

Original Article

Efficacy of acupuncture on children with autism spectrum disorder

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Abstract: Objective: To investigate the clinical efficacy of acupuncture on children with autism spectrum disorder (ASD). Methods: Sixty children with ASD admitted to Jiangxi Provincial Hospital of Traditional Chinese Medicine from January 2010 to January 2017 were included in this study and randomly divided into the experimental group and the control group. Each group had 30 cases. Acupuncture was used for children in the experimental group. The acupuncture points were selected as brain tri-points, Four-Shen points, Tou-Zhi points, temple tri-points, hand tri-points, Shou-Zhi points, tongue tri-points, foot tri-points, Zu-Zhi points, Fengchi and Yamen. Acupuncture was performed once a day for 30min each time for a total of 4 one-month courses. Patients in the control group were treated with conventional rehabilitation training for 4 months. Efficacy and changes in the scores of Childhood Autism Rating Scale (CARS), Autism Behavior Checklist (ABC), Clancy Autism Behavior Scale (CABS), personal social developmental quotient (DQ), and social adaptation DQ were compared between the two groups. Results: The overall response rate of children with ASD in the experimental group was 86.7%, and that of the control group was 56.7%; the difference between the two groups was statistically significant ($P = 0.024$). Before treatment, no significant difference was noted for CARS scores, ABC scores, CABS scores, personal social DQ and social adaptation DQ scores between the two groups (all $P > 0.05$). After treatment, CARS scores, ABC scores and CABS scores of the two groups were significantly lower than that before treatment, but personal social DQ and Social Adaptation DQ scores were significantly higher; the difference was statistically significant (all $P < 0.001$). CARS scores, ABC scores and CABS scores of the experimental group were significantly lower than those of the control group, but personal social DQ and Social Adaptation DQ scores of the experimental group were significantly higher; the difference was statistically significant (all $P < 0.001$). Conclusions: Acupuncture can significantly improve the symptoms of ASD in children and their behavior and social skills.

Keywords: Children with ASD, acupuncture, rehabilitation training, efficacy

Introduction

Autism spectrum disorder (ASD) in children is a disorder with abnormal behaviors among pediatric patients. Generally, it mainly manifests mental illness characterized by different degrees of social competence defects, language dysfunction, narrow interests, rigid behavior, and usually before 3 old years, which seriously threatens children's physical and mental health, and has caused a tremendous burden on the family and society [1-3]. The current clinical treatment of children with ASD is mainly drug treatment and comprehensive intervention [4]. Drug treatment have failed to fundamentally treat ASD in children, the

adverse drug reactions are obvious, and the overall effect is not satisfactory [5, 6]. Comprehensive intervention is widely used in clinical treatment of children with ASD. Although it can improve children's different skills, strengthen self-care ability and environmental adaptability, its effect is limited [7, 8]. Therefore, it is of great significance for clinicians to find a new treatment for children with ASD.

In Traditional Chinese Medicine (TCM), ASD in children is named as "congenital deficiency", "slowness to speak", etc. TCM has the advantage of overall and local argument. TCM believes that children with ASD are congenitally deficient, failure of nourishment in the spirit,

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Table 1. Comparison of general data between two groups of patients

Group	Case (n)	Male/Female (n)	Age (year)	Course of disease (year)	Illness severity		
					Mild	Moderate	Severe
Experimental group	30	17/13	6.5 ± 0.8	2.9 ± 0.6	4	8	18
Control group	30	19/11	6.8 ± 0.9	2.7 ± 0.5	3	6	21
t/χ ²		0.278	1.365	1.403		0.661	
P		0.598	0.178	0.166		0.719	

restrain liver function, deficient kidney essence and insufficient mind [9, 10]. Acupuncture is a new way to treat children with ASD in recent years [11, 12]. However, few studies have reported the effect of acupuncture on children with ASD. This study mainly investigated the effect of acupuncture on children with ASD, aiming to provide experimental basis for clinical treatment of children with ASD.

Materials and methods

Study subjects

Sixty children with ASD admitted to Jiangxi Provincial Hospital of Traditional Chinese Medicine from January 2010 to January 2017 as subjects were enrolled in this study and randomly divided into the experimental group and the control group. Each group had 30 cases. Patients in the experimental group were treated with acupuncture on the basis of conventional rehabilitation training, and those in the control group received conventional rehabilitation training. Inclusion criteria: Age was less than 14 years; it met the diagnostic criteria for children with ASD in the United States; it was expected to adhere to comprehensive intervention or acupuncture for 4 months [13]. Exclusion criteria: Severe liver and kidney dysfunction; accompanied by depression in children, schizophrenia, Asperger syndrome and other diseases; previous history of acupuncture; patients could not actively cooperate in this study. This study was approved by the Ethics Committee of Jiangxi Provincial Hospital of Traditional Chinese Medicine and all the guardians of the selected children signed informed consent.

