A case report of effective treatment of diabetic foot with the integration of traditional Chinese medicine and western medicine

Jiaojiao Gu a, Cuiru Li b, Dongqi Li a, Huailin Gao a,c,*

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ABSTRACT

Diabetic foot has become one of the leading causes of disability and death in diabetic patients. Restoring blood supply to the lower limbs, especially by increasing collateral vessels, is currently the most effective strategy. We report a 70-year-old female patient diagnosed with diabetic foot who was treated with integrated traditional Chinese and Western medicine. Western medicine treatment includes blood glucose control, lipid regulation, plaque stabilization, antiplatelet coagulation and anti-inflammation. Traditional Chinese medicine (TCM) treatment is based on the principles of promoting blood circulation and relieving pain, benefiting Qi and activating blood circulation, including oral Chinese medicine Tongxinluo and electro-acupuncture treatment. The vascular morphology of the patient's lower limbs and the levels of glucomlipid metabolism were evaluated before and after treatment. The results showed that after treatment, the patient had increased blood flow in the lower limbs, reduced plaque in the femoral arteries, and improved levels of glucomlipid metabolism.

1. Introduction

Diabetes is a chronic systemic metabolic disease that is genetically determined and associated with environmental factors. In recent years, as the number of people with diabetes has proliferated, its associated complications have also come to the forefront. Among them, diabetic foot is a common and complicated complication of diabetes, and according to statistics, diabetes have a 34% lifetime risk of developing diabetic foot [1]. The number of diabetic foot patients in China is increasing year by year, and the incidence of diabetic foot ulcers is as high as 8.1% among diabetic patients over 50 years of age, with an overall amputation rate of 19.0% [2]. The above conditions undoubtedly seriously affect the quality of life of patients and impose a huge economic burden on society.

The main pathological feature of diabetic foot is progressive occlusion of arteries in the lower limbs. It is characterized by intermittent claudication, loss of dorsalis pedis artery pulses, decreased foot skin temperature, cyanosis of the skin, decreased sensation, and even infection and ulcers. Currently, the basic approach to control the progression of diabetic foot is to improve the blood circulation in the lower limbs. Guidelines suggest that the vessel to the angiosome or direct revascularization should be preferred. However, based on current evidence, neither bypass surgery nor endovascular surgery such as drug-eluting balloons and drug-coated stents can be claimed to be superior in efficacy [3] due to their poor scientific validity. In addition, western medicine such as anti-infection therapy, antiplatelet coagulation are undeniably effective in the treatment of diabetic foot [4], but due to the risks of drug resistance, easy bleeding and high recurrence rate, they are not suitable for long-term use in diabetic foot patients and therefore more complementary therapies need to be sought [5]. In recent years, TCM has been accepted by more and more patients for its low cost and low side effects, and it also plays an important role in improving symptoms, maintaining the internal environment, regulating the immune system effects, and it also plays an important role in improving symptoms, maintaining the internal environment, regulating the immune system.

In this article, we present our experience in treating a case of diabetic foot with integrated traditional Chinese and Western medicine, which not only spared the patient from the pain of amputation, but also minimized the financial burden on the patient. We hope our report can provide some ideas for the clinical treatment of diabetic foot.

* Corresponding author.
E-mail address: gaohuilin126.com (H. Gao).

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2. Case presentation

2.1. Ethics statement

The reporting of this study conforms to the CARE guidelines and was approved by the Clinical Research Ethics Committee of Hebei Yiling Hospital (2022LCKY-010-01). Written informed consent was obtained from the patient to publish this case report and accompanying images.

2.2. Chief complaints

A 70-year-old Chinese woman came to the Endocrine Department of Hebei Yiling Hospital in March 2022 to manage her diabetes and bilateral lower limb edema with toe breakdown.

2.3. History of present illness

The patient was diagnosed with type 2 diabetes 10 years ago and has been receiving subcutaneous insulin and oral “acarbose and metformin” with good glycemic control. Two months prior to her visit to our clinic, she presented with localized ulcers in the second and third toes of the left foot with no obvious cause, and the wound has been gradually enlarging recently. The TCM diagnosis showed that the patient had a dark red tongue with normal tongue shape, thin white coating and a sunken delayed pulse.

2.4. History of past illness

There was no previous history of vasculitis. She had a cerebral infarction in 2019 and was treated with clopidogrel, aspirin, and atorvastatin followed by symptom relief. There was no history of diabetic neuropathy.

2.5. Personal and family history

She has a brother with type 2 diabetes, and she is a non-smoker and non-drinker. There is no family history of gangrene or major diseases, and no infectious diseases such as hepatitis or tuberculosis.

