

The effect of new scalp acupuncture on qi, 5 elements and acupuncture of meridians in patients with chronic stroke – pilot study

O efeito da nova acupuntura escalpeana no qi, 5 elementos e meridianos da acupuntura em pacientes com Acidente Vascular Cerebral crônico – estudo piloto

El efecto de la nueva acupuntura del cuero cabelludo sobre el qi, los 5 elementos y los meridianos de acupuntura en pacientes con accidente vascular cerebral crónico - estudio piloto

Thais Gebin Toledo¹, Andreia Maria Silva Vilela Terra²,
Adrielle Regina Quirino³, Luciana Maria dos Reis⁴, Carolina Kosour⁵,
Vanessa de Queiroz dos Santos⁶, Sidney Benedito da Silva⁷,
Adriana Teresa Silva Santos⁸

1. Student of the Graduate Program in Rehabilitation Sciences of the Institute of Motricity Sciences, Universidade Federal de Alfenas, Alfenas-MG, Brazil. ORCID: <https://orcid.org/0000-0002-9510-0017>

2. Professor of the Graduate Program in Rehabilitation Sciences of the Institute of Motricity Sciences, Universidade Federal de Alfenas, Alfenas-MG, Brazil. ORCID: <https://orcid.org/0000-0002-1255-8429>

3. Physical therapist graduated from the Universidade Federal de Alfenas, Alfenas-MG, Brazil. ORCID: <https://orcid.org/0000-0002-3613-2916>

4. Professor of the Graduate Program in Rehabilitation Sciences of the Institute of Motricity Sciences, Universidade Federal de Alfenas, Alfenas-MG, Brazil. ORCID: <https://orcid.org/0000-0002-0672-7804>

5. Professor of the Graduate Program in Rehabilitation Sciences of the Institute of Motricity Sciences, Universidade Federal de Alfenas, Alfenas-MG, Brazil. ORCID: <https://orcid.org/0000-0001-6479-9550>

6. Student of the Graduate Program in Rehabilitation Sciences of the Institute of Motricity Sciences, Universidade Federal de Alfenas, Alfenas-MG, Brazil. ORCID: <https://orcid.org/0000-0002-7971-2400>

7. Professor of the Physical Therapy at the Universidade do Vale do Sapucaí (UNIVAS), Pouso Alegre-MG, Brazil. OCID: <https://orcid.org/0000-0001-8836-1094>

8. Professor of the Graduate Program in Rehabilitation Sciences of the Institute of Motricity Sciences, Universidade Federal de Alfenas, Alfenas-MG, Brazil. ORCID: <https://orcid.org/0000-0002-9959-3269>

Resumo

Introdução. O acidente cerebral vascular (AVC) frequentemente leva a perda da autonomia, dependência para as atividades da vida diária e ruptura na interação social, podendo resultar em importante redução da qualidade de vida destes indivíduos. Grande parte dos sobreviventes apresenta déficits sensoriais motores residual, que vão interferir na realização de atividades funcionais. Minimizar as sequelas e aumentar a recuperação funcional é um ponto partida importante para os profissionais da reabilitação. **Objetivo.** Analisar o efeito da nova acupuntura escalpeana Yamamoto (AE) YNSA no Qi, 5 elementos e nos meridianos da acupuntura em pacientes com AVC crônico. **Método.** Estudo piloto quase experimental composto por nove pacientes com AVC crônico. Todos os participantes com diagnóstico de AVC crônico com idades entre 38 e 79 anos foram submetidos ao eletrodiagnóstico energético. Os pacientes receberam uma sessão AE no hemisfério contralateral do lado danificado correspondente à área motora e sensorial por 30 minutos. Foi aplicado o teste de Shapiro-Wilk, seguindo do teste t pareado. **Resultados.** Houve uma redução significativa no Yin, Fogo (Pericárdio) e Fogo (coração). Os seguintes órgãos e vísceras também apresentaram redução: pulmão, pericárdio direito, intestino delgado esquerdo e baço direito. **Conclusões.** Conclui-se que a AE YNSA pode promover equilíbrio do Qi, redução no elemento fogo e redução da ação de alguns meridianos da acupuntura em pacientes com AVC na amostra analisada.