Acupuncture

Huatuo brand No.35 stainless steel filiform needles of 1-inch were chosen. The method of twisting and rotating the needle was applied. Acupuncture points are as follows: Brain tri-points, Four-Shen points, Tou-Zhi points, temple tri-points, hand tri-points, Shou-Zhi points,

tongue tri-points, foot tri-points, Zu-Zhi points, Fengchi, and Yamen. Acupuncture was done once a day (10 min per time for 30 minutes), and paused once a week, with a total of 4 one-month courses.

Conventional rehabilitation training

Conventional rehabilitation training included language training, behavior correction and cognitive training. It was done once a day, about 4 hours per time, and paused once a week, with a total of 4 one-month courses.

Outcome measures

At the end of the whole course of treatment, the efficacy of the two groups was compared. Children were assessed by the Children Autism Rating Scale (CARS) [14]. The severity of ASD in children was classified as mild, moderate and severe. The corresponding CARS scores were 30-35 points, 36-41 points and above 42 points, respectively. Higher scores indicated worse ASD in children. The efficacy was classified into invalid, effective and excellent, and the corresponding decreased CARS total scores were less than 5 points, 5-10 points and above 19 points, respectively. Overall response rate = (effective + excellent number of cases)/total number of cases * 100%.

After the completion of the whole treatment courses, the two groups were compared in the Autism Child Behavior Scale (ABC Scale) and the Clancy Autism Behavior Scale (CABS): The ABC scale had a total of 57 questions, referring to children's feelings, body movements, social interactions, language, and self-care ability and so on [14]. Each question had 1-4 points. Higher scores suggested severe ASD. The CABS scale had a total of 14 questions, each with scores of 0-2, with higher scores indicating higher risk of ASD.

At the end of the whole treatment course, the social adaptation developmental quotient (DQ)

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Table 2. Efficacy comparison between two groups

Group	Case (n)	Efficacy grade (n)			Overall response rate
		Excellent	Effective	Invalid	
Experimental group	30	16	10	4	25 (86.7)*
Control group	30	2	15	13	17 (56.7)
t/ χ^2					5.079
P					0.024

Note: Compared with the control group, *P<0.05.

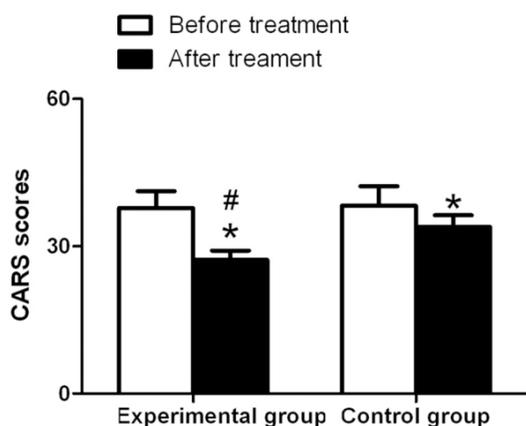


Figure 1. Comparison of CARS scores between two groups of children with ASD Compared to before treatment, *P<0.05; compared with control group at the same time point, #P<0.05.

and personal social DQ scores were compared between the two groups of children, with higher scores implying better development [15].

Statistical analysis

Experimental data were processed using SPSS18.0 software. Measurement data were expressed as mean ± standard deviation. Data before and after treatment in the group were compared using paired t test; data at the same time point between groups were compared using the independent sample t test. Enumeration data were expressed as a percentage, and comparisons between groups using χ^2 test. The difference was statistically significant as P < 0.05.

Results

Comparison of basic data between two groups of patients

There was no significant difference in basic data such as gender, age, course of disease,

and illness severity between the experimental group and the control group (all P > 0.05; **Table 1**).

Efficacy comparison of two groups

The overall response rate of children with ASD in the experimental group was 86.7%, which was significantly higher than that (56.7%) in the control group. The difference was statistically significant (P = 0.024; **Table 2**).

CARS scores comparison of two groups

No significant difference was found in CARS scores before treatment between the two groups (37.8 ± 3.4 vs 38.3 ± 3.9, t = 0.529, P = 0.599). After 4 months of treatment, the CARS score of the experimental group was 27.2 ± 1.9, and that of the control group was 33.9 ± 2.4. There was a statistically significant difference in the CARS score between the two groups (t = 11.990, P < 0.001). Compared to before treatment, the CARS scores in the two groups were significantly lower after treatment, and the differences were statistically significant (P < 0.001; **Figure 1**).

Comparison of ABC and CABS scales between two groups

Before treatment, there was no significant difference in the scores of ABC and CABS between the experimental group and the control group. Compared to before treatment, the scores of ABC and CABS scales were significantly lower after treatment in the two groups of children, and the differences were statistically significant (both P < 0.001). After treatment, the scores of ABC and CABS scales in the experimental group were significantly lower than those of the control group, and the differences were statistically significant (both P < 0.001; **Table 3**).

