

A PATIENT'S NON-ADHERENCE TO THE TREATMENT OF DIABETIC FOOT ULCERS: LONGITUDINAL CASE STUDY

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Abstract

Introduction: On average, diabetic foot ulcerations heal within 3 to 6 months. By adhering to treatment measures this period can be shortened and re-ulcerations prevented.

Aims: To analyze the causes and risk factors of re-ulcerations/recurrences/relapses of diabetic foot ulcers (DFU) on 1 case, to assess the effects of the applied treatment measures, and to suggest more effective methods to maintain motivation to treatment and successful healing of diabetic ulcerations.

Methods: A case study of a client diagnosed with DFU who was monitored, treated and educated in a vascular-surgical outpatient ward for 11 years (2010–2021). For data collection we used monitoring, tests and scales, an interview, a medical documentation analysis including laboratory, physical, clinical and anthropometric indicators, and a DFU photo documentation.

Result: A long-term DFU treatment (local surgical and wound therapy, pharmacological, short education about regimen measures) caused the client's loss of motivation and non-adherent behavior manifested by his nonadherence to the prescribed regimen measures (diet, relieving the ulcers), worsening of laboratory indicators (HbA1c), physical indicators (hypertension), clinical indicators (nonhealing scum of the wound, re-ulceration, infection), anthropometric indicators (BMI), insufficient treatment efficacy, and worsening of the prognosis of DFU (amputation). The fact that there were no physical inspections during the covid pandemic made this condition even worse.

Conclusion: Despite a long DFU treatment the client's DFU did not heal. Such a long-term patient must not only be educated but also led and supported, positively motivated to undergo treatment and to adhere to the regimen measures through life values, individual lifestyle, and open partnership with healthcare professionals.

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Keywords

diabetic foot ulcer (DFU), non/adherence, re-ulceration, risk factors, regimen measures, to support and to lead

Key points

Long-term, protracted and repeated treatment of DFU (11 years) led to the patient's nonadherence to the treatment regimen and recommended treatment measures, and later to total resignation by the patient to treatment, as well as resignation of members of the multidisciplinary team.

The long-term patients then cannot only be educated but also positively motivated to treatment and adherence to recommended regimen measures via their life values, individual lifestyle, and an open partnership with healthcare workers.

Attention also needs to be paid to stress mitigation and fighting social isolation.

INTRODUCTION

Diabetic foot syndrome (diabetic foot) is one of the most serious and most devastating complications of diabetes mellitus (DM). It is defined as Diabetic Foot Ulcer (DFU), which in a patient with DM is connected to neuropathy and/or peripheral arterial disease of the lower limb (Armstrong et al., 2017; Brem et al., 2006; Buggy and Moore, 2017). It is a multifactorial clinical triad of neurological, vascular, and musculoskeletal changes caused by inadequacy of normal function of peripheral nerves, which normally affects distal nerves in the lower limbs, namely the feet (Armstrong et al., 2017; Cavanagh et al., 1987; Crawford et al., 2007).

A strong mechanical predictor of DFS is increased plantar pressure resulting from undetected mechanical trauma and altered mechanics of the lower limbs (Crews et al., 2016; Doupis and Veves, 2008).

A high occurrence of lesions and ulceration is in the plantar area of metatarsal heads (MTH), where plantar pressure is usually the strongest (Fejfarová et al., 2014). The source of increased plantar pressure may be caused by internal factors like loss of protective sensation, plantar callus, dry skin, and impaired blood flow (Fernando et al., 2016).

Not only does DFU impair a patient's health condition, it also has a significant socioeconomic impact (Folstein et al., 1975). Foot ulcers are a diabetic complication connected to a significant risk of morbidity, mortality, and amputation (Fisher et al., 2012). The golden standard of complex DFU treatment includes metabolism modification, relieving pressure on ulceration (wheelchair, forearm crutches, special contact fixation and splints, therapeutic footwear, braces, special insoles, bed rest), ischemia treatment

(revascularization procedures), managing infection (ATB, local treatment), systematic local therapy (wound debridement), and therapeutic education (Brem et al., 2006; Hainer a Kunešová, in Kunešová et al., 2016; Jarl, 2018; Jarl and Lunqvist, 2016; Jirkovská et al. 2016; Kudlová a Kočvarová, 2020). Complex DFU therapy requires a multidisciplinary team made up of mainly physicians with various specializations, nurses, a dietician, an educator, and an actively collaborating patient (Jarl and Lunqvist, 2016; Jirkovská et al. 2016). However, it has turned out that physically limiting regimens may lead to increased psychological pressure (Kudlová a Kočvarová, 2020).

