

Research Progress of Integrated Traditional Chinese and Western Medicine in the Treatment of Uremic Cardiomyopathy

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Abstract: *Uremic Cardiomyopathy (UCM) represents a severe cardiovascular complication at the terminal stage of Chronic Kidney Disease (CKD), characterized by high morbidity and mortality rates that pose a significant global public health challenge. The pathogenesis of UCM is intricate, involving metabolic reprogramming, mitochondrial dysfunction, inflammatory responses, oxidative stress, among other facets, while clinical treatment lacks specific interventions. Conventional Western medicine primarily offers symptomatic support, which, although alleviates certain symptoms, fails to reverse the core pathological progression of myocardial injury. Traditional Chinese Medicine (TCM), leveraging its strengths in holistic regulation and multi-target intervention, demonstrates significant potential in improving cardiac and renal function in UCM patients, modulating metabolic disorders, and mitigating inflammatory damage. The integration of TCM and Western medicine, through the synergy of complementary advantages, achieves a "symptomatic control + root cause regulation" effect, and has become a pivotal developmental direction in UCM treatment. This paper systematically reviews the pathogenesis and treatment status of UCM from a Western medical perspective, elucidates TCM pathogenesis and therapeutic strategies, examines the clinical application and mechanistic studies of integrated treatment approaches, summarizes existing research challenges, and forecasts future trends, thereby providing a reference for the clinical management and scientific research of UCM.*

Keywords: Uremic Cardiomyopathy, Integrated Traditional Chinese and Western Medicine, Metabolic Reprogramming, Mitochondrial Function, Shu Li Jiang Zhuo Prescription, Cardio-Renal Axis.

1. Introduction

Uremic cardiomyopathy (UCM) refers to heart damage in patients with Chronic kidney disease (CKD) due to multiple abnormal factors that disturb the physiological balance of the heart [1]. Patients with chronic kidney disease (CKD) are unable to effectively remove waste and excess water from the body due to the decline of renal function, leading to the development of uremia. With the progress of the disease, Heart damage is gradually aggravated, and eventually Heart failure (HF) [2] may develop. The incidence of uremic cardiomyopathy in uremic patients is very high, more than 50% [3], mainly manifested as left ventricular hypertrophy, myocardial fibrosis and cardiac dysfunction. Cardiovascular Disease has become the main cause of death in patients with end-stage Renal Disease (ESRD). The mortality from cardiovascular disease in these patients is 15 to 30 times [4] higher than that in the general population. This statistic reflects the serious threat of uremic cardiomyopathy to the survival of patients. Therefore, uremic cardiomyopathy has become a major global health challenge [5].

The pathogenesis of uremic cardiomyopathy is complex [5, 6]. In addition to abnormal hemodynamic load, activation of the renin-angiotensin-aldosterone system (RAAS), excessive activation of the sympathetic nervous system, and Transforming growth factor beta (Tgf- β), In addition to traditional risk factors such as increased expression of TGF- β , uremic cardiomyopathy is also affected by non-traditional factors [7] such as uremic toxins and inflammation. At present, the treatment of uremic cardiomyopathy mainly relies on dialysis to replace renal function, remove excess water and metabolic waste from the body, and carry out symptomatic

and supportive treatment, such as the use of diuretics, blood pressure control drugs, and cardioprotective drugs [3]. However, these treatments are often difficult to reverse the progression of the disease, and the lack of specific treatments is still a challenge. Therefore, it is very important to explore effective and safe treatment strategies for improving the quality of life and prolonging the survival time of patients with uremic cardiomyopathy.

Traditional Chinese medicine has obvious advantages and curative effect in the treatment of uremic cardiomyopathy, which can effectively reduce adverse reactions of uremic cardiomyopathy, prolong the survival period of patients, control complications, and improve the quality [8] of life. There is no disease name of uremic cardiomyopathy in ancient Chinese medical books, but it is classified into chest impediment, palpitation, edema, heart failure and other categories. Its pathogenesis is mainly caused by chronic kidney disease, Yang qi failure, Yin cold excess, water dampness, turbidity and poison, which affects water and fluid metabolism, resulting in stagnation of water and drinking, reversal of water pathogens, damage to the heart and lung, and imbalance of heart, lung, qi and blood. The treatment principles and methods are to treat the root cause of the disease by benefiting temperature and Yang, and to treat the symptoms by promoting blood circulation and promoting water. Many clinical studies have shown that traditional Chinese medicine can effectively prevent and treat uremic cardiomyopathy [9-11]. Shuli Jiangzhuo decoction is based on the treatment of "Shuli Sanjiao, warming Yang and reducing turbidity". It has multiple pharmacological effects such as reducing Blood Urea Nitrogen (BUN) and Serum Creatinine (Scr) to improve renal function, regulating water

