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Application of the External Treatment Method of Traditional Chinese Medicine in the Elderly Diabetic High-Risk Foot Based on the Theory of "Preventive Treatment of Disease"

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Abstract: Diabetic foot (DF) has emerged as one of the most common chronic consequences of diabetes mellitus, characterized by prolonged disease duration, high treatment costs, a poor prognosis, and a high disability rate. Diabetic high-risk foot is the early stage of diabetic foot, the "disease prevention" of "treating no disease", which provides a critical window for clinical prevention and treatment. Traditional Chinese medicine (TCM) has emphasized the importance of preventive health care since ancient times. External therapies such as acupuncture, massage, acupoint injection, foot bath fumigation, and moxibustion have the advantages of simplicity, low cost, precise efficacy, and fewer side effects in preventing and treating diabetic high-risk foot. The multidisciplinary synergistic model formed by TCM complementary therapies and modern medical treatments, such as nutritional, peripheral nerve, and blood glucose regulation, provides new ideas for establishing standardized prevention and treatment protocols. In this paper, studies related to TCM-related complementary therapies for diabetic high-risk feet are systematically reviewed. Current advances in external application in TCM were described to better understand its effectiveness and safety in elderly patients.

Keywords: Diabetic high-risk foot; External Chinese medicine treatment method; Treatment of undiagnosed disorder; Review

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1. Introduction

According to the International Diabetes Federation (IDF)'s most recent estimations in 2021, diabetes mellitus is highly common among people over the age of 65 [1]. China, the United States, and India have the most diabetic patients over 65, with prevalence rates ranging from 14.9% to 25.0%. The prevalence of diabetes in China is

10.6% in people aged 20–79 years, with a prevalence of 141 million people, making it the country with the largest number of diabetic patients in the world [2].

The incidence of diabetic foot (DF) increases with the duration of diabetes mellitus. It is assumed that between 19%–34% of the estimated 537 million people with diabetes worldwide will develop diabetic foot ulcers(DFUs) in their lifetime, with the prevalence of diabetic foot as high as 8.1% among people with diabetes over the age of 50 years, with a two-year mortality rate of 51% and a limb amputation rate of more than 50% [3]. Neurologic function testing on diabetes patients found that around 60% to 90% of diabetic individuals have varied degrees of neuropathy, with 30% to 40% of these people exhibiting no subjective symptoms, and the nerve damage is often permanent and irreversible [4, 5]. Older patients with diabetic foot have a longer duration of disease, more comorbidities, and a higher risk of amputation. Therefore, early prevention and treatment of the diabetic foot is important to promote and maintain the health status of diabetic patients, especially elderly diabetic patients. Studies have shown that effective preventive measures for high-risk diabetic feet and mitigation of adverse effects can reduce the rate of diabetic foot amputation by 49% to 85%, showing that prevention is better than cure [6].

Diabetic high-risk foot is an early stage of the diabetic foot and is defined as the presence of risk factors for foot ulceration without the development of a foot ulcer. A multicenter cross-sectional study in the UK that included 6,487 patients with diabetes showed an overall detection rate of 28.5% for diabetic high-risk feet [7]. The prevalence correlated with the duration of diabetes, which reached 44% of diabetic patients aged 70 to 79 years. Diabetes mellitus type 2 (T2DM) in the elderly is a special population group with declining cognitive function, coexistence of multiple diseases, multiple medications, and complex medication regimens, which pose a major challenge to its management. Currently, there are diverse traditional Chinese medicine (TCM) management programs for type 2 diabetes mellitus in China and it is important to rationally integrate TCM and Western medicine resources to provide personalized management services to patients. Traditional Chinese medicine external treatment is the external use of Chinese herbal medicines through the action of the physical way, through the human skin, mucous membranes, and acupuncture points to absorb the drug into the body. This article provides an overview of the importance of prevention of high-risk diabetic foot, the current status and problems of early prevention, and the interventional measures of external treatment with TCM for early prevention, to provide reference for clinical care and research.

