

Progress in Traditional Chinese Medicine Treatment for Visual Function Impairment in Glaucoma

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Abstract: *Glaucoma is a chronic eye disease with a high global rate of blindness. Its damage to visual function is irreversible, mainly manifested as visual field defects and structural changes of the optic nerve. Although current Western medicine can effectively control intraocular pressure (IOP), it remains limited in slowing or halting the progressive loss of visual function. In recent years, Traditional Chinese Medicine (TCM) has shown unique advantages in the treatment of glaucoma, particularly in improving microcirculation, regulating neural function, and delaying disease progression. This paper systematically reviews the pathological mechanisms underlying visual function impairment in glaucoma and the traditional Chinese medical understanding of its pathogenesis. It focuses on recent advances in TCM interventions—including herbal compound prescriptions, single herbs and their extracts, acupuncture, and other methods—and discusses the current status and advantages of integrated TCM and Western medicine approaches. The paper also identifies current research limitations, such as the lack of high-quality evidence-based studies and standardized diagnostic classification, and proposes future directions involving deeper mechanistic exploration and more rigorous clinical protocols. This aims to provide new insights and theoretical support for the comprehensive prevention and treatment of glaucoma.*

Keywords: *Glaucoma; Visual Function Impairment; Traditional Chinese Medicine; Herbal Compounds; Neuroprotection*

1. Introduction

Glaucoma is a chronic eye disease marked by progressive optic nerve damage and visual field loss, and is the leading cause of irreversible blindness worldwide. By 2040, global cases are projected to exceed 110 million. Although Western treatments—such as medication, laser, and surgery—can reduce intraocular pressure (IOP) and slow progression, they cannot reverse existing nerve damage or fully preserve visual function. In Traditional Chinese Medicine (TCM), glaucoma corresponds to conditions like “Qingmang” and “Neizhang,” attributed to liver and kidney yin deficiency, qi stagnation, and phlegm-dampness obstructing the sensory orifices. With modern research integration, TCM shows potential in regulating ocular microcirculation and protecting the optic nerve. Treatments including herbal formulas, single herbs, and acupuncture are widely studied as complementary therapies. This paper reviews the pathological mechanisms of visual impairment in glaucoma, summarizes TCM treatment progress, and explores integrated therapeutic approaches to guide comprehensive glaucoma management.

2. Overview of Visual Function Impairment in Glaucoma

2.1 Manifestations and Evaluation Indicators

Glaucoma is a chronic disease primarily marked by progressive optic nerve damage and irreversible loss of visual function. In its early stages, it is often asymptomatic; by the time visual field defects emerge, significant irreversible damage to the optic nerve may have already occurred. As shown in Figure 1, the structure of a healthy eye maintains a dynamic balance between aqueous humor production and drainage, with a well-defined optic disc and tightly arranged optic nerve fibers. In contrast, the glaucomatous eye experiences impaired aqueous humor outflow, leading to increased intraocular pressure. This pressure compresses the optic nerve, resulting in axonal degeneration, deepened optic disc cupping, and ultimately, progressive vision loss or blindness[1].

