

Research Progress on External Treatment of Diabetes Foot

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Abstract: *Diabetes foot, as one of the most serious complications of diabetes, has a serious impact on families and society due to its high incidence rate, high disability rate, high mortality rate, poor curative effect and high medical costs. However, modern medicine mainly treats diabetes foot with systemic comprehensive treatment and local treatment. The systemic treatment includes sugar control, lipid reduction, anti infection, and local blood circulation promotion; The treatment of local wounds mainly focuses on the treatment of diabetes foot ulcer wounds, such as debridement, vacuum sealing drainage, skin flap transplantation, vascular intervention, hyperbaric oxygen therapy and other methods. In recent years, with the deepening and improvement of medical research, the treatment methods of diabetes foot have become more and more diverse, among which the research on the treatment of diabetes foot by external treatment of traditional Chinese medicine has continued to deepen. This article summarizes the external treatment methods of traditional Chinese medicine for diabetes foot in the past 10 years by consulting literature, and discusses the treatment according to the patient's symptoms and signs, as well as the application of external treatment methods of traditional Chinese medicine such as external washing, wet compress, fumigation, acupuncture, moxibustion, and encirclement, aiming to improve the clinical efficacy of diabetes foot treatment through the rational use of various therapies. This article summarizes the progress of the treatment research of diabetes foot above.*

Keywords: Diabetes foot, Traditional Chinese Medicine External Treatment, Research progress, Review.

1. Introduction

Diabetes foot is the local skin and deep tissue destruction caused by peripheral nerve and vascular diseases due to the long-term poor control of blood sugar. It is a common clinical complication of diabetes. At the same time, it is difficult to treat because of its high incidence rate, recurrence rate, disability rate and mortality rate [1]. In recent years, with the improvement of living standards in China, more and more people have diagnosed diabetes, showing a trend of youth. Secondly, research predicts that the total number of diabetes patients in the world will rise to 642 million in the next 20 years [2]. Therefore, the incidence rate of diabetes foot is also higher than before. Data shows that the prevalence of diabetes foot in China is 0.9%-14.5%, and the recurrence rate of diabetes foot within one year after recovery is as high as 31.6%, which has seriously affected the life health and quality of life of patients [3]. Most patients with diabetes foot will have abnormal sensation, pain, even ulcer formation, and even gangrene, which will seriously affect the quality of life of patients with diabetes foot. diabetes foot is a diabetes patient with neurological and vascular diseases, resulting in foot infection, ulcer formation, and deep tissue destruction, also known as diabetes toe gangrene [4]. Because the symptoms of diabetes foot are serious, the course of disease is repeated, difficult to cure, and difficult to treat, it has become a major problem that needs to be solved urgently in clinical practice. Western medicine mainly treats diabetes foot by controlling blood sugar, nutritional support, metabolic regulation, anti infection, improving microcirculation, etc., and at the same time, timely deals with local wounds to improve the quality of life of patients and reduce the disability rate. Although there is no clear record on the name of diabetes foot, according to the symptom description, diabetes foot belongs to the category of "gangrene" and "tendon gangrene". The ancient book records the Outline of the Department of Ulceration: "Sores and ulcers are diseases that occur outside,

and external treatment is particularly important. For mild cases, external treatment is the only way to achieve full success; for dangerous cases, external treatment is especially important. This is the science of choice medicine." It has laid a theoretical foundation for the external treatment of sore disease. Therefore, the external treatment of diabetes foot has a long history, outstanding efficacy and distinctive characteristics, which has been paid attention and studied by more and more scholars. In recent years, the research on the treatment of diabetes foot with external treatment of traditional Chinese medicine has gone deep and achieved remarkable results. The author summarized, analyzed and summarized the relevant literature in recent years, and summarized the research progress of external treatment of diabetes foot with traditional Chinese medicine.

2. Theoretical Basis of Traditional Chinese Medicine for Diabetes Foot

Doctors in ancient and modern times believe that diabetes belongs to the category of "diabetes" in traditional Chinese medicine. The basic pathogenesis is yin deficiency and heat dryness. The pathogenesis is mostly caused by qi stagnation, blood stasis, phlegm dampness, qi blood, blood deficiency, etc. Among them, traditional Chinese medicine has a long history of treating diabetes foot. However, most of the ancient books attribute it to the disease category of "gangrene" and "muscle gangrene". Doctors in various generations believe that its pathogenesis is to quench thirst for a long time, external evils invade the human body, positive deficiency and excess evils, and evil gases block the channels. Blood vessels are blocked, resulting in the loss of nourishment of the skin and hair of the meridians, the blood stasis of external evils turning into heat, the excess of heat and the meat rotting, and causing gangrene. Therefore, the basic pathogenesis of diabetes foot is blood stasis. The treatment principle is mainly to promote blood circulation, remove blood stasis and dredge

