ACUPUNCTURE & ELECTRO-THERAPEUTICS RES., INT. J., Vol. 19 pp. 227-249, 1994

0360-1293/94 $5.00 + .00

Acupuncture in the Treatment of Paralysis in Chronic and Acute Stroke Patients - Improvement Correlated with Specific CT Scan Lesion Sites

Margaret A. Naeser, Ph.D., Lic.Ac., Dipl.Ac. (NCCA)
Associate Research Professor of Neurology, Boston University School of Medicine
and Veterans Affairs Medical Center, Boston, Massachusetts
[Correspondence: V.A. Medical Center (116-B), 150 So. Huntington Ave., Boston, MA 02130]

Michael P. Alexander, M.D.
Associate Professor of Neurology, Boston University School of Medicine
and Braintree Hospital, Braintree, Massachusetts

Denise Stiassny-Eder, M.S., O.T.R.
Formerly, Boston University Aphasia Research Center at the Boston V.A. Medical Center

Vicki Galler, R.P.T., M.Ed., Judith Hobbs, R.P.T.
Formerly, Rehabilitation Medicine Service, Boston Veterans Affairs Medical Center

David Bachman, M.D.
Director of Behavioral Neurology, Department of Neurology
Medical University of South Carolina, Charleston, South Carolina

(Received July 15, 1994; Accepted with revisions August 15, 1994)

Abstract:

A total of 20 stroke patients received acupuncture, including 10 chronic and 10 acute patients; 19 of the 20 patients (95%) could be correctly classified regarding beneficial response to acupuncture, versus poor response, based on CT scan lesion site data, alone. Patients with beneficial response had damage to *less than half* of the motor pathway areas on CT scan, especially in the periventricular white matter area (PVWM) at the level of the body of the lateral ventricle. Overall, 8 of the 20 patients receiving acupuncture had beneficial response with measurable objective improvement in motor function, including 3 of the 10 chronic patients treated at > 3 months poststroke, and 5 of the 10 acute patients treated at < 3 months poststroke. Among the 8 patients with beneficial response, significant improvements were observed in knee flexion, knee extension, and shoulder abduction. Neither age, nor months poststroke when acupuncture was begun, was significantly correlated with the total number of improved tests, post-acupuncture. Two chronic patients with beneficial response first began receiving acupuncture at 3 years and 6 years poststroke. Most improvements were sustained for at least 4 months after the last acupuncture treatment.

KEY WORDS: Acupuncture; Stroke; Paralysis; Cerebrovascular disorders; Tomography, X-ray computed

INTRODUCTION

In 1975, Omura reported that acupuncture improved brain circulation and peripheral circulation of a paralyzed part of the body in stroke patients (1). In that study an acupuncture point was stimulated on the left (paralyzed) leg (St 36) in stroke patients, and an increase in cerebral blood flow was observed over the supraorbital artery region of the right forehead area (reflecting right cerebral hemisphere blood flow), ipsilateral to the hemisphere where the stroke had occurred (1). An increase in blood circulation to the paralyzed left hand (and non-paralyzed right hand) of the patients was also observed.

Two other studies have also suggested that acupuncture promotes vasodilation and increases cerebral blood flow (2, 3). A 1977 study by Chen & Erdmann stimulated an acupuncture point on the midline face, above the upper lip (GV 26) in rats, and observed an increase in tissue oxygenation to the frontal cortex areas (bilaterally) (2). A 1979 Chinese study inserted acupuncture needles along "the motor cortex line" of the scalp over the cerebral hemisphere ipsilateral to where the stroke had occurred. This study observed an increase in cerebral blood flow in stroke patients, but not normal controls (3).

Thus, results from these three studies suggest that insertion of acupuncture needles into different acupuncture points on the leg, face, or scalp, may each increase cerebral blood flow and circulation. It is possible that this increase in cerebral blood flow and circulation is one mechanism that is involved with mediating the slow improvement in paralysis following acupuncture treatments in stroke patients.

A few reports suggesting that acupuncture is useful in the treatment of paralysis following stroke were published in English in the 1970's (4, 5). The World Health Organization has listed acupuncture as a possible treatment for paresis in stroke patients since 1979 (6). In more recent studies where controls were used (sham acupuncture or no acupuncture), significantly more patients who received acupuncture treatment for paralysis due to stroke had an outcome level of "Good Response/Markedly Effective," than controls (7-11).

