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Pathogenesis and Advances in Chinese and Western Medicine Treatment of Speech Disorders in Children with Autism Spectrum Disorders

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Abstract: The causes of speech disorder in children with autism spectrum have not been fully clarified, and an in-depth understanding of the pathogenesis of the disease and the progress of research on Chinese and Western medicine treatment options can provide a basis for the clinical diagnosis and treatment of the disease, alleviate the pain of the children, and improve their quality of life. Through reviewing the literature to understand the latest research progress, the research progress of various scholars in the treatment of this disease in recent years was collated and reviewed. Resultly, the pathogenesis of speech disorders in children with autism spectrum is not clear, but the more accepted theory is the theory of lateralisation of language function. Numerous studies have shown that acupuncture treatment for speech disorders in children on the autism spectrum is varied, effective, and widely applicable, and acupuncture treatment has become the treatment of choice for many patients.

1. Introduction

Autism Spectrum Disorder (ASD) is a group of complex neurodevelopmental disorders that begin early in development, mostly in infancy and childhood, and are characterised by impairments in social interaction, communication disorders, narrowed interests, and stereotyped behaviours [1], and most are accompanied by varying degrees of intellectual, perceptual, and emotional impairments, while Speech and language disorders are one of the most common communication disorders [2]. And relevant studies [3-5] have shown that most of the children with ASD have speech disorder as the main early symptom or commonly accompanied by backwardness in language development, and the children will have a variety of manifestations such as using language incorrectly, not being able to express the correct meaning, difficulty in finding words and in severe cases, they even do not speak at all, and there is a significant correlation between the language development disorder and the overall developmental level of the children with ASD, especially their social impairment [6]. Therefore, long-lasting language disorders may have a serious impact on the daily life and quality of life of children with ASD [7]. The etiology and pathogenesis of ASD are still unclear, and the development of ASD may be related to genetic factors, environmental factors [8]. Chinese medicine treatment of ASD

focuses on the overall concept, mostly treating from the heart and spleen, heart and liver, spleen and kidney. It is stated in the "TCM Paediatrics Clinical Diagnosis and Treatment Guidelines - Autism Spectrum Disorders" [9] that the basic principle should be to regulate the heart, liver, spleen and kidney, and to wake up the brain and open the orifices, together with the use of traditional Chinese medicines, acupuncture, tuina, auricular acupuncture points, rehabilitation training, special education and other comprehensive interventions. However, because the pathogenesis of ASD speech disorders is also unclear, there is no special medication or acupuncture prescription group for ASD speech disorder symptoms, so more exploration is needed in the treatment of ASD speech disorders to provide a scientific and effective method for clinical diagnosis and treatment.

2. Status of modern medical research on ASD speech disorders

2.1. Pathogenesis

The pathogenesis of ASD is complex, and Western medicine does not yet have a clear understanding of it. Scholars at home and abroad have conducted in-depth explorations of the etiology of ASD from the aspects of epidemiology, genetics, immunology, maternal and perinatal biology, and most of them believe that it is caused by the interaction of genetic factors with environmental factors, abnormal immune function, abnormal neuronal development, imbalance in the ratio of intestinal flora, and other high-risk factors.

The systematic study of autism risk gene function by Zhang Jing [10] identified potential neurobiological mechanisms and common signalling pathways, and the important role of gene-environment interactions in the etiology of autism has also been gradually revealed. Deng Wenlin [11] analysed the clinical characteristics and co-morbidity rate of 58 pairs of twins with autism spectrum disorders and showed that the autism co-morbidity rate of identical twins was higher than that of fraternal twins with autism. TakahashiA [12] demonstrated that exons coding for interleukin-1β induced synonymous mutations in interleukin-1 receptor type 2 gene with a single nucleotide polymorphism. The mutation adversely affects the splicing, structure, and stability of mRNA, which in turn affects the physical process by which the protein acquires its functional structure and conformation, causing dysfunctional neuromodulation and leading to the development of the corresponding phenotype of autism in children. Wu Minglei [13] found that excessive increase in body mass during pregnancy is a risk factor for ASD in offspring. Mothers' history of adverse exposures before and during pregnancy, adverse emotions, smoking and passive smoking can increase the risk of ASD [14]. A related study, Liu Zehui [15] found that children with autism have a higher prevalence of autoimmune deficiency diseases than the normal population, with higher levels of T-cell counts and persistent dysfunction of their own peripheral and brain immune systems. Gu Youyu [16] found that intestinal dysbiosis has an important role in the development of ASD , involving the neuroendocrine system, the neuroimmune system and the vagus nervous system pathway.

