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Case Report

The role of holistic assessment, multidisciplinary diagnosis and treatment, and negative-pressure wound therapy with instillation in managing complex diabetic foot ulcers: a case-based discussion

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Abstract: The etiology of diabetic foot ulcers (DFU) is multifactorial, encompassing neuropathy, peripheral arterial disease, and susceptibility to infection. The management of DFU remains challenging due to high recurrence rates and amputation risks. While various treatments exist, a standardized, effective approach integrating holistic care is essential. This paper presents a detailed analysis of two representative cases of complex DFU managed within our institution. Both patients underwent a structured process involving immediate holistic assessment, formation of an MDT to devise personalized treatment strategies, surgery, application of NPWTi, and structured post-discharge planning including health education. Eventually, both patients achieved successful wound closure without major amputation. The successful management of complex DFU necessitates a paradigm shift from isolated interventions to a comprehensive strategy. This strategy should encompass 1) early holistic patient assessment, 2) centralized coordination via an MDT for personalized care plans, 3) meticulous surgical debridement, 4) judicious use of advanced adjunctive therapies like NPWTi, and 5) robust post-discharge follow-up and patient education to prevent recurrence. This framework serves as a practical guide until further robust evidence emerges to refine these recommendations.

Keywords: Diabetic foot ulcers, wound complications, multidisciplinary diagnosis and treatment, surgery, negative-pressure wound therapy with instillation

Introduction

Diabetic foot ulcers (DFU) are a serious and chronic complication of diabetes that may cause disability or even death in patients with diabetes [1-3]. It has posed the heaviest burden on patients, with the growing worldwide prevalence of diabetes mellitus and the prolonged life expectancy of diabetic patient populations around the world, the global prevalence of DFU ranges from 3% in Oceania to 13% in North America, with a global average of 6.4% [4]. The lifetime risk of a diabetic patient developing foot wounds has been estimated to be as high as 25%, with an estimated 14-20% of patients with foot wounds in agony with an amputation in the distal lower limb(s) of these patients [5].

Previous studies believed that the interplay of peripheral neuropathy, vascular disease, and trauma were the main causes of DFU among the variety of pathological conditions [6]. Peripheral neuropathy leads to loss of protective sensation, making the foot vulnerable to unrecognized minor trauma from ill-fitting footwear or foreign objects. Vascular disease, which is more prevalent and often more distal in indi-

viduals with diabetes, impairs blood flow, critically compromising the delivery of oxygen, nutrients, and immune cells necessary for wound healing and infection defense [6, 7]. It is crucial to note that while infection is a common and serious sequela of a break in the skin barrier, it is generally not the primary cause of the initial ulcer [8]. Prevention is paramount in DFU management. Key strategies include regular foot inspections by patients, wearing appropriate footwear to offload pressure, meticulous daily foot care, and optimal management of underlying comorbidities - particularly strict glycemic control, management of hypertension and dyslipidemia, and smoking cessation [9, 10]. Educational programs aimed at patients and caregivers have been shown to significantly reduce the incidence of first and recurrent ulcers [11]. Although a variety of management was applied in DFU. There is still a significant gap between our current and desired wound healing outcomes [5]. Medical practitioners urgently require the need to develop evidence-based practice guidelines. Current conventional treatment regimens include infection control (systemic antibiotics and local antibiotics are effective but need to be selected according to drug sensitivity), improving ischemia (vascular assessment and reconstruction significantly improves healing rates and reduces the risk of amputation), decompression therapy (use of orthoses or full-contact plaster greatly promotes ulcer healing), and topical debridement and dressing application (negative-pressure wound therapy and modern dressings effectively promote granulation growth and control exudation) [12]. Patient education and glycemic control are fundamental to preventing recurrence and ensuring efficacy. Overall, systematic and multidisciplinary treatment significantly improves healing and reduces amputation. There are also some scholars applying other methods of treatment; avowal declaration achieved a very good curative effect, such as topical dressings, oxygen therapies, acellular bioproducts, human growth factors, and energy-based therapies, etc [1, 2]. Even with these comprehensive approaches being adopted by more and more scholars, some patients are still unable to achieve the desired clinical effect. There is still room for improvement in DFU outcomes [13, 14].