The time poststroke when acupuncture treatments are initiated appears to be important in relationship to functional outcome. For example, significantly more stroke patients who received acupuncture treatment beginning within the first 3 months poststroke had a better outcome level than those who received acupuncture treatments beginning after the first 3 months poststroke (3, 4).

Johansson et al. observed in a study reported in 1993 from Sweden, that when acupuncture treatments were initiated within 4 - 10 days poststroke, there was a significantly better outcome in walking, balance, activities of daily living, and quality of life, mobility and emotion at 1 month, 3 months and 12 months in those patients treated with acupuncture, than those patients who were not treated with acupuncture (10). This study reported a savings of $26,000 per acute stroke patient treated with acupuncture, due to fewer days in nursing homes and rehabilitation facilities. Indeed, some studies have suggested that acupuncture treatments should be initiated within 36 hours poststroke in ischemic infarct cases (4); and within 24 hours poststroke in acute cerebral hemorrhage cases (12). Hu et al. (1993) observed that it is especially important to treat stroke patients with *severe* paralysis during the *acute* stage poststroke (9).

Our research group has published a small, controlled study that demonstrated improvement in poststroke arm/leg paresis after real acupuncture, but not after sham acupuncture (8). The positive effect of real acupuncture was only observed in patients in whom there was damage to *less than half* of the motor pathway areas on CT scan. The critical lesion site on CT scan was in the periventricular white matter area (PVWM area) at the level of the body of the lateral ventricle, containing, in part, descending pyramidal tract pathways and other important intra- and inter-hemispheric pathways.

All patients in our previous study were in the more *acute* phase poststroke, i.e., 1 to 3 months poststroke, when acupuncture treatment commenced (8). The primary purpose of the present

study was to examine the response to acupuncture in stroke patients with arm/leg paresis who were in *later* phases poststroke; however, acute patients were also included in this study. A secondary goal was to analyze again the relationship of lesion site on CT scan to acupuncture response.

MATERIALS AND METHOD

Subjects:

Twenty patients agreed to participate (Table 1). All patients had suffered a left hemisphere infarction and had significant right hemiparesis. Nineteen cases were righthanded. One patient was lefthanded, (case PP), who had a severe aphasia and left ideomotor apraxia after a left hemisphere stroke. Ten patients were treated with acupuncture during the *chronic* phase poststroke, beginning from 4 months poststroke onset (MPO), to 10 years poststroke onset. Ten patients were treated with acupuncture during the *acute* phase poststroke, which ranged from 1 to 3 MPO. All chronic and acute patients had greatly reduced leg and arm power with little or no isolated finger movement. None of the chronic patients was receiving physical therapy during the study. All of the acute patients were receiving physical therapy during the study.

Controls:

The 10 chronic patients served as their own controls, because they were treated beyond the period of greatest spontaneous recovery, i.e., the first 3 months poststroke (13). In addition, we studied three chronic stroke patients who received *no acupuncture treatments* (Table 1). These patients also had suffered a left hemisphere infarction and had significant right hemiparesis. They were examined three times over approximately a one-year period to investigate the stability of paralysis in chronic stroke patients. None of these chronic control patients was receiving physical therapy during the study. The results for the controls for the 10 acute patients (i.e., those acute patients who received sham acupuncture, n=6) were presented in our earlier acupuncture study (8).

Motor Evaluation:

A motor examination, the Boston Motor Inventory test (14), was designed for this research project. This test measured the isolated active range of motion (ROM) on the involved side for 4 leg movements and 3 arm movements, all proximal. The evaluation was performed by one of three physical therapists who were blind to the treatment condition (treatment versus no treatment). The 20 patients receiving acupuncture were tested a few days prior to the first treatment, and within a few days after completing the 20th and 40th treatments. Follow-up testing was also performed at 2 and 4 months following the last acupuncture treatment if the patient was available. The three chronic control patients not receiving acupuncture were tested three times, over approximately a one-year period.

Treatment:

Informed consent was obtained prior to acupuncture treatment. *Chronic* patients received 2 or 3 treatments per week as outpatients, for 2 or 3 months. *Acute* patients received 5 daily treatments per week as inpatients, for 1 or 2 months.

