

Effect of acupuncture and tuina plus rehabilitative therapy on lower limb motor dysfunction in infants with spastic cerebral palsy

针刺、推拿加康复治疗对痉挛性脑瘫患儿下肢运动功能障碍的影响

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Abstract

Objective: To observe the effect of acupuncture, tuina plus rehabilitative therapy on lower limb motor dysfunction in infants with spastic cerebral palsy.

Methods: A total of 60 infants with spastic cerebral palsy were randomly divided into a treatment group and a control group by random digital table, 30 cases in each group. The treatment group was treated with acupuncture, tuina therapy plus rehabilitative therapy of Western medicine. The control group was simply treated with rehabilitative therapy of Western medicine, as same as that for the treatment group. The assessment was respectively given to the sick infants before the treatment and after the treatment of six months, to evaluate lying and rolling scores in dimension A, to evaluate sitting score in dimension B, to evaluate crawling and kneeling scores in dimension C, and evaluate standing score in dimension D in the gross motor functions and determine the muscle tone of the gastrocnemius muscle by modified Ashworth scale (MAS).

Results: The differences were not statistically significant in comparison of the gross motor functions and the muscle tone of the gastrocnemius muscle between the two groups of sick infants before the treatment ($P>0.05$); after the treatment of six months, the above items were obviously improved in the two groups ($P<0.01$), better in the treatment group than in the control group, with the statistical significance in the differences between the groups ($P<0.01$).

Conclusion: Acupuncture, tuina plus rehabilitative therapy of Western medicine are remarkable in the therapeutic effects in the treatment of motor disorders of the lower limbs in the sick infants with spastic cerebral palsy. This therapeutic method is safe, simple and convenient and needs to be clinically popularized and applied.

Keywords: Acupuncture Therapy; Tuina; Massage; Rehabilitation; Cerebral Palsy; Myospasm; Movement Disorders; Infant

【摘要】目的: 观察针刺、推拿配合康复治疗对痉挛性脑瘫患儿下肢运动功能障碍的影响。**方法:** 将 60 例痉挛性脑瘫患儿根据随机数字表随机分为治疗组和对照组, 每组 30 例。治疗组采用针刺、推拿及西医康复治疗, 对照组单纯采用与治疗组相同的西医康复疗法, 分别对治疗前和治疗 6 个月后患儿粗大运动功能中的 A 区评定卧和翻身、B 区评定坐、C 区评定爬和跪、D 区评定站立积分和应用改良的 Ashworth 量表测定的患儿腓肠肌肌张力进行评价。**结果:** 治疗前两组患儿的粗大运动功能和患儿腓肠肌肌张力组间比较差异无统计学意义($P>0.05$); 治疗 6 个月后两组患儿的上述指标均较组内治疗前显著改善($P<0.01$), 且治疗组优于对照组, 组间差异有统计学意义($P<0.01$)。**结论:** 针刺、推拿配合西医康复治疗治疗痉挛性脑瘫患儿下肢功能运动障碍疗效显著, 治疗方法安全、简便, 值得临床推广、应用。

【关键词】 针刺疗法; 推拿; 按摩; 康复; 脑性瘫痪; 肌痉挛; 运动障碍; 婴儿

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Cerebral palsy (CP) refers to brain damage that occurred during pregnancy or shortly after birth (within 1 month). It involves a group of permanent disorders of the development of movement and posture^[1]. In China, the incidence rate of CP is 1‰-5‰^[2], and spastic CP is the most common type, accounting for 60%-70% of the

CP infants, mainly manifested by motor dysfunctions and abnormal postures. Moreover, the motor dysfunctions of lower limbs seriously influence the quality of life (QOL) of the sick infants and are one of the main points in the treatment. We treated the motor dysfunctions of the lower limbs with acupuncture and tuina for the sick infants with spastic CP at the early stage, based upon modern rehabilitation of Western medicine. Now, the report is given as follows.

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1 Clinical Materials

1.1 Diagnostic criteria

In reference to diagnostic and pattern criteria of CP approved in 2004 National Seminar on Infantile CP^[1]: CP caused by non-progressive brain damages; the pathological position of motor disorders in the brain; the morbidity occurring in the babyhood; sometimes complicated with mental retardation, epilepsy, perceptual disorder and other abnormalities; excluded central motor disorders induced by progressive diseases, infantile temporary mental retardation; manifestations of pyramidal system damages in the clinical symptoms.

