

Research Progress on the Treatment of Myopia in Traditional Chinese Medicine based on the Theory “The Liver Opens into the Eyes”

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Abstract: *In Traditional Chinese Medicine, myopia is classified as “inability to see distant objects” or “inability of the eyes to see far.” Its core pathogenesis lies in qi stagnation and blood stasis, as well as deficiency of qi and blood, which obstruct the nourishment of the ocular orifices by qi and blood, resulting in insufficient nourishment of the ocular collaterals and a dimmed visual acuity. Based on the theory that “the liver opens its orifice to the eyes”—where liver blood nourishes the ocular orifices and liver qi ascends to the eyes—this concept exhibits a high degree of intrinsic consistency with the pathogenic mechanism of myopia characterized by “qi stagnation and blood stasis, as well as deficiency of qi and blood.” From the perspective of modern pathophysiology, the upregulation of hypoxia-inducible factor-1 α (HIF-1 α) and the downregulation of transforming growth factor- β (TGF- β) have been identified as key mechanisms in the progression of myopia. Guided by the theory that “the liver opens into the eyes,” TCM interventions primarily follow two major therapeutic principles: regulating the liver and harmonizing qi, and nourishing blood to soothe the liver. Clinical and experimental studies have shown that this therapeutic approach can improve choroidal blood supply, alleviate scleral hypoxia, and slow the increase in axial length, demonstrating a comprehensive, multi-target effect. This article systematically traces the origins and development of the theory that “the liver opens into the eyes” and reviews the progress of TCM research on myopia treatment guided by this theory, with the aim of providing theoretical references and evidence-based support for the development of standardized integrated Chinese and Western medicine strategies for myopia prevention and control.*

Keywords: Myopia, “The Liver Opens into the Eyes”, Traditional Chinese Medicine treatment, Scleral remodeling, Axial length elongation.

1. Introduction

Myopia is a refractive error characterized primarily by blurred distance vision. In recent years, driven by significant changes in lifestyles and educational models, the global prevalence of this condition has continued to rise, and it has now become a major public health issue. Myopia not only impairs patients' visual function and quality of life but also increases the socioeconomic burden. Furthermore, high myopia is prone to inducing complications such as retinal detachment and age-related macular degeneration, and may even cause irreversible vision loss [1]. Modern research has revealed that abnormal axial length growth is the core driving factor in the progression of myopia, with its pathological changes involving the inhibition of retinal dopamine signaling, scleral collagen remodeling, and choroidal ischemia and hypoxia, among others [2–4]. Among these, the upregulation of hypoxia-inducible factor-1 α (HIF-1 α) and the downregulation of transforming growth factor- β (TGF- β) are key signaling events leading to scleral remodeling [5,6]. Currently, clinical interventions primarily involve low-concentration atropine, orthokeratology, and optical correction. Although these methods can slow axial length growth, they have limitations such as rebound after discontinuation and the risk of infection, and there is significant variability in treatment efficacy among individuals [7,8]. Traditional Chinese medicine (TCM) therapies, with their advantages of multi-target synergy, safety, and convenience, are increasingly becoming a focus of clinical research [9,10]. Myopia falls under the TCM categories of “a condition where one can see nearby objects but struggles with distant ones” and “inability of the eyes to see far,” rooted in qi stagnation and blood stasis, as well as deficiency of qi and blood. This leads to obstruction in the

orifices and collaterals of the eyes, preventing the “spiritual light” from projecting to distant objects, thereby manifesting as myopia. This aligns closely with the theory that “the liver opens its orifice to the eyes.” This theory was first recorded in the Su Wen (Simple Questions), and subsequent generations developed related concepts such as “Liver Qi communicates with the eyes” and “The liver receives blood and thus enables vision,” further enriching its academic significance [11,12]. These perspectives clearly indicate that the free flow of Liver Qi and the nourishing action of Liver Blood are essential foundations for maintaining visual function. Based on this understanding, the fundamental treatment principles of TCM for myopia are to regulate Liver Qi and nourish the blood to soothe the liver. Clinically, treatments such as acupuncture at acupoints around the eyes and oral administration of compound formulas that nourish blood and regulate liver qi are commonly used to improve choroidal blood supply and alleviate scleral hypoxia, thereby slowing axial length growth and protecting visual function [1,13–18]. This article systematically reviews research progress on the treatment of myopia in TCM guided by the theory that “the liver opens its orifice to the eyes,” aiming to provide a theoretical basis and evidence-based support for establishing safe, effective, and standardized strategies for the prevention and control of myopia through the integration of TCM and Western medicine.