2. Chinese and Western medical understanding of the diabetic high-risk foot

In 2015, the International Working Group on Diabetic Foot (IWGDF) clearly defined diabetic high-risk foot as “diabetic patients without active ulcers, but with peripheral neuropathy, with or without foot deformity or lower extremity vascular lesions, or a history of foot ulcers, or a history of amputation of the lower extremity or foot.” [8]. According to the Wagner Diabetic Foot Classification Criteria, there are grades 0 to 5. Wagner grade 0 is defined as DF with risk factors for foot ulceration but without ulceration, also known as diabetic high-risk foot.

The TCM guidelines and expert consensus define diabetic high-risk foot as “gangrene (diabetic foot disease - diabetic arterial occlusive disease of the limb) without ulceration.” [9]. The onset of the disease is characterized by poor Qi and blood. The veins and channels are not smooth, causing meridian obstruction, and gradually affect the skin, muscles, veins, nerves, and bone lesions. Serious cases can involve the five viscera and six bowels. In the advanced stages, disorders of Qi and blood impair circulation further. The balance of Qi and blood, as well as Yin and Yang, is disrupted, leading to the accumulation of phlegm, dampness, and toxic stagnation. The veins and

collaterals become thin and blocked, depriving the skin, tendons, and muscles of nourishment. This pathological progression ultimately contributes to the development of diabetic foot.

Figure 1. Wagner classification

3. The impact of elderly diabetic high-risk foot on the quality of life

Diabetic high-risk foot includes peripheral neuropathy and peripheral arterial lesions, with a variety of clinical symptoms, including sensory abnormalities, loss of sensation, itchy skin, dry skin, asymptomatic hypoglycemia, and postural hypotension. Among them, sensory nerve abnormalities are more common, presenting with numbness and pain. Damage to the motor nerves, common peroneal, and tibial nerves, can leave the patient with limb weakness and an inability to perform normal daily activities. So much so that the muscles of the lower limbs atrophy over time and the toes flex and deform, triggering changes in plantar pressure. In addition, diabetic high-risk feet are associated with gait, posture, and balance abnormalities. The results of a study by Fan *et al.* showed that the fall rate among hospitalized diabetic patients in China reached 21.58%, while another study on elderly diabetic patients found that the fall rate among elderly diabetic patients was 24.75% [10, 11].

Persistent progression of the high-risk foot can lead to ulceration of the patient's foot, which, without good healing management, can lead to avascular necrosis and muscle gangrene. In severe cases, amputation is even required, increasing the disability and mortality rates of elderly T2DM patients. In a community-based study that included 15,692 diabetic patients, symptoms of painful neuropathy were seen in 32.7% of patients aged 35–54 years, and in 35.7% of patients aged 55 years or older [12]. Data show that the global prevalence of diabetic foot ulcers is 6.3% (95% CI: 5.4%-7.3%), with an annual incidence of 1%–4%, of which the incidence in China is 4.1% (95% CI: 3.1%–5.2%) [13, 14]. Related studies have shown that diabetic patients have a lifetime probability of developing diabetic foot ulcers ranging from 19% to 34%, with a recurrence rate of 40% in the first year and 60% within three years for those who are cured [12, 15].

Elderly patients with high-risk diabetic foot often exhibit reduced self-management capabilities, with inconsistent adherence to insulin administration and medication regimens. Inadequate knowledge of diabetic foot prevention and poor foot care behavior. Cognitive ability declines with age. Older people with diabetes have reduced independence and lower adherence to medical care [16]. The elderly have insufficient knowledge of diabetic foot prevention and poor foot nursing behavior [17, 18]. In terms of foot care knowledge, diabetic patients have the worst knowledge of daily foot care and foot pain problem management. Negative emotions generated by changes in disease and insufficient family support tend to make patients lose confidence in treatment, which in turn hinders patients' healthcare behaviors. Persistent pain reduces treatment adherence, and depression occurs in 38.98% of patients [19, 21].