1.2 Inclusion criteria

In conformity with the diagnostic criteria of spastic CP, with the age ranging from 3 months to 18 months; the family member signed the informed consent and was able to finish the treatment.

1.3 Exclusion criteria

Sick infants used to be injected with Botox within 3 months or administrated with medications to reduce the muscle tone; sick infants with osteoarthropathy or nervous and muscular diseases influencing gross motor functions; sick infants unable to finish the treatment due to serious organic diseases of the heart and lung or epilepsy.

1.4 Statistical management

All data were processed by SPSS 13.0 version statistical software for statistical analysis. The measurement data were processed by normality and homogeneity of variance, and expressed by mean \pm standard deviation ($\bar{x} \pm s$). The paired *t*-test was used for comparison before and after the treatment within the group, and *t*-test was used for comparison between the groups. $P < 0.05$ was used to express the statistical significance.

1.5 General data

Totally, 60 infants were recruited from the Clinic or Ward of Acupuncture, Tuina and Rehabilitation of our hospital and were randomly divided into a treatment group and a control group based up the random digital table, 30 cases in each group. In the treatment group, the age ranged from 121 d to 453 d, and the duration ranged from 100 d to 418 d. In the control group, the age ranged from 144 d to 435 d and the duration ranged from 76 d to 397 d. The differences in the gender, age and duration of the sick infants between the two groups were not statistically significant ($P > 0.05$), indicating that the two groups were comparable (Table 1).

2 Therapeutic Methods

2.1 Treatment group

2.1.1 Acupuncture

Acupoints on the head: Baihui (GV 20), Sishencong (EX-HN 1), Zhisanzhen [Shenting (GV 24), bilateral

Benshen (GB 13)], Niesanzhen (the first point at 2 cun directly above the ear apex, the second and third points at 1 cun anterior and posterior to the first point).

Table 1. Comparison of general data between the two groups

Group	n	Gender (case)		Average age ($\bar{x} \pm s$, day)	Average duration ($\bar{x} \pm s$, day)
		Male	Female		
Treatment	30	18	12	202.3 \pm 6.4	128.5 \pm 11.2
Control	30	14	16	196.4 \pm 5.6	112.4 \pm 9.7

Other acupoints: Shenshu (BL 23), Mingmen (GV 4), Ganshu (BL 18), Pishu (BL 20), Huantiao (GB 30), Weizhong (BL 40), Chengshan (BL 57), Kunlun (BL 60), Futu (ST 32), Zusanli (ST 36), Jiexi (ST 41) and Sanyinjiao (SP 6).

Method: All the selected acupoints were routinely disinfected. The filiform needles of 0.30 mm in diameter and 25 mm in length were selected for the acupoints on the head and were quickly inserted into the scalp with a 30° angle between the needle and scalp. After the needle tip reached the lower layer of the epicranial aponeurosis, the needles were retained for 40 min. The other acupoints were punctured perpendicularly with the filiform needles of 0.30 mm in diameter and 25 mm in length, and the needles were manipulated with lifting, thrusting and twisting techniques and taken out immediately after the arrival of the needling sensation.

Precautions: Because of hair, the scalp must be disinfected strictly, in order to avoid infection. For infants with unclosed fontanel, the pricking technique was adopted with the filiform needle of 0.25 mm in diameter and 15 mm in length. Because of plentiful blood vessels in the head, the scalp is easy to bleed. Therefore, the needle holes should be pressed with cotton balls for 1-2 min after the needles were taken out.

2.1.2 Tuina

First step: After the sick infant took an anti-spastic body position, one-thumb An-pressing and Na-grasping manipulations (Figure 1 and Figure 2) were applied along the muscles on the advantage side of spasm all the way to the attachment of the tendon and muscle, where the plucking method and dot-pressing method were applied, to relax spasm.

Second step: After the sick infant took an anti-spastic body position, the digital An-pressing, Kou-knocking and Gun-rolling manipulations were applied to the muscles of the disadvantage side of spasm, in order to enhance the muscle tone of the muscles on this side (Figure 3).