Unitermos. AVC, Acupuntura, Reabilitação, Fisioterapia

Abstract

Introduction. Individuals affected by stroke often lead to loss of autonomy, dependence in activities of daily living, and social disruption, possibly leading to a reduced quality of life. Most survivors present residual sensory-motor deficits that interfere with the performance of functional activities. Reducing complications and improving the functional recovery of these individuals is an important starting point for rehabilitation professionals. **Objective.** To analyze the effect of the new Yamamoto scalp acupuncture (SA) YNSA on Qi, 5 elements and acupuncture of meridians in chronic stroke patients. **Method.** This is a quasi-experimental pilot study composed of nine chronic stroke patients. All participants diagnosed with chronic stroke aged from 38 to 79 years underwent energetic electrodiagnosis. Patients received a SA session on the contralateral hemisphere of the damaged side corresponding to the motor and sensory area for 30 minutes. The Shapiro-Wilk test was applied, followed by the paired t-test. **Results:** There was a significant reduction in the Yin, Fire (Pericardium) and Fire (heart). The following organs and viscera also presented a reduction: lung, right pericardium, left small intestine, and right spleen. **Conclusions.** It is concluded that AE YNSA can promote Qi balance, reduction in the fire element and reduction in the action of some acupuncture meridians in chronic stroke patients in the analysed sample.

Keywords. Stroke, Acupuncture Therapy, Rehabilitation, Physical Therapy

Resumen

Introducción. El accidente cerebrovascular (ACV) a menudo conduce a la pérdida de la autonomía, la dependencia para las actividades de la vida diaria y la interrupción de la interacción social, lo que puede resultar en una reducción importante en la calidad de vida de estos individuos. La mayoría de los supervivientes presentan déficits sensoriales motores residuales, que interferirán con el desempeño de las actividades funcionales. Minimizar las secuelas y aumentar la recuperación funcional es un punto de partida importante para los profesionales de la rehabilitación. **Objetivo.** Analizar el efecto de la nueva acupuntura del cuero cabelludo YNSA de Yamamoto (AE) sobre el qi, los 5 elementos y los meridianos de acupuntura en pacientes con accidente vascular cerebral crónico - estudio piloto. **Método.** Se trata de un estudio piloto cuasiexperimental de nueve pacientes con accidente cerebrovascular crónico. Todos los participantes diagnosticados con accidente cerebrovascular crónico de entre 38 y 79 años se sometieron a un electrodiagnóstico energético. Los pacientes recibieron una sesión de EA en el hemisferio contralateral en el lado lesionado correspondiente al área motora y sensorial durante 30 minutos. Se aplicó la prueba de Shapiro-Wilk, seguida de la prueba t pareada. **Resultados.** Hubo una reducción significativa en Yin, Fuego (Pericardio) y Fuego (corazón). Los siguientes órganos y vísceras también mostraron una reducción: pulmón, pericardio derecho, intestino delgado izquierdo y bazo derecho. **Conclusiones.** Se concluye que AE YNSA puede promover el equilibrio del Qi, la reducción del elemento fuego y la reducción de la acción de algunos meridianos de acupuntura en pacientes con accidente vascular cerebral crónico en la muestra analizada.

Palabras clave. Accidente cerebrovascular, acupuntura, rehabilitación, fisioterapia

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Corresponding address: Adriana Teresa Silva Santos. Av. Jovino Fernandes Sales 2600, prédio C, sala 101-G. Santa Clara. Alfenas-MG, Brasil. CEP 37133-840. E-mail: adriana.santos@unifal-mg.edu.br

INTRODUCTION

Stroke is defined as the sudden interruption of cerebral vascular flow that leads to brain lesions and damage to neurological functions¹. It is a major public health issue due

to its high incidence and great impact on the population. Stroke is one of the four leading causes of death worldwide, as well as one of the most disabling illnesses²⁻⁴.

Individuals affected by this condition often experience loss of autonomy, dependence in activities of daily living, and social disruption, possibly leading to a reduced quality of life⁵⁻⁶. Most survivors present residual sensory-motor deficits that interfere with the performance of functional activities⁷⁻⁹ and are correlated to the lesion size, location, and area¹⁰.

