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Research Progress on Using Non-drug Traditional Chinese Medicine Interventions to Treat Parkinson's Disease by Regulating the Gut-Brain Axis

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Abstract. Conventional Western medical treatments for Parkinson's disease (PD) still have limitations in terms of maintaining efficacy and managing adverse reactions; the "microbiota-gut-brain" axis offers a new perspective in this regard. The Braak hypothesis suggests that α-synuclein can enter the brain via the vagus nerve, and damage to the intestinal barrier and TLR4-mediated intestinal inflammation are key links in neurodegeneration along the gut-brain axis. This article reviewed the mechanisms and clinical evidence supporting the prevention and treatment of PD through therapies such as acupuncture (body, electroacupuncture, scalp, ocular, and abdominal), moxibustion, Traditional Chinese Medicine (TCM) exercises, and auricular acupuncture. In terms of mechanism, the evidence is fairly clear for electroacupuncture. It upregulated colonic GPR40/43, elevated GLP-1, and activated neuroprotective pathways such as PI3K-AKT-GSK3β through the gut microbiota–brain axis. By comparison, animal studies on other therapies mostly described broader effects, including modulation of the microbiota, repair of intestinal permeability, and inhibition of enteric inflammation. Clinical observations also suggested some symptom improvement. These therapies appear to improve motor symptoms and, to varying degrees,non-motor symptoms such as constipation, insomnia, and depression. One study reported an overall efficacy rate of 93.3% for ocular acupuncture, which was higher than the 75.6% observed for body acupuncture (single study). Still, this comparison should be treated cautiously. Most of the available evidence came from animal experiments and small-sample observational studies, with few direct cross-comparisons between therapies. For that reason, the gut-brain axis mechanisms involved in ocular acupuncture and scalp acupuncture still need closer examination and confirmation in large-sample multicenter studies.

Keywords: Parkinson's disease, microbiota-gut-brain axis, acupuncture, gut microbiota, non-pharmacological therapies in traditional Chinese medicine

1. Introduction

Parkinson's disease (PD) is a gradual neurodegenerative disorder caused by the loss of dopamine-producing neurons in the substantia nigra, and it presents with motor symptoms. Patients frequently

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present with non-motor symptoms such as constipation, depression, and insomnia, all of which significantly reduce their quality of life. Recently, the theory of the "brain-gut axis" has gained widespread attention; that is, the central nervous system and the enteric nervous system are connected in both directions by the vagus nerve, spinal cord, and hormonal pathways [1]. Research suggested that pathological changes in PD may originate in the gut and that α-synuclein may travel retrogradely from the gut to the brain via the vagus nerve [2]. This provides new targets for intervention strategies and makes non-pharmacological Traditional Chinese Medicine (TCM) therapies, such as acupuncture, an important avenue for exploring "integrated brain-gut treatment."

Research on acupuncture, moxibustion, qigong, and auricular acupuncture for treating PD has increased, but most of the available evidence still comes from animal experiments and small clinical studies. Direct comparisons across these therapies are limited, and the way they may act through the brain-gut axis is still not clear. A systematic review focused on this area is also still missing. Given this research background, this paper used a literature review to examine the mechanisms and clinical evidence of different non-pharmacological TCM therapies for PD intervention through the "microbiota-gut-brain" axis. The review compares their shared features and differences, points out current gaps in the literature, and suggests directions for later research as a reference for non-pharmacological prevention and treatment of PD using TCM.

2. Acupuncture

2.1. Body acupuncture

Body acupuncture refers to inserting fine needles into acupoints on the limbs, chest, abdomen, lower back, and other body areas, with manual twisting used for tonifying or dispersing. It is the basic and most commonly used acupuncture intervention for Parkinson's disease. Through the bidirectional transmission pathways of the brain-gut axis, acupuncture may produce dynamic regulation. It may help stabilize mental state and ease emotional stagnation by regulating the functions of the spleen, stomach, and intestines. At the same time, improved emotional state may help harmonize the qi mechanisms of the spleen and stomach. In this way, body acupuncture appears to regulate both the brain and gut together, which may relieve constipation and depression in patients with Parkinson's disease [3].