In this paper, we describe 2 cases of DFU in which patients were treated with negative-pressure wound therapy with instillation (NPWTi) after surgical debridement. At the same time, multidisciplinary diagnosis and treatment (MDT) of diabetic foot patients, the principle of debridement, postoperative follow-up, and health education were highlighted. The concept of holistic, systematic, and multidisciplinary cooperation in the diagnosis and treatment of DFU should be used throughout the treatment. We hope that these practical guidelines may serve as a reference document to aid in reducing the burden of diabetic foot disease.

Case report

Case 1

The patient is a 68-year-old female with a 10-year history of type 2 diabetes mellitus, who has been receiving oral hypoglycemic drug therapy: metformin 1.0 gram, twice a day, and saxagliptin 5 milligrams, once a day. Ten days prior to admission, the dorsal aspect of her right foot was struck by a heavy object. Subsequently, the skin gradually ulcerated and suppurated. After undergoing dressing change treatment at a community hospital, she was admitted to our hospital. On admission, her body temperature was 38.3°C, blood pressure was 140/95 mmHg, and fasting blood glucose was 22.4 mmol/L. She presented with a deep infection, with osteomyelitis in the fourth toe of the right foot, skin defects, and tendon exposure and necrosis (**Figure 1A**). A blood test showed an erythrocyte sedimentation rate (ESR) of 48 mm/h. The procalcitonin (PCT) level was 2 ng/L. Methicillin-resistant Staphylococcus aureus (MRSA) was isolated.

It is common practice to conduct an MDT. The diabetic physician adjusted blood glucose according to blood glucose monitoring. The anesthesiologist evaluates the surgical risks and chooses a suitable anesthesia method according to the patient's tolerance. Nutritionists provide health education and necessary nutritional support for treatment. A personalized surgical plan should be formulated. Actively control blood glucose levels and initiate anti-infective therapy. Perform staged surgical debridement, apply NPWTi, and use skin grafting to cover the wound surface. The goal is to preserve the patient's limb to the greatest possible extent and restore its weight-bearing function.

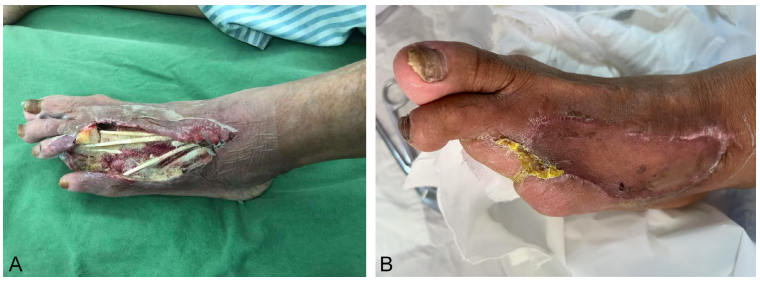

Figure 1. A. A wet gangrene in the fourth toe of the right foot and compartment syndrome of the plantar aspect of the forefoot and midfoot. Deep infection with osteomyelitis and skin defects, as well as tendon exposure and necrosis. B. The third and fifth toes were amputated, and amputated, the wound was covered using a free full-thickness skin graft. The weight-bearing function of her foot was retained, and the wound healed well.

First surgery: During the first surgery, the necrotic tissue, which includes necrotic tendons, muscles, and the third and fifth toes, has been cleared. We focus on processing infected tissue, especially that hidden in the fascia or interstitial space. When we confirm that there is no active bleeding and bleeding has completely stopped after debridement. The foot wound was coated with the device of NPWTi. The negative pressure applied is continuous. The pressure range was maintained at -125 mmHg between -130 mmHg. In order to maintain distal limb perfusion during treatment, the transcutaneous arterial oxygen tension ($TcpO_2$) must be > 40 mmHg and the ankle-brachial index (ABI) must range from 0.9 to 1.3. Normal saline has been used for instillation. After the continuous mode has been applied for 7 days.