2.6. Physical examination upon admission

Physical examination revealed decreased skin temperature in both lower limbs and dark red skin color with local deepening in both feet. There was an ulcer approximately 1 cm × 1 cm in size on both the second and third toes of the left foot, with a small amount of purulent discharge. Moreover, the patient’s femoral arteries were palpable bilaterally, the right anterior tibial artery was occasionally palpable, and the remaining lower limb arterial pulsations were not palpable. In addition, the patient’s body temperature, blood pressure were 36.3 °C and 138/76 mmHg, respectively.

2.7. Laboratory examinations

Laboratory evaluations included fasting blood glucose (FBG) 9.35 mmol/L, 2-hour postprandial blood glucose (2PBG) 16.24, Glycosylated Hemoglobin, Type A1C (HbA1c) 8.96%, serum total cholesterol (TC) 156 mg/dL, triglyceride (TG) 55 mg/dL, low-density lipoprotein (LDL) 3.79 mg/dL, high-density lipoprotein (HDL) 1.32 mg/dL, random blood glucose (RBG) 11.1 mmol/L, blood ketone body 0.1 mmol/L.

2.8. Imaging examinations

Color Doppler ultrasonography revealed that the patient had bilateral atherosclerosis of the lower limbs with multiple plaque formation, occlusion of the left anterior tibial artery and bilateral dorsalis pedis arteries, and possible occlusion of the left posterior tibial artery. computed tomography angiography (CTA) suggests reduced blood flow to the lower limbs and arterial occlusion.

2.9. Final diagnosis

The patient is an elderly female with 10 years of diabetes, effective on oral hypoglycemic medication and without ketosis. The diagnosis of diabetic foot, type 2 diabetes was considered in combination with laboratory tests and Doppler examination. Combined with the patient’s tongue and pulse, the TCM considers the diagnosis of Qi and Yin deficiency and stagnation of the collaterals.

2.10. Treatment

The patient was recommended to undergo left lower limb arteriography and balloon dilatation. Since she refused surgery, we developed a treatment plan combining Chinese and Western medicine according to her condition. Specifically, the patient was advised to have a low-salt, low-fat and high-quality protein diet, and the wounds were treated with regular disinfection and debridement. For western medical treatment, Novolin R 30U, 18 U in the morning and 18 U in the evening, was injected subcutaneously before meals. Acarbose tablets (150mg/day) were co-administered to control blood glucose. Moreover, the patient was given oral atorvastatin tablets (20mg/day) for lipid regulation and plaque stabilization, oral aspirin (100mg/day) for antiplatelet coagulation, and ceftriaxone injections for anti-infection, according to the Chinese guidelines for the prevention and treatment of diabetic foot [7]. In terms of TCM treatment, the patient was given oral Chinese medicine compound Tongxinluo (TXL, 4 capsules/time, 3 times/day) to tonify Qi, nourish Yin and promote circulation [8]. In addition, medium-frequency pulsed electrical therapy was performed on the patient’s bilateral Quchi (LI 11) and Tsusanli (ST 36) to unblock the collaterals and relieve pain [9]. The vascular morphology and blood flow in the lower limbs were observed by CTA and Color Doppler ultrasonography, and the patients’ glucolipid metabolism levels were observed by automatic biochemical analyzer.

2.11. Outcome and follow-up

During the 4 weeks of treatment, the patient showed good compliance and tolerance without any unanticipated events. After treatment, the patient claimed significant pain relief, and the patient’s wounds shrank significantly and fresh granulation tissue emerged. CTA showed that the stenosis and occlusion of the vessels in the patient’s lower limbs were relieved, and blood flow to the lower limb increased after treatment (Figure 1A). Color Doppler ultrasonography showed a decrease in the largest plaque diameter in the common femoral artery from 1.36 cm × 0.22 mm to 0.64 cm × 0.16 cm and an increase in flow signal in the superior and mid-lower segments of posterior tibial artery (Figure 1B). As shown in Table 1, the fully automated analyzer showed that the serum levels of FBG, 2hPBG, HbA1c, TC, TG, LDL-C and LDL-H in the patient tended to be normal after treatment, although not at normal levels. These results indicated that the combination of Chinese and Western medicine treatment played a role in restoring the blood supply to the lower limbs, increasing collateral vessels, reducing arterial plaque, and restoring the balance of glucolipid metabolism.

3. Discussion

Due to the wide distribution of diseased vessels and the complexity of the disease progression, the diabetic foot is still a global medical problem to date, and its management is a great challenge for both patients and physicians. Diabetic foot is the result of the interaction of various pathological factors. In recent years, individualized treatment based on the patient’s condition such as the degree of ulceration, the existence of
infection, blood circulation in the lower limbs, and other complications has benefited many diabetic foot patients.