metabolism, improving toxin accumulation in the body and protecting organ function. Previous experimental studies have confirmed that Shuli Jiangzhuo Decoction can significantly improve the heart and kidney function of UCM rats, and its mechanism is related to the down-regulation of NLRP3, Caspase-1, IL-1 β protein expression and the inhibition of myocardial cell pyroptosis [12]. However, the pathogenesis of uremic cardiomyopathy is complex, and its mechanism has not been fully elucidated. In recent years, the integrated traditional Chinese and western medicine treatment model has gradually matured. Through the synergistic effect of rapid control of core indicators by western medicine and in-depth regulation of metabolism and tissue repair by traditional Chinese medicine, the clinical efficacy and long-term prognosis of UCM patients have been significantly improved. Based on the latest research progress at home and abroad, this article systematically reviews the mechanism and treatment of western medicine, the theory and prescription of traditional Chinese medicine, and the synergistic effect of integrated traditional Chinese and western medicine, so as to provide a basis for the standardized diagnosis and treatment of UCM.

2. Research Progress of Western Medicine on Uremic Cardiomyopathy

2.1 Core Pathogenesis

2.1.1 Metabolic reprogramming and mitochondrial dysfunction

UCM is essentially a “metabolic reprogramming” disease, in which more than 90% of the energy of normal cardiomyocytes depends on mitochondrial fatty acid oxidation (FAO). In the state of UCM, the accumulation of uremic toxins (such as indole phenolic acid IS) directly damages the mitochondrial structure, leading to the block of FAO, and the myocardium is forced to turn to anaerobic glycolysis for energy supply, which is the Warburg effect [13]. The abnormal activation of hypoxia-inducible factor 1 α (HIF-1 α) is the core mechanism of this transition, which can up-regulate the expression of glucose transporter GLUT1 and key glycolytic enzyme (LDHA), promote glucose uptake and lactate production, and cause myocardial acidosis and oxidative [14] stress. At the same time, the increase of mitochondrial membrane permeability and the block of electron transport chain lead to the decrease of ATP synthesis efficiency and the production of reactive oxygen species (ROS), which further aggravates mitochondrial damage and myocardial cell apoptosis [15]. As an important protective factor, sKlotho protein deficiency can aggravate myocardial mitochondrial injury and cell hyper trophy [16] [17] [18] trophy by activating TRPC6 channel and blocking IGF1-PI3K-TRPC6 signaling pathway.

2.1.2 Inflammatory response and pyroptosis

Recent studies have confirmed that inflammatory response is a key driver of myocardial injury in UCM. In the environment of uremia, NLRP3 inflammasome is activated, which promotes the release of inflammatory factors such as IL-1 β and IL-18 and induces myocardial cell pyroptosis, a strong inflammatory cell death mode [19]. The expression of pyroptosis-related proteins (Caspase-1 and Gasdermin D) in

myocardial tissue of UCM rats is significantly increased, and the infiltration of inflammatory factors aggravates myocardial fibrosis and functional damage [20]. In addition, proinflammatory factors such as tumor necrosis factor (TNF- α) and interleukin (IL-6) can activate the NF- κ B pathway to accelerate myocardial hypertrophy and mesangial matrix deposition, forming a vicious cycle [21] of “inflammation-injury-fibrosis”.

2.1.3 Synergistic effect of multiple system disorders

The pathogenesis of UCM is the result of the synergistic effect of multiple factors: renal anemia leads to myocardial hypoxia and aggravates energy metabolism disorders [22]; The disorder of calcium and phosphorus metabolism leads to vascular calcification and myocardial interstitial fibrosis [23]. Oxidative stress aggravates myocardial cell death [24] by damaging myocardial cell membrane and DNA. The direct toxic effects of uremic toxins (such as indole sulfate and p-cresol sulfate) further damage the function [15] of heart and kidney tissue. These factors are intertwined and jointly promote the occurrence and progress of UCM.