Second surgery: The second debridement operation was performed. There was still more necrotic tissue, but the bacterial culture was negative, and the necrotic tissue continued to be carefully removed. Pay special attention to the maximum preservation of the structure of the foot during the surgery. And it is necessary to carefully remove the necrotic tissue that is hidden under the fascia site because the foot is more complex, including rich soft tissue and fascia space. The foot wound was coated with the device of NPWTi again.

Third surgery: After the continuous mode has been applied for 7 days. The granulation tissue grew well; the bacterial culture was negative. The wound was covered using a free full-thickness skin graft. The distal phalanx and proximal phalanges of the fifth toe were amputated. The stump was repaired with local soft tissue, and he was discharged after two weeks. The patient received health education and foot care from community physicians. Following a 3-year follow-up period, the patient achieved restored ambulatory function and exhibited no wound recurrence (**Figure 1B**).

Case 2

A 79-year-old male presented with a 10 cm * 8 cm wound in the right lateral ankle area, exposing the long and short peroneal tendons and showing signs of necrosis. Additionally, there is exposure of the superficial peroneal nerve and small saphenous vein. The granulation tissue was filthy with a large amount of secretion (**Figure 2A**). Despite previous treatment at multiple hospitals, the wound has failed to heal due to severe malnutrition. Fasting blood glucose 25.8 mmol/L. Streptococcus pyogenes and Staphylococcus aureus were isolated. MDT was administered after being hospitalized. The clinical pharmacist prescribed appropriate antibiotic therapy. The diabetic physician adjusted blood glucose according to blood glucose monitoring. The anesthesiologist chooses according to the patient's tolerance. Dietitians provided nutritional support based on the patient's laboratory results. During the first surgery, the necrotic tissue, including the long and short peroneal tendons, has been partially excised. The remaining parts of the long and short peroneal tendons and the superficial peroneal nerve were covered with surrounding tissue. The lower saphenous vein was carefully dissociated and ligated at both proximal and distal ends of the wound. When confirming that there is no active bleeding and bleeding has completely stopped after debridement, we apply NPWTi for DFU (**Figure 2B**). The pressure range was maintained at -100 mmHg between -110 mmHg. In order to maintain distal limb perfusion during treatment, the transcutaneous arterial oxygen tension ($TcpO_2$) must be > 40 mmHg and the ABI range from 0.9 to 1.3. After the continuous mode has been applied for 7 days. During the second debridement, there was still more necrotic tissue, but the bacterial culture was negative, and the necrotic tissue continued to be carefully removed, and NPWTi was applied for DFU. After the con-

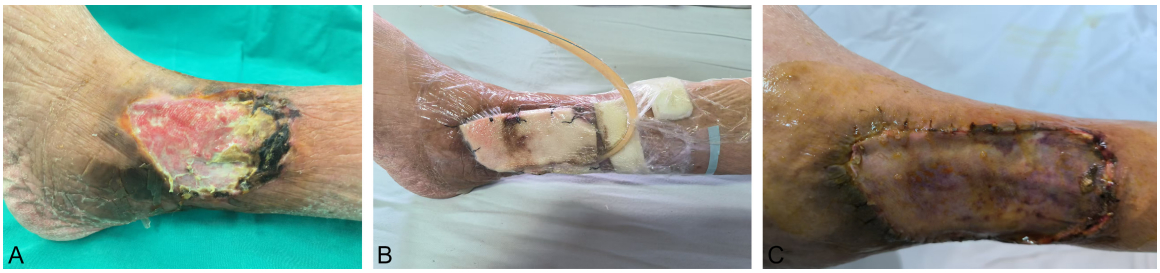

Figure 2. A. The size of the 10 * 8 cm wound in the right lateral ankle area presented, exposing the long and short peroneal tendons, showing signs of necrosis. Additionally, there is exposure of the superficial peroneal nerve and small saphenous vein. B. The foot wound was coated with the device of NPWTi. C. The wound was repaired with autogenous free skin grafting.

tinuous mode has been applied for 7 days. The granulation tissue grew well; the bacterial culture was negative. The wound was repaired with autogenous free skin grafting, and the patient was discharged after two weeks (**Figure 2C**). The patient received health education and foot care from community physicians. Following a 3-year follow-up period, no wound recurrence was exhibited.

