

Research Progress on Ear Acupuncture Treatment for Tourette Syndrome in Children

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Abstract: *Tourette's syndrome is very common in pediatric clinical practice, which seriously affects the daily life and learning of children. Ear acupuncture therapy is easy to operate, highly accepted by children, and widely used in clinical practice. In order to further determine the optimal treatment plan for children with Tourette's syndrome using ear acupuncture, this article uses computer searches of China National Knowledge Infrastructure, Wanfang Database, PubMed and Baidu Academic in recent years to summarize the total effective rate and prognosis of various treatment methods. It is concluded that whether ear acupuncture is used as a single therapy, or combined with traditional Chinese medicine, Western medicine, or other external therapies to treat Tourette's syndrome in children, it can achieve good therapeutic effects. Through comprehensive analysis, the combination of ear acupuncture with traditional Chinese medicine, ear acupuncture with pediatric massage is the best choice for treating Tourette's syndrome in children and is worthy of clinical promotion.*

Keywords: Ear acupuncture, Tourette syndrome in children, Pathogenesis, Research progress.

1. Introduction

Tourette's syndrome is formed by a combination of genetic, neurological, immune, and environmental factors. It is a neurological, psychomotor, and behavioral disorder that is prone to occur during childhood or adolescence. At present, it is relatively common in clinical practice, often manifested as brief, repetitive, unconscious, rhythmic, and irregular motor tics and/or vocal tics in one or more parts of the body [1,2], such as blinking, frowning, grinning, shrugging, making a sound in the throat, sniffing, etc. Although there is no clear record of Tourette's syndrome in ancient Chinese medical literature, according to its clinical manifestations, medical experts throughout history have often classified it as "involuntary jumping of surface muscles", "slow convulsions", "spasms of hands and feet", "liver wind", and other categories [3]. Due to its complex and variable symptoms, long course of illness, and easy recurrence, clinical diagnosis and treatment are difficult, and most parents find it difficult to persist in treatment, seriously affecting children's social, learning, and mental health. At present, the research on the etiology and pathogenesis of pediatric Tourette's syndrome has not yet been perfected by Western medicine, and the oral treatment of Western medicines has a large number of side effects and some of the medicines have inaccurate therapeutic efficacy. The unique holistic concept and advantages of dialectical treatment in traditional Chinese medicine are important methods for treating Tourette's syndrome in children. Therefore, it is very important to explore new diagnostic and therapeutic ideas from the perspective of traditional Chinese medicine.

Ear acupuncture is the development of traditional acupuncture in China, which is painless, safe, convenient, and less expensive, with high compliance of parents and children, and is expected to become a future research hotspot for the treatment of pediatric Tourette Syndrome. The author read the relevant literature in the past ten years, and found that ear acupuncture therapy is widely used in the treatment of a variety of clinical diseases [4], and the application of ear acupuncture therapy for the treatment of TS is effective in the

relevant research, so it is summarized as follows.

2. Etiology and Pathogenesis of Tourette's Syndrome in Children

According to Chinese medicine, children's Tourette's syndrome is characterized by

wind-fire-phlegm disturbance as the surface, and imbalance of internal organs and insufficiency of qi and blood as the essence, which is the syndrome of deficiency in origin and excess in superficiality [5]. The disease is located in the liver and can involve the heart, liver, spleen and kidney. "All wind and dizziness belong to the liver", so the liver wind is the primary pathogenesis of tic disorders in children [1]; children's "spleen is often deficient", coupled with improper feeding, may experience gastrointestinal stagnation, accumulate phlegm and heat, which can trigger liver wind and lead to tics [6]. Prof. Hu Guoheng [7] believes that children's tics are mainly attributed to the deficiency of kidney yin and the stirring of endogenous winds. The treatment should be "treating blood and wind" together. In addition, children's Tourette's syndrome is related to congenital endowment deficiency. Father's deficiency of blood and essence, mother's blood and qi insufficiency or mother's pregnancy mood, diet, sleep disorder, etc, will make the child congenital renal essence insufficiency, medulla oblongata loss of full, so that the body weak, it is easy to infection diseases, triggered by tics [8]. Prof. Luo Shijie [9] believes that children's Tourette's syndrome is closely related to Heart-Kidney Disharmony, The Su Wen - Tian Yuan Ji Da Lun said: "Jun Huo to brighten, phase huo to position". The ancient book "Su Wen - Tian Yuan Ji Da Lun" says: "Jun Huo (here refers to the heart fire) to brighten, phase fire (here refers to the kidney fire) to position". Jun fire, phase fire each in its place, the heart and kidney interactions, physiological functions can be coordinated, so the treatment should be traffic heart and kidney. Wang Kexin [10] and others believe that children's tics are related to the sweat pore occlusion (SPO). External wind invades the body, while the sweat pores are closed, so that the evil qi can not come out, which leads to internal wind

