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Current Status of Diagnosis and Treatment of Type 2 Diabetes Mellitus with Atherosclerosis in Traditional Chinese and Western Medicine

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Abstract: ***Type 2 diabetes mellitus is closely associated with the pathogenesis of atherosclerosis, which can lead to disability and mortality in patients, reducing their quality of life while increasing socioeconomic burdens. The core shared pathogenesis lies in insulin resistance and chronic low-grade inflammation. Traditional Chinese Medicine interprets the progression of this condition as evolving from "yin deficiency with dryness-heat" to "deficiency of both qi and yin," eventually leading to "phlegm-stasis binding." Modern medical treatment emphasizes a comprehensive risk management strategy centered on "ABC" (A1C, Blood pressure, Cholesterol), while TCM diagnosis and treatment include the use of Chinese patent medicines, single-herb studies, and compound decoctions, reflecting the advantages of multi-target and holistic regulation. This article systematically outlines the current status of diagnosis and treatment for the comorbidity of type 2 diabetes mellitus (T2DM) and atherosclerotic cardiovascular disease (ASCVD). Future research should conduct high-quality clinical studies integrating traditional Chinese and Western medicine, further explore synergistic mechanisms, and promote the standardized development of diagnosis and treatment practices.***

Keywords: Type 2 diabetes mellitus, Atherosclerosis, Dyslipidemia, Traditional Chinese medicine.

1. Introduction

Type 2 diabetes mellitus (T2DM) is a chronic metabolic disease characterized by insulin resistance and defective insulin secretion, accounting for over 90% of all diabetic patients [1]. Atherosclerotic cardiovascular disease (ASCVD) is closely associated with the development of T2DM and represents one of the most common complications of T2DM, as well as a leading cause of disability and mortality in patients [2]. In recent years, with the improvement in living standards, the incidence of T2DM has been increasing globally. Studies indicate [3] that compared to patients without ASCVD, the mortality rate in T2DM patients with ASCVD is increased by 80%. In clinical practice, patients with T2DM and ASCVD often face the challenge of polypharmacy [4], involving concurrent use of hypoglycemic agents, antihypertensive drugs, lipid-lowering medications, and antiplatelet agents, among others. This presents multiple challenges, including drug selection, interactions, adverse effects, and medication adherence, while also imposing a heavier economic burden on both society and individuals.

2. Understanding of T2DM Complicated with ASCVD in Traditional Chinese and Western Medicine

2.1 Pathogenesis in Western Medicine

The mechanisms underlying type 2 diabetes mellitus (T2DM) and atherosclerosis (AS) are closely interrelated, influencing each other and forming a vicious cycle. The core comorbidity between the two lies in insulin resistance and chronic low-grade inflammation [5]. Insulin resistance not only leads to elevated blood glucose but also triggers lipid metabolism disorders, such as hypertriglyceridemia and low high-density lipoprotein cholesterol, and promotes the generation of small, dense low-density lipoprotein (LDL). LDL particles are prone to invade and accumulate in the subendothelial layer of blood vessels, initiating AS plaque formation. Elevated LDL levels are a high-risk factor for atherosclerosis. Furthermore, as a metabolic disorder, T2DM is accompanied by dysfunctional adipose tissue that releases large amounts of pro-inflammatory factors (e.g., TNF-α, IL-6), which act in concert with endothelial dysfunction [6] to enhance monocyte adhesion, migration, and transformation into macrophages. These macrophages extensively engulf oxidized lipids to form foam cells, constituting the lipid core of the plaque. Hyperglycemia itself promotes the formation of advanced glycation end products (AGEs), and the interaction between AGEs and their receptors (RAGE) generates reactive oxygen species, exacerbating oxidative stress and activating multiple pathways such as protein kinase C, thereby damaging endothelial function and promoting vascular inflammation and fibrosis. Simultaneously, the heightened platelet reactivity and imbalance in the coagulation-fibrinolysis system commonly seen in diabetic patients [7] further promote thrombus formation. Plaque formation, vascular inflammation and fibrosis, and an imbalance in the blood coagulation-fibrinolysis system are all contributing factors to the development of atherosclerosis.