collaterals, and most of them are used both for symptoms and external treatment. External treatment of traditional Chinese medicine has a long history in the treatment of diabetes foot, mainly including external washing of traditional Chinese medicine, wet compress of traditional Chinese medicine, fumigation of traditional Chinese medicine, acupuncture, moxibustion, encirclement, etc. Clinical research shows that its efficacy is accurate, especially for the stage of removing decay and generating muscle on ulcer wounds, the external use of traditional Chinese medicine has a very significant effect.

3. Current Situation of External Treatment of Chinese Medicine for Diabetes Foot

3.1 External Washing Method of Traditional Chinese Medicine

The treatment of diabetes with external washing of traditional Chinese medicine is mostly used for the patients whose wound surface is rotten, new muscles are hard to grow, and smelly pus. The local wound surface is soaked with traditional Chinese medicine liquid to make the liquid absorbed and permeated through the skin and mucosa, so as to improve the effect of local wound microcirculation. Wang Mingqiang [5] et al believed that the combination of modern medical treatment and external washing of traditional Chinese medicine can effectively promote the repair of diabetes foot ulcers, reduce the exudation of wound secretions, and promote the growth of wound granulation tissue. Gao Tong [6] et al used the detoxification lotion to fumigate and wash the ulcer wound of diabetes rats, and the results showed that the number of fibroblasts in HE staining sections of the detoxification lotion group was significantly higher than that of the control group. Li Lingling [7] et al randomly divided 100 patients with diabetes foot ulcer into the test group and the control group. Both groups were treated with conventional western medicine to reduce blood sugar, improve circulation and local dressing change. The test group was given surgical dressing change after external washing of local Chinese medicine on the basis of basic treatment, and the control group was given surgical sterile dressing change directly. The results showed that the total clinical effective rates of the test group and the control group were 92% and 64% respectively, and the treatment group was significantly better than the control group ($P<0.05$). Research has proved that the effect of external washing combined with traditional Chinese medicine on diabetes foot ulcer is better than that of using western medicine alone. Ye Yushuang [8] randomly divided 70 cases into a treatment group and a control group, both of which received conventional Western medicine treatment. The treatment group was treated with Yangyin Runzao Tang and Huoxue Tongmai Tang, respectively, and their feet were soaked in warm water for 20 minutes before taking a nap and staying up late every day for a period of one year. The control group was treated with warm water for one year. The results showed that the total effective rate of the treatment group was 85.7%, while the total effective rate of the control group was 42.9%. The difference in efficacy between the two groups was statistically significant ($P<0.01$). It is suggested that the combination of the two prescriptions has significant therapeutic effect on diabetes foot. In summary, external washing of traditional Chinese medicine has significant

therapeutic effects in reducing wound inflammation, promoting granulation tissue growth, and improving local blood circulation. The treatment process is painless for patients, and the price is relatively low, making it easier for patients to accept.

3.2 Wet Compress Method of Traditional Chinese Medicine

The traditional Chinese medicine wet compress method is an external treatment method that involves soaking sterile gauze with traditional Chinese medicine solution and applying it locally to achieve the goals of promoting blood circulation, unblocking meridians, reducing swelling, dispersing nodules, clearing heat and detoxifying. Shao Xin [9] et al divided the patients with diabetes foot ulcer into two groups: the control group was given basic treatment and the wound surface was routinely changed, and the treatment group was given Chinese medicine wet dressing on the ulcer wound on the basis of the control group. The total effective rate of the treatment group was 87.10%, significantly better than the control group ($P<0.05$); The wound area of the treatment group was significantly smaller than that of the control group ($P<0.05$), and the wound healing rate was better than that of the control group ($P<0.05$). Song Shanshan [10] et al. found in the observation of the clinical efficacy of Yixiao Ointment in treating ulcerous wounds of diabetes foot patients that the patients in the Yixiao Ointment topical treatment group were better than those in the Kangfuxin Liquid topical treatment group in terms of both foot symptoms and wound reduction area after treatment, and there were no obvious adverse reactions during the treatment process. It can be confirmed that Yixiao Ointment topical treatment of diabetes foot ulcer wounds can significantly improve the patients' foot symptoms, promote wound healing, shorten the treatment cycle, and there are no obvious clinical adverse reactions. Its safety is good and worth clinical promotion. Wu Bifang [11] et al. observed the clinical treatment of 50 patients with diabetes foot, and found that the effect was more significant when wet compress was added to the surgical treatment.