and wind phlegm, and then turns into fire, so the twitching occurs. Prof. She Jilin [11] believes that this disease is related to the special allergic constitution of some children, and in the treatment, wind-expelling and anti-allergic drugs should be added, and at the same time, focusing on regulating from the lungs to enhance the children's constitution and improve their allergic state.

3. Mechanism of Action of Ear Acupuncture for Tourette's Syndrome in Children

3.1 Chinese Medicine Recognition

Ear acupuncture therapy is a characteristic external therapy of Chinese medicine. Chinese medicine believes that the ear and the twelve meridians of the human body have a close connection. The hand-Shaoyang, foot-Shaoyang, and hand-Taiyang meridians directly enter the ear, while the other meridians or their respective meridians run around the ear or their branches of channels enter the ear. Therefore, the human body meridians all directly or indirectly reach the ear. In addition, the ear and internal organs are also related. It is recorded in the "Lingshu: Five Readings and Five Missions Chapter," ear, kidney of the official "; According to the "Guidelines for Diagnosis and Treatment", "kidney for the ear of the Lord, the heart for the ear of the guest." It can be seen that the ear and the human body are very closely linked, so when the human body is sick, the disease can be treated by ear acupuncture [12].

Ear acupoints refer to the acupoints distributed on the auricle, also known as ear response points or stimulation points. In the book "Lingshu: The Forms of Evil Qi and Organ Diseases", it is said: "The ear is the gathering point of the ancestral meridians, with twelve meridians and 365 collaterals, and its blood and qi all rise on the surface and pass through the empty orifices." In clinical practice, selecting corresponding acupoints based on specific symptoms and massaging and stimulating with Wangbuliuxing seeds can regulate the balance of human organs, yin and yang, and meridian qi and blood, achieving the goal of calming the mind and stopping tics. Its therapeutic efficacy is stable, safer than conventional drug therapy, and the compliance of children is also higher, which can reduce recurrence and improve clinical efficacy [13].

In clinical practice, the commonly used acupoints for ear acupuncture therapy include: Tourette point, eye, nose, heart, Shenmen, Yuanzhong, liver, kidney, spleen and stomach, sympathetic, subcortical, endocrine, etc., all located on the auricle. Among them, the Tourette acupoint (located at the back of the ear, 3mm below the ear tip) is an empirical acupoint that has a calming and sedative effect. When combined with the eye and nose acupoints, it can enhance the effect of calming the wind and stopping Tourette [14]. Heart, Shenmen, and Yuanzhong acupoints can have the effect of calming spasms, opening the mind, and awakening the mind. Spleen and stomach acupoints can improve the ability of spleen and stomach transportation. Liver acupoints can calm liver wind, nourish blood, and relieve depression [15]. Kidney acupoints can nourish congenital kidney essence. Sympathetic, subcortical, and endocrine functions can also clear the heart, calm the mind, unblock the orifices, invigorate the spleen, and

benefit the kidneys [16].