Sterilized disposable, one-time use only, 34 gauge acupuncture needles (approximately 0.1 mm diameter) were inserted into a limited number of standard acupuncture points on the arms and legs (15). See Table 2 and Figures 1A and 1B. The "scalp needle acupuncture technique" was also performed. Sterilized needles were placed with shallow insertion along "the motor cortex line" of the scalp over the cerebral hemisphere where the stroke had taken place. For example, the needles were inserted over the left hemisphere scalp area when the patient had a right-sided arm/leg paralysis. See Figure 2.

Table 1. **Age; months post onset (MPO); number of improved lower extremity (LE), upper extremity (UE) tests; and CT scan extent of lesion data for all cases receiving acupuncture or no acupuncture.**

	Age Enter Study	MPO Enter Study	Total No. Acptr. Tx.'s	Total No. Improved LE/UE Tests	Total Lesion Extent in PVWM (Slices SM+1 and SM) (20 = Complete Lesion; 10 = Half)
ACUPUNCTURE - Beneficial Response Cases					
CP	54	4	40	4	(Cerebral Peduncle)
MJ	55	34	40	4	7.75
#PP	69	74	40	5	10.25
*HN	74	1	20	3	7.5
*CL	44	1	20	2	17.5
*SA	61	1	40	3	8
*SH	65	2	40	5	9
*CR	67	3	20	3	10
ACUPUNCTURE - Poor Response Cases					
NA	61	4	40	0	14.95
HL	54	9	40	0	13
RP	55	21	40	0	19.5
BR	58	34	20	1	(Leg and Arm Motor Cortex Area Lesions)
DE	61	34	40	1	20
GP	63	110	20	1	17.1
ME	70	128	40	0	(Leg and Arm Motor Cortex Area Lesions)
*GD	68.5	2	20	1	(Leg and Arm Motor Cortex Area Lesions)
*SS	56	3	20	1	(Leg and Arm Motor Cortex Area Lesions)
*ES	65	3	40	0	14
*GJ	58	3	20	0	17.6
*RJ	54	3	40	0	19.3
		MPO Test Times			
NO ACUPUNCTURE - All Poor Response Cases					
#PP	67	44/49/60	0	0	1
BH	42	133/137/142	0	0	7
EL	54	25/29/36	0	1	(Leg and Arm Motor Cortex Area Lesions)

#This patient was originally a chronic control case who received no acupuncture treatments up to 5 years post the first stroke. At 6 years post the first stroke, after a "second stroke", acupuncture treatments were begun.

*Patients considered to be acute cases; they entered the study at 1-3 months poststroke onset (MPO).

Table 2. Acupuncture points used for acupuncture treatments

Location of Acupuncture Points	List of Acupuncture Points
Right Arm (Paralyzed Side):[1]	LI (Large Intestine Meridian): #4, #11, #15 TW (Triple Warmer Meridian): #5, #9 Three Distal Baxie Points in web space between fingers
Right Leg (Paralyzed Side):[1]	St (Stomach Meridian): #31, #36 GB (Gall Bladder Meridian): #34, #39 Li (Liver Meridian): #3
Left Arm (Non-paralyzed Side):	LI (Large Intestine Meridian): #4, #11
Left Leg (Non-paralyzed Side):	St (Stomach Meridian): #36
Right and Left Ears:	Shenmen
Scalp Acupuncture on Side of Hemispheric Infarction (Left):[2]	Four or five needles along "the motor cortex line" of the scalp

[1]Low pulse repetition rate electrical stimulation (1-2 Hz.) was used on pairs of needles inserted on the right (paralyzed) arm, hand and leg: LI 11 and TW 9, or LI 4 and LI 11 on the paralyzed arm; TW 5 and the Baxie point at the web-space between the index finger and the third finger on the paralyzed hand; and GB 34 and 39 on the paralyzed leg, for 20 minutes per treatment session. The electrical stimulation was obtained from the Electro Acupunctoscope WQ-10B model from China (16). The intensity of stimulation was controlled by the patient and maintained at a comfortable level. See Figures 1A and 1B.

[2]Low pulse repetition rate electrical stimulation (1-2 Hz.) was also used on the scalp needles (20 minutes). See Figure 2 for location on the scalp where some of the acupuncture needles were inserted.

A low pulse repetition rate electrical stimulation (1-2 Hz.) was applied to selected pairs of needles (Table 2) using the WQ-10B model from China. This model has been described by Omura (16). The intensity of stimulation was controlled by the patient and maintained at a comfortable level. All patients received at least 20 treatments. When logistically possible for the patient to return for additional treatments, we extended the total to 40 treatments.