3.3 Traditional Chinese Medicine Fumigation Method

Traditional Chinese medicine fumigation refers to the process of adding traditional Chinese medicine liquid into a traditional Chinese medicine steam bath instrument, using the steam generated by heating the liquid to fumigate the affected area. This method is more conducive to the absorption of the active ingredients of the medicine by the human body. Bai Xianhua [12] et al randomly divided 64 patients with diabetes foot ulcer into two groups. The observation group was treated with traditional Chinese medicine fumigation on the basis of the control group, and the wound healing rate of the treatment group for 7 days and 14 days was higher than that of the control group. Zhang Yanhong [13] compared the clinical efficacy of Western medicine treatment alone and Western medicine combined with traditional Chinese medicine fumigation treatment through a controlled trial method. The results showed that Western medicine combined with traditional Chinese medicine fumigation treatment can accelerate the absorption of inflammation to a certain extent, effectively control infection, promote wound healing, and significantly improve patient satisfaction. In a word,

traditional Chinese medicine fumigation treatment of diabetes foot is simple and easy for patients to accept cooperation. On the basis of conventional treatment, combined with traditional Chinese medicine fumigation treatment can significantly improve the clinical efficacy, which should be popularized.

3.4 Acupuncture Therapy

Acupuncture can effectively reduce the incidence of complications of diabetes foot and its complications in the treatment of diabetes foot, and improve the clinical symptoms of patients with diabetes foot. Zheng Huitian [14] and others observed the effect of “tonifying the kidney and unblocking the collaterals” combined with acupuncture and moxibustion and drugs on diabetes peripheral neuropathy (DPN). The results showed that two months later, the clinical effective rate of the acupuncture group was 51.9%, and the total effective rate was 88.5%, with a significant difference compared with 30.8% and 71.2% of the control group (pure drug treatment). Zheng Huitian believed that the “tonifying the kidney and unblocking the collaterals” combined with acupuncture and moxibustion and drugs was a good method for treating DPN in the contemporary era. Lu Yunzhao [15] et al believed that the treatment of diabetes foot with Chinese herbal decoction for tonifying the kidney and strengthening the spleen combined with local acupuncture could improve the nerve conduction velocity of lower limbs of diabetes foot patients, promote the healing of foot wounds, and improve the clinical symptoms of patients. Li Yongfang [16] et al treated 84 cases of diabetes peripheral neuropathy with the method of reinforcing the root and unblocking the collaterals with electroacupuncture, and randomly divided them into an electroacupuncture group and a control group of 36 cases. Both groups used drugs to control blood sugar. The electroacupuncture group was divided into two groups: one group, Qihai, Guanyuan, Fenglong, Sanyinjiao; Two groups, Spleen Shu, Kidney Shu, Huan Tiao, and Fei Yang, selected acupoints according to the symptoms. All acupoints were treated with deep needling with filiform needles, and G6805 electroacupuncture instrument was applied to the acupoints in the nerve innervation area of the injury. The control group was treated with oral administration of Mecobalamin capsules. The results showed that the significant and total effective rates of the electroacupuncture group were better than those of the control group. Therefore, acupuncture treatment can improve the clinical symptoms of patients with diabetes foot and has a significant effect.

3.5 Moxibustion Therapy

Acupoint moxibustion for the treatment of diabetes foot patients has attracted many scholars' attention and research due to its effects of promoting qi and blood circulation, dredging meridians, warming yang and dispelling cold, regulating viscera internally, and improving skin externally. Li Chunfang [17] and others believed that moxibustion treatment for diabetes feet could effectively reduce wound exudation, improve blood supply of affected limbs, and thus accelerate wound healing. Luo Xiaoyan [18] and others divided the patients with diabetes foot into the control group and the observation group. Both groups were treated with conventional western medicine to reduce blood sugar, improve circulation and change local dressing. The