2.2 TCM Etiology and Pathogenesis

Ancient TCM texts lack specific records regarding the comorbidity of type 2 diabetes mellitus and atherosclerosis. Based on its clinical manifestations and signs, it should be categorized under TCM disease entities such as "Xiaoke" (wasting-thirst disorder) and "Xiongbi Xintong" (chest impediment and heart pain). TCM posits that the core pathogenesis of type 2 diabetes is "yin deficiency with dryness-heat," with yin deficiency as its root. Atherosclerosis falls under the categories of "Mai Bi" (vessel impediment), "Tan Zhuo" (phlegm-turbidity), and "Xue Yu" (blood stasis), with its core being the binding of phlegm-turbidity and static blood [8]. The combination of the two forms a dynamic

progression from "yin deficiency with dryness-heat" to "deficiency of both qi and yin," and ultimately to "phlegm-stasis binding." The onset is attributed to damage to the spleen and stomach due to overconsumption of rich, sweet foods and prolonged sedentary behavior, leading to impaired transportation and transformation of food and water. Over time, these accumulate in the middle jiao, forming "sugar-turbidity" and "lipid-turbidity." These turbid pathogens struggle and bind with each other, transforming into "phlegm-turbidity." Phlegm-turbidity obstructs the flow of qi, and qi stagnation impedes blood circulation; it directly congests the vessels and collaterals, damaging the vessel endothelium, thereby giving rise to internal static blood. The congelation and binding of phlegm and stasis within the blood vessels lead to the "phlegm-stasis binding" pathological state. When the condition persists over time, the phlegm, stasis, and turbidity pathogens consume and damage the body's healthy qi, resulting in the manifestation of "deficiency of both qi and yin" [9]. Simultaneously, the blockage by phlegm and stasis and the obstruction of the vessels and collaterals prevent the heart and spleen from receiving proper nourishment, promoting the progression of the disease.

3. Modern Medical Treatment Strategies

3.1 Lipid Lowering and Plaque Stabilization

Elevated blood lipid levels are a high-risk factor for both diabetes and atherosclerosis. Controlling lipid levels can further reduce the incidence of diabetes and cardiovascular diseases [10]. The domestically developed PCSK9 monoclonal antibody, Torcetrapib, demonstrated in a pooled analysis of clinical trials published in 2025 that after 12 weeks of treatment in Chinese patients with type 2 diabetes mellitus and hypercholesterolemia, low-density lipoprotein cholesterol (LDL-C) was reduced by up to 68.63%, with 97.19% of patients achieving the target LDL-C level (<1.8 mmol/L). Simultaneously, the treatment significantly lowered non-high-density lipoprotein cholesterol (non-HDL-C), apolipoprotein B, and lipoprotein(a) levels by 69.54%, 64.23%, and 36.39%, respectively. This drug exhibits low immunogenicity and a favorable safety profile, offering a new option for patients with statin intolerance or those requiring intensive lipid-lowering therapy [11]. Another review indicated that PCSK9-targeted therapies represented by evolocumab and inclisiran can reduce the risk of cardiovascular events in diabetic patients by 12%–17% without increasing the risk of new-onset diabetes [12].

3.2 Regulation of Glucose and Lipid Metabolism

Studies have shown that elevated blood glucose levels can lead to vascular endothelial inflammatory responses, impair endothelial function, and destabilize arterial plaques, thereby increasing the risk of cardiovascular events [13]. Through blood glucose regulation, the reduction in glucose levels can also indirectly improve the lipid profile [14], which is particularly suitable for diabetic patients with comorbid atherosclerotic cardiovascular disease. Research on Dapagliflozin combined with Metformin in newly diagnosed overweight/obese patients with type 2 diabetes confirmed that, in addition to significantly reducing HbA1c and body weight within three months, it also improves the lipid profile and urinary microalbumin, suggesting cardiorenal protective effects [15]. SGLT2 inhibitors (such as Empagliflozin, Ertugliflozin, etc.) can simultaneously improve liver enzymes, hepatic fat content, and TG levels in patients with type 2 diabetes and fatty liver disease, achieving multi-target metabolic benefits [16].