Speech disorders in children with ASD are associated with abnormalities in the functioning of the language centres in the brain [17]. Some children with ASD have better automatic than spontaneous speech, and the mechanism is associated with abnormalities in the inferior frontal gyrus, which is unable to translate existing speech frames into the execution of purposeful verbal movements, and tend to have better receptive and poorer expressive language. Some children with ASD have grammatical deficits and can only express their needs in words, which is typical of "telegraphic" speech. This type of speech disorder is associated with abnormalities in the anterior language areas of the cerebral cortex, resulting in disrupted coherent discourse and disruption of combinatorial organisation. Instead of a single speech disorder, approximately 63% of children with ASD <6 years of age have a mixed speech disorder.

Modern medicine views speech production as a process that requires the continuous activity of multiple systems and structures [18], including the cerebral cortex, respiratory muscles, larynx, and other voice-forming organs. It also requires feedback, auditory and perceptual synergies. Speech is the process by which expressive language operates in the oral cavity, resulting from the complex coordination of respiratory, laryngeal, soft palate, and articulatory movements. The pressure of the airflow created by breathing causes the vocal cords of the larynx to vibrate, thus producing sound; the sound from the larynx, together with the airflow, is directed by the soft palate into the nasal or oral cavity and shaped by other organs of articulation (e.g., the tongue, lips, teeth, and jaws) to produce the sounds of speech. Problems with sound production are more common in childhood. Speech intelligibility improves with age, as does cognitive development and the development of coordinated movements of the respiratory and articulatory organs. 50% intelligibility should be achieved by 36 months of age and 75% by 48 months of age.

Modern brain imaging studies have found that the lateralisation of language function involves the frontal lobe, temporal lobe, cingulate gyrus, fusiform gyrus and supplementary motor area [19], and the patients with ASD also show abnormal lateralisation of language function [20]. Lateralisation of brain language function is the most obvious feature of lateralisation of brain function, and damage to the left hemisphere of the brain, which is responsible for language processing and analysis can cause language dysfunction. At present, the theoretical foundation of lateralisation has been improved [21], but the clinical application in China, especially the clinical application research combined with Chinese medicine, is relatively small. Zhang Yun [22] investigated the structural magnetic resonance characteristics of the corpus callosum and language-related brain regions in 2-6-year-old children with autism spectrum disorders (ASD). The study demonstrated that female children with ASD exhibited significantly lower language abilities compared to males, linked to reduced cortical thickness in the dominant-hemisphere Broca's area. Furthermore, evidence of lateralized development in the Broca's area of ASD children was identified, supporting the language lateralization theory. Importantly, neuroanatomical analysis should encompass both the dominant and non-dominant hemispheres. Notably, while significant differences in language abilities among ASD children were primarily localized to Broca's area, structural variations in Wernicke's area remained statistically insignificant.

2.2. Progress in treatment

Modern medicine mostly uses behavioural modification, psychological intervention and other rehabilitation education to improve ASD stereotypical behaviour and social skills, based on the patient's communication and interaction, behaviour, language, intelligence and other disfunctions, targeted selection of language training, homework training, special education therapy. AppliedbehavioranalysisABA therapy changes behavioural tendencies by controlling the consequences of behavioural occurrences, thus shaping and developing desired behaviours and eliminating undesired behaviours. Auditory integration training is the use of speech disorder diagnostic and treatment instrument training to induce the child's voice, assist the child to continuously increase the duration of the voice, as well as to adjust the pitch and volume, and improve the child's nasal resonance ability, which can significantly improve the child's speech disorder [23]. Action modelling for participation in sports games improves social, language and motor functioning in children with autism [24]. Family-centred psychotherapy [25] can effectively alleviate the anxiety and depression of parents of children with autism, improve the effect of rehabilitation training, and improve the prognosis of children with autism. Music therapy [26, 27] can help to reduce the severity of autism in autistic children, and promote the improvement of autistic behaviours and the recovery of language function.

Medication is mostly used to improve psychoneurological symptoms of ASD or for the treatment of co-morbidities such as epilepsy and ADHD. At present, there are mainly antidepressants, antipsychotic drugs, mood stabilisers, vitamins and magnesium salts, central stimulants, dopamine antagonists, morphine antagonists and other drugs. Although Western medicines can have a certain therapeutic effect, the overall therapeutic effect still needs to be verified in a large number of cases, as they all have a certain degree of side effects, and there is not a high degree of adherence to the use of medicines in children.

