

NON-PHARMACOLOGICAL AND NONINVASIVE THERAPEUTIC METHODS IN DIABETIC-RELATED LOWER LIMB AMPUTATION

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Abstract

Despite the development of more potent pharmacological measures in the treatment of diabetes, the incidence of lower limb amputations record high rates. Potential postoperative complications are more common in diabetic patients and increase morbidity/mortality, impact the patient's ability to participate in therapy, and influence overall prognosis and treatment design and goals. The present study aims to analyze non-pharmacological and non-invasive rehabilitation methods to prevent postoperative complications and sequelae, and improving quality of life following diabetic foot amputation. Were included in the study 81 diabetic patients who underwent major lower limb amputation. The methods applied in the study group were: massage, passive/active mobilization, posture, isometric contractions, manual fascial mobilization, Kinesio taping. Patients who received immediate postoperative inpatient rehabilitation compared to those with no evidence of inpatient rehabilitation had less postoperative complications, improve physical functioning and receive a prescription for a prosthetic limb.

Key words: diabetic foot, amputation, non-pharmacological methods

INTRODUCTION

The type 2 diabetes is increasing global health problem which currently affects 194 million people worldwide and according to The international Diabetes Federation this number will increase to 333 million by 2025, with a massive burden in developing countries (IDF, 2004)

Diabetic foot represents a complex of syndromes due to diabetes complications, generating local trophic lesions that may occur as progressive complications under the influence of internal metabolic factors (hyperglycemia, hyperlipidemia, obesity, neuropathy) and exogenous aggressive agents like smoking, improper diet, inadequate footwear, repeated trauma (Serban V, 2011). Common diabetic complications such as peripheral neuropathy and peripheral vascular disease is twice as high in individuals with diabetes as in the general population, and contribute to the formation of foot ulcers, the latter by causing ischemia, gangrene and impaired wound healing (Vamos EP et al, 2010, Adler A. et al, 1999). A common occurrence of ulcer infections in patients with foot ulcers is a contributing risk factor for lower limb amputations (LLA), along with renal disorders (Alexandra A et al, 2012). Despite intensive interventions, many of these patients require a LLA, which has a high mortality, morbidity and

disability, with high social impact and poor clinical prognosis as well as considerable financial implications for health care systems. (Boulton AJ et al, 2005, Frykberg RG et al, 2006, Zidarov D et al, 2009). Potential postoperative complications are more common in diabetic patients and increase morbidity/mortality, impact the patient's ability to participate in therapy, and influence overall prognosis and treatment design and goals. Complications at the surgical site include hemorrhage or hematoma, wound infection, and failure to heal requiring additional operative interventions. (Aulivola B et al 2004). Joint contractures immediately proximal to the amputation site are serious complications that may interfere with prosthetic fitting and proper gait, and will eventually increase the energy requirements of ambulation; edema of the residual limb and/or muscular atrophy related to medical issues or immobility is possible, which will affect the wound healing, proper rehabilitation and patients' ability to don a prosthesis (Knetsche RP, et al 2001). Rehabilitation can occur at several times, places, and consists of many interventions. Post-operatively, physical therapy plays an integral role in restoring function, preparing patients for a lower-extremity orthotic or prosthetic device (Popescu R, Traistaru R, 2007) and includes patient education, mobility, functional training, as well as promoting wound healing, and optimizing range of motion and motor control of the residual and non-affected limbs (Knetsche RP, et al 2001, Alberto Esquenazi, Robert DiGiacomo, 2001).

Physiotherapy has developed over its history numerous techniques and methods of rehabilitation, successfully intervening in the prophylaxis and treatment of various diseases of the locomotor system and beyond. Besides traditional methods of massage, posture and mobilization, myofascial mobilization techniques and Kinesio taping are non-pharmacological and non-invasive rehabilitation methods which trace their effectiveness in increasing number of rehabilitation studies (Barnes JF. 2004, Chen Q et al. 2007, Richard Moore, 2012). The present study aims to analyze non-pharmacological and non-invasive rehabilitation methods to prevent postoperative complications and sequelae, and improving quality of life following diabetic foot amputation.