The average length of hospitalization for patients with diabetic foot in China is 15.59 days, and the average total cost of hospitalization is 28825.79 yuan [20, 22]. According to statistics, the global medical cost of diabetes in 2017 was as high as $727 billion, of which $110 billion was spent in China [23]. The treatment of diabetic foot takes up 12%–15% of diabetes healthcare costs in developed countries and up to 40% in developing countries [24]. The direct cost of diabetes care in the US was $237 billion in 2022, a third of which was spent on lower limb complications. Healthcare spending on DF care in the UK is even higher than for breast, prostate, and lung cancer combined [25]. Several studies have shown that the mean six-minute walk distance in patients with Diabetic peripheral neuropathy (DPN) is significantly lower than in healthy controls, with a general reduction of 20–35% [26, 27]. In patients with diabetic peripheral neuropathy, high mean peak pressure (MPP) and pressure–time integral (PTI) are common in forefoot segments, indicating overloading of high-risk segments of the plantar foot [28]. Diabetic foot is characterized by a high disability rate, high mortality rate, and high treatment cost, which seriously affects the quality of patients' survival and brings a heavy economic burden to patients, their families, and society.

4. Feasibility of Chinese medicine's idea of "treating the future disease" in the prevention and treatment of high-risk diabetic foot

For diabetic high-risk foot, Western medicine mainly uses pharmacological intervention for peripheral neuropathy and vascular lesions, with glycemic control, nerve nourishment, and pain management as the main principles of treatment. Western therapies for DF include foot care and infection management, blood sugar control, such as taking metformin, improving blood supply, and the common use of methylcobalamin to provide nutrients to nerve cells. However, treatment outcomes have been lacklustre. Only 24% or 30% of diabetic foot ulcers (DFUs) heal within 12 or 20 weeks, respectively, and patients are susceptible to serious complications, including wounds, osteomyelitis, cellulitis, and amputation [29]. Up to 40% of DFUs may require amputation, and following a major amputation, 50% of patients require another major amputation within two years. The relative mortality rate after amputation is about 50%, second only to lung cancer (86%) and higher than colorectal (39%) or breast cancer (23%) [30].

Western drug therapy alone only relieves and controls existing clinical symptoms in patients with diabetic high-risk feet. Chinese medicine can alleviate the adverse effects of diabetic high-risk foot as an adjunctive treatment. The IWGDF emphasizes that interventions for DFUs based on a multidisciplinary team approach with systematic and comprehensive education and preventive measures can significantly improve the prognosis and reduce the rate of amputation by 49%–85%. External treatment of diabetic foot in TCM is a major feature of TCM therapy. The Chinese Diabetic Foot Prevention and Control Guidelines (2019) state that prevention is better than

cure for diabetic foot, and that the occurrence of diabetic foot can be reduced by strengthening the management of high-risk diabetic foot to detect, diagnose, and treat high-risk foot at an early stage [31]. Diabetic foot is difficult to treat and prevention is better than cure. The Clinical Practice Guidelines for the Prevention and Management of the Diabetic Foot state that the five cornerstones of preventing the diabetic foot are identification of the diabetic foot at risk, regular screening of the diabetic foot at risk, education of the patient, their family and healthcare professionals, appropriate footwear for daily use, and treatment of the risk factors for ulceration.

The theory of "treating the disease before it occurs" has three levels of significance: (1) prevention of disease before it occurs, which requires improvement of living habits and strengthening the body; (2) preventing the change of the disease after it occurs, which suggests early diagnosis and treatment; and (3) prevention of recurrence of the disease, which means that active measures can be taken to promote the recovery of the organism after the disease, and to prevent the disease from recurring and reduce the after-effects. As far as diabetic foot is concerned, early treatment can prevent the disease from changing from light to heavy and from surface to inside. Therefore, early treatment of diabetic foot is very important. Especially when the diabetic foot grade 0 timely control the development of the disease, delay or even block its development from grade 0 to grade 1 will greatly reduce the disability and mortality rate of patients. Multiple guidelines recommend continuous, vigilant, and regular foot examinations for early detection and prevention of diabetic foot ulcers, integrating the concept of "treating the future illness" with clinical nursing to improve the prognosis of patients will be the focus of future research.