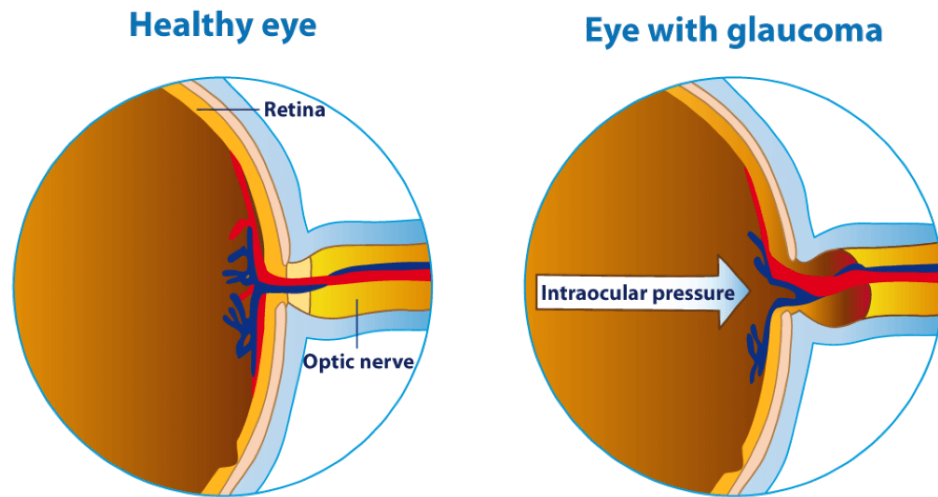


Figure 1 Schematic Comparison between Normal Eye and Glaucomatous Eye Structures

Visual function impairment in glaucoma primarily manifests as visual field defects, decreased visual acuity, and difficulties in night vision. Among these, visual field loss is the most diagnostically significant, with typical patterns including peripheral field constriction, nasal step, arcuate scotoma, and eventually central vision loss[2]. Structural changes such as increased cup-to-disc ratio (C/D ratio > 0.6) and blurred disc margins can be observed through ophthalmoscopy. Optical coherence tomography (OCT) provides quantitative evaluation of retinal nerve fiber layer (RNFL) thickness, aiding in early detection of optic nerve damage. In addition, objective electrophysiological tools such as electroretinography (ERG) and visual evoked potentials (VEP) can assess visual pathway functionality and supplement clinical decision-making. Therefore, evaluating visual function in glaucoma requires an integrated approach that combines subjective assessments (such as static and kinetic perimetry) with objective structural measurements (such as OCT and fundus photography), forming a comprehensive basis for diagnosis, disease monitoring, and treatment adjustment[3].

2.2 Pathological Mechanisms of Visual Function Impairment

Visual function impairment in glaucoma results from progressive optic nerve degeneration driven by multiple interacting factors. While elevated intraocular pressure (IOP) is the most direct cause—compressing the optic nerve head, disrupting axoplasmic flow, and triggering axonal degeneration—other mechanisms also play key roles. Reduced blood flow to the optic nerve due to high IOP or impaired autoregulation leads to ischemia and hypoxia, activating intrinsic apoptotic pathways and accelerating retinal ganglion cell (RGC) loss[4]. This damage can occur even at normal IOP levels, as seen in normal-tension glaucoma. Additionally, oxidative stress and neuroinflammation contribute significantly. Elevated inflammatory cytokines and reactive oxygen species (ROS) in the aqueous humor and optic nerve tissues worsen cellular injury. Mitochondrial dysfunction and glutamate excitotoxicity are also implicated in RGC apoptosis[5]. From a Traditional Chinese Medicine (TCM) perspective, such impairments are linked to liver-kidney deficiency, qi stagnation, and blood stasis. Modern studies suggest TCM therapies may improve microcirculation, reduce oxidative stress, and protect neurons, aligning with biological findings. Overall, glaucomatous visual loss stems from more than just elevated IOP. Effective management requires multidimensional strategies focused on neuroprotection and microenvironment regulation[6].

3. Traditional Chinese Medicine Understanding of Glaucoma Pathogenesis

3.1 TCM Disease Terminology and Syndrome Classification

Although glaucoma lacks a direct equivalent in Traditional Chinese Medicine (TCM), its symptoms—blurred vision, visual field narrowing, eye distension, and blindness—are documented in classical texts such as *Zhubing Yuanhou Lun* and *Zhengzhi Zhunsheng*, under terms like “Qingmang” (dim vision) and “Baomang” (sudden blindness), which correspond to chronic and acute glaucoma, respectively. Modern TCM classifies glaucoma into several syndromes: Liver-Kidney Yin Deficiency: Common in chronic cases, with symptoms like blurred vision, dry eyes, tinnitus, and lumbar

soreness. Liver Yang Hyperactivity: Seen in acute angle-closure glaucoma, with severe eye pain, irritability, and a red tongue. Qi Stagnation and Blood Stasis: Found in advanced stages, marked by stabbing eye pain and a dark, purplish tongue. Phlegm-Damp Obstruction: Seen in obese patients with heavy limbs, greasy tongue, and poor appetite. Some cases show mixed patterns, such as yin-yang or qi-yin deficiency. Treatment involves syndrome differentiation with principles like nourishing liver and kidney, invigorating blood, and clearing fire. In short, while glaucoma has no fixed TCM name, its syndrome classification system offers clear guidance for individualized treatment and integration with modern pathophysiology[7].