Among the causes of patient nonadherence is the characteristics of DM (mild course from the start, insignificant symptoms for taking timely measures), treatment-related problems (dietary and movement limitation, regimen requirements), and insufficient support provided by loved ones. Thus, in persons with DM, it is not only about incorrect application of pharmacotherapy including insulin therapy, but also about adherence to regimen measures (regular self-monitoring, lifestyle modification, diet, and movement), and about active continual work with the patient's environment and his personal motivation (Jarl and Lunqvist, 2016). Adherence encompasses a wider notion of the problem, mainly reflecting the necessity of the patient's active involvement. Instead of his being a "passive executor" of orders", he is a motivated collaborator understanding the importance of adherence to recommendations. Adherence is closely connected to the patient's persistence – it says how much he is capable of correctly using medication or adhering to another treatment regimen (Korada, 2020; Kossioris et al., 2017). Support and targeted education of persons with diabetes ensuing from their individual needs may help achieve better adherence and persistence. Some of the factors affecting the adherence of a person with diabetes, however, cannot be influenced at all (age, gender, the patient's personality, cognitive abilities, etc.), but there are many that can be influenced (lack of time or information, weak motivation, low support from the patient's loved ones, paternalistic approach of the physician/health care professionals, inappropriate communication, socioeconomic factors) (Korada, 2020).

This case study presents the case of a therapeutically educated patient with DFU who underwent specialized medical care. To collect data, the following methods were used: observation, interview, photo documentation, and analyses of medical documentation (medical history, current diseases, comorbidities, selfmanagement and treatment of DM, comorbidities, and DFU, and education). We also monitored laboratory indicators (HbA1c), physical and clinical indicators (blood pressure, DFU – wound base, environment, complications, etc.), and anthropometric indicators (BMI).

Case Report

This man was born in 1953 and used to be a maintenance worker. He was diagnosed with Type 2 diabetes mellitus in 2005 and was a disabled retiree from 2010. He was treated from 2008 with supplementary doses of quickly acting insulin (Lispro) three times a day (a total of 68 IU/day), and one dose of long-lasting insulin (Glargin) 28 IU/day (administered in the evening). From 2013, he had complications: hypertension,

cardiomyopathy, atrial fibrillation, heart failure, NYHA III, ejection fraction 45%, chronic renal insufficiency, nonproliferating diabetic retinopathy, hepatomegalia, liver steatosis, morbid obesity, osteomyelitis of the left heel bone, and secondary tibial lymphedema, and ulcers on the left and later also right foot. He drank alcohol occasionally and did not smoke. Pharmacotherapy (April 2021): venopharmaceuticals, diuretics, potassium chloride, calcium channel blockers, antireumatics, antiflogistics, antihypertension medicines, beta-blocker, antithrombotics, antisclerotics, ACE inhibitors. He negated allergies.

From 2010 April 2021, the patient was in long-term care (11 years) of the vascular surgery clinic for ulcers on his left foot and later his right foot:

- In 2010, the amputation of II-V toes on the left foot – healed but deformed.
- From December 17, 2012, when photo documentation of the ulcer development was taken, he was treated with a plantar ulcer on the lower left limb (10×3 cm) after stepping on a sharp object. Therapy: necrectomy, local debridement, excochleation, application of modern materials of wet wound therapy based on the condition of the wound base, repeated education, how to relieve the left foot. Despite all this, the patient kept using inadequate footwear (Fig 1), the wound base stagnated, hyperceratoses were formed surrounding the wound (the patient put load on the foot with the wound, BMI of 40.1 kg/m²), compensation for DM (HbA1c – 69 mmol/l), hypertension (140/90 mmHg). The patient was recommended consultation with a dietician and a check in a clinic of diabetology and internal medicine. From May 5, 2013, after reeducation and with the help of instruction videos, the patient was using special therapeutic footwear with an insole with removable pins to effectively ease the pressure on the wound (Fig. 2), and forearm crutches. The ulcer had healed by July 30, 2013 (Fig. 3). After that, regular checks were performed on him every three months.
- On November 19, 2014, the patient walked into the surgical outpatient ward with a new wound on the big toe of his left foot. Examination result: HbA1c – 96 mmol/l, BMI 45.8 kg/m², blood pressure 210/110 mmHg, CT angiography – arteries passable, duplex venous sonography negative, X-ray found big toe skelet destruction (Fig. 4). Treating the ulcer with standard local wound therapy (removing hyperceratoses, excochleation, rinsing/dressing the wound, and wet wound therapy) for one year did not help heal the ulcer. Every time the patient and his family came to the clinic, they were educated by the nurse and physician. They were repeatedly told it was necessary for the patient to lose some weight and compensate for DM, to ease pressure on the ulcer, to rinse it and apply the materials of wet wound therapy. The big toe does not fulfill its support function anymore. On January 6, 2015, an amputation was performed. However, even the stump healed slowly, and was fully healed by August 27, 2016.
- On September 27, 2016, a new ulcer on his left foot in the area of lymphedema on the planta of the stump, or rather under Head of MTT (metatarsus) was found. Examination results: BMI 42 kg/m², HbA1c – 72 mmol/l, blood pressure 190/95 mmHg, CT angiography on November 11, 2016, without indication to endovascular treatment. Local therapy: excochleation, removing hyperceratoses, application of gel onto the wound base, and nonadherent dressing. The patient was educated about the need to relieve the ulcer, wet wound therapy, and the need to wear appropriate