From a pathological perspective, body acupuncture suppressed the activation of intestinal glial cells, reduced the transport of α-synuclein from the substantia nigra to the brain through the vagus nerve, and lessened injury to dopaminergic neurons in that region [4-6]; It also increased the expression of intestinal tight junction protein ZO-1, inhibited the release of pro-inflammatory cytokines such as NF-κB and IL-6, and reduced enteric neuroinflammation [4]. In relation to the gut microbiome, traditional body acupuncture uses gastrointestinal somatic acupoints such as Tianshu (ST25), Dàchángshū (BL27), and Xiàliáo (ST37), together with a small number of cranial acupoints. This approach can increase the abundance of probiotic bacteria that produce short-chain fatty acids, reduce harmful bacteria, ease systemic low-grade inflammation caused by lipopolysaccharide (LPS) in circulating blood, and help restore intestinal barrier integrity. Empirical data indicated that combining Western pharmacotherapy with acupuncture can significantly reduce UPDRS and HAMD scores while improving PDSS sleep metrics, and these clinical outcomes were better than those achieved with Western drugs alone [7]. More specifically, body acupuncture focused on points such as Yichong (LR11), Zusanli (ST36), and Sanyinjiao (SP6) may regulate the sleep-wake rhythm by increasing concentrations of the central inhibitory neurotransmitter GABA.

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2.2. Electroacupuncture

According to the Braak pathological model, pathology in Parkinson's disease may begin in intestinal tissue. In this view,α-synuclein in the gut can move retrogradely along the vagal nerve tract and then spread to the brain, which provides a basis for explaining how the "microbiota-gut-brain" axis may be involved in this disorder [8]. Patients with PD show increased intestinal permeability. Clinical studies have also confirmed intestinal epithelial barrier damage and microbial translocation in PD subjects, while TLR4-triggered intestinal inflammation appears to link gut changes with neurodegenerative processes along the gut-brain pathway [9]. Research has indicated that electroacupuncture may produce neuroprotective effects through the microbiota-gut-brain axis. Li Xuefeng et al. found that electroacupuncture at Baihui, Zusanli, and Taichong points increased gut microbiota diversity in PD mice, corrected microbiota imbalance, promoted the production of short-chain fatty acids (SCFAs), and upregulated GPR40/43 genes in the colon, which then raised serum GLP-1 concentrations. This matters mechanistically. GLP-1 can cross the blood-brain barrier, bind to GLP-1 receptors in the substantia nigra, and activate the PI3K-AKT-GSK3β cascade. As a result, pro-inflammatory cytokines are reduced, dopaminergic neuronal function is improved, and motor impairments are alleviated in PD models [10]. Other studies have reached a similar conclusion. Electroacupuncture stimulation of acupoints along the Foot Yangming Meridian was shown to correct gut microbiota imbalance in PD rats and reduce circulating endotoxins and inflammatory mediators [11]. Taken together, these findings suggest that regulation of the gut-brain axis may be one of the main ways electroacupuncture acts in P

Other studies have also supported the protective effects of electroacupuncture, but the mechanisms are not limited to one pathway. It may slow dopaminergic neuron degeneration by activating the Akt/BDNF survival pathway [12]; It has also been reported to inhibit the NLRP3 inflammasome pathway and lower α-synuclein and IL-1β/IL-18 levels [13, 14]; In addition, electroacupuncture may improve autophagy-lysosomal dysfunction and reduce oxidative stress. A comparison with manual acupuncture shows a more mixed pattern. Electroacupuncture appears more effective in regulating the gut microbiota and relieving severe constipation, whereas both methods seem to have similar effects on emotional regulation and endocrine balance. This difference matters in practice. Strong stimulation tends to increase cortisol levels and disturb the gut-brain axis, so for elderly Parkinson's patients with constitutional deficiency, gentle manual acupuncture is likely more appropriate [15].

2.3. Scalp acupuncture

Scalp acupuncture involves needling specific areas of the scalp to treat neurological disorders. It works by stimulating projection zones on the scalp, which may help regulate cognitive function and support brain health, and it has shown good results in treating tremor-related symptoms. In clinical use, point selection often follows Jiao's scalp acupuncture zone system. For example, needling the motor and equilibrium area may improve movement problems and balance in patients with Parkinson's disease (PD) [16]. Medical records indicate that combining scalp acupuncture with traditional body acupuncture produced favorable results in 36 instances of Parkinson's disease (PD). A similar pattern appears when scalp acupuncture is used alongside levodopa, which may improve muscular stiffness, shakiness, motor coordination, and daily living abilities in PD sufferers [17]. Taken together, these findings suggest that combining scalp acupuncture with other treatments may be more helpful for reducing PD symptoms [18].