MATERIAL AND METHOD

The study included 81 diabetic type 2 patients undergoing lower limb amputations, admitted in Emergency Clinical County Hospital of Oradea between 2007-2011. The current study was restricted to major amputations. All patients were evaluated clinical-biological and functional and were taken into account the following: age, gender, glycemic control, comorbidities, level of amputation, postoperative complications, functional capacity, and compliance.

The patients were divided into two groups. The first patients group was the study group (n=42), which received individualized rehabilitation program (posture, massage, isometric contractions, passive/active mobilisation, vascular and neuromuscular treatment using Kinesio Taping method, myofascial techniques) from the first postoperative day, and the second group was the control group (n=39) that received consultative rehabilitation and education about the need for correct posture and segmental/global mobilization. All patients received surgical care of the wound and compressive bandage of the stump, stabilization of blood glucose levels and treatment of associated diseases, dietary measures and with prohibit the consumption of toxic (smoke, alcohol).

Data obtained were statistically analyzed and quantified in terms of achieving the proposed objectives, respectively increase postoperative complications, improve functional capacity and quality of life following LLA in diabetic patient.

RESULTS AND DISCUSSIONS

Analyzing the data collected, it was observed that in relation to age and gender, diabetic men are more likely to undergo LLA and are younger with 6 and up to 12 years at the time of amputation than women, due to more frequently presence of risk factors such as smoke, peripheral neuropathy (PN), peripheral arteriopathy disease (PAD), neuroarthropathy and higher foot pressure (FP), improper diet, poor foot self-examination, inadequate footwear, repeated trauma (fig.1).

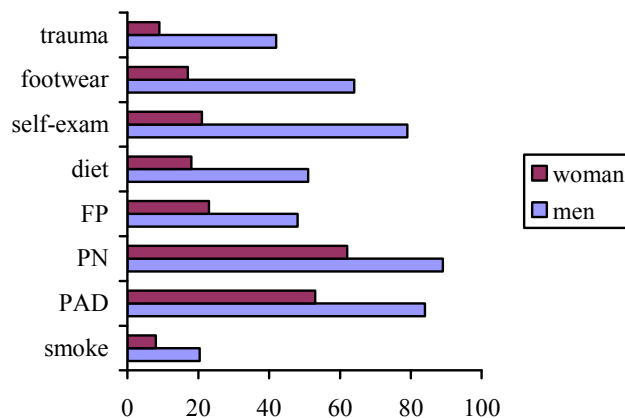


Fig 1. Risk factors for diabetes-related LLA.

All patients had poor glycaemic control, 87% were insulin-treated before admission, and the presence of associated diseases exacerbated diabetes and the development of foot complications requiring LLA. The most common underlying disease was ischemic heart disease (62%), hypertension (59%), cerebral ischemia/chronic stroke (18%), obesity (32%) (fig.2)

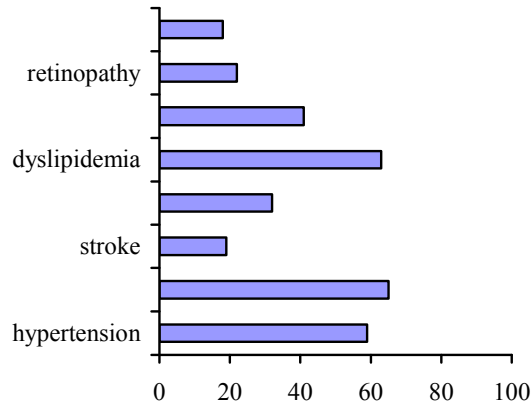


Fig.2. Comorbidities in diabetic patients undergoing LLA.

