persistent hyperglycaemia, which affects the destruction of various body systems. Disorders occur primarily in the form of: angiopathy, neuropathy, retinopathy and nephropathy, leading to impaired function of these systems. Downplaying symptoms, unregulated blood glucose level and long-term disease process can easily lead to the development of so-called Diabetic Foot Syndrome [1]. The sensory disturbances and foot deformities associated with the occurrence of neuropathy due to the disturbance in the proportion of the muscle tone of the feet may contribute to the formation of corns, calluses, calluses and often invisible to the patient wounds in inaccessible control places. In addition, the occurring microangiopathy results in abnormal blood supply and therefore tissue nutrition within the feet. Appearance of a wound within the lower limb, resulting, for example, from an injury, may lead to the development of ulceration. Due to the skin trophic disorder, the wound healing process is very long, often recurrent [2]. In the case of abnormal treatment and wound care, an infection may occur, which, if not treated appropriately, may be the reason for later qualification for limb amputation due to the threat to life. Both in the early stage of diabetes and in extreme cases of patients after limb amputation , physical activity plays an extremely important role [3].

Description of the issue

The main reason for amputation in case of patients with diabetes is failure in the treatment of Diabetic Foot Syndrome. The underlying condition is an abnormal syndrome in the form of: neuropathy, angiopathy. The first of the above mentioned results first of all in disorders of feeling pain, touch and temperature, deformation of feet in the form of flexor muscles prevalence and emphasizing the heads of the metatarsal bones, in addition, disorders also affect the autonomic system. Angiopathy, in turn, leads to stiffening of the arteries and arterial and therefore the development of atherosclerotic plaque, affecting the disorder of the flow in these vessels. Sensory disturbances are most often a factor triggering a cascade of problems in the area of the foot. Patients often do not realize that a wound or imprint has been created as a result of abrasions, injuries or wearing of incorrect shoes. When applying for treatment, they expect the wound to heal, but due to improper blood supply within the foot, the healing process is extremely difficult. In some cases, an ulcer infection may occur. At the

time when antibiotic treatment turns out to be ineffective or inappropriate and there is a risk of systemic infection, doctors decide to amputate the limb. In some cases, patients decide to amputate due to the strong and unyielding limb pain associated with its ischemia [4]. In case of people with diabetes, the most common are amputations: individual fingers, part of the metatarsus or at the level of the lower leg and thigh. In this group of patients the most characteristic amputations are: Lisfranck and Chopart. The first one is carried out between the tarsus and instep bone, while the second one is between the ankle bone and the talus bone. In the case of shortening the limb at the level of the lower leg. The most functional stumps are 16-19 cm long below the knee joint [5]. Physiotherapy plays a key role in the return to fitness after limb amputation. The rehabilitation process is divided into three basic periods:

- Early postoperative stage, which lasts up to about 10 days after surgery,
- Post-hospital stage, during which healing occurs completely, it lasts up to 3 months after the surgery,
- A prosthesis step in which the patient is taught to move in the prosthesis.

Immediately after the amputation, the patient should start rehabilitation in the first day. Exercises in this period consist primarily of performing basic movements in joints, however, in a lying position on the back or sitting. In addition, attention should be paid to strengthening the muscles of the shoulder girdle, using resistance and isometric exercises. Between 1 and 2 days after the procedure, the patient learns to change to a wheelchair and use the toilet independently, while on the third day, the patient takes up learning to walk, depending on the degree of fitness, using various types of auxiliary devices.Extreme anti-edema prophylaxis is extremely important in the first weeks after amputation. It is therefore necessary to inform the patient which activities should be avoided. The patient should not:

- Sit with the stump down,
- Insert cushions, fittings for knee bends,
- Sit with your foot on your foot [6].

Fig. 1. Recommended positioning lying sideways.

One of the most important stages of rehabilitation of the patient after the lower limb amputation is the gait reeducation exercises. The learning of locomotion begins at the balcony and handrails. When the patient is able to move independently on eg handrails and maintains a stable vertical position, it is recommended to learn how to walk on crutches, most often it is a period between 3 and 10 days after the procedure.
Before the period of prosthesis, special attention should also be paid to failure to create contractures in the joints. In the case of amputation at the lower leg level, the stump usually tends to be set in a flexion contraction, whereas in the case of amputation at the thigh level, it is the setting: bend, visiting the external rotation. In addition to the correct posture positions, specific exercises can be used to counteract pathological contractures [7]. Examples of exercises are presented on (Fig.2) and (Fig.3).