2.2 Current Status of Western Medicine Treatment

2.2.1 Conventional symptomatic treatment

Blood purification: The removal of uremic toxins by hemodialysis, peritoneal dialysis and other methods can reduce the direct damage of toxins to the myocardium, but it is difficult to completely remove the medium and large molecular toxins, and the improvement of myocardial metabolic disorders is limited [25].

Blood pressure control: renin-angiotensin-aldosterone system (RAAS) inhibitors (such as valsartan and losartan) are the first choice, which can reduce myocardial hypertrophy and fibrosis, but some patients cannot tolerate adequate medication [26] due to renal function limitation.

Correction of anemia: erythropoietin and iron were used to improve anemia and relieve myocardial hypoxia, but the dosage should be strictly controlled to avoid aggravating the cardiovascular burden [22].

Metabolic regulation: statins are used to regulate blood lipids, and sodium-glucose cotransporter-2 inhibitors (SGLT-2i) are used to improve glucose metabolism, but there is no direct intervention [27] on energy metabolic reprogramming in the core of UCM.

2.2.2 Exploration of targeted therapy

Mitochondrial protective agents: mitochondrial-targeted antioxidants, such as MitoQ and SS-31, can reduce mitochondrial oxidative damage and improve ATP synthesis efficiency, but they are still in the preclinical or early clinical research stage [28].

Inflammatory inhibitors: Inhibitors targeting NLRP3 inflammasome, such as MCC950, have been shown to reduce UCM myocardial pyroptosis and inflammatory injury in animal experiments, but have not been used in clinical [29]

practice.

Metabolic modulators: Drugs that activate the PPAR α pathway (such as fibrates) can promote fatty acid oxidation, inhibit glycolysis, and partially reverse metabolic reprogramming, but their clinical efficacy still needs to be verified [30] by large sample studies.

In general, although western medicine treatment can control some clinical indicators, it is difficult to reverse the core pathological process of UCM, and there are some problems such as poor drug tolerance and obvious side effects. Therefore, it is urgent to find more effective treatment strategies.

3. Research Progress of Traditional Chinese Medicine on Uremic Cardiomyopathy

3.1 Attribution of Disease Name and Core Pathogenesis

In ancient Chinese medical books, there is no record of the disease name of “uremic cardiomyopathy”. According to its related clinical symptoms and pathogenesis, it can be classified into the categories of: retention of urine, retention of urine, edema, palpitation and deficiency of labor. Due to the damage of various kinds of nephropathy and the function of the viscera over time, especially the spleen and kidney deficiency, the disease gradually aggravates, and finally leads to the deficiency of the vital qi, turbidity and blood stasis obstruct the kidney collaterals, leading to the loss of the function of the kidney to open and close the muscle and the retention of dampness and urine toxicity in the body, leading to the ling of water and qi in the heart, dampness and turbidity, dampness and heat, blood stasis and urine toxicity hinder the generation of qi and blood, trapping solid and causing deficiency. Dampness and uremia affect the viscera, six bowels and limbs and produce many symptoms, which become the important pathological factors of the disease.

The pathogenesis of UCM is secondary to CRF. There is a certain correlation between UCM and CRF in the pathogenesis. The pathogenic viscera of UCM are mainly related to the dysfunction of kidney, spleen and heart, and are closely related [31] to the pathological factors such as dampness, phlegm, blood stasis and toxic pathogens. It is said in the Plain Questions that “the kidney is the main body of water”, indicating that the kidney plays an important role in the metabolism of water and fluid. The deficiency of kidney qi and kidney Yang leads to the disorder of water and fluid metabolism, the retention of water and moisture, flooding the heart, affecting the distribution of Yang qi in the heart, leading to weakness of heart qi and beating weakness, manifested as palpitation, shortness of breath, edema and other symptoms [32]. In *Su Wen Zhi zhen Yao Da Lun*, it said, “All dampness and swelling belong to the spleen.” The spleen is prone to dryness and dampness, spleen deficiency has lost the division of transportation, water dampness does not change, and it is accumulated into phlegm, phlegm dampness obstructs the middle jiao, spleen deficiency and dampness is abundant, the middle coe qi is unfavorable, and the rise and fall are abnormal. It not only affects the metabolism of water and fluid, but also increases the burden of the heart, water and qi ling the heart, leading to chest tightness, palpitations, and