3. Research status of Chinese medicine on ASD speech disorders

3.1. Pathogenesis

The ancient Chinese medical books have not seen the name of "autism". Through the various descriptions of ancient medical doctors, autism spectrum disorders belong to the Chinese medicine "speech delay", "eyes without emotion", "fainting of the spirit", "foetal weakness" and other diseases. According to Chinese medicine theory, the etiology of autism is congenital insufficiency, deficiency of kidney essence, loss of nourishment in later life and transformation in spleen. With the development of medicine, many medical doctors, based on ancient Chinese medical texts, combined with modern medical research and clinical experience, most of them believe that the disease of ASD is in the brain, and the internal organs are closely related to the heart, liver, spleen and kidney.

Chinese medicine believes that language disorders are related to the five viscera as a whole. "Ling Shu " said: "The throat, the reason why the gas up and down also. The mouth and lips are the fans of sound. The tongue is the mechanism of sound. The uvula is the gateway to the voice". "Ren Zhai Zhi Zhi Fang Lun- sound" said: "the heart for the sound of the Lord, the lungs for the sound of the household, the kidneys for the root of the sound". " The three causes of extreme a disease evidence Theory" said: "lung gas into the heart is able to speak". Changes in the atmosphere, can also cause changes in the voice, as "Suwen" said: "sound as from the room in the speech, is the moisture of the atmosphere also". Ancient medical practitioners of speech disorders of the name of the disease is not uniform, generally known as "loss of raspy, " "tongue raspy, " "language disorder ". However, ancient doctors did not distinguish between dysarthria and aphasia, and generally considered them to be the same symptom, and therefore did not differentiate between them in terms of pathogenesis and treatment. Modern scholars Yi Wuqiang [28] believes that the content of speech is formed in the heart and brain, the brain is the house of the gods, speech is the voice of the heart, language needs to be sent through the minds of the gods, so the content of the language is first formed in the heart and brain, and the expression of speech needs to be in the heart, brain and gods under the control of the lungs, the tongue, the teeth, the lips, the nose, the larynx and other organs of articulation and the relevant muscles work in collaboration with the end.

3.2. Treatment Progress

Chinese medicine treatment of this disease has the advantages of holistic review, evidence-based treatment, tailoring to the individual, and taking into account both the symptoms and the root cause. It has received increasing attention in the treatment of ASD. At present, Chinese medicine treatment of autism is mostly based on traditional Chinese medicine and acupuncture treatment, supplemented by tuina, acupoint injection and auricular acupuncture points, and combined with modern rehabilitation training such as educational intervention, behavioural modification, speech therapy and sensory integration training.

Yan Xiaozhong said, "If the heart is not sufficient, the child will not be able to speak at the age of five or six." In the Song Dynasty, the "Tai Ping Sheng Hui Fang" suggested: "Insufficiency of heart

and weakness of the tongue make the child's speech delayed." In the Qing Dynasty, the "Yi Zong Jinjian " suggested: "The symptoms of five delays are mostly due to the weakness of the parents' qi and blood." Based on the theoretical basis of "holistic concept, identification and treatment", Chinese medicine can be tailored to the needs of each individual, giving full play to the advantages of Chinese medicine, and is highly effective in solving the accompanying gastrointestinal problems, sleep problems, emotional problems, intelligence, language ability and attention of different children, and in alleviating the physical and mental damages of the children, and then improving the core symptoms, which can improve the social ability of ASD in the short term, and improve the life and survival of children. It can short-term improve the social ability of children with ASD, and improve the quality of life and survival. Li Yinzhi [29] showed that traditional Chinese medicine is one of the effective options for treating ASD. Qu Xiujun [30] showed that the effect of fire-inducing soup in treating ASD in children was satisfactory. Hao Hongwen [31] summarised Wang Sumei's experience in treating children with ASD, pointing out that in treating children with ASD, on the basis of tonifying the kidneys and filling the essence, benefiting the intellect and clearing the collaterals, spleen strengthening and supporting the yang, resolving phlegm and opening the orifices, or levelling the liver and suppressing the yang, as well as tranquilising the mind should be given as appropriate. Zhou Nianying [32] used Lizhong decoction plus flavour together with behavioural education to treat children with ASD, and significant improvements were observed in the children's physical condition, sleep, and desire to eat. Cao Jianying [33] used self-proposed Nourishing Heart and Anti-closure Soup to treat heart-spleen deficiency type of ASD, which has the effect of improving gastrointestinal symptoms and balancing intestinal microflora in children with ASD.