Discussion

Diagnosis of DFU

In 1956, Oakley first proposed the concept of "diabetic foot" [15]. It was reported that two-thirds of diabetic foot were associated with neuropathy, one in two was associated with hypertension, retinopathy, or nephropathy, and a quarter to a third were combined with cardiovascular duct, cerebral blood duct, or lower limb blood duct disease or dyslipemia [7]. Diagnosis of diabetic foot ulcer is a systematic process; the key is to identify high-risk patients early, conduct comprehensive initial assessments (including nerve, blood vessel, and infection status), and use appropriate classification systems (such as the Wagner Grading System and the University of Texas Diabetic Wound Classification [12]) to guide treatment decisions and judge prognosis. For foot ulcers that have atypical sites, abnormal appearances, or poor responses to conventional treatment, it is necessary to consider differentiating them from other diseases, such as vascular ulcers, neurological ulcers, and even malignant skin tumors.

On the application of MDT in DFU

The patients with diabetic foot are often scattered in different departments. For example, the endocrinology department, general administration department, general surgery and orthopedics, etc. Due to professional expertise and professional limitations, the professional director focuses on their own profession; the treatment is often not holistic and systematic. Physicians are unable to understand the surgical situation solution and dare not carry out effective debridement; the surgeon delayed the operation because perioperative medical conditions could not be addressed as well. The aforementioned factors may contribute to the delayed initiation of treatment for this disease.

MDT highlights the role of an interprofessional team in collaborating to provide a well-coordinated diagnosis and choose an individualized treatment strategy to affect the curative effect of the patients. Why does it emphasize the application of MDT in the treatment of DFU? This is determined by the characteristic of itself [16-21]. Optimally managing diabetic foot disease has been a challenge to clinicians for many years due to its complex multifactorial etiology, lack of adequate tools to study the underlying pathology, and the need for developing closely interacting interdisciplinary teams. Traditionally, to treat DFU solely with a surgeon or physician is limited, and the controlled diabetic foot wound possibly is temporary. Although diabetic foot wound is first caused by internal medicine diabetes, it essentially involves infection, blood supply, nerves, and other aspects. Further on, most patients of DFU had kidney disease, cardiovascular and cerebrovascular disease, low protein, anemia, electrolyte disorder complications, etc. Therefore, for each patient, we need to choose individualized treatment recommendations, and it is necessary to invite experts from different fields to participate in the whole treatment process. More and

more scholars think a multidisciplinary limb salvage team should include orthopedic teams (foot and ankle), anesthesiologists, endocrinologists, vascular surgeons, radiologists, infection physicians, and physiotherapists, as well as psychological counseling if necessary [16, 17].

Perioperative management is particularly important for patients requiring surgery. For all diabetic foot patients, a comprehensive medical assessment, especially of the function of important organs such as the heart, brain, and kidney and risk factors, as well as lower limb lesions. Lastly, in order to reduce recurrence and effectively treat DFU, the follow-up is necessary. When the patient is discharged from the hospital, it is necessary to request a rehabilitation doctor to guide rehabilitation treatment and a nutrition doctor to guide nutritional treatment. Especially to guide patients to implement regular internal medicine follow-up.

DFU is a multidisciplinary clinical disease. It is difficult for any individual discipline to deal with it. Multidisciplinary cooperation in clinical practice is the prerequisite to obtaining the best therapeutic effect. The collaborative diagnosis and treatment of our MDT team provides high-quality treatment options for patients in the case, successfully preventing the progression and recurrence of patients' DFU. Establishing a formal MDT team is an important step in the treatment of any complex DFU, which ensures centralized coordination of patient care from admission to long-term follow-up. However, the specific MDT team composition should be adjusted according to the actual situation of the patient.