Comparison of personal social DQ and social adaptation DQ scores between two groups

Before treatment, there was no statistically significant difference in personal social DQ and social adaptation DQ scores between the two groups. After treatment, personal social DQ and social adaptation DQ scores in the two groups were significantly higher, with statistical

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Table 3. Comparison of ABC and CABS scores between two groups

Group	Case (n)	ABC score		t	P	CABS score		t	P
		Before treatment	After treatment			Before treatment	After treatment		
Experimental group	30	78.9 ± 5.2	69.7 ± 4.6	3.252	0.012	21.2 ± 1.3	16.5 ± 0.9	20.352	0.002
Control group	30	79.1 ± 5.7	76.3 ± 4.9	6.062	0.026	20.8 ± 1.1	18.4 ± 1.0	41.569	0.001
t		0.142	5.379			1.287	7.735		
P		0.888	< 0.001			0.203	< 0.001		

Table 4. Comparison of personal social DQ and social adaptation DQ scores between the two groups

Group	Case (n)	Personal social DQ score		Social adaptation DQ score	
		Before treatment	After treatment	Before treatment	After treatment
Experimental group	30	20.6 ± 2.2	29.2 ± 2.7	21.1 ± 1.5	34.1 ± 1.9
Control group	30	21.1 ± 2.5	26.3 ± 2.9	20.5 ± 1.3	25.4 ± 1.7
t/χ ²		0.822	4.009	1.656	18.690
P		0.414	< 0.001	0.103	< 0.001

differences (both $P < 0.001$). Personal social DQ and social adaptation DQ scores in the experimental group were significantly higher than those in the control group, with statistical differences (both $P < 0.001$; **Table 4**).

Discussion

ASD in children is a severe and widespread disorder that is one of the main causes of functional disability in children [16]. The disease has slow onset, a long course, and poor natural prognosis. Studies have shown that the incidence of children with ASD is about 0.1%-1%, and has been rising year by year [17]. Lack of independent social skills and self-care ability are important issues for children and their families. At present, the pathogenesis of children with ASD is not yet clear. The effective treatment of children with ASD has always been the focus and difficulty for scholars.

In recent years, with the improvement of clinical technology, the diagnostic level of children with ASD has significantly improved. However, there is no effective method for treatment of children with ASD. Although rehabilitation training currently widely used in clinical practice has certain efficacy, and improves the symptoms of children, this is only to stimulate the children's low-level reflex used to build conditional reflex. It cannot essentially improve the pathological state of the patient's brain to restore it to normal [18, 19]. In recent years, traditional Chinese acupuncture has not only made breakthroughs

in pain and medical diseases, but also achieved good efficacy in mental disorder [20]. TCM theory believes that the cause of children with ASD is congenital deficiency with lesion sites in the brain, manifested different degrees of mental retardation and abnormal behavior. It belongs to mind disease. All kinds of symptoms are related to the brain, but also have a close relationship with the heart, liver and kidney [21]. In this study, the acupoints selected for acupuncture were mostly distributed in the temporal lobe, the parietal lobe and the frontal lobe in the projection area of the body surface [22]. Acupuncture helps to improve the local blood flow in these parts of the brain tissue, remove metabolites, accelerate metabolism and improve brain function [23]. In addition, acupuncture with tongue tri-points is helpful to dredge the qi and blood in the tongue, so as to achieve the function of Tong Qiao Qi Yu. Acupuncture at Shou-Zhi points and Zu-Zhi points can help to strengthen the sensitivity of the children to the sound and pain, and increase their communication skills [24]. It can be seen that acupuncture directly affects the cerebral cortex, stimulates brain cells, increases the excitability of nerve cells, improves the blood flow of brain tissue, promotes the recovery of brain function, fundamentally improves the emotional and intellectual functions and reduces abnormal behaviors [25].

The CARS, ABC, CABS, and DQ scales are currently commonly used in clinical evaluation of children with ASD. The results of this study

showed that compared to before treatment, the scores of CARS, ABC, and CABS scales were significantly lower in the experimental group and the control group, but the personal social DQ and social adaptation DQ scores were significantly higher. The difference was statistically significant, indicating that acupuncture and rehabilitation training both have certain effect on children with ASD. Further research showed that compared with the control group, the scores of CARS, ABC, and CABS scales in the experimental group were significantly lower after treatment, but the personal social DQ and social adaptation DQ scores were significantly higher. The differences were also statistically significant, implying that acupuncture in children with ASD is more effective than rehabilitation, which is basically consistent with the results reported by Warren et al. [26].

In summary, acupuncture could effectively improve the clinical manifestations of children with ASD. Compared with rehabilitation training, the efficacy was significantly improved, especially in terms of behavior and social skills. Acupuncture is worthy of clinical promotion. This study has the following limitations: Small sample size, single-center, no long-term follow-up results, and observation indicators that focus only on efficacy. Further research is needed to increase sample size. Multi-center long-term follow-ups and in-depth study from the molecular biology level are required to develop more effective treatment for children with ASD.

Disclosure of conflict of interest

None.

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