observation group was treated with traditional Chinese medicine fumigation combined with acupoint moxibustion. The results showed that the fasting and 2-hour postprandial blood glucose levels, as well as the McGill Pain Questionnaire (MPQ) scores, were significantly lower in the observation group after treatment compared to before treatment and the control group ($P<0.05$); The improvement of peak blood flow velocity, arterial diameter, symptom score, and ABI after treatment was better than that of the control group ($P<0.05$); The total effective rate was significantly higher than that of the control group ($P<0.05$). Zhang Lingfeng [19] et al divided 80 patients with diabetes foot into the control group and the observation group according to the random number table. The control group was treated with moxibustion. The observation group was treated with traditional Chinese medicine foot bath on the basis of the control group. Both groups were treated for 8 consecutive weeks. The whole blood low shear viscosity, whole blood high shear viscosity, plasma viscosity, and hematocrit levels of the two groups were lower than those before treatment. Secondly, the median nerve MNCV, median nerve SNCV, common peroneal nerve MNCV, and common peroneal nerve SNCV of the two groups were higher than those before treatment, with a statistically significant difference ($P<0.05$). To sum up, moxibustion treatment of diabetes foot patients can accelerate the disappearance of symptoms, reduce the level of hemorheological indicators, improve nerve conduction speed, and achieve the effect of improving the prognosis of patients.

3.6 Hooping Method

The encirclement method is an important part of the external treatment of traditional Chinese medicine. It can restrain sore toxin, clear heat and detumescence, dissipate blood stasis and pain, warm channels and dissipate phlegm, and plays an important role in the treatment of diabetes feet. The encirclement medicine, also known as encirclement medicine and application, is a paste made of powder and liquid, and an important way of external treatment of traditional Chinese medicine. Gao Jiaxu [20] treated diabetes foot with Yang acupuncture method, which can dredge the meridians and expel evil, encourage zhengqi, and transform qixue. The test group had better scores for improving clinical symptoms of traditional Chinese medicine. The total effective rate of the treatment group was 91.66%, higher than 80.76% of the control group, with a statistically significant difference ($P<0.05$). Jia Xianglong [21] et al used Huiyang Shengji Ointment to treat foot yin ulcer of diabetes. By warming yang and replenishing qi, it can promote the toxin, that is, necrotic tissue on the wound surface, limit liquefaction and discharge, accelerate the role of healthy qi in the ulcer area, and strengthen anti infection ability and local blood circulation. Du Lirong [22] and others used Jiangjun Powder in combination with conventional treatment for 30 patients with diabetes foot. They found that on the basis of conventional treatment, the use of antibiotics and the use time can be reduced, and the wound healing time can be accelerated.

4. Summary and Outlook

To sum up, with the continuous improvement of medical level and the deepening of clinical research, the therapeutic effect of diabetes foot has been continuously improved. Among

them, the combination of traditional Chinese medicine and western medicine has significant therapeutic effect on diabetes foot, especially the extensive application of external treatment of traditional Chinese medicine has brought new light to the treatment of diabetes foot. As stated in the Theory of the Origin and Development of Medicine: "Surgery is the most important method for external treatment", the external treatment of Chinese medicine has a long history in the treatment of diabetes feet. The external treatment of Chinese medicine is rich in methods and effective in the treatment of diabetes feet; Secondly, under the guidance of the basic theory of traditional Chinese medicine, traditional Chinese medicine surgery, combined with syndrome differentiation and holistic concepts, has a wide range of treatment methods and precise clinical efficacy, making it easier for patients to accept. Secondly, the course of diabetes foot is longer, and the price of traditional Chinese medicine treatment is relatively low, which can greatly reduce the economic pressure of patients' families. Of course, there are also disadvantages in the treatment of diabetes foot by traditional Chinese medicine, such as the difference in the criteria for syndrome differentiation and clinical efficacy evaluation, over reliance on personal experience, different compatibility and dosage of traditional Chinese medicine prescriptions, less experimental research and clinical and basic research data, which to some extent hinder its development. Therefore, we should fully learn from the strengths of traditional Chinese medicine and western medicine, complement each other's strengths, and provide effective solutions for the treatment of diabetes foot patients.