The unique advantages of external treatment of Chinese medicine for the prevention and treatment of chronic diseases in the elderly are becoming more and more prominent: (1) it is simple to administer and does not need to be taken internally; (2) it is applied directly to the lesion and the effect of the medicine is concentrated. The reason is that through the skin and mucous membrane penetration, the drug is absorbed into the body through the skin and mucous membrane, which avoids the first-pass effect of the drug and strengthens the targeting effect of the drug and does not need to be taken internally, avoiding direct damage to the organs and improving the efficiency of utilization; and the second is to stimulate the whole body reaction through the meridians of the acupoints. Clinicians mostly use Ashi acupoints to take points through the channels and collaterals to find the right points, through the body surface acupuncture points to stimulate the meridian conduction. The body has a drug absorption system to help distribute the essence and harmonize the Qi and blood to reach the internal organs, to achieve the effect of disease prevention and treatment. The external treatment methods of Chinese medicine applied to elderly diabetic high-risk feet are traditional Chinese medicine foot bath fumigation, acupoint paste, acupoint injection, moxibustion, acupoint massage, etc., which can effectively improve the local blood circulation and nerve conduction function [38, 42, 47, 50].

5. Application of external treatment of Chinese medicine in the prevention and treatment of diabetic high-risk foot

With the application of Chinese medicine in the care of diabetes mellitus patients, Chinese medicine nursing is more standardized and scientific, and the guidance of clinical patient care is more practical and effective. TCM nursing is guided by evidence-based thinking and supported by TCM nursing techniques, which can effectively improve the prognosis of patients by dredging the meridians and activating the lateral branches to help the normal function of Qi and blood.

5.1. Chinese medicine fumigation

Chinese medicine fumigation is a therapeutic method that uses medicines decocted in a broth and fumigated or drenched on the skin or affected area while it is warm. Generally, the medicinal soup is first smoked with steam and then washed when the medicine cools down. With the help of drug action and heat effect, this therapy acts on the body through the skin and mucous membranes, which can stimulate vasodilatation of the extremities, promote local blood and lymphatic reflux, and play the role of activating blood circulation, relieving pain, dispersing cold, and replenishing Qi. Zhong *et al.* randomly divided 102 patients with diabetic high-risk foot into control group (51 cases) and treatment group (51 cases), the control group was given basic drug hypoglycemic treatment, and the treatment group was given Baiyu Lingxian fumigation, which resulted in better improvement of the clinical symptoms, faster nerve conduction, and better repair of the damaged nerves of the patients [32]. Wang *et al*. tested the treatment of diabetic high-risk foot patients with *Paeonia lactiflora* and licorice soup plus flavor combined with traditional Chinese medicine fumigation for a period of 3 months [33]. The results showed that compared with the control group (54 cases) treated with oral methylcobalamin tablets, the observation group showed better improvement in symptoms and signs, and more significant improvement in nerve and blood flow.

Despite its efficacy, TCM fumigation, as a method of treating high-risk diabetic foot in the elderly, has some drawbacks, especially when used on the elderly, with the temperature control being a significant problem. The temperature of fumigation is difficult to grasp for the elderly. Due to ageing, the elderly population has reduced body's perceptual ability and reaction speed, as well as reduced sensitivity to temperature changes [34]. When performing TCM fumigation, if the water temperature is too high, diabetic patients with abnormal sensory nerves and decreased temperature awareness may not be able to detect it in time, thus leading to skin burns. Elderly patients with diabetic foot skin are inherently more fragile. Once scalded, not only will there be difficulty in healing, but will also be prone to infection, further aggravating the condition. Secondly, elderly diabetic foot patients are often accompanied by vascular and neuropathy. These lesions affect the patient's foot blood circulation and nerve function. An over 10-minute foot soak will cause a decrease in sympathetic excitability and an increase in vagal tone, resulting in an increase in heart rate and a decrease in blood pressure [35]. When Chinese medicine fumigation is carried out, all the blood is quickly concentrated in the lower limbs, causing a transient insufficient blood supply to the brain and the heart. This will lead to dizziness, panic, and chest tightness, and even induce cardiovascular and cerebrovascular diseases. Preventive measures can be taken in the form of smart temperature-controlled foot bath tubs and controlled foot soaking time.