footwear. The patient was regularly visited at home by the dressing service to redress the wound. During regular checks at the surgical outpatient ward, the staff repeatedly pointed out that he was not using suitable footwear (Fig. 1), his lower limb bandage was not done right (Fig. 5), told him to reduce his weight and compensate for DM and hypertension, the patient was sent to diabetology, cardiology and nephrology outpatient wards, to a dietician, and was recommended psychological intervention (a psychologist's contact information was handed over to him). The patient was offered a laparoscopic bandage of the stomach but he refused it, as he did psychological help. The ulcer is still inappropriately stressed (severe obesity). Health care staff asked the patient to pay for some of the wet wound therapy materials.

- In 2018, the patient sought help at a private surgical clinic. Within the local therapy, health care staff tried applying a lot of expensive wet wound therapy materials on the wound base (hydro gel dressing, materials containing silver, alginate, etc.) that were fully covered by insurance. The physician also promised the patient plastic surgery – dermoepidermal graft. However, he asked the patient for an active approach to the treatment regimen – relieving the ulcer, reduction of weight (BMI 42 kg/m²), and compensation of DM (HbA1c – 73 mmol/l). The patient did not fulfill this commitment, did not actively collaborate regarding the treatment regimen, and kept refusing psychological and dietary interventions. Health care staff of the surgical clinic stopped using expensive wet wound therapy materials after one year of such treatment and started using cheaper ones (Prontosan Gel and nonadherent dressings).
- In April 2019 another ulcer was found on the planta of the foot at the vascular surgical outpatient ward, approximately 15×23cm, the wound base granulating, coated, secreting Wagner 3, hyperceratoses visible around the ulcer again. The patient demanded the “promised surgery”. He was wearing inappropriate footwear claiming he cannot put on anything else due to lymphedema. He used a walking stick to ease the pressure, a compression bandage of his lower limbs was not performed (he claimed it bothered him and caused him discomfort). The ulcer was inappropriately dressed and smelled bad. The results were: HbA1c 80 mmol/l, BMI 42 kg/m². The patient demanded plastic surgery. In respect to the above facts, not relieving the foot and a high BMI, the physician did not recommend surgery.
- Starting in April 2020, in connection to the covid pandemic, the patient stopped coming to the specialized outpatient wards for regular checks citing fear of infection. Communication with the vascular surgical clinic occurred once over the phone. The patient was recommended measuring skin temperature on his lower limbs (for timely discovery of possible infection and other complications). Prescription was done via so-called e-prescription. Wet wound therapy materials, disinfectants, secondary dressing, insulin, and other medicines were administered by his wife.
- An ulcer of approximately 6×8.5cm on the planta of his right foot was observed in April 2021 at the surgical outpatient ward; the ulcer on the planta of his left foot was 4×9cm (Fig. 6). In both cases the wound base is a vital, clean, area around the hyperceratosis with necrotic crust, feet perfused to the periphery, no swelling, Wagner 3, lymphedema of both feet. Examination results: HbA1c 82 mmol/l, BMI

44 kg/m². Local therapy: necrectomy performed, excochleation, hyperceratoses EX, Prontosan gel + MT dressing applied. Recommended redressing with Prontosan gel + nonadherent dressing. He was issued an application for a revision medical examination, and high compressive bandages of his feet were recommended. In January 2021 he was diagnosed with a malignant melanoma on his right upper limb (5 cm), possibly with metastases. Excision was performed. The patient and his loved ones were educated on lower limb care.