References

- [1] Diabetes Foot Disease Branch of China Healthcare International Exchange Promotion Association, diabetes Foot Disease Expert Committee of International Vascular Alliance China Branch, Chinese Guide for Diagnosis and Treatment of diabetes Foot [J]. Chinese Journal of Clinicians, 2020, 48 (1): 19-27.
- [2] International Diabetes Federation. IDF Diabetes Atlas, 10th. Brussels [EB/OL]. (2021-12-06) [2022-01-17]. <http://www.Diabetesatlas.org>.
- [3] Zhu Zhenfeng, Gao Xuemei, Wu Xia. Application study of moist burn ointment combined with dragon's blood in the treatment of radiation-induced skin injury in head and neck tumors [J]. Chinese Journal of Burns and Ulcers, 2017, 29 (3): 225-228.
- [4] Chen Mingwei, Xu Zhangrong. Diabetes foot disease: times are changing [J]. Chinese Journal of diabetes, 2020, 12 (6): 359-363.
- [5] Wang Mingqiang, Xie Wei. Clinical observation on the treatment of diabetes foot with external washing of modified Huaputaoshengji Powder [J]. Journal of Guizhou University of Traditional Chinese Medicine, 2021, 43 (1): 61-63.
- [6] Gao Tong, Kong Chang, Zhao Quanlin, et al. Study on Jiedu Lotion Promoting TGF - β 1 Expression and Fibroblast Growth in diabetes Rats [J]. Sichuan Journal of Traditional Chinese Medicine, 2015, 33 (5): 46-48.
- [7] Li Lingling, Xie Chunguang, Chen Mingxiu, et al. Observation on the efficacy of external washing of Chinese medicine in the treatment of diabetes foot ulcer [J]. World Latest Medicine Information (Electronic Version), 2018, 18 (105): 34-37.
- [8] Ye Yushuang. Thirty five cases of early diabetes foot were treated with external washing prescription of traditional Chinese medicine [J]. Zhejiang Journal of Integrated Traditional Chinese and Western Medicine, 2014, 24 (10): 918-919.
- [9] Shao Xin, Wu Xuesu, Ran Yingzhuo, et al. Clinical observation on 31 cases of diabetes foot ulcer treated with external application of traditional Chinese medicine [J]. Jiangsu Journal of Traditional Chinese Medicine, 2017, 49 (12): 38-40.
- [10] Song Shanshan, Li Dayong, Li Xin, et al. Clinical Research on Yixiao Ointment in Treating diabetes Foot [J]. Shaanxi Traditional Chinese Medicine, 2021, 42 (9): 1236-1239.
- [11] Wu Bifang, Zhao Binghua. Observation on the clinical rehabilitation effect of diabetes foot ulcer treated with wet compress of Chinese medicine [J]. Bipod and Health Care, 2017, 26 (12): 95-97.
- [12] Bai Xianhua, Yin Lanying, Yang Haiqing, et al. Effect of traditional Chinese medicine fumigation combined with conventional western medicine treatment on the healing of diabetes foot ulcer and the VEGF, MMP-2 and TIMP-1 in wound exudate [J]. Journal of Traditional Chinese Medicine, 2018, 59 (20): 1763-1765 1782.
- [13] Zhang Yanhong. Clinical observation on fumigation treatment and nursing of diabetes foot [J]. Guangming Traditional Chinese Medicine, 2021, 36 (4): 648-650.
- [14] Zheng Huitian, Li Yongfang, Yuan Shunxing, et al. Treatment of 52 cases of diabetes peripheral neuropathy with acupuncture and medicine [J]. Shanghai acupuncture and moxibustion Journal, 2000, 19 (1): 8.
- [15] Lu Yunhao, Xu Dan. Clinical observation on the treatment of diabetes foot with the method of invigorating the kidney and spleen combined with acupuncture [J]. Modern Distance Education of Chinese Medicine, 2022, 20 (2): 69-70.
- [16] Li Yongfang, Kang Erzhu, Zheng Huitian. Clinical study on the treatment of diabetes peripheral neuropathy with electroacupuncture for strengthening the root and unblocking collaterals [J]. Clinical Journal of acupuncture and moxibustion and Moxibustion, 2000, 16 (10): 3.
- [17] Li Chunfang. Application of moxibustion nursing intervention in diabetes foot [J]. Medical Diet and Health, 2020, 18 (11): 155-157.
- [18] Luo Xiaoyan. Clinical study on the treatment of early diabetes foot with traditional Chinese medicine fumigation and washing formula combined with acupoint moxibustion [J]. Shaanxi Journal of Traditional Chinese Medicine, 2018, 39 (8): 1077-1079.
- [19] Zhang Lingfeng, Wang Yadi, Li Sai. Effect of moxibustion combined with traditional Chinese medicine foot bath on patients with diabetes foot [J]. China Minkang Medical Journal, 2023, 35 (1): 122-124.
- [20] Gao Jiaxiu. Clinical study on limb changes of diabetes peripheral neuropathy treated by body acupuncture combined with Yang acupuncture [D]. Shenyang: Liaoning University of Traditional Chinese Medicine, 2012: 21-26.
- [21] Jia Xianglong, Xu Xuying. Summary of Huiyang Shengji Ointment in Treating Foot Yin Ulcer of diabetes

- [20] Chinese Journal of Traditional Chinese Medicine, 2019, 34 (1): 267-269.
- [22] Du Lirong, Xu Lei, Tian Wei. 30 cases of infected diabetes foot treated with Jiangjun Sanguanwei [J]. Shandong Journal of Traditional Chinese Medicine, 2015,34 (05): 356-357.