5.2. Acupuncture point patching

Acupoint therapy is based on the meridian theory. The corresponding disease-related acupoints were selected, and the precise treatment of the appropriate drugs are turned into a fine powder. The powder is then turned into a paste using water or vegetable oil. Alternatively, solidifying agents such as petroleum jelly, yellow vinegar, rice, or jujube paste may be used to prepare ointments, pills, or therapeutic cakes [36]. The paste, used to treat the disease of a non-invasive pain acupoint therapy, is directly applied to the acupoints and the affected area (Ashi point). The medicine, with the help of herbal action and meridian stimulation, will stimulate the acupoints, regulate the balance of Yin and Yang in the internal organs, and promote the dredging of meridians, Qi, and blood, to achieve the purpose of preventing and treating diseases. In Wu's research, 77 cases of diabetic high-risk foot patients were selected. Two groups of patients were given conventional basic intervention; the control group was treated using methylcobalamin oral treatment and the observation group in the control group had the addition of traditional

Chinese medicine acupoints paste intervention [37]. After 3 months of intervention, traditional Chinese medicine acupoint patch intervention for diabetic peripheral neuropathy can significantly improve the clinical efficacy, reduce the TCSS score, improve the peripheral nerve conduction velocity, and have a high degree of clinical treatment satisfaction. Chen *et al.* used acupoint plasters (saffron, cinnamon sticks, Chuanxiong, and Xinxin were powdered and made into a paste, which was applied to the foot Sanli and Sanyinjiao points) for the treatment of diabetic at-risk feet, which could effectively promote the improvement of clinical symptoms of the patients [39]. Li *et al.* applied Chinese medicine hard paste heat paste to treat 40 cases of diabetic foot, applying it to bilateral Yongquan and Sanyinjiao points. Each time, the paste was applied for 4h, once a day [40]. The results showed that the patients' TCM evidence score and inflammatory factor decreased after treatment compared with before treatment.

In clinical practice, acupuncture point dressing is mostly used as an adjunctive therapy. Its limited effectiveness may be due to the short application duration, which may not allow the medication to fully exert its therapeutic effects. Typically, acupuncture point dressings are applied for 4–6 hours, a duration that may be insufficient for optimal drug absorption [39]. At the same time, the adhesive tape of the acupressure points for the elderly is also easy to trigger allergic reactions. Elderly people's skin is more sensitive and less tolerant to adhesive materials such as adhesive tape, which is prone to allergic symptoms such as redness, swelling, and itching. This will not only affect the patient's experience but also may interrupt the treatment due to allergic symptoms, thus affecting the overall effect of acupoint taping. Allergy prevention can be achieved by cleansing the skin with mild medical cleansing products to remove dirt, oil, and stratum corneum build-up on the skin surface to facilitate better penetration and absorption of the medication, as well as to reduce the risk of allergy due to unclean skin. After cleansing, a small amount of moisturizer such as petroleum jelly can be applied to keep the skin moisturized and enhance the skin barrier function, but care should be taken to not apply too much so as not to affect the effect of the medication application [40].

5.3. Acupoint injection

Acupoint injection is a combination of chemical stimulation of drugs and mechanical stimulation of needling acting on meridians to produce the effect of promoting nerve repair and nerve nutrition. Zhu randomly divided 120 patients with diabetic high-risk feet into a study group and a control group [41]. The control group received basic symptomatic treatment with Western medicine, while the research group received acupoint injections of Lanxessin in addition to the same Western medical treatment. Based on the basic symptomatic treatment of Western medicine, the efficacy of acupoint injection for the treatment of diabetic peripheral neuropathy of the splenic phlegm-dampness type was obvious. It can inhibit inflammation, improve oxidative stress, and reduce the damage of vascular endothelial function. Zhao divided 70 patients with type 2 diabetes mellitus high-risk foot into two groups [42]. For the conventional treatment of diabetes, the control group was treated with microprobe, and the treatment group was treated with saffron injection acupoint injection for the control group.