fatigue [33]. Dampness is insidiousness, long into phlegm and drink, phlegm clouded clear orifices, block qi, affect heart function, loss of consciousness, further aggravate palpitation, chest tightness, dizziness and other symptoms. “Qi is the commander of blood, blood is the mother of qi”, qi deficiency is unable to promote blood flow, blood flow is not smooth, long into blood stasis, coupled with unfavorable blood is water, heart blood stasis causes insufficient blood supply to the myocardium, and eventually causes myocardial damage, manifested as pain in the front of the heart, even pain lead to shoulder and back, pulse signs and other symptoms [34] such as astringency. Long-term blood stasis block, one affects the generation of new blood, the two tissue old blood does not go, no blood in the myocardium, damage leads to myocardial fibrosis, and then aggravates the condition [35]. Due to renal failure, uremia patients accumulate toxins in the body, dampness and phlegm are Yin factors, which easily block qi, damage Yang, lead to qi disorder, and further damage the heart and Yang [36].

3.2 The Application of TCM Treatment Principle and Prescription

Traditional Chinese medicine (TCM) has the advantages of multi-target, multi-pathway and multi-link comprehensive regulation in the prevention and treatment of chronic diseases, especially in the treatment of UCM, which has shown unique clinical value [26]. Based on the pathogenesis characteristics of “deficiency of essence and excess of standard, heart and kidney diseases”, the basic principle of traditional Chinese medicine (TCM) treatment of UCM is “treating samples together and taking into consideration both heart and kidney”. The core treatment principles include reducing diuresis and turbidity, strengthening Yang to remove turbidity, removing turbidity and detoxification, promoting blood circulation and removing blood stasis, tonifying kidney and benefiting heart, etc. Monomer or compound preparations of Chinese medicine has a large number of studies have shown that can effectively improve the renal function, reduce the serum level of Scr and BUN, regulate lipid metabolism, rectify anemia, inhibition of tissue fibrosis process [37-41]. Traditional Chinese medicine (TCM) treatment of UCM focuses on tonifying the heart and kidney, warming Yang and benefiting qi, promoting blood circulation and removing blood stasis, reducing turbidity and detoxifying. The synergistic effect of compound and single medicine is often used to enhance the curative effect. Among them, *Angelica sinensis*, *Astragalus membranaceus*, *Aconite radix aconiti*, *Codonopsis rhizoma*, fried *Atractylodes rhizoma atractylodes*, processed *Rehmanniae radix*, *Salvia miltiorrhiza*, *Chuangxiong*, *Jixueteng*, *rhubarb*, *Sophorae japonica*, *Junxue*, and oysters have good effects [42-45] in improving blood circulation, regulating immune function, and removing dampness, turbidness and toxic pathogens. *Danshen* injection, *Astragalus* injection, *Shengmai* injection and *Shenkang* injection, which are traditional Chinese medicine monomer injections, can take effect quickly through intravenous administration, with high bioavailability and stable medicinal components, and can quickly act on target organs [46]. Chinese patent medicine *Shenyankangfu* tablet, *Shenshuaining* capsule, *Bailing* capsule, *Huangkui* capsule, *Niaoduoqing* granule, etc., have been widely used in clinical practice, which play an important [47-49] role in improving renal microcirculation, promoting toxin excretion and

delaying the progression of the disease. In addition, traditional Chinese medicine enema, medicated bath, external application, iontophoresis and other external treatments can assist to reduce the level of uremic toxins and relieve clinical symptoms [50-51]. Yang We [52] et al. pointed out that the application of drugs for activating blood circulation and removing blood circulation such as *Salvia miltiorrhiza*, *Angelica sinensis*, and *Chuanxiong* in the early stage of the disease can effectively reduce the burden of the heart and kidney and slow down the pathological damage. Other experimental studies have shown that supplementing drugs such as *Cordyceps sinensis* and *Epimedium* can significantly reduce the mortality rate of 5/6 nephrectomy rats, improve anemia, and effectively reduce the levels of Scr and BUN. These studies provide important theoretical basis and clinical guidance [53-54] for the prevention and treatment of UCM with traditional Chinese medicine.