Acupuncture treatment for autism includes head acupuncture and body acupuncture. Head acupuncture can directly act on the brain acupuncture points, stimulate the corresponding brain function area, improve the blood flow in the brain, which is conducive to the reconstruction of brain nerve function. At present, there are mainly Jin's head acupuncture, Jiao's head acupuncture, Tang's head acupuncture, wake up the brain to open the head acupuncture and other therapies, which is important for the adjustment of the function of organs and organs and the development of the nervous system, can play a role in enriching the medulla oblongata, brain health and intelligence, open and close the opening of the role of the brain.

As for speech disorder, as the most common co-morbidity of autism, its main treatment is mostly acupuncture. Hu Li [34] and other researchers believe that meridian acupuncture can dredge the meridians, wake up the brain and regulate the tonotactic muscles, and the use of meridian acupuncture to assist in the treatment of cognitive speech dysarthria in children with autism can effectively improve the children's clinical symptoms, behaviours, clarity of phonation, and orofacial motor function. Li Chongcai [35] selected 50 cases of autistic children with speech disorders as research subjects, and divided them into the control group and the observation group according to the method of random number table, 25 cases each. The observation group used acupuncture combined with acupoint massage. It was found that the effect of using acupuncture combined with acupoint massage in the treatment of children with autism speech disorder was remarkable, which could effectively improve the children's speech function and improve the behavioural symptoms. Zhang Wenliu [36] observed the therapeutic effect on ASD speech disorder through acupuncture combined with acupoint acupuncture, and found that the treatment of children with autism spectrum disorder by acupoint acupuncture with the theory of pivoting the spirit can effectively improve the children's cognitive and linguistic functions, and the clinical efficacy is remarkable. Meanwhile, foreign researchers Surapaty [37], Elsheikh [38] and others have proved that laser acupuncture has improved the speech ability and social interaction of ASD patients through clinical randomised controlled trials. It has been shown that acupuncture at the Neiguan point can activate the left side of the brain, mainly the parietal, frontal, temporal, and occipital lobes, and specifically activate the left side of the hippocampus and the

bilateral pontine brain, which are the main regions controlling language [39]. Dang Weili [40] initially explored the mechanism of acupuncture at Neiguan to promote myelin tissue remodelling based on the negative regulation of PI3K/Akt/GSK3β signalling pathway by PTEN gene through animal experiments, and the results of their study found that acupuncture at Neiguan acupoints could promote myelin structure remodelling by up-regulating the expression of PTEN to inhibit the PI3K/Akt/GSK3β signalling pathway. Moreover, several researchers [41,42] have demonstrated from clinical observations that acupuncture at Neiguan acupoints or acupuncture at Neiguan acupoints in combination with other therapies can improve the speech dysfunction of autistic patients significantly. Meanwhile, a study [43] shows that tongue three needles are located at the root of the tongue, where the Ren vein and Yinwei vein meet, and are mostly used in the treatment of speech disorders caused by various reasons. Considering that most of the autistic children are accompanied by different degrees of speech disorders, the tongue three needles are selected for acupuncture to clear the brain and wake up the mind, benefit the pharynx and promote the production of body fluid, and improve speech function.

4. Discussion

Autism Spectrum Disorder (ASD) is currently recognised as a difficult-to-treat disease, with its speech impairment, which also blocks the child's way of communication with the outside world to a certain extent, causing great pain to the child and his/her family. At present, there is still a lack of absolutely effective treatment methods in the clinic, modern medicine is mostly used in rehabilitation therapy means of treatment, Western medicine is mostly used to improve the psycho-neurological symptoms of ASD or used in epilepsy. In the treatment of this disease, Chinese medicine has the remarkable features of good effect, safety, no adverse reactions, and it can also reduce complications and drug-induced adverse reactions. At the same time, review of the literature found that more and more studies have proved that the effect of the composite treatment method combining acupuncture and rehabilitation interventions is significantly better than that of the single treatment plan. Therefore, the clinical treatment should integrate the acupuncture technique with the intervention programme, adopt different treatment methods for different children, continuously improve the efficiency of the treatment of the disease, give full play to the advantages of Chinese medicine and acupuncture, and alleviate the pain of the children and their families, and improve the quality of life.

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