Clinical studies that administered acupuncture therapy suggest that needle insertion reorganizes and balances chemical mediators, boosting brain function and consequently rebounding in sensory-motor and visceral responses, cognitive processes, sleep, and emotion¹¹⁻¹³. In the East it involves stimulation at certain points, to flow Qi through the meridians. These effects comply with the philosophical principles of traditional Chinese medicine (TCM), whose goal is to restore the *Yin-Yang* balance¹¹. When administered after cerebral ischemia in rats, the electroacupuncture enhanced motor cortex excitability and enabled motor function recovery¹⁴.

According to Chinese thought, everything that exists in the universe has these two aspects: yin and yang. In general, the characteristics of being active, hot, bright, and functional belong to yang; the characteristics of being static, cold, dark, and organic belong to yin, and are considered two opposite energies that we call Qi¹⁵. Qi is an invisible immaterial substance that circulates in our body through

energy channels called meridians¹⁶. Disease for TCM is the state of imbalance that can manifest as a deficiency or excess of Qi¹⁵. Pathogenically diseases can be caused by excessive wind, cold, heat, humidity, and dryness or also by overloads of emotion and excessive thinking¹⁵.

An objective way to measure Qi may be performed by the Ryodoraku method, which consists in analysing the existence of electrical conductance in specific points of the skin (source point - high concentration of Qi), like the path of the main meridians of acupuncture (12 on each side of the body)¹⁶. By measuring the conductivity of each meridian, we can verify energetic excesses or deficiencies¹⁷.

The theory of the five elements (wood, fire, earth, metal, and water) is another aspect analysed in TCM, it serves to categorize all things in nature as well as correlate them to five physiological systems centred on the organs and viscera of the human body through the meridians (Liver - gallbladder; heart - small intestine; stomach - spleen; lung - large intestine and kidney - bladder)¹⁶.

Scalp acupuncture (SA) is a specialized acupuncture technique used to stimulate specific areas of the scalp, able to harmonize and regulate the functional activities of the brain and body¹⁷. A review with meta-analyses that included only clinical trials with ischemic stroke that applied AE bilaterally and unilaterally showed improvements in neurological deficits when compared to the control group¹⁸. However, these were insufficient reports due to poor methodological quality.

Studies conducted with functional magnetic resonance imaging (fMRI) in stroke patients found changes in the activation of motor cortex, premotor, and supplementary motor area after SA¹⁹. To date, scientific evidence indicates no study approaching the effect of SA on acupuncture meridians. Thus, the objective of the present study was to analyze the effect of the new Yamamoto scalp acupuncture (AE) YNSA on Qi, 5 elements and acupuncture of meridians in chronic stroke patients.

METHOD

Study Design

This is a quasi-experimental pilot study submitted and approved by the Ethics Committee of the Universidade Federal de Alfenas number 3.156.443. All participants agreed to participate by signing the consent form, where they were informed about the goals and procedures of the research and assured of anonymity. All the norms and guidelines established by the resolution 466/12 of the National Health Council (CNS) were respected. This study was registered at the Brazilian Registry of Clinical Trials (ReBEC) under number RBR-8Hz5V5.

The study was conducted at the Physical Therapy School Clinic of the Universidade Federal de Alfenas (UNIFAL)/MG from January to June 2019, in a single session.

Sample

Our sample consisted of nine individuals clinically diagnosed with ischemic stroke in the chronic phase. From the 21 patients selected from the UNIFAL-MG physical therapy school clinic waiting list, only 11 met the inclusion criteria: aged over 50 years, spastic hemiparesis due to stroke, both genders, mild to moderate motor impairment according to Fugl-Meyer scale, good cognitive ability, time of injury above 3 months, and agreed to participate in the study by signing the consent form. Exclusion criteria were hemiparesis caused by another neurological disorder, severe cognitive impairment, and bilateral sensory-motor sequelae. Two patients refused to participate in the study.