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2.4. Ocular acupuncture

Ocular needling was founded by Professor Peng Jingshan. It is based on the proposed connection between ocular regions, meridians, and internal viscera, and in clinical use it is known for being relatively simple to perform and for producing effects quickly. During his clinical investigation, Professor Tian Weizhu argued that the basic pathology of Parkinson's disease lies in liver and kidney yin insufficiency, while factors such as wind-fire,phlegm-dampness, and blood stasis appear more as accompanying manifestations. On this basis, his group developed a treatment approach focused on the liver and kidneys. They combined eye needling with traditional body acupuncture to tonify liver and kidney deficiency and promote circulation through the meridians and muscles, with positive clinical results [19]. Clinical evidence indicates that the comprehensive efficacy rate of ocular needling for Parkinson's disease reaches 93.3%, higher than the 75.6% efficiency reported for body acupuncture alone [20]; The difference is noticeable. In addition, tDCS combined with ocular needling can improve motor function in patients with Parkinson's disease [21]. From the perspective of the brain-gut axis, Professor Wang Pengqin proposed a "simultaneous brain-gut management" method that uses Peng's ocular needling together with body acupuncture for Parkinson's disease accompanied by constipation. This method aims to regulate the spirit and unblock the viscera while also nourishing the kidneys, regulating the spleen, and soothing the liver. Reported outcomes were favorable [22]. Taken together, eye acupuncture appears effective in treating Parkinson's disease and is often used alongside other therapies. Even so, research on its mechanism within the brain-gut axis is still limited. Most current explanations draw from studies on body acupuncture and electroacupuncture rather than direct evidence on eye acupuncture itself. More targeted research is still needed here.

2.5. Other acupuncture techniques

Several specialized acupuncture techniques are also used to treat PD through the brain-gut axis, but they do not work in the same way. The basic idea behind the brain-gut axis is that gut microbiota imbalance may contribute to the pathogenesis of PD through enteric α-syn aggregation, vagus nerve activation, and inflammation entering the brain. Based on this view, electroacupuncture protocols that combine scalp acupuncture with abdominal acupuncture are intended to act on these pathways through the brain-gut axis [23]. Sun Shentian founded the Sun Method of Abdominal Acupuncture. This method focuses on "brain-gut coordination," regulates the "abdominal brain" through specific zones, and combines with the "Brain-Awakening Formula" so that treatment addresses both the brain and gut at the same time [24]. Evidence from clinical studies points to some benefit. Abdominal acupuncture has been reported to improve motor function and balance through effects related to the brain-gut axis. In a randomized controlled trial involving 60 cases, it improved scores on the 6-minute walk test and the Berg Balance Scale, and it also regulated 5-HT and cytokine levels [25]. The Jin San Zhen Mental Regulation Acupuncture method appears more focused on emotional comorbidities, with significant improvement in anxiety and depression scores as well as quality of life in PD patients [26]. Qihuang Acupuncture is used to relieve muscle rigidity by regulating qi and blood flow. A randomized controlled trial involving 60 cases found lower UPDRS-III rigidity score and muscle tone after treatment [27]. Other approaches have also been used in combination. The joint application of body acupuncture, scalp acupuncture, and pressure acupuncture draws on different features of traditional Chinese external therapies and has been reported to improve PD symptoms [28].

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3. Non-acupuncture traditional Chinese medicine therapies

3.1. The traditional Chinese medicine exercise

The regimen of "Baduanjin" is based on the ideas of "guiding and breathing exercises" and "unity of body and mind". By regulating the qi mechanism of the spleen and stomach, modulating the abundance of gut microbiota, improving the secretion of brain-gut peptides, repairing the intestinal barrier, and so on, it alleviates both motor and non-motor symptoms of Parkinson's disease (PD) through the brain-gut axis as a regulatory center [29]. Several clinical studies have shown that exercises based on traditional Chinese medicine (TCM) can improve motor function, balance, quality of life and psychological well-being in patients with Parkinson's disease (PD): the "Tremor-Relief Three-Needle Technique" combined with the Eight Brocades can improve early-stage motor control in PD patients [30]; the Five Animal Exercises can enhance balance and quality of life for people with mild to moderate PD [31]; simplified diabolo rehabilitation exercises improve motor skills and reduce depression in patients with mild PD [32]; and the Eight Brocades in conjunction with repetitive transcranial magnetic stimulation (rTMS) have also been shown to improve motor function and quality of life in PD patients [33]. All the above studies have shown that TCG exercises can reduce the symptoms of Parkinson's disease (PD) further.