Acupoint injection of traditional Chinese medicine can significantly reduce the MDNS scores and signs and symptoms scores of DPN patients and improve the quality of life. Although acupoint injection can promote the recovery of nerve function, repeated needling of the affected limbs of diabetic high-risk feet has a potential risk of infection. These include an increased risk of infection, aggravation of pain due to repeated needling, and occasional bleeding at the injection site. In patients with existing skin damage, the likelihood of developing foot ulcers is significantly higher [43]. Apply light pressure to the needle puncture site for a few moments with a sterile

dry cotton ball to prevent bleeding and hematoma formation. If bleeding occurs, apply pressure until bleeding stops. Advise the patient to keep the site clean and dry within 24 hours after the needling and avoid water to prevent infection. If there is slight redness, swelling, pain, and other reactions at the site of needling, it is generally a normal phenomenon and cold compresses can be applied locally.

5.4. Moxibustion

Moxibustion is divided into direct moxibustion and indirect moxibustion. Direct moxibustion can be divided into scar moxibustion and no scar moxibustion. Indirect moxibustion can be divided into interstitial ginger moxibustion, interstitial garlic moxibustion, interstitial salt moxibustion, and interstitial appendage cake moxibustion [44]. The clinical effectiveness of moxibustion in treating DPN has been widely recognized. Recent studies showed that moxibustion can increase serum superoxide dismutase concentration, reduce free-radical production, prevent impairments of nerve tissues resulting from free-radical accumulation, and alleviate neuro-inflammation possibly by inhibiting NF-κB and activating Nrf2 [46]. Zheng treated 70 cases of DPN patients with pave moxibustion therapy [45]. The treatment group used methylcobalamin treatment plus pave moxibustion therapy and found that pave moxibustion therapy significantly improved clinical symptoms and nerve conduction velocity after 2 courses of treatment. Wei Xiang *et al.* observed 60 cases of diabetic peripheral neuropathy patients who were hospitalized and found that thunder fire moxibustion therapy can achieve the effect of warming meridians and opening collaterals through the meridian and acupoints through the meridian sensory transmission together and treat diabetic peripheral neuropathy [47].

Elderly people have thinner skin and lower tolerance to high temperatures and are prone to burns when moxibustion is performed. Secondly, symptoms of diabetes are manifested by dry mouth and thirst, which are aggravated by moxibustion (fire). Moxibustion treats diseases through warm and hot stimulation, but elderly people are weak and prone to Yin deficiency and fire [48]. When performing moxibustion treatment, symptoms such as dry mouth, fire, or allergic skin reactions such as rashes may result from warm and hot stimulation. Reducing the incidence of burns can be achieved by increasing rounds and observing the skin for 5–10 minutes.

5.5. Acupressure

Acupressure can mobilize local meridian Qi, improve the function of the five organs, dredge the meridians, increase the temperature and sensitivity of the skin at the end of the limbs, enhance circulation, promote nerve repair, and have a good overall effect. Chinese acupressure can effectively improve the clinical symptoms of DPN patients, such as limb pain, coldness, numbness, soreness, and weakness, and alleviate patients' abnormal pain, warmth, vibration, and pinprick tactile sensations [49]. Guo considered that acupressure is a simple and easy means to provide a suitable, convenient, and effective intervention method for patients who cannot come to outpatient follow-up on time [50]. One hundred and twenty patients with diabetic high-risk feet were divided into three groups: the control group, the methylcobalamin group, and the acupressure group. All three groups were given conventional basic treatment, and the control group was given no other treatment; the methylcobalamin group was given oral methylcobalamin tablets, 0.5 mg each time, 3 times a day. The acupressure group was given ten acupressure points, including Qiaogong, Neiguan, Blood Sea, Huizhong, Chengshan, Ashigangsanli, Sanyinjiao, Taixi, Taichong, Neitin. In the acupressure group, 10 specific acupoints were selected, with each point stimulated for 3 minutes, followed by continuous massage lasting approximately 20 minutes. Treatments were administered five times per week over a period of two weeks.

This intervention resulted in significant improvements in clinical symptom scores and Toronto Clinical Scoring System (TCSS) scores. However, no significant differences were observed in nerve conduction velocity between the groups. Ma's trial was divided into two groups, with 59 cases in each group [51]. The test group used conventional intervention + acupressure, and the control group used conventional intervention. In the results, the sensory and motor nerve conduction velocities of the peroneal nerve in the test group were higher than those in the control group, and the difference was statistically significant ($P < 0.05$) proving that acupressure care can help to improve the patient's condition, and to prevent and control the progression and deterioration of DPN.