Fig. 2. An example of an exercise in the prevention of contraction of the stump visitor at the thigh level.

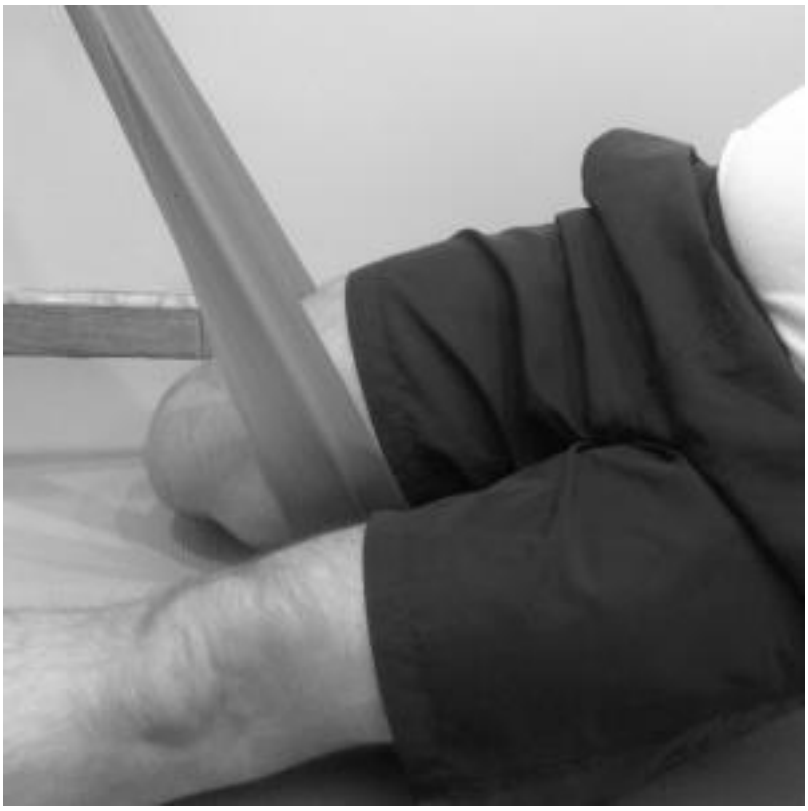

Fig. 3. An example of exercise in the prevention of contraction contraction of the stump at the thigh level.

In addition, before we put on the prosthesis we should take care of the correct shape of the stump, i.e. inverted cone. One of the most effective forms of shaping the stump is bandaging, which ensures the right volume, facilitating later placement of the stump in the prosthesis funnel.

Fig. 4. Bandaging the stump.

In the improvement process, the so-called hardening the stump. This term means performing activities aimed at thickening the epidermis and reducing the sensitivity of the stump to mechanical injuries. For hardening, you can use different types of brushes, balls with spikes, pea bags. These activities will reduce the discomfort of placing the stump in the prosthesis funnel. Hardening should start on the second day after surgery, omitting the postoperative wound [8].

In the period of about 3 months after the amputation, in most cases, the period of prosthesis

of the stump and rehabilitation after prosthesis begins. The aim of the physiotherapist's procedure in this period is first of all learning to use the prosthesis and locomotion. The patient should be advised about hygiene recommendations before each implant placement, namely: the stump should be washed, thoroughly dried and properly placed in the prosthesis. Similarly to the early rehabilitation stage, during this period we also teach the patient to walk on handrails, balconies and crutches. We pay attention to the alternate loading of the right and left sides and the length of the steps. With time, we also introduce exercises: equivalent, change of direction, walk up the stairs, walk on variable ground and with obstacles. An indispensable element of rehabilitation at this stage are exercises aimed at increasing the strength of salt limbs and torso muscles, as well as learning to fall and rise from falls [9].

Summary

Type II diabetes is a syndrome of metabolic disorders that affects a growing population. Complications in the form of neuropathy and angiopathy may lead to the development of Diabetic Foot Syndrome [10]. Incorrect prophylaxis, treatment and inattention may lead to wounds and difficult to heal ulcers, which in some cases may lead to limb amputation. Patients who decided to amputate the lower limb require immediate rehabilitation already on the first day after surgery. Initially, physiotherapy is performed to prepare the patient for prosthesis [11]. During this period, care should be taken to shape the stump properly and harden it using specific procedures. It is only when the patient is strong enough and independent that one can begin to learn to use a prosthesis. The most important stages of improvement can be walking reeducation, trying to achieve gait as physiological as possible [12, 13, 14].

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