2. Basic Overview of Myopia

Myopia is a refractive error that is becoming increasingly prevalent worldwide. In recent years, its incidence has continued to rise, and it is increasingly becoming a major public health challenge facing countries around the world.

Based on an analysis of relevant data, Holden BA, and others predict that by 2050, the global prevalence of myopia will rise to 49.8%. The situation regarding myopia prevention and control in China is also cause for concern. Data from show that between 2005 and 2019, the overall myopia rate among students aged 7–18 in China rose from 47.92% to 60.08%; simultaneously, the prevalence of myopia among Han Chinese students aged 6–18 also showed a gradual increase with age. Myopia not only affects patients' psychological well-being, social functioning, and quality of life but also places a heavier economic burden on families. Of particular concern is that high myopia poses a serious threat to the visual health of children and adolescents; associated complications such as retinal detachment, macular degeneration, and glaucoma can lead to irreversible vision loss and even blindness [4]. From a pathophysiological perspective, high myopia is driven by the interaction between genetic susceptibility and environmental factors [21]; essentially, they result from abnormal axial length growth and an imbalance in accommodative function, ultimately leading to refractive errors. Specifically, retinal optical defocus activates the retina-sclera signaling pathway, inhibits dopamine release, and thereby promotes scleral collagen remodeling, choroidal thinning, and axial length growth. Environmental factors such as close-up work and insufficient light exposure further exacerbate this process [2,8,22], which collectively contribute to irreversible refractive changes. Currently, Western medical treatments remain the primary means of myopia intervention. Clinically, interventions often include pharmacological interventions such as low-concentration atropine, optical corrections such as spectacle lenses or orthokeratology lenses, and physical therapies such as vision training. While these methods offer certain advantages in slowing axial length growth and enabling individualized, precise regulation, each intervention has its own limitations. Discontinuation of low-concentration atropine often leads to a rebound in refractive error; the use of orthokeratology lenses requires strict adherence to hygiene protocols to reduce the risk of infection; and visual training and conventional eyeglasses can only correct refractive errors, with limited effectiveness in inhibiting axial length elongation [7,12,23–27]. Given the aforementioned adverse reactions and the risk of regression after discontinuation, there is a clinical need to explore safer and more sustainable long-term intervention strategies. Traditional Chinese medicine (TCM) treatment for myopia offers advantages such as ease of administration, diverse modalities, few adverse reactions, and cost-effectiveness. It can complement conventional Western medical therapies and play a unique role in prevention, control, and treatment at different stages of myopia onset and progression. Therefore, guided by the theory that “the liver opens its orifice to the eyes,” TCM treatment for myopia—through methods such as herbal medicine, acupuncture, and auricular acupuncture—achieves effects such as improving visual function and ocular blood flow and slowing the progression of myopia. This approach is of great significance for enriching myopia treatment strategies and achieving synergistic effects through a multi-modal approach.

3. Etiology and Pathogenesis of Myopia

Traditional Chinese Medicine has long recognized the etiology and pathogenesis of myopia, classifying it under

