

Research Progress and Mechanism Exploration of Integrated Traditional Chinese and Western Medicine in Treating Peripheral Vascular Diseases: A Review Focusing on Arteriosclerosis Obliterans and Diabetic Foot

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Abstract: Peripheral vascular disease (PVD) is a common and frequently encountered condition in clinical practice. Among them, arteriosclerosis obliterans (ASO) and diabetic foot (DF) have garnered significant attention due to their high incidence and disability rates. This article systematically reviews the research progress in integrated traditional Chinese and western medicine for treating ASO and diabetic foot in recent years, summarizing aspects such as western medical treatment strategies, traditional Chinese medicine syndrome differentiation and treatment, clinical applications of integrated medicine, and underlying mechanisms. Research indicates that the combined application of western vascular interventions, stem cell therapies, and modern medicine with active ingredients of traditional Chinese medicine and compound formulations demonstrates synergistic advantages. Mechanistic studies have confirmed that traditional Chinese medicine exerts therapeutic effects through multiple pathways, including regulating lipid metabolism, inhibiting inflammatory responses, modulating macrophage polarization, and interfering with ferroptosis. This review aims to provide a reference for the clinical practice and basic research of integrated traditional Chinese and western medicine in treating peripheral vascular diseases.

Keywords: integrated traditional Chinese and western medicine; arteriosclerosis obliterans; diabetic foot; peripheral vascular disease; mechanism of action

1. Introduction

Peripheral vascular disease refers to vascular disorders outside the cardiocerebral vessels, with lower limb arteriosclerosis obliterans (ASO) and diabetic foot (DF) being the most common. ASO is characterized by vascular stenosis and occlusion, manifesting as intermittent claudication, rest pain, and gangrene [1]. DF is a leading cause of amputation in diabetic patients. With population aging, their prevalence in China is increasing, imposing heavy burdens [2].

Modern medical treatments include managing underlying diseases, endovascular intervention, bypass surgery, and wound repair. However, challenges such as post-interventional restenosis, poor surgical tolerance, and difficulty in chronic wound healing remain. Traditional Chinese Medicine (TCM), characterized by holistic regulation and multi-target intervention, demonstrates unique advantages in symptom improvement and wound healing. Recent advances in network pharmacology and molecular biology have deepened mechanistic research on integrated TCM-Western medicine, providing a scientific basis for clinical application.

2. Current Status and Limitations of Western Medical Treatment

2.1 Western Medical Treatment of Arteriosclerosis Obliterans

Treatment of ASO focuses on revascularization and risk factor control. Basic treatment includes smoking cessation, blood pressure and glucose control, lipid regulation, and antiplatelet therapy. For critical limb ischemia, endovascular intervention (balloon angioplasty, stenting) is preferred due to minimal invasiveness. Hybrid surgery can improve long-term patency for complex lesions. However, challenges remain: post-interventional restenosis rates are high, some patients with diffuse lesions cannot undergo complete revascularization, and revascularization alone is insufficient for wound healing in patients with tissue defects.

2.2 Western Medical Treatment of Diabetic Foot

DF treatment emphasizes a multidisciplinary approach: blood glucose control, infection management, revascularization, and wound care. Strict glycemic control is fundamental, and antibiotics should be selected based on susceptibility testing. Local management follows "debridement, anti-infection, moisture retention, healing promotion." Novel dressings, negative pressure therapy, and hyperbaric oxygen have improved healing rates. Stem cell therapies show potential in promoting

angiogenesis. However, chronic inflammation is difficult to reverse, with M1 macrophages persistently accumulating in wounds, forming an "inflammatory stalemate" that impedes repair. Additionally, existing treatments are costly, and some patients cannot receive optimal care due to financial constraints or comorbidities.

3. Traditional Chinese Medicine Syndrome Differentiation and Characteristic Therapies

3.1 TCM Understanding of Arteriosclerosis Obliterans

In TCM, ASO falls under “gangrene” or “pulse impediment.” Its pathogenesis is deficiency in the root with excess in the branch, with qi and blood deficiency as the root, and cold-dampness, phlegm-turbidity, and blood stasis as the branch. Based on staging, it is classified into syndromes such as cold coagulation and blood stasis, dampness-heat pouring downward, blazing heat-toxin, and qi-yin deficiency. Treatment follows “treat the branch in acute conditions, treat the root in chronic conditions,” emphasizing clearing heat, detoxifying, activating blood, and resolving stasis in acute phase, and supplementing qi, nourishing yin, warming yang, and unblocking collaterals in remission.

3.2 TCM Differentiation of Diabetic Foot

DF differentiation is often associated with long-standing wasting-thirst disorder, with qi-yin deficiency as the root, and blood stasis, dampness-heat, and heat-toxin as the branch. Common syndromes include dampness-heat toxin exuberance, blood vessel stasis obstruction, and qi-yin deficiency with blood stasis. Treatment is stage-based: during acute infection, clear heat, remove dampness, and detoxify using modified Simiao Yong'an Decoction; during the ischemic phase, activate blood and unblock collaterals using Buyang Huanwu Decoction or Xuefu Zhuyu Decoction; during wound healing, supplement qi, nourish yin, and expel toxins to promote regeneration.