4. Clinical Application and Mechanism of Integrated Traditional Chinese and Western Medicine in the Treatment of Uremic Cardiomyopathy

4.1 Clinical Application Model and Curative Effect

The combination of traditional Chinese and western medicine in the treatment of UCM achieves complementary advantages through the mode of “symptomatic control of western medicine + syndrome differentiation and conditioning of traditional Chinese medicine”, which has achieved significant clinical efficacy. The main application modes include the following:

4.1.1 Basic treatment of western medicine + TCM syndrome differentiation prescription

On the basis of conventional western medicine treatment such as hemodialysis, blood pressure control (valsartan, amlodipine, etc.), and anemia correction, syndrome differentiation and prescription treatment were given according to the patient's syndrome characteristics. Du Zhihong [55] used Shulijiangzhuo decoction combined with hemodialysis to treat 30 patients with chronic renal failure complicated with UCM. The results showed that the levels of serum creatinine and urea nitrogen were significantly decreased, the symptoms such as palpitation and edema were significantly improved, and the ability of self-care was significantly improved. Ni Shihao [56] treated UCM patients with Yiqi Wenyang Huoxue Lishui decoction combined with RAAS inhibitor, and found that the combined treatment group was superior to the simple western medicine group in improving cardiac function (left ventricular ejection fraction, short axis shortening rate) and reducing myocardial injury markers (CK-MB, NT-ProBNP).

4.1.2 Western medicine targeted therapy + TCM specific prescription intervention

For the core pathological links of UCM, western medicine targeted drugs (such as valsartan and SGLT-2i) combined with traditional Chinese medicine specific prescriptions (such as Shuli Jiangzhuo decoction and Zhenwu decoction) were

used to achieve the synergistic effect of “targeted regulation + overall regulation”. Animal experiments have shown that Shuli Jiangzhuo Decoction combined with valsartan can significantly improve the heart and kidney function of 5/6 nephrectomy UCM rats, reduce the heart mass index and renal fibrosis, and the curative effect is better than that of the single drug group [12]. Clinical studies have confirmed that this combination model can reduce the dosage of western medicine, reduce the incidence of adverse reactions, and enhance the regulation of metabolic disorders and inflammatory damage.

4.1.3 External treatment of traditional Chinese medicine + conventional treatment of western medicine

For UCM patients with gastrointestinal symptoms, skin itching and other complications, on the basis of western medicine treatment, traditional Chinese medicine external treatment (such as Chinese medicine enema, acupoint application and moxibustion) can significantly improve the symptoms. Traditional Chinese medicine enema can reduce the burden of kidney metabolism by excreting turbidity and toxin from the intestine. Moxibustion at Guanyuan (CV 4), Qihai (CV 6), Zusanli (ST 36) and other acupoints can warm Yang and invigorating the spleen, promote blood circulation and clear collateral-circulation, and assist in improving heart and kidney [51] function.

4.2 Study on the Mechanism of Synergistic Action

The synergistic effect of integrated traditional Chinese and western medicine in the treatment of UCM stems from their complementary intervention at the level of pathological mechanisms, mainly reflected in the following aspects:

4.2.1 Regulation of energy metabolism and mitochondrial function

Western medicine drugs (such as valsartan) can reduce cardiac hypertrophy by inhibiting RAAS system, but the improvement of energy metabolism reprogramming is limited. Traditional Chinese medicine (TCM), such as Shuli Jiangzhuo Decoction and *Astragalus membranaceus*, can reverse Warburg effect [57] by activating AMPK/PGC-1 α pathway, promoting mitochondrial biosynthesis and fatty acid oxidation, inhibiting glycolysis. It has been confirmed that Shuli Jiangzhuo Decoction combined with valsartan can significantly improve the ATP content of heart and kidney tissues, mitochondrial membrane potential and respiratory chain complex activity in UCM rats, and the effect is better than that of single drug.

4.2.2 It can inhibit inflammatory response and oxidative stress

Western medicine anti-inflammatory drugs (such as statins) can inhibit the release of some inflammatory factors, but the long-term use is easy to produce side effects. Traditional Chinese medicine (TCM), such as *Salvia miltiorrhiza* and *Scutellaria baicalensis*, can inhibit the NF- κ B pathway and the activation of NLRP3 inflammasome, reduce the release of inflammatory factors such as IL-1 β and TNF- α , and upregulate the activities of antioxidant enzymes such as SOD and GSH-Px to remove excessive ROS. The combination of

traditional Chinese medicine and western medicine can block the vicious cycle of “inflammation and oxidative stress” from multiple links, and reduce myocardial and kidney damage [29].

4.2.3 It can reduce fibrosis and cardiac hypertrophy

Western medicine drugs (such as RAAS inhibitors) can inhibit myocardial and renal fibrosis, but their targets are single. Traditional Chinese medicine (TCM), such as Shuli Jiangzhuo Decoction and Zhenwu decoction, can inhibit the activation of fibroblasts and extracellular matrix deposition by regulating multiple pathways such as TGF- β /Smad, MAPK (p38/JNK/ERK), and reverse cardiac hypertrophy. It has been found that Shuli Jiangzhuo decoction combined with valsartan can significantly reduce the expression of α -SMA and Collagen I in myocardial tissue of UCM rats, and alleviate renal interstitial fibrosis and myocardial hypertrophy [58].