3.3 Risk Factor Management

Risk management for this condition requires evidence-based, stringent comprehensive intervention strategies centered on the "ABC" approach [17]. According to authoritative guidelines such as ACC/AHA, ADA, and ESC, this strategy includes: A: Individualizing the glycemic control target (A1C) and prioritizing glucose-lowering medications with proven cardiovascular benefits, such as SGLT2 inhibitors and GLP-1 receptor agonists. Multiple cardiovascular outcome trials have confirmed their ability to significantly reduce the risk of major adverse cardiovascular events and heart failure hospitalization [18]. For diabetic patients with established ASCVD, aspirin should be initiated for secondary prevention if not contraindicated. B: The blood pressure control target is <130/80 mmHg. ACEI/ARB medications are often the first-line choice due to their cardio-renal protective effects [19]. C: Intensive lowering of low-density lipoprotein cholesterol (LDL-C) is the cornerstone of management [20]. High-intensity statin therapy forms the foundation. If targets are not achieved, combination with ezetimibe or a PCSK9 inhibitor is required. Furthermore, lifestyle interventions — including smoking cessation, medical nutrition therapy, and regular physical activity—serve as the basis for all pharmacological treatments. Comprehensive multi-dimensional risk factor management can significantly improve patients' cardiovascular outcomes.

4. Traditional Chinese Medicine Diagnosis and Treatment Methods

4.1 Application of Chinese Patent Medicines

Shenqi Fuzheng Injection is a Chinese patent medicine injection with detoxifying, blood-activating, and stasis-resolving effects. It can be used clinically in the treatment of multi-organ diseases, including comorbid conditions such as hypertension, type 2 diabetes mellitus, and coronary atherosclerotic heart disease. Zhou Renjie [21] conducted a clinical application monitoring and safety evaluation study, confirming its therapeutic effectiveness and emphasizing the need to pay attention to its interactions with antihypertensive, hypoglycemic, and antiarrhythmic drugs during clinical use. Jiangtang Sanhuang Tablets are a Chinese patent medicine developed by Professor Xiong Manqi from Guangzhou University of Chinese Medicine, based on the pathogenesis of "deficiency of both qi and yin, and internal obstruction of blood stasis." Fan Yuelin [22], through experimental research exploring the protective effects of Jiangtang Sanhuang Tablets on diabetic cardiomyopathy from immunological, histopathological, and molecular biological perspectives, found that this medication can effectively intervene in abnormal glucose metabolism and reduce myocardial ischemia area, confirming its therapeutic role for diabetes and cardiovascular diseases. Jiang Dan [23] conducted an RCT study on Sanqi Dan Granules for treating

type 2 diabetes mellitus combined with hypertension. By observing the efficacy on TCM syndrome, cuff blood pressure, diabetes-related indicators, and blood lipids in both groups, and performing statistical analysis, the conclusion was drawn: Sanqi Dan Granules can effectively improve clinical symptoms in patients with the pattern of "deficiency of both qi and yin, and internal obstruction of blood stasis, " enhance insulin sensitivity, alleviate insulin resistance, and reduce total cholesterol (TC) and LDL-C levels, which is beneficial for anti-atherosclerosis. Chinese patent medicines combine the strengths of TCM in treating both the root and branch of disease with the convenience of Western medicine in administration, addressing the practical issue of the inconvenience of preparing and carrying traditional herbal decoctions. Current related clinical and mechanistic studies also confirm their effectiveness, making them a viable option for chronic disease treatment.