3.2. Moxibustion

Some related studies found that mild moxibustion at acupoints such as Tianshu and Guanyuan may help regulate disrupted gut microbiota [34]. In a clinical study, Li Tiantian et al. reported that external TCM therapies, including moxibustion, improved symptoms such as constipation and depression in PD patients through bidirectional regulation of the gut-brain axis. They also argued that this intervention may affect the gut microbiota through the same pathway, which offers another way to think about the clinical prevention and treatment of Parkinson's disease [35]. Wen Xin et al. used a treatment plan that combined abdominal acupuncture with moxibustion to warm Yang and tonify the kidneys in patients with rigid-hypokinetic Parkinson's disease. Their results showed improvement in clinical symptoms and suggested that disease progression may have slowed to some extent [36].

3.3. Other therapies

Auricular acupuncture has garnered attention in recent years as an adjunctive treatment for PD due to its simplicity, non-invasive nature, and high patient acceptance. Research on transcutaneous auricular vagus nerve stimulation (taVNS, also known as auricular electroacupuncture) for the treatment of early- to mid-stage Parkinson's disease has been conducted—some studies suggested that taVNS immediately modulates activity in the bilateral supplementary motor areas and prefrontal cortex, which may represent the neural mechanism underlying its efficacy as an adjunctive treatment for early- to mid-stage PD [37]; furthermore, clinical studies confirmed its effectiveness in treating depression associated with Parkinson's disease [38]; The combination of Zengye Decoction with modifications and ear acupoint bean-press therapy yielded good results in treating constipation in patients with Parkinson's disease of the liver-kidney yin deficiency type [39]; another study showed that ear acupoint bean-press therapy combined with a sedative formula to treat insomnia in patients with Parkinson's disease of the liver-kidney yin deficiency type was highly effective and safe [40]; Research has also found that stimulation of the ear with auricular acupuncture can modulate the

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motility of the gastrointestinal tract and the autonomic nervous system through activation of the afferent-efferent pathways of the vagus nerve, thus offering a potential treatment path for Parkinson's disease (PD) via the ear-gut-brain axis [41].

4. Discussion

In short, non-pharmacological Chinese medicine therapies, such as acupuncture, moxibustion, traditional Chinese medicine exercise, and auricular acupoint therapy, can alleviate the motor and non-motor symptoms of Parkinson's disease, including constipation, depression, and insomnia, by regulating multiple pathways of the "microbiota-gut-brain" axis, such as modifying gut microbiota, repairing the intestinal barrier, and suppressing enteric neuroinflammation. Within the theoretical framework of the gut-brain axis, acupuncture and electroacupuncture can bidirectionally regulate gastrointestinal function and emotional well-being; scalp, eye, and abdominal acupuncture each have their own distinct characteristics and are often used in combination; moxibustion and TCM exercises focus on regulating qi circulation and the spleen and stomach; and auricular acupuncture stimulation can regulate gastrointestinal and autonomic nervous system functions via the vagus nerve pathway. Compatible with Western medical treatments, these therapies appear to have some practical advantages, including fewer side effects, better patient acceptance, and the possibility of long-term use. Clinical observations also suggest that they can improve patients' symptoms and quality of life.

Still, the current evidence base is limited. Most findings come from animal studies and small-sample clinical observations, and different therapies have rarely been compared in a systematic way. Evaluation criteria also remain inconsistent. Research on underlying mechanisms mainly relies on evidence from body acupuncture and electroacupuncture, while work on brain-gut axis mechanisms in therapies such as scalp acupuncture and eye acupuncture is still limited. Future research should focus on standardizing acupoint selection and operating procedures, unifying clinical efficacy evaluation criteria, and carrying out large-sample, multicenter clinical trials. Gut microbiota analysis may also help clarify how non-pharmacological TCM therapies act through the gut-brain axis in the prevention and treatment of Parkinson's disease.

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