categories such as “the syndrome of being able to see nearby but not far away” and “inability of the eyes to see distant objects.” Its causes can be attributed to congenital constitutional deficiency, improper use of the eyes, and inappropriate dietary and lifestyle habits, which lead to pathological states of qi stagnation and blood stasis, as well as deficiency of qi and blood. Ultimately, this results in a lack of moisture in the ocular orifices, causing blurred vision when looking at distant objects. The *Treatise on the Origins and Symptoms of Various Diseases: Symptoms of Eye Diseases* was the earliest text to document this condition, describing it as “the eyes being unable to see distant objects, with vision appearing hazy and indistinct,” and emphasizing that “exhaustion of the zang-fu organs and deficiency of liver qi” were its primary causes. The *Essentials of the Silver Sea* directly identifies the cause of this disease as “blood deficiency and qi insufficiency”; The *Precious Manual on Eye Examination: Internal Ophthalmic Disorders* first introduced the term “syndrome of being able to see up close but unable to see far,” proposing that “deficiency in the Liver Meridian leads to disease in the Kidney Meridian” and emphasizing that depletion of the Liver Meridian and insufficiency of the spirit's radiance are key pathogenic mechanisms. Furthermore, the principle that “prolonged visual strain injures the blood; prolonged worry injures the spirit; when the spirit is injured, fire is stirred; when fire is stirred, the blood becomes dry; when the blood is dry, stasis occurs”—thus elucidating that deficiency of qi and blood, along with qi stagnation and blood stasis, constitute the core pathogenesis of this disease; The *Comprehensive Treatise on Ophthalmology* formally established the term “myopia.” The statement in the text, “If both eyes are nearsighted from birth, it is a natural condition; if not, it is a source of future trouble,” clarifies that the etiology is closely related to heredity. The passage, “When essence and blood are deficient, the light is insufficient; when dispersion is impaired, the orifices do not function properly,” suggests that the pathogenesis involves deficiency of qi and blood and stagnation of liver qi, ultimately leading to a lack of nourishment for the ocular orifices and the failure of the spiritual light to be concentrated.

In summary, the pathogenesis of myopia can be summarized as qi stagnation and blood stasis in the liver, coupled with deficiency of qi and blood. Insufficient liver blood fails to ascend to nourish the eyes, while stagnant liver qi impedes the flow of the ocular collaterals; both factors affect the ocular orifices, depriving the eyes of proper nourishment, and ultimately result in difficulty seeing distant objects while being able to see nearby ones, as well as blurred and dim vision.

4. Treatment of Myopia Based on the Theory that “The Liver Opens into the Eyes”

The pathogenesis of myopia centers on qi stagnation and blood stasis, as well as deficiency of qi and blood. The theory that “the liver opens its orifice to the eyes” was first proposed in *The Plain Questions: Discourse on the True Words of the Golden Chamber* and later elaborated upon in numerous classical texts, establishing that the liver's blood nourishes the eyes and the liver's qi regulates the flow of qi as the foundation of visual function [28]. This theory aims to tonify and regulate the liver, regulate qi, nourish blood, and soften

the liver, thereby nourishing the orifices of the eyes to enhance visual acuity. Modern medicine has revealed that scleral hypoxia and collagen remodeling are key events in the progression of myopia, with the upregulation of HIF-1 α and downregulation of TGF- β expression constituting the primary molecular pathway changes [5,6,16]. Both approaches share a common focus on “regulating the Liver’s function of discharge and restoring the flow of qi and blood to the orifices of the eyes.” Traditional Chinese Medicine (TCM) nourishes the eye collaterals by soothing the Liver and nourishing the blood, while Western medicine targets scleral hypoxia and abnormal collagen metabolism to slow axial length growth. The core philosophy of both lies in restoring the nourishment of qi and blood to the orifices of the eyes and maintaining their structural homeostasis; their underlying logic is highly consistent. This understanding provides a direct theoretical foundation for TCM myopia treatment based on the theory that “the liver opens its orifice to the eyes” [13,15,17].

4.1 Origins of the “Liver Opens into the Eyes” Theory

The original formulation of “the liver opens its orifice to the eyes” first appeared in *The Plain Questions: Discourse on the True Words of the Golden Chamber*: “The east is associated with the color blue; it communicates with the liver, opens its orifice to the eyes, and stores essence in the liver.” This view regards the eyes and the liver as interconnected in both physiological and pathological terms, aiming to establish the eyes’ crucial role as the external orifice of the liver [28]; *The Lingshu: Pulse Measurements* states: “Liver qi communicates with the eyes; when the liver is harmonious, the eyes can distinguish the five colors,” emphasizing that the regulated flow of liver qi is the procedural foundation for the eyes to function normally [28,29]; *The Su Wen: Chapter on the Generation of the Five Zang Organs* states: “When a person lies down, blood returns to the liver; the liver receives blood and thus enables vision.” This passage first reveals the physiological relationship between liver blood and the eyes, elucidating that the nourishment of the eyes by liver blood is the material foundation for maintaining visual function [11]; *The Ling Shu: Treatise on Meridians* elaborates on the Liver Meridian: “...connects to the eye meridian, emerges from the forehead, and meets the Governor Vessel at the crown,” providing a certain meridian-based foundation for this theory; *Treatise on the Origins and Symptoms of Various Diseases: Diseases of the Five Zang Organs and Six Fu Organs* concludes that “when liver qi is excessive..., it should be purged; when liver qi is deficient..., it should be tonified,” clarifying the principles of tonification and purgation for treating liver-related eye diseases [30]; Furthermore, *Essential Prescriptions Worth a Thousand Pieces of Gold for Emergency Use: Diseases of the Seven Orifices* distinguishes between tonifying and draining treatment methods based on the age of fifty: “Before the age of fifty, one may take the Liver-Draining Decoction; after fifty, one must not drain the liver... but should only tonify the liver,” thereby establishing a diagnostic and therapeutic system for eye diseases based on the theory that “the liver opens into the eyes” [30]; *Taiping Shenghui Fang* first proposed the concept of the “five circles of the eye,” further clarifying the specific locations associated with the theory that “the liver opens into the eyes,” and placed the liver at the forefront of discussions on the pathogenesis of eye diseases. In summary, the theory that “the liver opens into