3.2 Pathogenesis of Glaucoma from the Perspective of TCM

TCM emphasizes the principle that “internal causes are primary, external causes are secondary,” and attributes the onset of glaucoma to dysfunctions of the liver, kidney, and spleen. The core pathogenesis lies in liver and kidney deficiency, qi and blood disharmony, and obstruction of the sensory orifices by turbid pathogens[8]. Emotional disturbance, dietary irregularities, and overexertion are considered external triggers that transform deficiency into excess, resulting in pathological products such as blood stasis, fire, phlegm, and dampness, which ultimately impair vision and lead to syndromes such as “Qingmang” and “Neizhang.”

(1) Liver and Kidney Deficiency as the Root Cause

Huangdi Neijing states, “The liver opens into the eyes” and “The kidney governs bone and generates marrow that connects to the brain,” highlighting the importance of liver and kidney essence in eye health. Most glaucoma patients are middle-aged or elderly with declining liver and kidney function and insufficient essence and blood to nourish the eyes. This leads to optic nerve and retinal undernourishment, gradual dimming of vision, and functional decline. In later stages, symptoms like lumbar soreness, tinnitus, and fatigue further confirm the constitutional deficiency.

(2) Qi Stagnation and Blood Stasis Obstructing the Meridians

When qi flows smoothly, blood circulates; when qi stagnates, blood stasis occurs. TCM holds that “blood stasis blocks the collaterals, and blockage deprives the eyes of nourishment.” Glaucoma patients often experience distending eye pain, splitting headache, dark tongue with stasis spots, and a choppy pulse. Qi stagnation can impede aqueous humor dynamics, elevate IOP, disrupt ocular microcirculation, and result in chronic ischemic damage to the optic nerve and irreversible visual function loss.

(3) Phlegm-Damp Obstructing the Clear Orifices

The spleen governs transformation and transportation; when weakened, it produces phlegm. Phlegm-dampness can block the orifices and obscure vision. Some glaucoma patients show signs of head heaviness, chest tightness, fatigue, greasy tongue coating, and poor digestion. In modern contexts of high-fat diets and sedentary lifestyles, metabolic disturbances worsen ocular pathology, making phlegm-dampness a key pathological factor in recurrent or refractory cases.

(4) Hyperactive Liver Fire Injuring the Eye Collaterals

Emotional stress, suppressed anger, or yin deficiency can lead to liver fire rising. Acute glaucoma episodes often involve red, painful eyes, sudden vision loss, throbbing headache, bitter taste, dry throat, and irritability—indicative of liver fire attacking the eyes. TCM often treats this pattern with herbs that clear liver fire, extinguish wind, and brighten vision to relieve IOP and inflammation.

(5) Invasion of External Pathogens and Emotional Triggers

Wind, heat, or toxins invading from the exterior may trigger latent internal imbalances, especially during abrupt climate changes, environmental stress, or visual fatigue, leading to IOP fluctuations. Excessive emotions may cause liver qi stagnation, further exacerbating blood stasis and disease progression. Modern studies also confirm that emotional stress can activate sympathetic nerves and affect IOP regulation, aligning with TCM theories such as “anger harms the liver” and “grief damages qi.”

In conclusion, TCM views glaucoma as a condition of root deficiency with secondary excess, involving a mix of deficiency and excess syndromes. The core pathogenesis lies in liver and kidney deficiency, complicated by qi stagnation, blood stasis, phlegm obstruction, and liver fire. TCM syndrome differentiation and holistic treatment—focusing on nourishing the liver and kidney, invigorating blood, resolving phlegm, and clearing fire—can effectively modulate the ocular microenvironment, delay disease progression, and offer a unique perspective to complement modern glaucoma management[9].