Assessment tools

The mini-mental state examination (MMSE), the Fugl-Meyer motor assessment scale (FMA), and electrodiagnostic instrument for energy profile were used for evaluation.

Mini-mental state examination (MMSE)

The MMSE was used to assess patients' cognitive abilities. This instrument allows cognitive assessment based on different parameters²⁰, such as temporal orientation, spatial orientation, memory, attention and calculation, evocation, language, and visual-constructive ability. Its maximum score is 30 points, indicating a better cognitive ability²¹. MMSE cut-off score is adjusted by education level:

for over 7 years of education, cut-off point is 28; from 4 to 7 years, it is 24; for 1 to 3 years, 23; and 19 for illiterate²².

Fulg-Meyer assessment scale (FMA)

The FMA evaluates the upper and lower limb sensory-motor functioning based on six parameters: range of motion, pain, sensitivity, motor function, balance, coordination, and speed. Items are scored on a 3-point ordinal scale, totaling 226 points: 0 - cannot perform, 1 - performs partially; and 2 - performs fully²³. The evaluation of normal motor function totals 100 points, used to determine sample selection (upper limb 66 and lower limb 34). The score is according to the level of motor impairment, whereby less than 50 points indicate severe motor impairment; 50-84 strong; 85-95 moderate; and 96-99 mild²³. There is adequate inter- (ICC=.99) and intra-rater reliability (ICC=.98)²⁴. This scale was used only to characterize the sample, it was not used to compare the sensorimotor data before and after the intervention, because it was not sensitive enough to verify the results in only one session.

Electrodiagnosis for Energy Profile

Energy electrodiagnostics assesses the energy profile of the acupuncture meridians by means of the electrical resistance of the skin at specific points called acupoints (highest concentration of Qi)²⁵.

The device used was Ryodoscope RDC Ryodoraku®. The equipment has 2 cables: active electrode (cable used to

evaluate the acupoints) and passive (ground cable). Powered by the USB port (5v), measurement voltage 12V, with maximum measurement current 200 μ ($\pm 2\%$), continuous operation mode. The device was attached via the USB port to the HP notebook (pavilion entertainment PC). The notebook device was equipped with KM - KIMETER version 2.1 software for data collection and analysis. The AcuGraph system has acceptable validity²⁶.

The software generates the graphic creation of the Ryodoraku pattern, the yin/Yang, line graph, the 5 elements, the Pentagram, the Energy Cycle, the elements - organs and víceras (lung, large intestine, pericardium, triple energize, heart, small intestine, spleen, stomach, gallbladder, liver, kidney, and bladder) and Ryodoraku treatment protocol. For this study we used the graphic creation of yin and yang, the elements - organs and vicerias and the 5 elements (wood, fire, earth, metal, and water) corresponding to 6 organs and vicerias on the right and left side of the human body. The metal element corresponds to the lung - large intestine, the fire element corresponds to the heart - small intestine/pericardium - triple heater, the wood element corresponds to the liver - gallbladder, the water element corresponds to the bladder - kidney, and the earth element corresponds to the stomach - spleen).

For the analysis, the patient remained in sedation for 15 minutes in an air-conditioned room with a temperature of 25°C, the patient was asked to hold a passive electrode in one hand, and the active electrode was placed on several

points of the hands and feet.

The measurement on the hand acupoints were lung point 9 (LU9); pericardium 6 (PC6), heart point 7 (HT7); larger intestine point 5 (LI5), triple energizer point 4 (TE4), small intestine point 5 (SI5) and the foot: Spleen 3 (SP3), Liver 3 (LR3), Kidney 4 (KI4), Bladder 65 (BL65), Gallbladder 40 (GB40), Stomach 42 (ST42) bilaterally, starting with the left hand and ending with the right foot. Acupoints LU9, PC6 and HT7 are located on the flexor crease of the wrist laterally, centrally, and medially, respectively. Acupoints LI5, TE4, and SI5 are in the extensor crease of the lateral wrist, centrally and medially, respectively²⁵.