4.2 Monotherapy with Single Chinese Medicinal Herbs

Deng Yuyong [24] utilized network pharmacology to screen the active components of Puerariae Lobatae Radix (Gegen) and Pinelliae Rhizoma (Banxia), along with their corresponding targets. Through enrichment analysis and visual analysis, it was found that the main core components, such as formononetin, β-sitosterol, baicalein, stigmasterol, and coniferin, primarily target processes involving lipid regulation, atherosclerosis, and the AGE-RAGE signaling pathway in diabetic complications, thereby further regulating and improving diabetes. Chen Yao [25], in a related study on lipid metabolism and inflammatory factors in diabetic rats, explored the mechanisms of the Chinese medicinal herb Polygonati Rhizoma (Huangjing). After modeling in rats and validating indicators, it was discovered that Huangjing could significantly reduce the secretion of TNF-α from adipocytes and improve glucose and lipid metabolism disorders. Furthermore, it effectively lowered the rats' total cholesterol, triglycerides, low-density lipoprotein, and atherosclerosis index, indicating a certain preventive and therapeutic effect on cardiovascular and cerebrovascular diseases and diabetic complications. Zhang Xiangyuan [26], in a real-world study on the treatment of type 2 diabetes mellitus with Coptidis Rhizoma (Huanglian) and Zingiberis Rhizoma (Ganjiang), found that the dosage of Huanglian was proportional to the patient response rate. The herb pair combination effectively improved insulin secretion, thereby exerting anti-inflammatory and blood glucose-regulating effects. Exploring the therapeutic targets and related mechanisms of single Chinese medicinal herbs in treating diseases can explain the specific mechanisms of TCM in treating this condition from a molecular biology perspective and promote the wider application of TCM in disease treatment.

4.3 Application of Compound Decoctions

Compound decoctions can leverage the organic combination of medicinal herbs to exert holistic regulatory effects through multiple components, multiple targets, and multiple pathways, thereby enhancing therapeutic efficacy, reducing toxic side effects, and enabling personalized treatment. Chen Li [27], in a clinical study on type 2 diabetes mellitus combined with carotid atherosclerosis, selected the Biling Qutong Decoction. Measured indicators included TCM syndrome score, blood glucose, serum uric acid, creatinine, blood urea nitrogen, blood lipids, carotid intima-media thickness, plaque Crouse score, homocysteine, and NF-κB p65 levels. The study confirmed that Biling Qutong Decoction could effectively improve blood glucose, uric acid, blood lipids, and Hcy levels in patients with type 2 diabetes and gout complicated by carotid atherosclerosis, downregulate the expression of FGF-21 and NF-κB p65, and alleviate carotid atherosclerosis. Li Yue [28] explored the therapeutic effect of the Yingwei Formula on this condition based on the theory of Nutritive (Ying) and Defensive (Wei) Qi. Citing the theoretical basis that "When the Nutritive and Defensive Qi are obstructed, the blood congeals and fails to flow," the article discussed the relationship between wasting-thirst (diabetes) and vascular lesions. A small-sample clinical study was also conducted, concluding that under the guidance of the "Nutritive and Defensive Qi theory," this formula indeed achieves certain therapeutic effects in type 2 diabetes and its vascular complications, offering a new perspective for the prevention and treatment of this disease with Traditional Chinese Medicine.

5. Summary and Outlook

This article systematically reviews the current status of diagnosis and treatment for Type 2 Diabetes Mellitus (T2DM) comorbid with Atherosclerotic Cardiovascular Disease (ASCVD) in both Traditional Chinese Medicine (TCM) and Western medicine. It points out that a vicious cycle is formed between the two conditions under the influence of shared mechanisms such as insulin resistance and chronic low-grade inflammation, significantly increasing patient mortality. Modern medicine emphasizes a core strategy of comprehensive "ABC" intervention. In TCM, this comorbidity is categorized as "Xiaoke" (wasting-thirst) combined with "Xiongbi" (chest impediment) and "Mai Bi" (vessel impediment). The pathogenesis evolves from "yin deficiency with dryness-heat" to "deficiency of both qi and yin," culminating in "phlegm-stasis binding." The treatment demonstrates multi-level interventions including Chinese patent medicines, single herbs, and compound decoctions, reflecting the advantages of multi-target and holistic regulation.

Looking ahead, although both TCM and Western medicine have formed certain consensuses in the diagnosis and treatment of this condition, significant gaps remain in the field of integrated therapy. Future research should focus on conducting high-quality, large-sample, long-term randomized controlled clinical trials to deeply explore the mechanisms of synergistic multi-target effects in integrated Chinese and Western medicine interventions. Modern technological approaches such as omics technologies and molecular imaging can be utilized to reveal the scientific connotation of treatment pathways integrating "disease and pattern." Simultaneously, efforts should be made to promote real-world studies that conform to international standards, focusing on hard endpoints and patient-reported outcomes, in order to provide higher-level evidence-based support for the integrated prevention and treatment of T2DM comorbid with ASCVD, ultimately fostering the standardization and precision of clinical practice.