3.2 Modern Medical Perspectives

There are a large number of blood vessels, nerves, and lymphatic vessels distributed on the auricle. When various stimuli such as pressing and needling act on the auricle, they can excite the nerve receptors of the auricle, and transmit impulses from the spinal nerve branches distributed in the auricle, as well as the branches of the glossopharynx, auricular temporal, facial, and vagus nerves, to the trigeminal nerve, and then to the brainstem. After the integration of impulse information through the brainstem network structure, it extends upwards to the thalamus and projects to the cerebral cortex, and downwards to the spinal cord, issuing two different commands of "inhibition" and "promotion", regulating functions such as breathing, sleep, saliva secretion, cardiovascular reflex, etc., and playing a role in calming and regulating organ function. Therefore, stimulating the ear acupoints can regulate nerves, thereby regulating various organs and organs throughout the body. In addition, stimulating ear acupoints can also regulate the release of neurotransmitters in the body and regulate the dynamic balance of various hormones in body fluids through the thalamic pituitary pathway, thereby stimulating non-specific defense responses in the human body. It can also achieve the effects of regulating autonomic nervous system, sedation, and analgesia [17,18].

4. Clinical Efficacy of Ear Acupuncture in the Treatment of Tourette's Syndrome in Children

4.1 Ear Acupuncture Monotherapy

The pathogenesis of Tourette's syndrome in children is complex, and all five organs and six viscera can cause the disease. Therefore, ear acupuncture is used to adjust the balance of organs, qi and blood, and yin and yang, improving the child's ability to resist the disease. Liu Xingwang [19] treated 30 children with Tourette's syndrome with ear acupuncture, and used a self control before and after to observe the therapeutic effect. The subcortical, heart, liver, spleen, portal, brain, and endocrine were taken and adjusted according to the symptoms. Advise parents to press at least 3 times a day, with each acupoint pressed for 0.5-1 minutes each time; Change every 3 days, with a 1-day interval between each session. 10 sessions are considered as one course of treatment, and the therapeutic effect is summarized through continuous treatment for 3 courses and follow-up observation for half a year. The results showed that 15 cases showed significant improvement, 12 cases were effective, and 3 cases were ineffective, with a total effective rate of 90%. Coincidentally, Wu Huifen [20] et al. observed the therapeutic effect of ear acupuncture on Tourette's syndrome in children. Using the same method, 16 patients with Tourette's syndrome were treated with ear acupuncture and followed up for 3 months. One case showed significant effect, 13 cases were effective, and 2 cases were ineffective, with a total effective rate of 87.5%, indicating that ear acupuncture has a good therapeutic effect on Tourette's syndrome in children.

4.2 Ear Acupuncture Combined with Endotherapy

4.2.1 Ear acupuncture combined with Proprietary Chinese medicine therapy

In the study on evaluating the therapeutic effect of ear acupuncture, Bian Ju [16] et al. selected 62 children with Tourette's syndrome. On the basis of treatment with children's intelligence syrup (control group), acupoints were selected as heart, Shenmen, liver, kidney, endocrine, sympathetic, and subcortical, and ear acupuncture was used for 3 months. A comparative analysis was conducted before and 3 months after treatment, and it was found that the total effective rate of the control group was 74.2%, while the total effective rate of the combination group was 93.5% ($P < 0.05$). Peng Beiru [21] et al. treated 90 children with Tourette's syndrome with auricular acupuncture therapy combined with Yizhi Ningshen Liquid (a proprietary Chinese medicine made by Guangdong Provincial Hospital of Traditional Chinese Medicine). The total course of treatment was 12 weeks, with a follow-up of 12 weeks after stopping the medication. Comparison of the scores on the Connors' Parent and Teacher Scale revealed that the auricular acupuncture group showed improvement in the scores on the Parent and Teacher Scale, and there was still further improvement in the follow-up after stopping the treatment ($P < 0.05$). Therefore, auricular acupuncture combined with pCms is effective in the treatment of tic disorders in children and has a good prognosis.

4.2.2 Ear acupuncture combined with Chinese herbal medicine

After summarizing the clinical experience of many ancient doctors, it has been found that many Chinese herbal medicines have the functions of relieving phlegm, stopping convulsions, calming liver wind, nourishing kidney and spleen, etc. In clinical practice, ear acupuncture is often combined with such drugs to achieve the goal of treating children's tic disorder.