On debridement in DFU

Although the breadth of diabetic foot wound treatment currently being studied is promising, there are still no coincident principles that guide the standard of care [22]. Over the years the most debated theories have been surgical or antibiotic therapy as a first approach. Among the different ways of debridement, surgery is generally seen as the fastest and most effective therapy. Tan et al. reported that an aggressive surgical approach with minor amputation reduces the risk of major amputation above the ankle and reduces the length of hospitalization and associated costs [23]. But this treatment leaves patients with a lifelong loss of function.

For DFU surgical debridement, the principle of "thorough and minimally invasive" should be usually adopted [24]. Firstly, our experience is not to advocate one-time large-scale debridement, which can easily lead to more tissue defects and bleeding risk after surgical debridement. Surgical debridement should be done in batches or multiple times by widely adopted. According to the age, cardiopulmonary function, and other basic conditions, as well as the wound (size, depth, location, and blood supply) preparation degree, choose the corresponding soft tissue repair technology and make adequate preoperative preparation. Secondly, because the structure of the foot is more complex, including rich soft tissue and fascia space, it is necessary to carefully remove the necrotic tissue, which is hidden under the fascia site. During the operation, the drainage effect can be improved by the thorough removal of the necrotic tissue. In addition, the surgical wound bleeding should also be paid more attention because the wound has a period of time for swelling and revascularization after the operation. The swelling and revascularization of the wound make it easy to cause bleeding recurrence in the wound; especially those patients taking anticoagulant drugs long-term are more likely to have recurrent bleeding after the operation. For those patients who need to save the limb, the post-surgical function, especially for the weight-bearing function, should be fully considered for the treatment of bone and joints. An aggressive approach can lead to an extended tissue loss. We recommend bone destruction, and the scope of surgical bone resection was diagnosed and determined according to preoperative imaging, histopathological, or bacteriological results. The bone reconstruction method is selected according to the existing changes of foot biomechanics. Especially when some patients need deferred bone reconstruction, better plans must be done ahead based on both the severity of infection and the patient's characteristics; that is the case to reduce medical disputes and to improve treatment effect.

Moreover, in surgical debridement of diabetic foot wounds, the minimally invasive principle is equally important in addition to thorough debridement surgery. Only in this way can the clinical goals of therapy be achieved, including the effective control of infection, the prevention of negative pressure drainage bleeding again

after surgery, and maximum retention of weight-bearing function. As shown in our case, one debridement is often not enough; planned, phased debridement based on wound evolution is usually necessary. This approach can better define invigorating tissue, control systemic inflammatory responses caused by large-scale debridement, and enable repeated bacteriological assessments. For DFU patients, we recommend prioritizing multiple, planned staged debridements rather than a single aggressive surgery, always aiming to retain the maximum functional structure. It is important to emphasize here that negative-pressure wound therapy with instillation should not be used as a substitute for appropriate medical and surgical care [25].

On NPWTi in DFU

The concept of wound irrigation has long been appreciated as beneficial for cleaning contaminated wounds and has been widely adopted by clinicians. The application of negative pressure wound therapy (NPWT) revolutionized the care of complex wounds in 1997; it has rapidly become the treatment of choice for many complex wounds, including chronic wounds, infected wounds, osteomyelitis, and surgical implant infections [26-28].

We have previously published the report of using vacuum sealing drainage (VSD) before skin grafts or flap coverage combined with limited internal and/or external fixation as a suitable option for Gustilo and Anderson grade III injury. Our experience successfully achieves the preparation for reconstructive surgery, stabilization of the wound bed, wound bed decontamination, improved graft and flap survival rate, restoration of wound bed integrity, stimulation of granulation tissue, accelerated wound healing, shortened healing time, and improved patient function.

Traditionally, the device of NPWT did not design lateral inlet holes. As a result, the exudate, harmful cytokines and necrosis tissue within the wound could not be effectively diluted and drained in the meantime. In addition, the local soft tissue was becoming dry over time after negative pressure attraction. That is the case; local soft tissue was affected, distal blood supply was decreasing, and tissue growth was restricting. These negative effects particularly should do nothing to risk in patients with diabetes wounds.