The measurement on the acupoints on the feet were: kidney point 4 (KI4), located between medial malleolus and achilles tendon; spleen point 3 (SP3), located in the depression between head and the diaphysis of the 1st metatarsal; liver point 3 (LR3), located at the base of the 2nd metatarsal; bladder point 65 (BL65), located in the depression between head and diaphysis of the 5th metatarsal; gallbladder point 40 (GB40), in the depression in front of the lateral malleolus, stomach 42 (ST42) at the base of the 3rd metatarsal²⁵.

The energy profile of acupuncture meridians is determined in μA , so values between 40 and 60 μA indicates energy balance pattern, values above induce energy excess and values below energy deficiency²⁷.

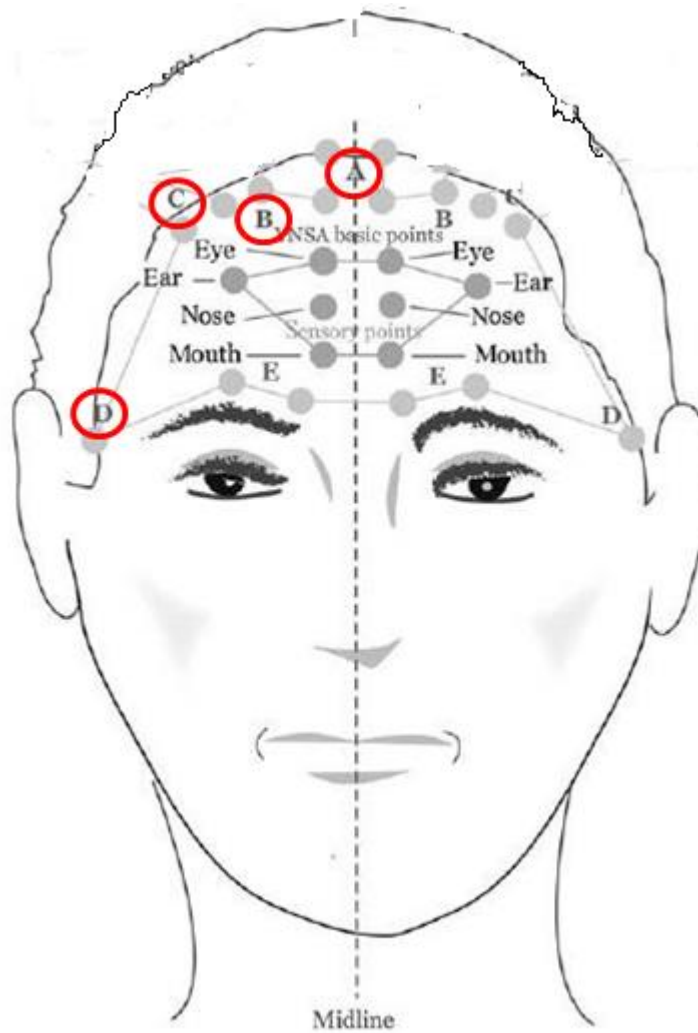
Procedures

The procedure was divided into four phases. In Phase 1, sociodemographic and clinical data were collected and analyzed using the FMA and MMSE scale to be included in the study. Participants were also informed about all about the goals and procedures of the research and instructed to sign the consent form. In Phase 2, electrodiagnosis was administered to patients and energy profile determined. In Phase 3, intervention (scalp acupuncture described below) was implemented. Finally, energy profile was reassessed in Phase 4. Phases 2, 3, and 4 were all performed on the same day, whereas Phase 1 was implemented 1 week earlier.

The Yamamoto new scalp acupuncture (YNSA) intervention was administered to all patients as follows: patients were placed in supine position in the examination bed, and points A (1cm from the sagittal line), B (1cm lateral to point A), C (2.5cm lateral to point B), and D (4cm from the ear helix) were demarcated with measuring tape (Figure 1).

Scalp acupuncture was administered by a professional with 12 years of experience, who perpendicularly inserted four 0.25X025cm Dong Bang® needles of 0.2-mm diameter until patients felt the Qi, without reaching the bone. Before insertion, the site was cleaned with 70% alcohol on a cotton-wool ball and the needle was unilaterally applied on the contralateral scalp of the affected limb²⁸.