Huang Renhai [22] applied ear acupuncture at the points of Tourette's syndrome, sympathetic, liver, subcortical, endocrine, kidney, heart, Shenmen, brain, and other acupoints, and combined it with a self-designed traditional Chinese medicine formula - Anshen Qutan Tang to treat Tourette's syndrome in children. The treatment lasted for 30 days and was compared with oral administration of haloperidol alone. Observing the frequency, intensity, TCM syndrome scores at different time periods, and incidence of adverse reactions after 30 days, the results showed that the therapeutic effect of ear acupoint combined with Anshen Qutan Tang was significantly better than that of haloperidol group ($P < 0.05$).

Zhang Xinyao [23] selected ear acupoints such as subcortical, Shenmen, brainstem, sympathetic, heart, liver, and kidney for dialectical modification combined with Gastrodia and Uncaria Beverag to treat children with tic disorders (liver hyperactivity and wind movement syndrome). The results showed that the combination of the two significantly reduced the tic score of the Yale Tourette Syndrome Severity Scale (YGTSS) and improved tic symptoms. The total effective rates of disease treatment in the treatment group and the control group were 86.7% and 70.0%, respectively ($P < 0.05$). And there were no adverse reactions in the study, indicating high safety.

Wu Sa [24] selected 86 cases of children with TS for the study, and selected heart, Shenmen, subcortical, adrenal, endocrine, liver, spleen, kidney, thalamus and other acupoints for auricular acupuncture, and combined with Chaihu Guizhi Decoction to harmonize Ying-qi and Wei-qi, and reconcile Shaoyang, as well as to improve the immune ability of the body and the anti-inflammatory effect. After the experimental study, it was found that Chaihu Guizhi Decoction combined with auricular acupuncture was more effective than oral haloperidol tablets alone in increasing the serum levels of iron (Fe), zinc (Zn) and other trace elements and lowering the level of immunoglobulin (IgE) in the children, and the incidence rate of adverse reactions in the study group (2.33%) was lower than that in the control group (20.93%) when compared with the pre-treatment period, and the difference was statistically significant.

Lin Tingting [25] treated tic disorder (external wind-induced type) in children by combining auricular acupuncture with a self-formulated Chinese herbal formula called "Qufeng Andong Fang". The results were compared with the oral administration of western medicine thiamphenicol hydrochloride tablets alone. After 4 weeks of treatment, it was found that the total effective rates of YGTSS points were 89.29% and 79.31% in the combined group and the western medicine group, respectively; the total effective rates of Chinese Medicine Symptom Scale points were 96.43% and 86.21% in the combined group and the western medicine group, respectively, which were significantly different ($P < 0.05$); during the period of treatment, there were no obvious adverse reactions in the combined group, and there were 4 cases of adverse reactions in the western medicine group. It indicates that the clinical efficacy of "Qufeng Andong Fang" combined with auricular acupoint therapy is better than that of thiabendazole alone, and the safety is higher.

4.2.3 Ear acupuncture combined with western medicine therapy

Western medicine treatment of children with Tourette's syndrome is preferred to drug therapy, although it can improve the symptoms, but there are short duration of efficacy, adverse reactions and other shortcomings. At present, most advocate the combination of Chinese and Western medicine therapy, both symptomatic and fundamental. Guan Jingying [26] selected twitching points, sympathetic, subcortical, heart, Shenmen, liver, kidney and other acupoints to administer auricular acupuncture and combined with oral thiamphenicol hydrochloride for the treatment of pediatric Tourette's syndrome, the total course of treatment was 4 weeks, and the follow-up was 8 weeks. The results showed that the total effective rate was 81.25% in the treatment group and 71.43% in the control group, and the difference between the two groups was statistically significant. There were no serious adverse reactions in both groups.

4.3 Ear Acupuncture Combined with External Therapy

4.3.1 Ear acupuncture combined with pediatric massage therapy

Pediatric massage refers to the use of professional techniques

to stimulate corresponding acupoints and meridians, activate muscles and bones locally, unblock meridians, promote qi and blood circulation, and play a role in supporting the right and eliminating evil, adjusting yin and yang, and regulating blood and qi.