On admission, 79% patients had gangrene limited to the foot, 17% had extensive gangrene, and 74% cases were emergency amputations. 4% patients had gangrene of the stump after an amputation performed in history. The amputation level was determined by gangrene extension and pathological individual aspects (severity of arterial and neuropathic complications, comorbidities, patient's condition, functional level), resulting in 79% below the knee amputation (BKA) and 21% above the knee amputation (AKA) (fig.3)

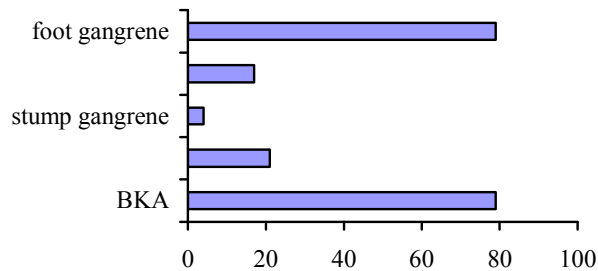


Fig.3. Extension of gangrene and level of amputation performed.

Postoperatively 57% had low functional capacity and 43% relatively good. The local complications occurred postoperatively showed a lower rate in the study group and were represented by edema (3%), wound supuration (6%), wound dehiscence (4%), chronic progressive gangrene (2%) with the consequence appearance of stiffness in the proximal joints and muscle hypotrophy. In 13% of cases were found psychological influences associated with algic syndrome and phantom limb in the study group. Muscle spasms and contractures were more frequent in the control group, as well as other postoperative complications that can occur immediately or distant (fig.4).

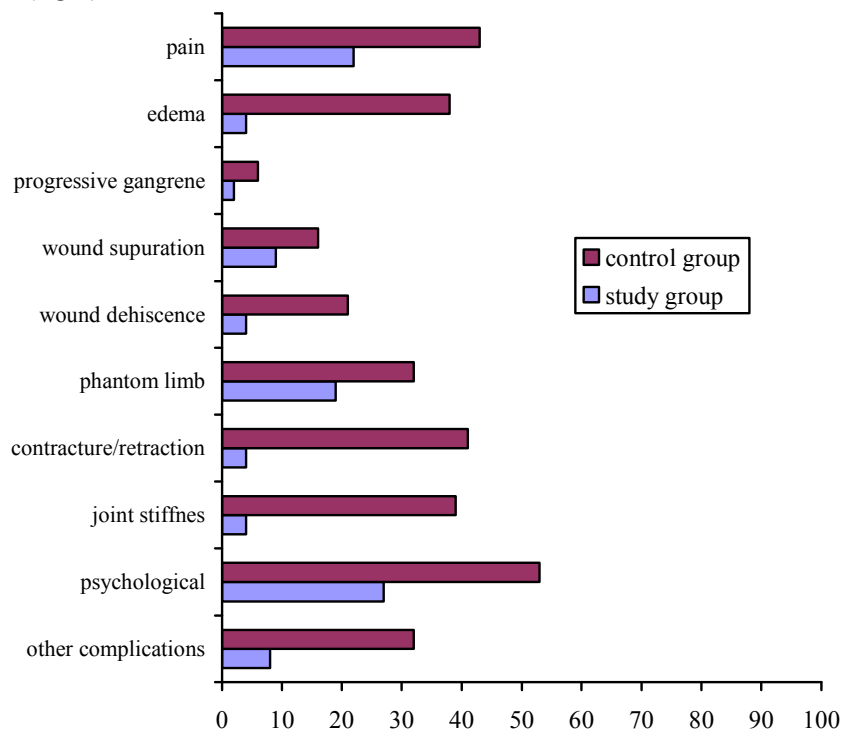


Fig.4. Complications occurred postoperatively

Factors that led to the unfavorable evolution were: local and functional complications, incorrect surgical section of the plans, poor health, older age, serious associated diseases, continuing smoking, wrong posture, low interest of the patient (fig.5).