Figure 1. Yamamoto Scalp acupuncture with brain points. Adapted by the authors from Schockert *et al.*³⁹.



Statistical Analysis

Descriptive statistics were used to characterize sample, mean, standard deviation, and percentage. The Shapiro-Wilk test and paired t-test were used to test data normality. The data were analyzed using the Statistical Package for the Social Sciences (SPSS) v. 20.0.

RESULT

Table 1 shows the anthropometric and clinical data of the participants. We found a male predominance and a higher incidence of ischemic stroke.

Table 1. The anthropometric and clinical characteristics of stroke patients.

Variables		n=9
Age (years) - $\bar{x} \pm \sigma$		59.22±13.45
Time of stroke - (months) $\bar{x} \pm \sigma$		41.44±39.00
Fugl-Meyer (points) - $\bar{x} \pm \sigma$		141.88±48.47
MEEM (points) - $\bar{x} \pm \sigma$		24.5±2.75
Gender (%)	Male	77.77
	Female	22.22
Type of stroke (%)	Ischemic	88.88
	Hemorrhagic	11.11

$\bar{x} \pm \sigma$ = mean \pm standard deviation, MMSE = Mini Mental State Examination.

Table 2 demonstrates the mean and standard deviation and p value yin and yang variables the stroke subjects. It is observed that there was significant reduction in Yin variables ($p=0.04$).

Table 2. Shows the values of the mean, standard deviation, and p value of the yin and yang variables of the patients analyzed in the study.

Variables	Pre-intervention	Post-intervention	p-value
Yin	144.44±82.87	97.66±65.90	0.04*
Yang	145.22±95.49	116.88±89.14	0.18

* Paired t-test, * $p < 0.05$

Table 3 demonstrates the mean, standard deviation, and p-value of the 5 elements of the study population. There was a significant difference in Fire PC ($p=0.04$) and Fire HT (0.04).

Table 3. Shows the values of the mean, standard deviation, and p value of the 5 elements of the study population.

Variables	Pre-intervention	Post-intervention	p-value
Metal	31.88±23.87	23.11±17.60	0.06
PC/Fire	30.11±20.10	19.66±16.70	0.04*
HT/Fire	26.11±20.07	15.44±12.51	0.04*
Earth	21.44±12.29	15.55±9.83	0.07
Wood	16.89±11.81	16.00±14.18	0.8
Water	17.77±9.24	16.33±10.46	0.5

PC/Fire – Pericardium/Fire; HT/Fire – Heart/fire, * Paired t-test, * $p<0.05$

Table 4 shows the values of the mean, standard deviation, and p value of the elements of organs and viscera of the studied population. There was a significant difference left LU ($p=0,03$), right PC ($p=0.01$), left SI ($p=0.03$), and right SP ($p=0.00$).

DISCUSSION

TCM characterizes the pathophysiology of stroke as the "blow" of wind (zhongfeng), in which it invades organs and viscera²⁹. In the contemporary view, the rapid, turbulent, and hyperactive movement of yang (fire) invades the channels of the organs and viscera of the upper body,

interrupting the flow of Qi and blood (xue), generating the signs and symptoms of stroke. The same can occur when turbulence and obstruction are generated by wind and mucosity³⁰.

Table 4. The values of the mean, standard deviation, and p value of the elements of organs and viscera of meridian of the population studied.

Variables	Pre-intervention	Post-intervention	p-value
Right LU	29.11±22.84	20.22±17.15	0.09
Left LU	33.00±23.69	21.55±17.83	0.03*
Right PC	30.77±16.28	19.22±16.64	0.01*
Left PC	26.88±21.77	16.55±13.47	0.07
Right HT	20.77±17.89	11.88±13.94	0.15
Left HT	24.88±22.44	12.11±10.26	0.07
Right SI	23.77±19.96	21.33±19.94	0.50
Left SI	30.89±25.29	14.00±13.04	0.03*
Right TE	30.66±23.63	21.66±22.03	0.11
Left TE	33.55±26.29	23.11±21.50	0.11
Right LI	29.77±22.45	25.11±17.73	0.19
Left LI	36.55±29.84	26.66±22.26	0.15
Right SP	29.77±16.80	16.33±7.29	0.006*
Left SP	22.55±12.80	18.22±13.74	0.18
Right LR	17.66±14.70	14.00±12.64	0.36
Left LR	21.00±14.85	14.44±10.97	0.20
Right KI	17.44±13.29	16.11±10.16	0.74
Left KI	15.55±10.71	15.44±13.38	0.97
Right BL	20.44±11.56	18.55±13.63	0.53
Left BL	19.33±13.00	16.66±13.91	0.42
Right GB	14.22±12.38	17.33±16.45	0.42
Left GB	16.33±10.75	19.88±18.70	0.53
Right ST	18.88±15.30	15.11±15.14	0,33
Left ST	16.33±14.05	14.66±13.20	0.66