Dai Weifeng [27] et al. selected 34 children with Tourette syndrome using a pre - and post control method and treated them with pediatric massage combined with ear acupuncture. Select acupoints on the face, upper limbs, lower limbs, and abdomen, supplemented by massage techniques, until there is a feeling of soreness and swelling at the acupoints; Combination of subcortical, heart, Shenmen, liver, spleen, etc. for ear acupuncture treatment. Observe its clinical efficacy after 3 months of treatment. The results showed that the total effective rate after treatment was 91.2%, the recurrence rate was 2.9%, and there were no adverse reactions.

Wang Ting [28] et al. used pediatric massage combined with ear acupoints to treat tic disorders in children. The control group was treated with routine pediatric massage, while the treatment group was treated with pediatric massage combined with ear acupuncture (heart, Shenmen, brainstem, endocrine, subcortical, sympathetic, liver, kidney points) for one month. The final results showed that the total effective rate was 93.33% in the treatment group and 80.00% in the control group ($P < 0.05$). The combination of pediatric massage and ear acupuncture is more effective in treating Tourette's syndrome in children than using pediatric massage alone.

The clinical efficacy of He Jiaying [29] et al. using the massage methods of calming the wind and stopping spasms (such as opening the Tianmen, pushing the Kangong, reversing the internal Eight Trigrams; pinching the spine, rubbing the abdomen, etc.) combined with ear acupuncture therapy (liver, spleen, stomach, brain, Shenmen, subcortical and other acupoints) to treat Tourette's syndrome in children with spleen deficiency and liver hyperactivity. The control group was treated with the traditional Chinese medicine formula "Gastrodia and Uncaria Beverage" combined with "Yigong San", which was modified according to the syndrome. The results showed that the total effective rate of the combination group was 90%, higher than the control group's 82% ($P < 0.05$).

In the study by Wei Mingjie [30] et al. on the therapeutic effect of pediatric massage combined with ear acupuncture in the treatment of Tourette's syndrome in children, the control group received a self-designed "Pinggan Qianyang formula" with modifications. On the basis of this, the observation group used pediatric massage (spinal massage and acupoint massage techniques) combined with ear acupuncture (ear acupuncture points such as Tourette's point, endocrine, sympathetic, heart, Shenmen, lung, etc.) for auxiliary treatment. The results showed that the total effective rate of the control group was 69.23%, while the treatment group was 92.30% ($P < 0.05$). The combination of ear acupuncture and pediatric massage has a definite therapeutic effect on Tourette's syndrome in children.

4.3.2 Ear acupuncture combined with other adjuvant therapies

Yuan Zenghui [31] selected 60 children with TS, all of whom were treated with traditional Chinese medicine acupoint

application (Shenmen, Shenque, Ganshu, Pishu and other acupoints) combined with ear acupuncture (acupoints: throat, mouth, eye, sympathetic, Shenmen, endocrine, subcortical, etc.). Observing its clinical efficacy, it was found that there was a significant change in the TCM syndrome score after treatment compared to before. The total effective rate of treatment for patients was 86.7% ($P < 0.05$). Gao Yan [32] et al. studied the clinical efficacy of traditional Chinese medicine acupoint application (Baihui, Sishencong, Fengchi, Lianquan, Shenmen and other acupoints) combined with ear acupuncture (heart, liver, brain, Shenmen, subcortical, endocrine) in treating children with tic disorder of spleen deficiency and liver hyperactivity type. Oral administration of Western medicine haloperidol was given as the control group, with a treatment period of one month. The final result showed that the total effective rate of the combination group treatment was 92.5%, while the control group was 67.5% ($P < 0.05$). This indicates that acupoint application combined with ear acupuncture is more effective in treating Tourette's syndrome in children compared to oral Western medicine alone.