3.3 Characteristics of TCM External Therapies

External therapies have unique advantages. Chinese herbal wet compresses and fumigation-washing therapies act directly on the affected area, clearing heat, detoxifying, activating blood, and unblocking collaterals. Acupuncture improves local circulation and alleviates pain, using acupoints such as Zusanli (ST36), Sanyinjiao (SP6), and Yanglingquan (GB34). Sustained-release preparations, such as asiaticoside-based gel dressings, provide new approaches for DF wound treatment[3].

4. Clinical Research on Integrated Treatment

4.1 Integrated Treatment of Arteriosclerosis Obliterans

Integrated treatment significantly improves symptoms and long-term outcomes in ASO patients. Adding blood-activating and stasis-resolving herbs (e.g., *Salvia miltiorrhiza*, *Ligusticum chuanxiong*, leech) to antiplatelet and lipid-regulating therapy reduces blood viscosity and improves microcirculation. Perioperative use of TCM can reduce restenosis. A clinical study of 60 ASO patients showed that adding “Tanyu Tongzhi Formula” to conventional treatment for 12 weeks significantly prolonged intermittent claudication distance and improved the ankle-brachial index[4].

4.2 Integrated Treatment of Diabetic Foot

Integrated treatment emphasizes “combination of internal and external treatment, systemic and local approaches.” Adding TCM for internal and external use significantly shortens wound healing time and reduces amputation rate. Simiao Yong'an Decoction combined with conventional treatment yields a significantly higher effective rate than Western treatment alone. A prospective controlled study showed wound healing time was approximately 40% shorter in the integrated group, and the total effective rate increased by more than 25%[5].

4.3 Analysis of Synergistic Effects

Synergistic mechanisms operate at multiple levels: Chinese herbs improve microcirculation, enhancing tissue perfusion effects of Western medicine; they regulate immune status, enhancing anti-infection capacity; and they promote tissue repair, compensating for limitations of simple debridement. The multiple active ingredients in TCM compounds intervene through multi-target mechanisms, achieving an organic combination of “holistic regulation” and “precision treatment.”

5. Mechanistic Studies

5.1 Regulation of Lipid Metabolism

Lipid metabolism disorder is the initiating factor of atherosclerosis. Various Chinese herbal compounds exert anti-

atherosclerotic effects by regulating lipid metabolism. Sanzi San significantly reduces serum total cholesterol and LDL-C levels in atherosclerotic mice and alleviates aortic plaque burden. Metabolomics studies on Simiao Yong'an Decoction for diabetic foot show changes in serum lipid metabolites such as sphingomyelin, suggesting the phosphatidylinositol signaling pathway may be a key mechanism[6].

5.2 Anti-inflammation and Immunomodulation

Inflammatory responses run through both ASO and DF. Tanyu Tongzhi Formula reduces serum IL-6 and IL-1 β levels and inhibits NLRP3 inflammasome activation, alleviating vascular inflammation. In chronic DF wounds, persistent M1 macrophage accumulation impedes healing. Asiaticoside selectively induces ferroptosis in M1 cells by activating ferritinophagy, increasing NCOA4 expression and ferritin degradation, leading to iron overload and lipid peroxidation, thereby eliminating M1 cells without affecting M2 cells—a novel mechanism for TCM in DF treatment.

5.3 Angiogenesis and Tissue Repair

Promoting angiogenesis and tissue repair is key in treating ischemic peripheral vascular diseases. Tanyu Tongzhi Formula increases collagen content within aortic plaques and enhances plaque stability. Network pharmacology predicts that Simiao Yong'an Decoction promotes angiogenesis via MAPK, HIF-1, and TLR pathways. Additionally, exosomes derived from human umbilical cord mesenchymal stem cells combined with TCM compounds alleviate tissue damage through lipid metabolism and atherosclerosis-related pathways[7].

5.4 Network Pharmacology and Multi-target Mechanisms

Network pharmacology elucidates the complex mechanisms of TCM compounds. Main active ingredients of Simiao Yong'an Decoction for DF include luteolin, quercetin, and formononetin, acting through targets such as AKT1, TNF, and MAPK8. Forty-one compounds in Sanzi San exert anti-atherosclerotic effects by regulating natural killer cell activity. These studies reveal the “multi-component, multi-target, multi-pathway” synergistic network of TCM compounds, providing modern scientific insights for integrated medicine.

6. Prospects and Conclusion

Significant progress has been made in integrated traditional Chinese and Western medicine for treating peripheral vascular diseases, but challenges remain. Existing clinical studies are mostly single-center with small samples, lacking high-quality randomized controlled trial evidence. Quality control and standardization of Chinese herbal compounds need improvement. Optimal integrated treatment protocols require further exploration, balancing individualized and standardized approaches[8].

Future research should focus on: conducting large-scale, multicenter prospective studies to establish evidence-based evidence; utilizing multi-omics technologies to elucidate mechanisms of TCM compounds; developing bioinformatics-based precision medication strategies for individualized treatment; and promoting novel TCM delivery systems (e.g., hydrogels, exosomes) to improve bioavailability and targeting.

In summary, integrated treatment for ASO and diabetic foot demonstrates synergistic advantages. TCM exerts effects through multiple mechanisms, including regulating lipid metabolism, anti-inflammation, immunomodulation, promoting angiogenesis, and inducing ferroptosis, providing new strategies for peripheral vascular diseases. With deeper mechanistic research and accumulating evidence, integrated TCM-Western medicine will play an increasingly important role in this field.

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