Fig. 1: Inappropriate footwear in which the patient often comes to the doctor's surgery



Fig. 2: Therapeutic footwear with an insole and removable pin where it touches the wound.



Fig. 3: Wound on the planta of the lower left limb 0.3×3.5 cm shortly before healing; hyperkeratosis surrounding the wound.



Fig. 4: X-ray - there is significant destruction of the skelet of both the basal and distal phalanges with osteolysis – progression of osteomyelitis. State after amputation of the 2nd to 5th toes.



Fig. 5: Ulcer on the left foot 5×3.5 cm, BMI 42 kg/m², large hyperkeratosis, lymphedema, compression bandage not applied properly.



Fig. 6: Ulcers on both feet hyperkeratoses, lymphedema, BMI 44 kg/m²



DISCUSSION

Despite low angiological stress in the patient and long-time DFU treatment (11 years) by health care professionals his foot ulcers did not heal. At first, diabetic ulcers were only localized on his left foot, but from 2011 also on his right. The client's motivation to active collaboration treating his DFU (modifying his lifestyle, DM compensation, relieving the ulcers) fluctuated. From 2016 the client stopped actively collaborating whatsoever. His nonadherence to the treatment regimen was demonstrated by his failing to wear suitable therapeutic footwear (Fig. 1), inadequate relieving of the foot (he only used one forearm crutch for longer walks; and not even that at home), inadequately performed compression of the lower limbs in connection to lower limb lymphedema (Fig. 5), long term diabetes decompensation (HbA1c from 69 to 96 mmol/mol, the norm for HbA1c is 45-50 mmol/mol), hypertension (from 140/90 to 210/110 mmHg, the norm is 120/80 mmHg), and severe obesity (from 40.1 kg/m² to 45.8 kg/m², the norm for BMI is 18.5 to 25 kg/m²).

The main problem while treating obesity is diet therapy including change of diet. Any change of diet should be based on individual work with the patient. From the family's medical history we knew that the patient's parents suffered from obesity and Type 2 DM. The client stated that he came from the country where it is normal to eat big hearty meals. He loved eating pork and sausage. "He also used to go to the pub for a beer, but as he could not walk there anymore, his wife would bring him home bottled beer. He did not want to eat less, saying: "What would be left of my life then?" In 2016 the client was sent to a dietician for consultation. The dietician then customized a new diet for him. His wife cooked according to it for one month. However, his wife said that he then ate his fill from the fridge or pantry. His wife also admitted that she loved to eat a lot and was very undisciplined, too." The client continued drinking bottled or canned beer daily (1–4 beers a day). As early as 2016 he refused laparoscopic bandage of the stomach, which he also did in 2018 and 2019. Mysimba (a combination of naltrexon and bupropion) was applied in 2020, but with little effect.

The Czech Republic only uses medicines approved by the State Institute for Drug Administration as anti-obesity drugs. Adipex retard (fentermin) is considered as a centrally effective drug (it affects the notions of being full or hungry). However, it is being withdrawn from circulation now due to its adverse side effects. Mysimba is a newer drug from this category (a combination of naltrexon and bupropion), which is used as an antidepressant for the treatment of alcoholism and opiate weaning. . Xenical (orlistat) reduces absorption of nutrients (intestinal lipases blocker). The last group are incretin mimetics – Saxenda (liraglutid), applied subcutaneously, which enhance the feeling of being full and inhibit gastric emptying (Keukenkamp et al., 2018).

Wearing therapeutic footwear was a problem for the client right from the start of DFU treatment: "he had a hard time bending down to put on his shoes due to his big belly". From 2016 he developed a secondary tibial lymphedema, which is why "it is easier for him to walk barefoot of wearing warm socks". Due to alleged discomfort he only wore therapeutic footwear when he went to see the doctor. While at home, he only walked

to the bathroom without footwear, leaning on the walls for support instead of using forearm crutches. He only felt mild pain while walking as a result of developed peripheral neuropathy (a one on a ten-point VAS scale). Later he needed a wheelchair for longer trips. Physical activity could not be prescribed as he was supposed to relieve the planta of the foot. Based on long term monitoring of patients in vascular-surgical outpatient wards focused on wearing suitable footwear we discovered that patients did not mind wearing comfortable prophylactic footwear. However, they tend to wear therapeutic footwear irregularly and inconsistently, mentioning discomfort as the main reason for this. Kossioris et al. (2017) in their crosssectional study focused on wearing preventive and therapeutic footwear in patients with DM found that there were fewer of those with active ulcers on their feet who wore suitable therapeutic footwear than risk patients. High cost was mentioned as the main reason for not wearing therapeutic footwear (Lebrun et al., 2010).