We treated the patient with antibiotics for only a short time because she had no infection. Throughout the treatment, the patient was given subcutaneous injections of Novaline 30 R and oral acarbose for glycemic control. Given the patient's high lipid levels, we gave her atorvastatin for lipid regulation and plaque stabilization, and aspirin for antiplatelet coagulation as a routine treatment. Western medicine has been shown to have certain efficacy in the treatment of diabetic foot, however, there is increasing evidence that the combination of Chinese and Western medicine is more effective in treating diabetic foot [10].

According to Chinese medicine, diabetic foot belongs to the category of “collateral-vascular system diseases”. The collaterals are morphologically consistent with the microscopic blood vessels in Western medicine, and have the function of infiltrating Qi and blood, moistening metabolism, and exchanging fluid and blood. Because of the tortuous and narrow form of the collaterals, when the pathogenic factors injure the collaterals, the Qi and blood running in them are most likely to be “blocked”, so the principle of treatment is “unblocking the collaterals” [11]. In response to the characteristics of “collateral-vascular system diseases”, Academician Yiling Wu developed the Tongxinluo formula, which is a representative formula of the theory of collateral disease, based on the principle of “unblocking the collaterals to relieve pain, activating blood circulation to remove blood stasis”.

TXL was registered with the State Food and Drug Administration (SFDA) in China in 1996 and has been widely used in China for the treatment of cardiovascular diseases. The formula includes leech, scorpion, centipede, periostracum cicadae, ground beetle, radix ginseng, radix paeoniae rubra, lignum albergiae odoriferae, dalbergia wood, frankincense, ice chips and spine date seed. It has the effect of opening the collaterals, tonifying Qi and nourishing Yin. Therefore, TXL has a theoretical basis for the treatment of diabetic foot [12]. Previous studies have found that TXL has good effects in inhibiting thrombosis, protecting vascular endothelial cells, maintaining vasodilation, and reducing

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**Figure 1.** The vascular morphology and the blood flow of the patient’s lower limbs were assessed before and after treatment. (A) Representative CTA images of the diabetic foot patient before and after treatment. (B) Color Doppler ultrasound scans of the lower limbs before and after treatment. The plaque diameter of the common femoral artery was measured, as well as the blood flow signal of the posterior tibial artery.

**Table 1. Changes in laboratory examinations in the diabetic foot patient before and after treatment.**

|                  | FBG (mmol/L) | 2hPBG (mmol/L) | HbAlc (mmol/L) | TC (mmol/L) | TG (mmol/L) | LDLC (mmol/L) | HDLC (mmol/L) |
|------------------|--------------|----------------|----------------|-------------|-------------|---------------|---------------|
| Pre-treatment    | 9.35         | 16.24          | 8.96           | 6.28        | 3.71        | 3.79          | 1.32          |
| post-treatment   | 7.54         | 10.48          | 6.39           | 4.64        | 2.64        | 2.52          | 1.41          |
inflammatory agents for diabetic foot in clinical practice. In addition to herbal treatment, acupuncture is an important part of Chinese medicine, which has the effect of harmonizing Yin and Yang, opening collaterals and relieving pain. For several years, acupuncture has been paid more and more attention as an adjuvant therapy for diabetic foot, which can reduce blood viscosity, increase arterial perfusion and improve the functional status of lower limb vessels in diabetic foot patients to some extent [15]. We selected bilateral Quchi and Tsusanli for electrical stimulation, which can increase metabolism and promote circulation of Qi and blood [16]. This case proves that, based on the treatment of western medicine such as blood glucose control, lipid regulation, plaque stabilization, and anti-inflammation, adding Chinese herbal medicine and acupuncture can not only improve the patient's glucolipid metabolism, but also effectively improve the circulation in the lower limbs and increase collateral blood vessels. Since we have only reported this case, we cannot fully explain the specific efficacy of Chinese herbal medicine TXL and acupuncture in the treatment of diabetic PAD, and we will set up a randomized controlled trial to further prove it in future clinical trials.

4. Conclusion

In this report, we present and describe a 70-year-old patient with diabetic foot who demonstrated good diabetic control as well as restoration of blood supply to the lower limbs after combined Western and Chinese medical treatment. Our report gives some ideas for the treatment of diabetic PAD patients, especially in early-onset diabetic patients.

Declarations

Author contribution statement

All authors listed have significantly contributed to the investigation, development and writing of this article.

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Data availability statement

Data will be made available on request.

Declaration of interests statement

The authors declare no conflict of interest.

Additional information

No additional information is available for this paper.

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