the eyes” not only substantiates the physiological relationship and functional basis between the liver and the eyes but also provides a solid theoretical foundation for the construction of a comprehensive diagnostic and therapeutic system [31].

To this day, this theory continues to be relevant in contemporary clinical practice. In ophthalmology, this ancient theory has gradually given rise to a comprehensive treatment principle encompassing “regulating the liver and promoting the flow of qi, and nourishing the blood to soothe the liver,” which is widely applied in the treatment of various ophthalmic conditions: The treatment of thyroid-associated ophthalmopathy should prioritize “regulating, soothing, and softening the liver” to improve patients’ clinical symptoms [11]; cases of dry eye have confirmed that this approach can significantly improve tear secretion and tear film stability [32,33]; in the treatment of cataracts from a liver-centered perspective, Xiaoyao San is first administered to soothe the liver and regulate qi, followed by modified formulas incorporating ingredients such as Mimenghua to nourish the liver and improve vision, with all follow-up visits showing marked efficacy [34]; This provides a new theoretical perspective and intervention pathway for the development of a comprehensive treatment system for optic nerve damage caused by glaucoma [35]. Although the pathologies differ, the treatment remains centered on regulating and tonifying the liver’s qi and blood and restoring the circulation of qi, blood, and body fluids in the eyes. This is highly consistent with the pathogenesis of myopia characterized by qi stagnation and blood stasis, as well as deficiency of qi and blood, providing a solid theoretical foundation for the treatment of myopia using Traditional Chinese Medicine.

4.2 Traditional Chinese Medicine Treatment for Myopia Based on the Theory of “The Liver Opens Its Orifice to the Eyes”

Throughout history, although medical practitioners have employed various methods to treat myopia, they have all converged on the principle of “soothing the liver and regulating qi, nourishing blood and softening the liver.” The *Shenshi Yaohan* dedicates a chapter titled “Ability to See Up Close but Difficulty Seeing Afar,” stating that “insufficient liver blood prevents the spirit’s light from shining forth,” and treats this with *Dizhi Pills* to generate blood and regulate qi; the *Yinhai Jingwei* emphasizes that “stagnation of liver qi causes blurred vision” and pioneered the use of *Jiawei Xiugan Powder* to clear and regulate liver qi. Building on this foundation, modern clinical practice employs acupuncture at acupoints around the eyes in combination with distal acupoints to soothe the liver and unblock the meridians, or prescribes oral formulations such as the *Zhu Jing Pills*, the *Blood-Nourishing and Kidney-Tonifying Formula*, and the *Qi-Boosting, Yin-Nourishing, and Vision-Enhancing Formula* to nourish the blood and soften the liver. Although the treatment methods differ, the core principle remains “soothing the liver and regulating qi, nourishing the blood and softening the liver,” jointly achieving the restoration of qi and blood in the ocular orifices and the maintenance of clear vision.