4. Progress in Traditional Chinese Medicine (TCM) Treatment Research

In recent years, the value of TCM in glaucoma treatment has become increasingly evident. TCM not only plays a positive role in delaying visual function impairment and stabilizing intraocular pressure (IOP) fluctuations, but also significantly contributes to improving patients' overall quality of life, reducing adverse drug reactions, and enabling individualized interventions. TCM-based treatment encompasses multi-level and multi-mechanism therapeutic strategies, including classical herbal formulas, single-herb medicines, modern preparations, and external therapies. Regarding herbal compound prescriptions, classical formulas such as Qiju Dihuang Wan and Mingmu Dihuang Decoction, known for nourishing the liver and kidneys, clearing heat, and improving vision, are widely used in patients with liver-kidney yin deficiency. Meanwhile, formulas such as Xuefu Zhuyu Tang and Tongqiao Huoxue Tang, which promote blood circulation and unblock meridians, are more suitable for patients with qi stagnation and blood stasis syndromes, helping improve fundus microcirculation and relieve IOP-related discomfort. Modern research has confirmed that these prescriptions exert therapeutic effects through synergistic actions including neuroprotection, anti-inflammatory and antioxidant activity, and regulation of optic nerve blood perfusion[10].



Figure 2 Application of Auricular Acupressure Seeds in the Adjunctive Treatment of Glaucoma

In addition, significant progress has been made in the study of single herbs and their active components. Herbs such as *Salvia miltiorrhiza* (Danshen), *Astragalus membranaceus*, *Chrysanthemum*, and *Cassia obtusifolia* have demonstrated beneficial effects. Their active constituents—including tanshinones, flavonoids, and quercetin—exhibit properties such as anti-apoptotic activity, antioxidation, and vasodilation, which help improve the local ocular microenvironment and reduce optic nerve damage in glaucoma patients. Besides pharmacological treatments, TCM external therapies—recognized for being noninvasive, gentle, and highly acceptable—also play a significant role in the auxiliary treatment of glaucoma. Auricular acupressure, in particular, has gained widespread clinical popularity in recent years. As shown in Figure 2, seeds of *Vaccaria segetalis* or small magnetic beads are placed on specific auricular points (e.g., Eye, Liver, Sympathetic) and pressed regularly by the patient under guidance. Continuous stimulation of these nerve terminals and meridian response zones on the ear is believed to regulate internal organ function, promote qi and blood flow, and restore yin-yang balance. Modern studies suggest that auricular acupressure can modulate autonomic nervous system activity via neural reflexes, thereby influencing systemic circulation and endocrine status. This intervention has been shown to stabilize IOP and alleviate symptoms such as ocular distension and dizziness, and is particularly suitable for chronic-phase management or postoperative recovery. Recent preclinical studies have also found that combining acupuncture with auricular acupressure may not only help maintain IOP stability but also promote retinal ganglion cell function, demonstrating potential neuroprotective benefits. These findings suggest that TCM external therapies, beyond their palliative function, may become important adjunctive strategies for delaying the progression of visual

function impairment. In summary, research on TCM treatment of glaucoma has evolved from symptomatic relief to mechanistic exploration, and from traditional empirical use to evidence-based approaches. Whether through herbal compound formulas, active extractives, or non-invasive external therapies such as auricular acupressure, TCM offers multi-target, low-toxicity, and sustainable interventions. These provide a more comprehensive and individualized treatment strategy for glaucoma. However, further studies are needed to enhance outcome quantification, standardize treatment protocols, and clarify mechanisms of action to better integrate TCM into the modern clinical management of glaucoma.

5. Exploration of Integrated TCM and Western Medicine Treatment

5.1 Analysis of Combined Treatment Models

In clinical practice, while Western medicine offers effective IOP-lowering treatments for glaucoma—such as pharmacologic therapy, laser procedures, or surgical drainage—it remains limited in preventing optic nerve degeneration and restoring visual function. Additionally, long-term use of Western medications may lead to drug dependence and adverse effects. To address these limitations, integrated TCM and Western medicine approaches have gradually emerged as an important direction in comprehensive glaucoma management. This combined treatment model emphasizes the integration of modern diagnostic precision and IOP control with the TCM principles of holistic regulation and syndrome differentiation. It aims to construct a multidimensional intervention system with “IOP control as the foundation, neuroprotection as the core, and systemic balance as the support.” Common forms of integrated treatment include:

1) Herbal and pharmaceutical IOP-lowering combinations

Clinical studies have shown that combining formulas such as Qiju Dihuang Wan or Mingmu Dihuang Decoction with beta-blockers or prostaglandin analogs for treating primary open-angle glaucoma does not interfere with Western medications' hypotensive effects. On the contrary, these combinations may reduce side effects and enhance treatment stability. For example, patients using combined therapies showed improvements in optic nerve cupping, macular thickness, and fundus blood flow—indicating neuroprotection and enhanced microcirculation.