The ancient Chinese masterpiece "Miraculous Pivot - Nine Needles and Twelve Elements" has the following words: "No use of stone, want to micro-needle, through its meridians, regulating its blood and qi". Chen Li [33], chief physician, used auricular acupuncture points combined with press needles (taking Shenmen, liver, and frontal points as main points) to assist treatment on the basis of identification and analysis. It has the effect of calming the liver and clearing the heart, nourishing the brain and tranquilizing the mind, and improving the symptoms of tics, with satisfactory clinical efficacy. Zhang Li [34] observed the efficacy of "Qingling press-needles" combined with auricular acupuncture point on children's tic disorder in the study, applying ordinary acupuncture treatment as a comparison, the results show that the total effective rate of treatment is 90% in the observation group, and 70% in the control group, and it can effectively reduce the recurrence rate ($P < 0.05$). It indicates that auricular acupuncture points combined with snap needles are effective in the treatment of pediatric Tourette's syndrome, and the effect is better than that of ordinary acupuncture.

Wang Zhiru [35] treated children's tic disorder with scalp acupuncture (with Fengchi, Fengfu and Baihui as the main points) combined with auricular acupuncture (Shenmen, Marginal Middle, Dorsal Gully of the Ear, Liver, Heart, Kidney and Spleen), and chose thiabendazole hydrochloride tablets orally as the control group to observe and compare the efficacies of the two groups. It was found that the total effective rate of treatment in the combined group (96.67%) was higher than that in the western medicine group (78.33%), and the improvement of tic symptoms was also higher in the combined group ($P < 0.05$).

Yang Yanmei [36] utilized head acupuncture (selecting the parietal midline, frontal midline, inferior 2/5 parietal anterior temporal oblique line, and inferior parietal occipital line) together with auricular acupuncture (subcortical, cardiac, and shenmen) for the treatment of children with tics, and ordinary acupuncture treatment was used as a control. The results showed that both treatments could improve the total YGTSS scores and vocal and motor tic scores of children with tic disorder, but the efficacy of the combined group (total

effective rate: 93.33%) was better than that of the ordinary acupuncture group (total effective rate: 80.00%), and the difference was statistically significant.

5. Discussion and Outlook

Ear acupuncture, also known as "auricular point pressing", "ear acupoint bean pressing", etc., generally refers to the use of medical tape to the Chinese traditional herbs "Seeds of Wangbuliuxing" fixed in the ear acupoints, every day according to the condition, regular or irregular pressure stimulation and a longer period of time to stay in the needle, so that the auricle has a sore, hot and swollen feeling. The Miraculous Pivot said: "ears are the gathering point of various meridians", Chinese medicine believes that the hundred meridians gathered in the ear, so China's traditional medicine attaches great importance to the role of ear acupuncture in the disease. And ear acupuncture small appearance, mild pain, no toxic effects of drugs, does not harm the body's internal organs and tissues, the risk of infection is extremely small, easy for children and their families to accept.

This paper lists the methods of auricular acupuncture monotherapy and auricular acupuncture combined with proprietary Chinese medicines, Chinese herbs, western medicines, pediatric massage, acupoint application and so on to treat pediatric Tourette's syndrome, respectively. In the literature analysis, it was found that (1) auricular acupuncture monotherapy had some efficacy (total effective rate: 87.5%, 90%), but there was no control group, and the literature was small, so the reference significance was not significant. (2) The total effective rate of the controlled trial of the auricular acupuncture combined with pCms group was 93.5%, and the efficacy was assessed by the parents' and teachers' scales, and the prognosis was found to be good through follow-up. However, the way of judging the efficacy through the scale is controversial and there is less literature. (3) Auricular acupuncture combined with Chinese herbal medicine in the treatment of Tourette's syndrome in children has the most clinical studies, and the experimental process is more rigorous, with diversified indicators of therapeutic efficacy, all of which have achieved accurate therapeutic efficacy while proving its safety. (4) The literature on auricular acupuncture combined with western medicine is scarce, and the clinical reference significance is not significant. (5) auricular acupuncture combined with pediatric massage therapy clinical research is also more, and the results are good (total effective rate are higher than 90%), and no adverse reactions, worthy of clinical promotion. (6) ear acupuncture combined with acupoints paste, press needles, scalp needles, head needles, etc., are medical practitioners in recent years for the treatment of Tourette's syndrome new ideas, have achieved some efficacy, there is a certain value of exploration, but still need to be clinically further improved.

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