From 2018 the client took the Minimental state exam test (MMSE) during every regular neurology department visit in order to detect possible dementia (Norman et al., 2020). From the start (2016) the client had a borderline finding of 25 points out of 30, and was recommended a detailed neuropsychological examination. Between January 2017 and November 2021 he repeatedly reached 20–24 points (light dementia).

Psychotherapy and consistent education focused on strengthening the patient's motivation to adherence to the set regimen measures are often omitted. The patient's loved ones should also attend psychotherapy. Without his loved ones he was not able to handle the situation. Only clinical psychologists can perform psychotherapy in the Czech Republic, and there are few of them. Waiting times are long, even half year, and the frequency of the sessions is one per two months.

Even if the psychological aspects connected to the treatment of diabetes are still rather marginal among clinical psychologists, their impact on the lives of patients may be significant. Diabetes distress is a condition when the patient is forced to deal with a chronic disease that is hard to treat, he falls into negativism and despair. The result, besides generally decreased life quality, may be also a lack of motivation to treatment and loss of control over the disease. Prevalence of this problem in the diabetic population reaches 18–35%. The client underwent one Diabetic Distress Scale (DDS-17) examination per year since 2018 (Schaper et al., 2019). Diabetic distress differs from classic distress in its connectedness to loss of control over the level of glycemia. Diabetes is the main cause, and the patient's inability to cope with it and its worsening are the main results. DDS-17 maps 4 main distress domains connected to diabetes: emotional stress, distress connected to the treatment regimen, distress connected to the physician, and interpersonal distress. The client was found to suffer from mild anxiety and was recommended consulting a psychologist. He refused the consultation saying: *"I am no fool"*. In respect to the above mentioned lack of psychologists in clinical practice he was not persuaded anymore. However, his general practitioner prescribed him low doses of antidepressants from 2018 (stronger antidepressants must be prescribed by a psychiatrist). The client was also recommended social services, which he, however, also refused, saying: *"we are managing just fine and don't want any strangers at home."*

From 2018, however, a home care agency nurse came there twice a week to redress his wounds.

The patient was briefly educated during each visit to the surgical outpatient ward (verbally, using education materials), in terms of caring for diabetic foot (in accordance with the recommendations of the Czech Diabetes Society). Brief education of the patient was also done in other specialized outpatient wards (diabetes, surgery, lymphology, internal medicine) by the doctor or nurse. However, all this education was totally ineffective in case of this patient. Starting in April 2021, oncological diagnosis (malignant melanoma) was given priority over the DFU treatment. From that time he only came to the surgery ward twice, and we last saw him in November 2021. He had surgically irremovable metastases in the brain. Home palliative care started.

In their systematic review, Jarl and Lundqvist (2016) focused on factors connected to adherence to wearing therapeutic footwear in patients with DM – mainly on factors connected to the patient, therapy and health condition. They state that there is only weak evidence that gender, duration of DM, and medical history of ulcers are not connected with adherence. Evidence for or against other factors (e.g., shoe type and comfort, number of steps per day, the patient's age and education, etc.) were weak or contradictory (Scott and Spouse, 2013). However, such results can hardly be generalized as the studies were of different designs, they defined and measured adherence in different ways, and studied different factors that might affect adherence (Fisher et al., 2012; Scott and Spouse, 2013). As early as 2017, Cavanagh et al. stated that increased maximum plantar pressure was a strong predictor that might have adverse effects and cause plantar ulcers (Fejfarová et al., 2014).

Crews et al. (2016) in their prospective, multicentric international study on 79 persons with type 2 diabetes and plantar DFU (46 from Great Britain and 33 from the United States) assessed the connection between adherence to relieving DFU and its healing for the duration of 6 weeks. Potential demographic factors, diseases, and psychological determinants of adherence were examined too. The authors found that greater adherence to relieving the ulcer leads to a better and faster healing of the diabetic foot ulcer, while postural instability connected to neuropathy is a strong predictor of nonadherence (Veves et al., 1992).