2) Pre- and postoperative integrative interventions

In the surgical treatment of acute angle-closure glaucoma, TCM can help alleviate acute symptoms preoperatively by regulating qi and relieving ocular pressure. Postoperatively, treatments that invigorate qi, nourish yin, and promote blood circulation assist in tissue repair, inflammation reduction, and recurrence prevention. Non-pharmacologic therapies such as acupuncture and auricular acupressure have also been shown to alleviate discomfort and accelerate recovery during the postoperative phase.

3) Functional combination strategies

Some studies have explored functionally integrated programs that target visual function preservation. On the basis of IOP control by Western medications, TCM therapies are added to reduce visual fatigue, regulate sleep quality, and manage emotional states, thereby improving patients' systemic tolerance and visual system adaptability. Such strategies prioritize long-term disease management and individualized care, aligning with modern chronic disease models.

In general, integrated TCM and Western treatment embodies the concept of “complementary advantages and synergistic efficacy.” While Western medicine can quickly control acute symptoms, TCM offers holistic, multi-targeted regulation that enhances the body's ability to resist pathophysiological damage. Current clinical observations and systematic reviews have confirmed that combined treatments outperform monotherapy in preserving visual function, improving quality of life, and reducing recurrence rates. However, potential issues such as herb-drug interactions and inconsistent evaluation standards must be addressed through pathway optimization and large-scale clinical studies to ensure safety and efficacy.

5.2 Potential of TCM Interventions in Delaying Visual Function Deterioration

The central concern in glaucoma is the irreversible nature of its visual function impairment. Once optic nerve fibers are damaged, regeneration is virtually impossible. Therefore, beyond lowering IOP, the key clinical goal is to delay or prevent further loss of vision. In recent years, both clinical and basic

research have increasingly shown that TCM holds unique advantages and developmental potential in this area. TCM not only complements IOP-lowering therapies but also contributes to neuroprotection, microcirculation improvement, and enhanced systemic resilience. Clinical observations indicate that some TCM prescriptions, when used alongside IOP control, can slow visual field loss and improve optic disc morphology, suggesting neurofunctional preservation. For example, long-term use of formulas that nourish the liver and kidneys and promote circulation often leads to reduced ocular pressure sensations, fewer headaches, and less visual fatigue—reflecting improved tissue stability and systemic synergy. Additionally, prospective clinical trials have reported significantly higher visual function maintenance rates in patients receiving combined therapy compared to those using Western medicine alone, highlighting the enduring efficacy of TCM interventions during the chronic phase. Mechanistically, TCM exerts effects through multi-target pathways such as “tonifying deficiency,” “activating blood circulation,” “eliminating dampness,” and “clearing heat.” These not only regulate aqueous humor dynamics but also influence ocular blood flow, cellular metabolism, and oxidative stress. Active compounds like tanshinones and astragalus polysaccharides have been shown to inhibit apoptosis signaling (e.g., caspase-3), modulate local vascular endothelial factors, and enhance retinal ganglion cell survival. Furthermore, therapies such as auricular acupressure and acupuncture, by stimulating specific acupoints, can adjust sympathetic tone and improve cerebral-ocular blood supply, thus indirectly slowing vision deterioration. Importantly, TCM also emphasizes constitutional conditioning and emotional regulation, which are crucial for long-term glaucoma management. As a chronic progressive disease, glaucoma is closely tied to psychological stress and lifestyle factors. TCM’s holistic approach helps patients establish healthy routines and relieve anxiety, thereby improving treatment adherence and enhancing long-term outcomes. While challenges remain—such as insufficient mechanistic research and a lack of unified efficacy evaluation criteria—current findings have already demonstrated the potential of TCM in delaying visual decline. With the aid of modern technologies such as imaging, molecular biology, and clinical evaluation tools, future research will further clarify both short- and long-term benefits, ultimately elevating TCM from an adjunctive role to a central intervention in the neuroprotection of glaucoma.