References

[1] Shao Mengyao, Pan Xinxin, Lu Min, et al. A Study on Factors Influencing Anxiety and Depression in Patients with Type 2 Diabetes Comorbidities Using the Random Forest Algorithm[J/OL]. Chinese Nursing Researsh, 2026, (02):185-192[2026-01-18].

[2] Ding Yating, Shi Xiaoyan, Wu Hongfei, et al. Research Progress on the Role of CD4+ T Cell Metabolic Reprogramming in Inducing Cell Differentiation to Promote Atherosclerosis and Its Therapeutic Strategies [J/OL]. Acta Pharmaceutica Sinica, 1-21[2026-01-18].

[3] HU Yilan, SONG Xiaodan, WEN Miaoyu, et al. Clinical Efficacy of Bushen Tongmai Prescription in Treating Type 2 Diabetes Mellitus Complicated with Atherosclerotic Cardiovascular Disease of Kidney Deficiency and Blood Stasis Type and Its Influence on Serum Mir-126[J]. Journal of Guangzhou University of Traditional Chinese Medicine, 2025, 42(04):842-848.

[4] LIANG Jinhua, CHEN Tugang. Research Progress of Type 2 Diabetes Mellitus with Coronary Atherosclerotic Heart Disease[J]. Diabetes New World Magazine, 2024, 27(03):189-193.

[5] ZHOU Ya-qi, Gulinigaer·MAIMAITITUERSUN, et al. Mechanism of protection of glucagon-like peptide-1 receptor agonists in patients with type 2 diabetes and cardiovascular disease and related research progress[J]. Chinese Journal of Cardiovascular Research, 2025, 23(12):1069-1075.

[6] HAO Sai, SUN Jishu, FAN Ruobing, WANG Xianjuan, et al. Effects of liraglutide on vascular remodeling, gut microbiota metabolites and serum CTRP13 in patients with type 2 diabetes mellitus complicated by atherosclerosis[J]. Laboratory Medicine and Clinic, 2025, 22(18):2560-2566.

[7] Zhang Fenfen, Huang Qiufang, Shen Xiaoqi. The Value of Metoprolol Combined with Dapagliflozin in Treating Type 2 Diabetes Complicated by Coronary Atherosclerotic Heart Disease[J]. Diabetes New World Magazine, 2025, 28(22):79-82.

[8] Wang Chengbin, Deng Deqiang. Research Advances in the Integrated Chinese and Western Medicine Prevention and Treatment of Type 2 Diabetes with Dyslipidemia[J]. Clinical Research in Traditional Chinese Medicine, 2025, 17(33):131-138.

[9] Yin Mengting. A Study on the Correlation Between Carotid Atherosclerosis and Adipokines in Type 2 Diabetes Patients with Different Traditional Chinese Medicine Syndromes[D]. Nanjing University of Traditional Chinese Medicine, 2025.

[10] Xu Qingju, Guan Shouming, Guo Yuanmin. Observation on the Efficacy of Dual-Lowering Decoction Combined with Western Medicine in Treating Type 2 Diabetes with Hyperlipidemia[J]. Chinese Journal of Traditional Medical Science and Technology, 2025, 32(02):327-329.

[11] QI L, SHEN H, CHAl M, et al. Efficacy and safety of Tafolecimab in Chinese patients with type 2diabetes and hypercholesterolemia: a post-hoc analysis of pooled data from three phase 3 trials[J]. Cardiovasc Diabetol, 2025, 24(1):264.

[12] BÉLIARD S, MOURRE F, VALÉRO R. Hyperlipidaemia in diabetes: are there particular considerations for next-generation therapies[J]. Diabetologia, 2024, 67(6):974-984.

[13] ZHANG Yun, LI Jin-yan. Clinical Observation of Englizin in the Treatment of Patients with Type 2 Diabetes Mellitus Complicated with Atherosclerosis[J]. Journal of Rare and Uncommon Diseases, 2025, 32(06):155-157.