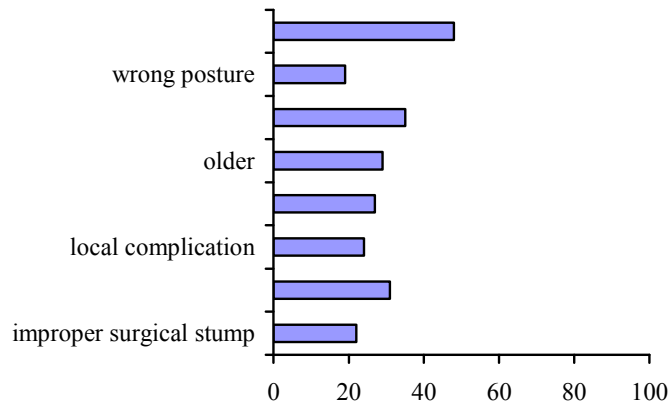


Fig.5. Unfavorable factors.

Factors that led to a favorable outcome in the study group were: glycemic control, adequate surgical blunt, early rehabilitation (from the first postoperative day), decreased postoperative complications, compliance, family support. Therefore, at discharge 78% of patients achieved an improvement in global and segmental functional capacity, 64% achieved the ability to transfer in a wheelchair, 42% had improvement of postural deficits and balance in standing with supportive devices. Despite superior results in the study group than the control group recorded at discharge, long-term monitoring showed minimal differences in the two groups regarding the continuing rehabilitation in specialized centers and prosthesis adapting (fig.6)

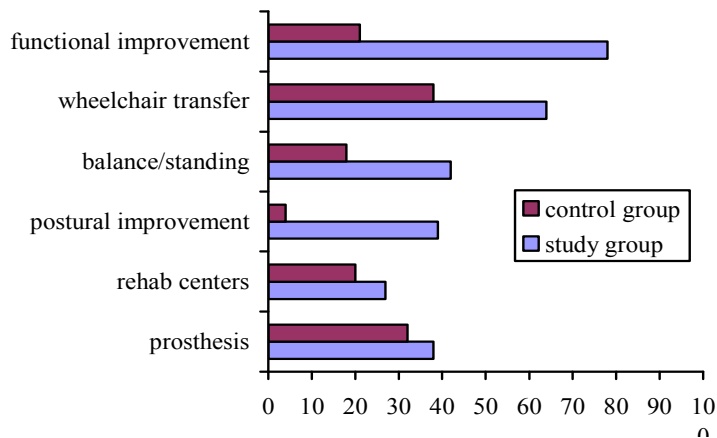


Fig.6.Short-term and long-term results.

CONCLUSIONS

Prevention of diabetic foot lesions are essential for maintaining functional capacity and quality of life. Unfortunately amputations in diabetic patients still registering high rates. Amputation dramatically affect patient quality of life, so that the rehabilitation should start from the first day after surgery to reduce the incidence of postoperative complications, in order to restore functional capacity. Moreover, considering the particular pathological complexity which occurs amputation, can be applied non-pharmacological and non-invasive therapeutic measures that contribute to the conservation and recovery of joint function, muscular, nervous and circulatory and surgical wound healing.

Early mobility has been shown to improve functional outcomes, foster independence, decrease mortality rates, and reduce acute care length of stay after diabetes-related LLA, therefore immobility should be minimized; unfortunately exercise, as therapeutic factor is underestimated by the patient.

Analysis of the data obtained shows that study group have achieved significantly better results than control group, respectively decreased of pain, sensitivity disorders, myofascial retraction and postoperative swelling, improved circulation, lower risk of complications at the amputation stump and contralateral leg, maintaining/improving muscle tone and joint mobility, improved psychological aspects. The Kinesio Taping method was beneficial in the rehabilitation program, intervening in the cycle represented by arteriopathy, hypotonia, stasis, pain, hipomobility, by vascular and lymphatic action, sensory, muscular and articular actions. Should not be underestimated the effects of massage applied to recent stump and global (antalgic effect, decontracturant, stimulant or sedative, trophic, lymphatic drainage, psychogenic). After discharge and surgical wound healing, ideal next step would be to continue the functional recovery and preparation for prosthetics in a specialized center, but most of the patients do not use these services, due to socio-economic and psychological reasons, remaining with low functional capacity and dependent on persons within the family. Successful rehabilitation following amputation is complex and requires multiple medical, surgical, and rehabilitation team, for enhancing the mobility of affected individuals and improving their health and quality of life.

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