4.2.4 It can promote the clearance of uremic toxins

Hemodialysis can remove small molecular toxins, but the effect of removing medium and large molecular toxins is not good. Traditional Chinese medicine (TCM), such as rhubarb and salvia miltiorrhiza, can enhance the ability of toxin clearance by promoting intestinal excretion and improving renal microcirculation, while reducing direct damage of toxins to the myocardium. The combination of traditional Chinese medicine and western medicine can achieve the “complementary synergy” of toxin clearance and reduce the impact [59] of internal environmental disorders on the heart and kidney.

5. Future Trends

5.1 Integrated Application of Systems Biology Techniques

Multi-omics technologies such as metabolomics, proteomics, and transcriptomics were used to systematically map the cardio-renal metabolism of UCM, screen the core differential proteins and signaling pathways of integrated traditional Chinese and western medicine treatment, and construct a molecular regulatory network of “toxin-target-pathway-efficacy”. To predict the core active components and action targets of traditional Chinese medicine compounds by network pharmacology and molecular docking technology, and to provide a basis for the optimization of traditional Chinese medicine compounds and the research and development of new drugs.

5.2 Optimization of Targeted Therapy and Individualized Regimen

1) Focusing on the core targets such as mitochondrial function and energy metabolism pathway, developing combined preparations of “targeted drugs of western medicine + active ingredients of traditional Chinese medicine” to achieve precise intervention;

2) Based on the patient’s metabolic phenotype, genetic characteristics, and TCM syndrome type, an individualized treatment model was constructed, and the integrated traditional Chinese and western medicine treatment plan was

optimized by an artificial intelligence-assisted system to improve the stability of the therapeutic effect.

3) Early metabolic intervention should be emphasized to identify early metabolic abnormalities before the appearance of clinical symptoms of UCM, and to block the progression of the disease through integrated traditional Chinese and western medicine intervention.

5.3 Cardio-renal Synergy Research and Clinical Translation

1) Breaking the “organ island” research paradigm, establishing a common sample bank of heart and kidney, and carrying out the analysis of “combined use of dual-organ metabolome” to verify the synergistic regulation effect of integrated traditional Chinese and western medicine on heart and kidney energy metabolism.

2) Developing non-invasive or minimally invasive metabolic marker detection techniques (such as serum metabolomics indicators and imaging techniques) to achieve dynamic monitoring and evaluation of therapeutic effect;

3) Carry out large-sample, multi-center and long-term follow-up clinical studies, establish an evidence-based medical evidence system of integrated traditional Chinese and western medicine for the treatment of UCM, and formulate standardized diagnosis and treatment guidelines.

6. Conclusions

Uremic cardiomyopathy, as a serious complication of end-stage CKD, has a complex pathological mechanism and faces many challenges in clinical treatment. Conventional western medicine can quickly control blood pressure and correct anemia and other symptoms, but it is difficult to reverse the core process of myocardial metabolic damage and fibrosis. With the advantages of holistic regulation and multi-target intervention, traditional Chinese medicine (TCM) has shown its unique value [60] in improving cardiac and renal function, regulating metabolic disorders, and reducing inflammatory damage. Through the synergistic effect of “symptomatic control of western medicine + root conditioning of traditional Chinese medicine”, integrated traditional Chinese and Western medicine therapy achieves complementary advantages in regulating energy metabolism, inhibiting inflammatory oxidative stress, reducing fibrosis, and promoting toxin clearance, which has become an important development direction of UCM treatment. Although some progress has been made in current research, there are still some problems, such as insufficient mechanism research depth, low level of clinical evidence, and difficulties in translation and application. In the future, it is necessary to deepen the research on the synergistic mechanism of integrated traditional Chinese and western medicine with the help of systems biology technology. Large sample and multi-center clinical research should be carried out to establish standardized diagnosis and treatment standards. Strengthen the exploration of individualized and precise treatment, and promote the transformation from basic research to clinical application. It is believed that with the deepening of research, the integration of traditional Chinese

and western medicine will provide more effective treatment strategies for UCM patients and significantly improve their clinical prognosis.

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