[14] Ajabnoor G M A, Hashim K T, Alzahrani M M, et al. The possible effect of the long-term use of glucagon-like peptide-1 receptor agonists (GLP-1RA) on Hba1c and lipid profile in type 2 diabetes mellitus: a retrospective study in KAUH, Jeddah, Saudi Arabia[J]. Diseases, 2023, 11(1): 50.

[15] Wang Yadi, Shen Liyan, Li Yang, et al. Effects of Dapagliflozin on Glucose and Lipid Metabolism and Urinary Microalbumin in Newly Diagnosed Overweight and Obese Patients with Type 2 Diabetes Mellitus[J]. Advances in Clinical Medicine, 2022, 12(4):2651-2659.

[16] BICA I C, STOICA R A, SALMEN T, et al. The Effects of Sodium-Glucose Cotransporter 2-Inhibitors on Steatosis and Fibrosis in Patients with Non-Alcoholic Fatty Liver Disease or Steatohepatitisand Type 2 Diabetes: A Systematic Review of Randomized Controlled Trials[J]. Medicina (Kaunas), 2023, 59(6): 1136.

[17] Chen Yanqi. Distribution of Traditional Chinese Medicine Syndromes and Associated Risk Factors in Patients with Type 2 Diabetes and Concurrent Coronary Heart Disease[D]. Yunnan University of Chinese Medicine, 2024.

[18] Abbas Y. Glycosylated Hemoglobin: The importance in management of type 2 diabetes[J]. Journal of Stress Physiology & Biochemistry, 2011, 7(4): 122-129.

[19] ACCORD Study Group. Effects of intensive blood-pressure control in type 2 diabetes mellitus[J]. New England Journal of Medicine, 2010, 362(17): 1575-1585.

[20] Hurst R T, Lee R W. Increased incidence of coronary atherosclerosis in type 2 diabetes mellitus: mechanisms and management[J]. Annals of internal medicine, 2003, 139(10): 824-834.

[21] Zhou Renjie. Clinical Application Monitoring and Safety Evaluation of Ginseng and Astragalus Injection for Strengthening the Constitution[D]. Shandong University of Traditional Chinese Medicine, 2014.

[22] Fan Yuelin. The Cardioprotective Effects of Jiangtang Sanhuang Tablets on Diabetic Rats and Their Influence on the Regulatory Mechanism of Bradykinin β1 Receptors [D]. Guangzhou University of Chinese Medicine, 2013.

[23] Jiang Dan, Luoluo Luo, He Wang. Effect of Sanqidan Granule in Treating Patients of Type 2 Diabetes Mellitus Complicated with Hypertension[J]. Chinese Journal of Integrated Traditional and Western Medicine, 2009, 29(08):737-739.

[24] DENG Yuyong, ZHAO Qihan, LI Shan. A Network-based Pharmacological Study on the Improvement Mechanism of Radix Puerariae and Tuber Pinellia on Type 2 Diabetes Mellitus[J]. Diabetes New World Magazine, 2023, 26(08):84-90.

[25] Chen Yao. Study on the Effects of Polygonatum on Glucose and Lipid Metabolism and TNF-α Levels in

Type 2 Diabetic Rats[D]. Beijing University of Chinese Medicine, 2018.
[26] Zhang Xiangyuan. A Registration Study on the Treatment of T2DM with Coptis-Containing Compound Formulations and Investigation into the Hypoglycemic Mechanism of the Coptis-Dried Ginger Pair[D]. Beijing University of Chinese Medicine, 2024.
[27] CHEN Li, LI Zhongnan, WANG Yu. The Effect of the TCM Syndrome of Biling Qutong Formula on FGF-21, NF-κB p65 and Carotid Atherosclerosis in Patients with type 2 Diabetes Mellitus and Gout[J]. Journal of Shaanxi University of Chinese Medicine, 2025, 48(5):15-20.
[28] Li Yue, Exploring the Prevention and Control of Atherosclerosis in Type 2 Diabetes Mellitus and Its Mechanism of Action Using the “Ying-Wei Formula” Based on the “Ying-Wei Theory”. Second Affiliated Hospital of Xingtai Medical College, Hebei Province, 2024-02-26.