Third step: After the sick infant took a supine position, the passive movements of Bashen-pulling and Yao-shaking manipulations were applied to the hip joint, knee joint and ankle joint, in order to lubricate the joints and correct body position (Figure 4).



Figure 1. One-thumb An-pressing manipulation



Figure 2. Na-grasping manipulation



Figure 3. Gun-rolling manipulation

Fourth step: After the sick infant took a prone position, Nie-pinching spine manipulation was used, and Back-Shu points were An-pressed and Rou-kneaded, Ganshu (BL 18), Pishu (BL 20) and Shenshu (BL 23) in predominance, in order to intensify the postnatal foundation and strengthen the body constitution (Figure 5).

2.1.3 Rehabilitation treatment

Bobath neurodevelopment treatment was used to promote appearance of normal motor mode by controlling the abnormal motor mode, abnormal tension and abnormal collaborative mode.



Figure 4. Yao-shaking manipulation



Figure 5. Nie-pinching spine manipulation

2.2 Control group

The patients in the control group were treated with the same rehabilitation as those in the treatment group.

2.3 Course of treatment

Acupuncture and tuina treatment was given once every other day. The rehabilitation treatment was given once respectively in the morning and afternoon, for 30 min each time. After the treatment of 6 months, the therapeutic effects were observed.

3 Observation of Results

3.1 Observed items

3.1.1 Gross motor functions

Before and after treatment, the scores were evaluated in the two groups in dimension A (lying, rolling, totally 17 items), dimension B (sitting, totally 20 items), C (crawling and kneeling, totally 14 items) and dimension D (standing, totally 13 items) of Gross motor function measurement scale (GMFM). The highest score in each item was 3 points. The higher the total score, the better the gross motor function^[3-4].

3.1.2 Muscle tone of the gastrocnemius muscle

The modified Ashworth scale (MAS) was used to determine the muscle tone of the gastrocnemius muscle.

Method: After the sick infant took a lateral recumbent position, with the hip joint flexed in 45° and knee joint extended to its maximum, and with the head and body trunk on a straight line, the examiner faced the sick infant and held his or her knee joint with one hand to stabilize the lower limb, and put the other hand on the inferior part of his or her foot, with the thumb on the lateral side of the heel and the other fingers at the medial side of the heel bone, and the palm on the metatarsal surface of the foot, to move the ankle joint of the sick infant from a maximum plantar flexion to a maximum dorsiflexion, after telling the sick infant to relax as much as possible. The finishing time of each movement was about 1 s. The evaluation was repeated three times, and the average values were recorded (for convenient statistics, grade 0, 1, 1⁺, 2, 3 and 4 were respectively quantified into 1, 2, 3, 4, 5 and 6 points). The higher the grade, the higher the corresponding score, indicating that the muscle tone was higher^[4].

Grade 0: No increase in muscle tone.

Grade 1: Slight increase in muscle tone, manifested by a catch and release or by minimal resistance at the end of the range of motion when the affected part(s) is moved in flexion or extension.

Grade 1⁺: Slight increase in muscle tone, manifested by a catch, followed by minimal resistance throughout the remainder (less than half) of the range of motion (ROM).

Grade 2: More marked increase in muscle tone through most of the ROM, but affected part(s) easily moved.

Grade 3: Considerable increase in muscle tone, passive movement difficult.

Grade 4: Affected part(s) rigid in flexion or extension.

3.2 Results

Before treatment, the differences in the total scores in dimension A, B, C and D of the gross motor functions and the muscle tone of the gastrocnemius muscle by MAS determination in the sick infants between the two groups were not statistically significant ($P>0.05$). After the treatment of six months, the scores of the above two items were significantly changed (all $P<0.01$), and the differences between the two groups were statistically significant ($P<0.01$). The above results indicated that both the therapeutic plans can improve the gross motor functions of the sick infants; moreover, acupuncture, tuina plus rehabilitative therapy are better than rehabilitative therapy alone in the therapeutic effects (Table 2 and Table 3).