Paired t-test, *p<0.05, LU = Lung, P = Pericardium/circulation sex, HT = Heart, SI = Small Intestine, TE = Triple energizer, LI = Large Intestine, SP = Spleen, LR = Liver, KI = kidney, BL = Bladder, GB = Gallbladder, ST = Stomach

Li *et al.*³¹ attributed the etiology of wind "blow" into four groups: a) overwork, emotional stress and excessive sexual activity cause deficiency of yin of the kidney and liver and rise of yang of the liver which especially in the elderly, can generate wind in the liver; b) irregular diet and excessive physical exertion: large amounts of sweet foods, dairy and fried foods weaken the spleen and generate mucosity, which can combine with fire; c) excessive sexual activity and inadequate rest weakens the essence of the kidney and generates deficiency of the marrow, which fails to nourish the blood (xue) and eventually to pictures of stasis (stagnation) of it; d) excessive physical exertion and inadequate rest weaken the spleen, muscles and channels, allowing the manifestation of the internal wind by the deficiency of Qi and blood in them and greater susceptibility to the attacks of external wind³⁰.

In TCM, brain diseases are considered systemic, rather than disorders of a single organ, their treatment aims to normalize not only the organs, but also the balance of functional interaction between the organs³².

The result, of the present study, indicates that YNSA EA induced positive responses for the variables: Yin, Fire element, left LU, right PC, left SI and right SP. Two studies, one with 264 patients³³ and the other with 1246 patients³⁴, all diagnosed with ischemic stroke, showed reduction in some variables: 5 elements, organs, and viscera.

Clinical research shows that application of AE (motor area) can increase cerebral blood flow, reduce the focus of

infarction, and promote the establishment of cerebral collateral circulation^{35,36}.

AE can increase the blood supply in the cerebral cortex, increases the metabolite level of brain cells, activates potential neurons, and promotes the formation of brain synapses³⁷.

AE YNSA promotes improvement in function, pain, quality of life³⁸ and muscle tone, with activation in the motor cortex, premotor area, and supplementary motor area, in stroke patients³⁹.

Yin represents decreased Qi activity, which suggests rest and negative polarity, indicating parasympathetic action⁴⁰. It is noted in the present study, that this reduction of yin was found, suggesting better vagal action and energetic balance.

The fire element is a constituent of the 5 elements, characterized as hot, light, and movement⁴⁰. The overload of this element may be the condition of the stroke patient³⁰. The result found in the present study, regarding this question indicated that the EA promoted a reduction of this element, suggesting an energy balance in this element.

Another variable addressed in this study was the organs and viscera, among them is LU, PC and SP. When there is a deficiency of Qi of these structures, it indicates symptoms of contracture or impotence of the muscles, and as for the SP, it indicates muscle fatigue and edema⁴¹. These data correlate to the characteristic clinical picture of the stroke. All these analyzed variables had a reduction after the application of

YNSA EA.

The limitations found in the present study were absence of a control group - for a better comparison of the data, limited sample size - due to the difficulty in contacting the patients and difficulty in recruitment, and lack of use of the sensory-motor scale after the intervention. Follow-up and a longer time of intervention are suggested.

It is hoped that this study can generate a contribution for future research.

CONCLUSION

It is concluded that AE YNSA can promote Qi balance, reduction in the fire element and reduction in the action of some acupuncture meridians in chronic stroke patients in the analysed sample.

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