In their explorative study, Keukenkamp et al. (2018) assessed the effect and usability of motivational interviews to improve adherence in the context of wearing appropriate footwear by persons with diabetes with a high risk of foot ulcers, and those with low adherence to wearing prescribed custom-made footwear. For the duration of 7 days, adherence was objectively measured using special insoles in shoes with a pressure sensor to monitor the pressure exerted by the foot in the shoe. Adherence was assessed at home and outside home at the start, after the first week, and 3 months after the intervention. The authors concluded that adherence to wearing footwear at home increased one week after the motivational interview to a clinically relevant but statistically insignificant level (i.e., 80 %), but then returned to the base level. When far from home, adherence is good from the start and stays this way over time. Using the motivational interview seems to be useful for the given purpose and group of patients (Vráblík, 2013).

In case of our patient, his adherence to the treatment regimen was very low (*Hyperkeratoses on the planta confirm too much pressure on the foot with the wounds. The patient confirms that he walks without support at home despite the fact he is aware of the adverse effects this may have on healing the ulcers. He defends himself by claiming that wearing therapeutic footwear limits his movement*). After many years, even his family members lost motivation to adhere to the complicated treatment regimen (redressing was done by his daughter – a surgical nurse – from the start, then from 2014 to present by dressing service). In view of long-term noncollaboration between the patient and the multidisciplinary team, its members gave up on treatment aimed at healing the ulcers.

Our client was assessed regarding his adherence to the treatment regimen every half-year based on focused questions regarding his adherence to the regimen, laboratory, clinical, and anthropometric results, and based on checking on his adherence to the prescribed diet. The result was low adherence to the treatment. The client's willingness and ability to adhere to treatment were affected by his age, male gender, cognitive abilities, self-confidence, stress, depressions, regular consumption of alcohol, long term treatment, social isolation, polymorbidity and polypharmacotherapy, and also inadequate communication with his physician (lack of time for communication). Some of the above factors cannot be affected at all (e.g. the patient's personality, age, gender, or his cognitive abilities), while others can (self-confidence and confidence in his own abilities, stress, depressions, regular consumption of alcohol, social isolation, or communication). Adherence is a complicated process that is affected by more than two hundred different factors (in general for example the factors of the health care system, socioeconomic factors, and factors connected to the disease, therapy and the patient). Some factors cannot be affected (age, ethnicity, environment) while others can (the patients' opinion of the treatment, their knowledge of the disease, short term social benefits, personal benefits of their own decision making process, and the impact of their own decisions on their everyday lives). The questionnaire survey conducted by the company IQVIAE in the territory of the Czech Republic in 2019 was focused on finding problems connected to nonadherence to treatment. A total of 102 physicians and 510 patients took part in it. The research showed that in case of adherence to treatment it was affected by age, gender, self-confidence, confidence in the patient's own abilities, stress, depressions, and dependence on alcohol consumption. Regular intensive movement is difficult especially for older patients due to pain of the musculoskeletal system. Engaging the family and the patient's social environment is considered by the respondents as one of the most effective means how to achieve change of lifestyle.

We also assume that supportive, accompanying, and psycho-educational interventions stemming from the individual needs of the patient might help him achieve better adherence. However, according to Norman et al. (2020) and their systematic overview aimed at presenting evidence of the efficacy of psychosocial interventions to support healing or to decrease the occurrence of new foot ulcerations in persons with DM there are no quality randomized controlled studies that would support the effect of psychosocial interventions on the prevention of ulceration or its healing (Walsh et al., 2016). However,

psycho-educational interventions could not occur due to the patient's refusal. During the coronavirus pandemic, the situation worsened.

Recommended lifestyle change that is the base of treating many metabolic diseases may be difficult for many individuals, the reasons being social or economic, negative emotions, depression, anger, hostility, but also misinterpretation. These long-term patients cannot only be educated but also supported, positively motivated toward treatment and adherence to the recommended regimen measures via their life values, individual lifestyle, and an open partnership with healthcare workers. Attention also needs to be paid to stress mitigation and fighting social isolation. These tasks can only be fulfilled by personal coaching within supportive supervision by a healthcare professional (nurse) – patient. The reason for supporting the patient in the long-term, is, besides episodic directive, education or reeducation, to provide continual, long-term nondirective support based on the individual needs of a professional healthcare professional – most commonly a nurse (Zeber et al., 2013). That is why it is necessary to add to the multidisciplinary team caring for clients with DFU psychologists, dieticians, educators, and health care and social workers who would work individually with the psychosocial needs of the client, his/her values, motivation to adherence to DFU treatment. However, this approach is very expensive.