4.2.1 Soothing the Liver, Regulating Qi, and Improving Vision

In the acupuncture treatment of myopia, acupoints around the eyes are frequently selected, such as Jingming, Zanzhu, Taiyang, Tongziliang, and Sizhukong, combined with distal points such as Taichong, Zusanli, and Guangming to soothe the liver and improve vision. This approach enhances the excitability of retinal ganglion cells and relieves spasm of the ciliary muscle and periocular muscles, thereby improving visual function [37–39]; Common Chinese herbal medicines used include Goji berries, Chinese angelica root, Schisandra berries, Acorus tatarinowii rhizom, and Polygala root—all of which help soothe the liver and regulate blood circulation [40]. These herbs improve ocular microcirculation and nutrient supply, restore the balance of intraocular fluid metabolism and retinal function, thereby slowing the progression of myopia [9,10].

Acupuncture and herbal formulas exert their effects by improving scleral hypoxia and inhibiting axial length growth. Gao Yunxian [18] found that electroacupuncture stimulation of the Jingming acupoint in rats with form-deprivation-induced myopia resulted in significantly higher serum TGF- β 2 levels in the electroacupuncture group compared to the myopia model group; the effect was comparable to that of retrobulbar injection of epidermal growth factor or retrobulbar injection of the epidermal growth factor receptor; Deng Rou [17] et al. used acupuncture at the Taiyang, Hegu, Gan Shu, and Shen Ting points to intervene in a myopic rat model. The HIF-1 α protein expression levels in the sclera of guinea pigs in the acupuncture group were significantly lower than those in the model group, suggesting that acupuncture can improve scleral hypoxia by downregulating HIF-1 α protein expression, thereby delaying myopia; Chen Shu et al. administered different doses of the “Myopia Reversal Pill” (primarily composed of traditional Chinese medicinal herbs such as Bupleurum, Salvia, Angelica, Acorus, Polygala, Paeonia, and Carica) to guinea pigs in a myopia model and observed that the pill significantly increased TGF- β 1 expression levels; Hao Wu [16] et al. administered the traditional Chinese medicine monomer rhodioliol via peribulbar injection in guinea pigs with a myopia model and demonstrated that it could reverse hypoxia-induced HIF-1 α upregulation, thereby alleviating scleral hypoxia and delaying axial length growth.

In summary, the treatment of myopia with traditional Chinese medicine is based on the theory that “the liver opens its orifice to the eyes.” Under the key therapeutic principle of “soothing the liver, regulating qi, and improving vision,” it downregulates HIF-1 α expression and upregulates TGF- β 2 expression, thereby enhancing scleral stability, controlling axial length, and improving visual function.

4.2.2 Nourishing Blood, Softening the Liver, and Clarifying Vision

For the treatment of myopia, Tujing Pills (primarily composed of Cuscuta seed, Lycium fruit, Cistanche, and prepared Rehmannia root), the Blood-Nourishing and Kidney-Tonifying Formula (primarily composed of Rubus fruit, Cuscuta seed, Lycium fruit, prepared Rehmannia root, Angelica sinensis, and white peony root), and the Qi-Boosting, Yin-Nourishing, and Vision-Enhancing Formula (primarily composed of prepared Rehmannia root, Angelica sinensis, White Peony Root, Bupleurum, Papaya, and Dodder Seed,

among others). These oral formulations nourish the blood and soothe the liver, thereby improving vision.

The effectiveness of TCM in treating myopia has been conclusively demonstrated by experimental evidence. Zhang Miao [15] and others administered a Zujing Wan suspension via gastric lavage to rats with a myopia model. They observed that the experimental group’s refractive error and axial length showed significant improvement compared to the control group, and the experimental group exhibited a more compact scleral tissue structure. In accordance with the TCM theory that “the liver opens its orifice to the eyes,” this therapy improves ocular microcirculatory disorders by nourishing the blood and soothing the liver. Yongle Du [14] et al. found that the Zhujing Wan treatment group could counteract the progression of myopia and alleviate retinal ischemia-hypoxia by reducing inducible nitric oxide synthase (iNOS) mRNA expression, increasing LPCAT1 mRNA expression, and elevating levels of 4-acetylaminobutyric acid and DL-DPPC. Wang Xiaojing [10] and colleagues observed in a myopia rat model that rats in the “Nourish Blood and Tonify Kidney” formula group exhibited significantly higher levels of TGF- β 2 expression compared to the control group, and that this formula increased retinal thickness and the number of ganglion cells, thereby delaying scleral thinning and axial length elongation. Zi Yingxin [13] et al. conducted an experimental study in which rats were administered the “Qi-tonifying, Yin-nourishing, and Vision-enhancing Formula” via gastric lavage. They found that, compared with the myopia model group, the TCM group exhibited significantly reduced expression of HIF1- α and nNOS proteins in scleral tissue, thereby inhibiting scleral remodeling and participating in the retinal neuroregulatory network associated with myopia.