The management of DFU remains a subject of contention among medical professionals due to the multifactorial nature of its etiology. Most diabetic wounds require appropriate debridement. The debriding could not enable diabetic wounds to get into the normal wound-healing phases, assuming local inhibitory wound-healing factors within the wound could be effectively diluted and drained. Therefore, it is particularly important to effectively remove these local inhibitory wound-healing factors.

NPWTi was introduced to the United States acute care market in 2004 [29]. It combines the mechanisms of action of standard NPWT according to the set time and intermittent delivery of an instilled topical solution. The combination of negative pressure wound therapy and intermittent controlled delivery of a topical solution to the wound can effectively dilute and drain local inhibitory wound-healing factors and bioburden and improves the therapeutic effect compared with traditional negative pressure wound therapy.

Currently, NPWTi is indicated primarily for delayed primary closure of wounds: acute and chronic infected wounds, contaminated wounds, diabetic wounds, traumatic wounds, pressure ulcers, wounds with bone exposure, wounds with underlying osteomyelitis, painful wounds, as a transitional treatment between staged/delayed amputation, exudate-rich, rotting wounds, and refractory wounds that do not respond well to conventional NPWT [30]. NPWTi includes two key techniques of wound treatment: negative pressure wound treatment and wound irrigation. NPWT has been successfully used in the treatment of various acute and chronic wounds. Modifications of this foundation of wound care have added instillation with a dwell time to NPWTi. This new system of NPWTi offers more comprehensive wound care through wound irrigation, allowing more control of the wound environment and delivering topical solutions to the affected tissues directly. NPWTi helps create a favorable wound healing environment by removing infectious material, decreasing edema, and promoting perfusion and granulation tissue formation. Additionally, NPWT has been reported to help reduce time to wound closure and length of hospital stay. A

comparison between the two therapies, NPWT and NPWTi, is described, and two real-world applications of NPWTi are presented. Infusing a local solution and removing it through alternating negative pressure cycles is an important development of the NPWT concept. It is important to note here that when we decide to use NPWTi, the following issues need to be considered [14, 31-33].

First of all, the strength of using negative pressure. There is a huge difference in the strength of using negative pressure, as indicated by many published studies. In retrospective research, Timers reported a good therapeutic effect when usingnegative pressures ranging from 300 to 600 mmHg with instillation. In the instillation group the rate of recurrence of infection was 3/30 (10%), whereas 55/93 (58.5%) of the controls had a recurrence. Moreover, in those treated with instillation, the total duration of hospital stay was shortened, the number of surgical procedures was smaller as compared with the controls, and the need for repeated surgical interventions was less in comparison with the present standard approach. However, Moryk reported in experimental wounds that were treated with 125 mmHg vacuum had been filled with granulation tissue by day 8 in swine; wounds treated with lower (filled 21.2% with new tissue) or higher (filled 5.9% with new tissue) than 125 mmHg result in a significant decrease in the formation of granulation tissue at this time. Our experience is more in favor of the strength of using negative pressure being higher than 125 mmHg, consistent with what is described by Kim PJ et al..

Moreover, the period when negative pressure is applied is continuous, not intermittent. In practice, intermittent negative pressure will increase the possibility of maceration to the surrounding tissue, loss of a seal, and lead to the leaks of the occlusive dressing. Our experience is more in favor of the negative pressure applied is continuous. Additionally, a recommendation for an absolute volume of solution is not possible. In practice, diabetic wounds are irregular or inconsistent in size; too much volume of solution may cause maceration of the surrounding tissue, which leads to the leaks of the occlusive dressing. On the contrary, insufficient volume will not allow enough solution to irrigate the entire wound, especially since some irregular wounds are more obvious. We recommend an appropriate volume of instillation solution to monitor the foam until the foam is visibly saturated. As far as the installation solution also needs to be concerned. The literature recommends different instillation solution [34]. It is important to consider the goals of the therapy when selecting an instillation solution, taking into account the solution's potential toxicity, activity, availability, and cost. And these suggestions have been accepted by more and more expert panels.