CONCLUSION

Despite long-term complex treatment of DFU, it was not possible to achieve any significant results in the healing of ulcers. Long-term, protracted and repeated treatment of DFU (11 years) led to the patient's nonadherence to the treatment regimen and recommended treatment measures, and later to total resignation of the patient from treatment, as well as resignation of the members of the multidisciplinary team. We think that support and psycho-educational interventions stemming from the individual needs of the patient might help the patient achieve better adherence or at least not worsening of his condition and delaying of all the discovered complications.

Limits

The case study conclusions cannot be generalized to all DFU clients. Based on long term experience in the field, however, we think that psychosocial support of clients, not only with DFU, is underestimated and downplayed in the Czech Republic in the long run, which is reflected in low financial support of such interventions from insurance companies. People in the Czech Republic are not used to paying more for services not covered by insurance companies, investing time, money and energy in prevention.

Consent

The patient consented to the publication of this case.

Conflict of Interest

All authors declare no conflicts of interest.

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References

ARMSTRONG, D. G., BOULTON, A. J. M. and BUS, S. A. A Diabetic Foot Ulcers and Their Recurrence. *N Engl J Med*. 2017, vol. 376, no. 24, p. 2367–2375.

BREM, H., SHEEHAN, P., ROSENBERG, H. J. et al. Evidence-based protocol for diabetic foot ulcers. *Plast Reconstr Surg*. 2006, vol. 117, no. Suppl 7, p. 193S–209S.

BUGGY, A. and MOORE, Z. The impact of the multidisciplinary team in the management of individuals with diabetic foot ulcers: a systematic review. *J Wound Care*. 2017, vol. 26, no. 6, p. 324–339. Available from: <https://doi.org/10.12968/jowc.2017.26.6.324>.

CAVANAGH, P. R., RODGERS, M. M. and Liboshi, A. Pressure distribution under symptom-free feet during barefoot standing. *Foot Ankle*. 1987, vol. 7, no. 5, p. 262–276.

CRAWFORD, F., INKSTER, M., KLEIJNEN J. et al. Predicting foot ulcers in patients with diabetes: a systematic review and meta-analysis. *QJM*, 2007, vol. 100, no. 2, p. 65–86.

CREWS, R. T., SHEN, B. J., CAMPBELL, L. et al. Role and Determinants of Adherence to Off-loading in Diabetic Foot Ulcer Healing: A Prospective Investigation. *Diabetes Care*. 2016, vol. 39, no. 8, p. 1371–1377. Available from: <http://dx.doi.org.proxy.k.utb.cz/10.2337/dc15-2373>.

DOUPIS, J. and VEVES, A. Classification, diagnosis, and treatment of diabetic foot ulcers. *Wounds*. 2008, vol. 20, no. 5, p. 117–126.

FEJFAROVÁ, V., JIRKOVSKÁ, A., DRAGOMIRECKÁ, E. et al. Does the diabetic foot have a significant impact on selected psychological or social characteristics of patients with diabetes mellitus? *Journal of Diabetes Research*. 2014, p. 371–938. Dostupné z: <https://doi.org/10.1155/2014/371938>.

FERNANDO, M. E., CROWTHER, R. G., LAZZARINI, P. A. et al. Plantar pressures are higher in cases with diabetic foot ulcers compared to controls despite a longer stance phase duration. *BMC Endocr Disord*. 2016, vol. 16, no. 1, p. 51.

FOLSTEIN, M. F., FOLSTEIN, S. E. and McHUGH P. R. Mini mental state. A practical method for grading the cognitive state of patients for the clinician. *J Psychiatr Res*. 1975, vol 12, no. 3, p. 189–198.

FISHER, L., HESSLER, D. M., POLONSKY, W. H. and MULLAN, J. When is diabetes distress clinically meaningful? Establishing cut points for the Diabetes Distress Scale. *Diabetes Care*. 2012, vol. 35, no. 2, p. 259–264. doi: 10.2337/dc11-1572.

HAINER, V. a KUNEŠOVÁ, M. Farmakoterapie obezity. In: Kunešová et al. *Základy obezitologie Pharmacotherapy of obesity*. In: Kunešová et al. *Basics of obesityology*. Praha: Galén, 2016, s. 139–144. ISBN 978-80-7492-217-6.