In summary, based on the theory that “the liver opens its orifice to the eyes,” and through the key therapeutic principle of “nourishing blood, softening the liver, and improving vision,” the syndrome-differentiated use of oral Chinese herbal medicine can inhibit the expression of iNOS and HIF1- α proteins, thereby maintaining the compact structure of the sclera, delaying axial lengthening, and achieving comprehensive effects such as reducing damage to the sclera and retina and protecting visual function.

5. Summary and Outlook

From the perspective of Traditional Chinese Medicine, the core pathogenesis of myopia lies in qi stagnation and blood stasis, as well as deficiency of qi and blood, which ultimately lead to impaired circulation in the ocular meridians and inadequate nourishment of the eyes—a finding that aligns closely with the theory that “the liver opens its orifice to the eyes.” Guided by this theory, the treatment principles for myopia emphasize soothing the liver and regulating qi, as well as nourishing blood and softening the liver, to restore the normal flow of qi and blood through the ocular orifices. Modern mechanistic studies indicate that the pathological basis of myopia involves changes such as choroidal thinning, retinal pigment epithelium dysfunction, and scleral remodeling. Key mechanisms include decreased TGF- β expression and increased HIF-1 α expression [5,6,41]. Based on the theory that “the liver opens its orifice to the eyes,” TCM treatment for myopia can simultaneously upregulate

TGF- β expression, downregulate HIF-1 α expression, enhance choroidal blood supply, reduce damage to various intraocular structures, and slow axial length elongation, thereby protecting visual function and preventing further disease progression.

In summary, guided by the theory that “the liver opens into the eyes,” comprehensive TCM therapies for myopia exert their effects through the following three mechanisms: 1) Slowing scleral thinning. This is primarily achieved by inhibiting the expression of hypoxia-inducible factor-1 α (HIF-1 α), thereby reducing the degradation of collagen fibers and slowing scleral thinning. 2) Alleviating choroidal ischemia and hypoxia. By downregulating HIF-1 α expression and steadily degrading its subunits, TCM restores collagen synthesis to improve the state of choroidal hypoxia. Additionally, it reduces iNOS mRNA expression and promotes choroidal thickening. 3) Improves ocular microcirculation. Through methods such as acupuncture and massage, local qi and blood circulation can be unblocked to improve ocular microcirculation and enhance visual function. In Traditional Chinese Medicine (TCM), “qi stagnation and blood stasis” corresponds to Western medical concepts of scleral thinning and visual impairment; “deficiency of qi and blood” corresponds to scleral and choroidal hypoxia. The theories and core mechanisms of the two systems are highly aligned. Guided by the theory that “the liver opens its orifice to the eyes,” the approaches of “soothing the liver, regulating qi, and improving vision” and “nourishing blood, softening the liver, and improving vision” maintain clear advantages in improving visual function and reducing adverse drug reactions. These approaches can alleviate the financial burden and psychological stress associated with disease treatment, improve patients’ quality of life, and provide theoretical support and clinical references for establishing a more systematic and standardized integrated Traditional Chinese and Western medicine system for myopia prevention and control.

Current research on TCM treatment for myopia still faces several unresolved issues. For example, the core theoretical concepts and mechanisms of action require further elaboration; large-scale clinical studies remain relatively scarce; and there is a lack of standardized treatment protocols [11,30,42]. Existing research on the “liver-eye” mechanism has largely focused on individual metabolic pathways, lacking a systematic characterization of signaling molecules, transporters, and receptor networks within the liver-eye axis [43]. Future research could fully leverage modern techniques such as bioinformatics, network pharmacology, and metabolomics to systematically elucidate the molecular regulatory networks underlying the therapeutic approaches of “soothing the liver and regulating qi” and “nourishing blood and softening the liver.” Efforts should also be directed toward conducting multicenter, large-sample, high-quality clinical studies to fully harness the unique advantages and significant role of traditional Chinese medicine (TCM), thereby providing higher-level evidence-based medical evidence for the treatment of myopia with TCM.

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