Table 2. Comparison GMFM score before and after treatment between the two groups ($\bar{x} \pm s$, point)

Group	n	Time	Dimension A	Dimension B	Dimension C	Dimension D
Treatment	30	Before treatment	32.12±11.35	30.87±10.27	22.14±8.34	15.21±6.37
		After treatment	47.51±12.75 ¹⁾²⁾	50.65±14.86 ¹⁾²⁾	31.81±11.81 ¹⁾²⁾	23.14±7.63 ¹⁾²⁾
Control	30	Before treatment	30.22±10.23	33.28±12.57	21.33±7.24	16.38±7.81
		After treatment	42.34±12.24 ¹⁾	44.54±12.52 ¹⁾	27.56±9.35 ¹⁾	19.25±8.29 ¹⁾

Note: Comparison within the same group before treatment, 1) $P<0.01$; compared with the control group after treatment, 2) $P<0.01$

Table 3. Comparison of muscle tone of gastrocnemius muscle between the two groups ($\bar{x} \pm s$)

Group	n	Before treatment	After treatment
Treatment	30	4.67±1.75	2.54±0.87 ¹⁾²⁾
Control	30	4.58±1.62	3.11±0.96 ¹⁾

Note: Comparison within the same group, 1) $P<0.01$; compared with the control group after treatment, 2) $P<0.01$

4 Discussion

In Chinese medicine, CP falls into the category of ‘five retardations’, ‘five flaccidities’ or ‘five rigidities’. It primarily results from congenital deficiency and postnatal malnutrition. Alternatively, it may occur as a result of stagnant blood or turbid phlegm obstructing the brain collaterals. These factors may lead to malnourishment of the brain marrow, bones, sinews, muscles and limbs. This condition is mainly associated with the brain, liver, spleen and kidney.

Baihui (GV 20) is the gathering site of yang. Therefore, acupuncture at Baihui (GV 20) can excite yang qi of the human body to dredge and regulate the Governor Vessel, tonify the marrow, strengthen the brain and benefit intelligence. Sishencong (EX-HN 1), Zhisanzhen and Niesanzhen are located in the head. The combination of these acupoints can improve the metabolism and functions of cerebral cells, reduce nitric oxide and malondialdehyde, eliminate oxygen free radicals, promote blood circulation of the brain, enhance the excitement and conductive functions of the nerves, activate the dormant nerve cells of the brain, rebuild the neural network and promote the compensation of the cerebral functions of CP infants, so as to reduce the muscle tone and improve the activity of the joints and finally build up the normal motor pattern^[5-7]. Yangming meridians are rich in qi and blood and responsible for nourishing tendons. The spleen and stomach are the postnatal foundation and the resources for transformation of qi and blood. Therefore, the acupoints in body acupuncture are mainly selected from

Back-Shu points and yang meridians of the lower limb, in the purpose to strengthen the spleen and benefit intelligence, in order to realize the effects to build up the earth and consolidate the constitution on one hand, and to dredge the meridians and collaterals, in order to achieve the effect to regulate qi and activate blood on the other hand.

Tuina can dredge the meridians and collaterals, circulate qi and blood, and balance yin and yang. Tuina manipulations can relax the muscular spasm, reduce the muscle tone, strengthen the tendons and bones, enhance the muscle strength, promote motor development and correct the abnormal postures, and can simultaneously improve the digestive functions, elevate the immunity and strengthen the body^[6-11]. Nie-pinching spine manipulation can enhance the contents of trace elements necessary for the human body (such as Fe, Zn, Cu) and reduce the contents of unnecessary trace elements (such as Cd) to a certain limit, beneficial to the synthetic metabolism of nucleic acids and proteins, and increase the enzyme activity, beneficial to the development of the brain, nervous system and motor system^[12]. Focusing on reflex inhibition and facilitation, Bobath neurodevelopment treatment can maintain the length of the muscles and tendons of the growing infants in the best scope by reducing the muscle tone, lengthening the spastic muscular and fibrous tissues, and promoting the development of the normal spinal column, bones and joints^[13-15], and simultaneously can normalize the motor pattern gradually by inhibiting the abnormal postures and motor modes, assisting the production of the normal reaction by repeated stimulation and training^[16-19].

This study indicated that the early application of acupuncture, tuina and rehabilitative therapy is better than rehabilitative therapy alone for motor disorder of the lower limbs of the sick infants with spastic CP and needs to be clinically popularized.

Conflict of Interest

There was no potential conflict of interest in this article.

Statement of Informed Consent

Informed consent was obtained from the guardians of the recruited children in this study.

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