NPWTi was a critical adjunct in both cases, used after initial and subsequent debridement. Its application strongly and effectively promoted wound healing in patients, reducing the number of surgeries and hospital stays. The core value of NPWTi lies in the periodic lavage-stay-suction cycle. Therefore, we recommend that in complex, infected, contaminated, or poorly responsive wounds, especially DFU, NPWTi can be applied effectively to clean the wound, reduce bioburden, and promote granulation tissue growth, thereby creating favorable conditions for eventual surgical closure or secondary healing. It should be noted that NPWTi is an adjunct therapy after debridement and is not a substitute for adequate surgical debridement of infected or necrotic tissue. For systemic infections, appropriate antibiotics must be used based on culture and susceptibility results. Wounds should be reassessed at each dressing change to decide whether to continue NPWTi, switch to conventional NPWT, or allow final closure.

On health education of family doctor or a community doctor

The recurrence of DFU rates is very high, being greater than 50% after 3 years. Many studies around the world support the belief that implementing prevention and management principles is associated with a decrease in recurrence of DFU [9-11, 35]. The diagnosis, treatment, and prevention of DFU are interconnected. The holistic assessment plays a crucial role in the prognosis of treatment. The whole physical assessment should include the assessment of medical disease, blood sugar control level, lower limb vascular conditions, and nutritional status of the whole body. Any factors that are not controlled will directly impact the wound healing. Good blood sugar should be controlled and run through the whole treatment process in patients with diabetic foot.

After the acute phase, considering the cost and societal impact of diabetic foot problems, to adequately manage the patients, formulating one pragmatic follow-up program, and detecting earlier potential failures of well-retained structured and well-healed wounds are necessary in the modern era.

A follow-up plan according to the individual differences of patients, disease progress, and accurate health problems of patients should be made by a family doctor or a community doctor. There is evidence confirming the efficacy of preventative foot care education either in the prevention of first foot ulcers or of recurrent foot ulceration. Plantar pressure evaluation should also be performed after ulcer healing. Evaluation and fitting of appropriate supports and other necessary preventive implementation to avoid ulcer recurrence effectively. A family doctor or a community doctor can provide foot care education and regularly check the skin thermometer, alerting patients in the pre-ulcerative phase with the hope of preventing the actual ulcer from developing.

In health education, nutrition plays an essential role in chronic wound healing, as extra nutrients are needed for tissue repair and to restore losses through wound exudate. Insufficient intake of nutrition has been linked to delayed wound healing and dehiscence. Supplementation would improve healing of foot ulcers in persons with diabetes [18]. Various vitamins and supplements also impact wound healing also [36]. Some suggestions from the multidisciplinary diabetic foot care team are worth recommending. In 2017, RCTs suggested the use of magnesium, omega-3 fatty acids, zinc sulfate, and vitamin D benefits wound healing [37, 38].

Conclusion

1. The purpose of this paper is to provide our experience in order to effectively treat DFU, which is a comprehensive evaluation of the patient that must be done as soon as possible. Multidisciplinary consultation is of vital importance in the diagnosis and treatment of DFU. Successful healing of DFU typically requires a holistic concept, a system concept, and a multidisciplinary approach.

2. NPWT and NPWTi are viable options for the treatment of DFU after surgical debridement. Combining surface flushing technology and negative pressure drainage technology. NPWTi has been confirmed to play an important role in the healing of the DFU. There is no consensus in the published literature on the strength and the mode of using negative pressure. The instillation solution and volume also lack consensus. The experience provided is customized to the specific circumstances.

3. The surgical debridement principle of "thorough and minimally invasive" should be usually adopted in DFU. The objective is to establish an enhanced biological milieu conducive to wound healing.

4. Holistic assessment and system concept play a crucial role in the prognosis of treatment. Health education from a family doctor or a community doctor is a recommended way. These can shorten hospital stays, reduce medical costs, and reduce post-surgical recurrence.

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Informed consent was obtained from all individual participants included in the study.

Disclosure of conflict of interest

None.

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