Although acupressure is convenient, patients may lack a correct understanding of acupressure. Elderly diabetic high-risk feet will have lower limb vascular lesions, and the extrusion during massage may damage the inner wall of blood vessels, leading to thrombosis. Those with venous thrombosis already formed, blind massage may lead to thrombus dislodgement, triggering serious complications such as pulmonary embolism [52]. hen patients continue self-massage at home after discharge, improper techniques, such as incorrect acupoint location, inappropriate methods, or excessive pressure, may lead to discomfort, lower limb pain, or even injury [53]. Therefore, proper training in acupoint identification and massage intensity is essential. It is recommended that massage be performed by trained professionals, as incorrect application may compromise therapeutic outcomes and fail to achieve the desired results.

6. Discussion

Diabetic high-risk foot patients belong to the category of "gangrene", "tendon gangrene", "pulse paralysis", etc [54, 55]. Chinese medicine believes that this condition is primarily attributed to a deficiency of Qi and blood, as well as a depletion of bodily fluids and Qi, thus the meridians can't run normally and circulate [56]. In the later stages of the condition, external pathogenic factors, such as fire and toxic foreign evils, invade the limbs. As the disease becomes prolonged, turbid toxins accumulate and cause obstruction, leading to a deficiency of Qi and blood, an imbalance of Yin and Yang, and damage to the meridians. Over time, this results in long-standing blood stasis, a loss of nourishment to the foot, and progression to a high-risk diabetic foot. Therefore, treatment should primarily focus on regulating Qi and blood, unblocking the meridians, and dispersing turbid toxins. At this stage of diabetic high-risk foot, actively improving peripheral neuropathy and other conditions through the combination of Chinese and Western medicine treatment can prevent and slow down the progression of the disease. Existing studies have demonstrated that Traditional Chinese Medicine (TCM) interventions based on the principle of "treating illness before it arises" can effectively improve clinical symptoms and increase nerve conduction velocity in patients with high-risk diabetic foot, while also exhibiting a favorable safety profile [57, 58].

However, there is still some room for improvement. It is recommended to provide a more specific and scientific treatment plan for high-risk diabetic foot based on evidence-based medicine. That is, external treatment methods should be selected based on the patient's specific condition, with strict adherence to indications and standardized operating procedures. In addition, greater attention should be given to the regulation and control of herbal formulation and drug compounding. At present, the research of TCM external treatment for diabetic foot is mostly based on clinical observation. The research of the mechanism of action is relatively small, and its biological research should be strengthened to explore the key links and targets of the specific mechanism of action. Furthermore, review of the literature has found that the length of the TCM external intervention program is relatively short. The length of the intervention can be increased or followed up to observe the changes of patients'

long-term indicators, to improve the application and treatment of external Chinese medicine in the clinical management of high-risk foot in elderly diabetes.

7. Conclusion

The application of external Chinese medicine nursing methods based on the idea of treating the future disease in the high-risk foot stage 0 (without ulcers but with risk factors), i.e., early intervention to slow down the progression of the disease, embodies the idea of 'prevention is more important than cure', whose core lies in the idea of 'preventing disease before it occurs, and preventing changes in the case of existing disease'. External Chinese medicine treatments such as herbal fumigation, acupoint stimulation, and topical ointment can improve local blood circulation, promote tissue repair, relieve pain and swelling, and inhibit infections, thus slowing down the progression of the disease through multi-dimensional interventions, and lowering the risk of foot ulcers and amputations. At present, whether it is massage or Chinese medicine external treatment, there is a lack of clinical big data research as a support point. It is difficult to standardize the implementation and treatment. The method to apply traditional Chinese medicine theories and techniques in a more targeted and effective manner for the prevention and treatment of diabetic high-risk feet in the elderly population is the problem that needs to be solved urgently.

Disclosure statement

The authors declare no conflict of interest.

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