6. Challenges and Future Directions

Although research on the role of Traditional Chinese Medicine (TCM) in preserving visual function in glaucoma has made notable progress in recent years, it remains largely in a transitional phase—from empirical observation to scientific validation. While the potential of TCM interventions has been increasingly acknowledged, it is equally important to recognize the current limitations in theoretical frameworks, research methodologies, and levels of evidence that need to be addressed. First, syndrome differentiation standards in TCM remain inconsistent, and a systematic classification system is still lacking. In clinical practice, the classification of TCM syndromes for glaucoma often relies on individual practitioner experience. Although commonly recognized patterns such as liver-kidney yin deficiency, liver yang hyperactivity, and qi stagnation with blood stasis have been proposed, there is a lack of standardized diagnostic scales and hierarchy of evidence. This impedes the reproducibility of pattern differentiation across centers and populations, limits the comparability of treatment outcomes, and restricts the application of modern research tools within the TCM theoretical framework. Second, the evaluation system for TCM efficacy remains underdeveloped, and high-quality evidence-based support is lacking. Most existing studies are observational, single-center, and small-scale, with relatively few randomized controlled trials (RCTs). Inconsistent inclusion criteria and complex intervention protocols make it difficult to establish globally recognized clinical evidence chains. Moreover, many studies focus on IOP changes or subjective symptom scores, while objective visual function indicators—such as OCT parameters, visual field indices, and retinal nerve fiber layer thickness—are seldom systematically analyzed, weakening the clinical persuasiveness of outcomes. Third, mechanistic studies are relatively limited, and the integration of modern technologies with TCM research is still insufficient. Although some pharmacological studies have preliminarily revealed the neuroprotective effects of compounds like tanshinones and flavonoids, most findings remain at the *in vitro* or animal study level. These are not directly applicable to real-world clinical settings due to discrepancies in dosage, formulation, and compound complexity. Furthermore, therapies such as acupuncture and auricular acupressure still lack thorough mechanistic interpretation from the perspective of modern neuroscience, reducing their credibility and acceptance in international academic discourse. Additionally, at the level of integrated TCM and Western medicine, there is no standardized clinical pathway for combined treatment. Key issues remain unsolved, such as how to formulate scientific combination protocols, avoid drug interactions, and establish interdisciplinary evaluation models. Individualized care, long-term management, and therapeutic follow-up also lack a systematic

framework and sufficient data, limiting the depth of TCM involvement in the chronic management of glaucoma. Looking forward, the following strategies should be prioritized in advancing TCM research in glaucoma treatment: (1) Establish standardized diagnostic criteria and syndrome differentiation tools to improve the objectivity and reproducibility of TCM patterns; (2) Conduct large-scale, multicenter, double-blind RCTs, with a focus on longitudinal changes in objective visual function indicators; (3) Integrate modern technologies such as multimodal imaging, biomarker detection, transcriptomics, and metabolomics to deepen mechanistic understanding and promote precision-based development of TCM; (4) Explore the use of AI and big data in glaucoma management to enable intelligent, personalized, and remotely accessible TCM-based treatment models. In summary, while the path of TCM treatment for glaucomatous visual impairment is still under refinement, its theoretical foundation—centered on holistic regulation, microenvironment optimization, and multi-target intervention—shows great promise. With systematic promotion through policy design, research investment, and interdisciplinary integration, TCM is well-positioned to shift from an adjunctive role to a core therapeutic force in glaucoma prevention and treatment, contributing a distinctive, China-originated approach to global chronic eye disease management.

7. Conclusion

Glaucoma is a chronic blinding disease characterized primarily by optic nerve damage, and Western medical approaches alone are often insufficient to fully prevent the deterioration of visual function. TCM offers complementary advantages through holistic regulation, syndrome-based differentiation, and multi-target interventions, demonstrating potential in improving visual function and delaying disease progression. Current research has developed relatively systematic intervention models—from compound herbal formulas and active constituents to acupuncture and auricular therapies—and integrated TCM-Western medicine approaches have yielded encouraging clinical results. Nevertheless, challenges remain, including the lack of standardized syndrome classification, limited mechanistic research, and insufficient evidence-based validation. Future efforts should focus on standardizing clinical research, expanding multicenter trials, and deepening mechanistic exploration to promote the scientific and standardized application of TCM in glaucoma treatment, ultimately providing more reliable therapeutic options for preserving visual function and enhancing quality of life.

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