JARL, G. Methodological considerations of investigating adherence to using offloading devices among people with diabetes. *Patient Preference & Adherence*. 2018, no. 12, p. 1767–1775. Available from: <https://doi.org/10.2147/PPA.S175738>.

JARL, G. and LUNDQVIST, L. O. Adherence to wearing therapeutic shoes among people with diabetes: a systematic review and reflections. *Patient Prefer Adherence*. 2016, vol. 8, no. 10, p. 1521–1528. Available from: <https://doi.org/10.2147/PPA.S112275>.

JIRKOVSKÁ, A., LACIGOVÁ, S., RUŠAVÝ, Z. et al. *Recommended procedure for diabetic foot syndrome prevention, diagnostics, and therapy*. 2016. Available from: http://www.diab.cz/dokumenty/standard_diab_noha.pdf.

KUDLOVÁ, P. a KOČVAROVÁ, I. Quality of life in patients with diabetic foot ulcers. *Central European Journal of Nursing and Midwifery*. 2020, vol. 11, no. 1, p. 34–42. Dostupné z: <https://doi.org/10.15452/cejnm.2020.11.0006>.

KORADA, H. Effectiveness of customized insoles on maximum plantar pressure in diabetic foot syndrome: A systematic review. *Diabetes & Metabolic Syndrome: Clinical Research & Reviews*. 2020, vol. 14, no. 5.

KOSSIORIS, A., TENTOLOURIS, N., KYRIAZOPOULOU, V. et al. Initial and continued adherence to wearing appropriate footwear in people with diabetic foot disease: results of a pilot study. *Hellenic Journal of Nursing Science*. 2017, vol. 10, p. 21–28.

KEUKENKAMP, R., MERKX, M. J., BUSCH-WESTBROEK, T. E. et al. An Explorative Study on the Efficacy and Feasibility of the Use of Motivational Interviewing to Improve Footwear Adherence in Persons with Diabetes at High Risk for Foot Ulceration. *J Am Podiatr Med Assoc.* 2018, vol. 108, no. 2, p. 90–99. Available from: <http://dx.doi.org.proxy.k.utb.cz/10.7547/16-171>.

LEBRUN, E., TOMIC-CANIC, M. and KIRSNER, R. S. The role of surgical debridement in healing of diabetic foot ulcers. *Wound Repair And Regeneration.* 2010, vol. 18, no. 5, p. 433–438. Available from: <https://doi.org/10.1111/j.1524-475X.2010.00619.x>.

NORMAN, G., WESTBY, M. J., VEDHARA, K. GAME, F. N. and CULLUM A. Effectiveness of psychosocial interventions for the prevention and treatment of foot ulcers in people with diabetes: a systematic review. *Diabetic Medicine.* 2020, vol. 37, no. 8, p. 1256–1265. Available from: <https://doi.org/10.1111/dme.14326>.

SCHAPER, N. C., NETTEN, J. J., APELOVIST, J. et al. The International Working Group on the Diabetic Foot. *Part of the 2019 IWGDF Guidelines on the Prevention and Management of Diabetic Foot Disease.* Available from: <https://iwgdfguidelines.org/wp-content/uploads/2019/05/IWGDF-Guidelines-2019.pdf>.

SCOTT, I. and SPOUSE, J. *Practice Based Learning in Nursing, Health and Social Care: Mentorship, Facilitation and Supervision.* John Wiley & Sons, 2013, 213 p. ISBN 978-0-470-65608-8.

VEVES, A., MURRAY, H. J., YOUNG, M. J. et al. The risk of foot ulceration in diabetic patients with high foot pressure: a prospective study. *Diabetologia.* 1992, vol. 35, no. 7, p. 660–663.

VRÁBLÍK, M. Adherence and the possibilities to affect it. *Med. Praxi.* 2013, vol. 10, no. 11–12, p. 369–373.

WALSH, J., HOFFSTAD, O., SULLIVAN, M. et al. Association of diabetic foot ulcer and death in a populationbased cohort from the United Kingdom. *Diabetic Medicine.* 2016, vol. 33, no. 11, p. 1493–1498. Available from: <https://doi.org/10.1111/dme.13054>.

ZEBER, J. E., MANIAS, E., WILLIAMS, A. F. et al. A systematic literature review of psychosocial and behavioral factors associated with initial medication adherence: a report of the ISPOR medication adherence & persistence special interest group. *Value Health.* 2013, vol. 16, no. 5, p. 891–900.

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