

**SOUTH BAYLO UNIVERSITY**

**Electro Acupuncture Treatment of Stroke Induced Hemiplegia**

**by**

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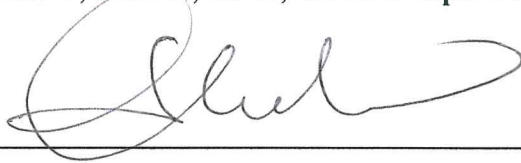
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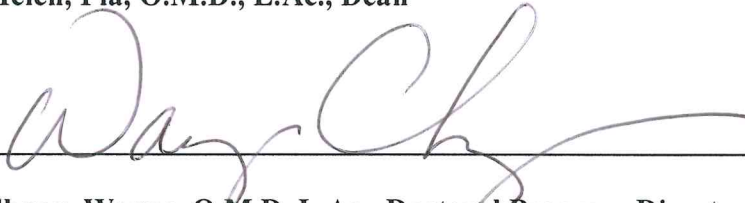
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# **Electro Acupuncture Treatment of Stroke Induced Hemiplegia**

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**SOUTH BAYLO UNIVERISTY AT ANAHEIM, 2017**

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## **ABSTRACT**

### **OBJECTIVE:**

To observe the effectiveness of electro stimulation of *Shousanli* (LI10), Tung's *Ling Gu* (22.05), *He Gu* (LI 4), *Yanglingquan* (GB 34), *Tai Chong* (LIV 3) and *Zusanli* (St 36) as a supportive treatment to scalp acupuncture for the treatment of stroke related hemiplegia, one-year post stroke occurrence.

### **METHODS:**

A case study of a 78-year-old female stroke patient with right side hemiplegia. Electro acupuncture was applied from *Shousanli* (LI 10) to *He Gu* (LI 4), alternated with Tung's *Ling Gu* (22.05), for the treatment of arm paralysis. Electro acupuncture was also applied from *Zusanli* (ST 36) to *Tai Chong* (LIV 3), alternated with *Yanglingquan* (GB 34), for the treatment of leg paralysis. Other accompanying points such as Tung's *Da Bai*, SJ 6, *Ba Xie*, SP 9, etc. were also randomly used at varying times without electro stimulation. Left sided scalp acupuncture was applied to the motor and sensory areas. Treatment duration consisted of 30 minutes, one to two times a week for a period of 9 months.

## **RESULTS:**

The patient regained sensory recognition of both arm and leg, via response to pain stimuli and tickle stimuli, whereas there was no stimuli recognition prior to treatment. The motor function of arm movement was improved by an estimated 30% via cognitive rising of the arm and hand. The leg was also improved by an estimated 30% via cognitive rising of lower leg and foot, and usage of hips and thigh to push against resistance, whereas there were no responsive movements of either arm or hand prior to treatment.

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## I. INTRODUCTION

Stroke affects millions of people worldwide today. It has been reported that stroke is the third leading cause of death in the United States after heart attack and cancer and is the leading cause of adult disability<sup>4</sup>. Furthermore, that disability affects about 75% of stroke survivors and can affect patients physically, mentally, emotionally, or a combination of all three<sup>4</sup>. It is also estimated that 90% of hemorrhagic strokes occur between the ages of 50 and 79, after a long-standing history of hypertension<sup>8</sup>. Ischemic strokes are frequently seen in middle age people who also have a history of hypertension, hyperlipidemia, diabetes or heart disease<sup>8</sup>. The vast majority of these stroke incidents will result in paralysis of one form or another. Within this group of paralysis, hemiplegic condition of limbs will account for many patients requiring the use of wheelchairs or other mechanical means of assistance.

From a western perspective, the window of opportunity to successfully treat stroke lies within a very narrow availability of time and after that window of time success is greatly diminished. Like the western perspective, eastern medicine also suggests that successful treatment results can only be obtained within a certain period of time after the initial stroke occurrence, albeit the eastern perspective gives a longer window of opportunity regarding that treatment time period. Well known physician and textbook author Giovanni Maciocia comments that the best results are obtained if acupuncture is given within 1 month, and good results if within 3 months, but that stroke is difficult to treat after 6 months, and more so after 1 year<sup>12</sup>.

According to David Mayor, MA, BA, MBA, “If muscle is not to waste, it must be treated as soon as possible after paralysis sets in. Exercise, acupuncture and electrotherapy are all important methods of maintaining the muscle’s nerve supply and proprioception, as well as preventing atrophy of the muscle itself ... manual acupuncture at scalp points was found to improve the weight-lifting capacity of paralyzed legs in one experimental study ... in another report, 2-year follow-up after 20 sessions of mixed manual acupuncture and electro acupuncture treatment indicated patients’ improved ability to maintain balance”<sup>12</sup>.

In a study of 98 patients at the Zhongnan Hospital of Wuhan University, the findings showed that there was a more significant improvement among the group treated with electro acupuncture than there was compared to the control group without the procedure<sup>13</sup>. Furthermore, it also showed that motor functions of the limbs of the hemiplegic patients were also improved significantly after using the electro acupuncture<sup>13</sup>. While scalp acupuncture, alone, has been shown to be an effective treatment for stroke patients’ recovery, the use of electro acupuncture of accompanying hemiplegic limbs cannot be overlooked as an adjunct treatment, especially after the “ideal” window of opportunity has expired.

What this paper proposes is the efficacy of electro acupuncture at specific sites that will greatly enhance the effectiveness of paralysis treatment thereby increasing the use of paralyzed limbs to one degree or another sooner. This paper will discuss the methods and their application, in regards to specific locations on the body, their theoretical purpose, relative connection to other modalities as well as their intended outcomes.



## II. MATERIALS & METHODS

The subject matter of this paper proposes to show the supportive use, and effectiveness, of electro-stimulation between *Shousanli* (LI10) and *He Gu* (LI 4) alternated with Tung's *Ling Gu* (22.05) for the treatment of arm paralysis. Accompanying the electro-stimulation were Tung's *Da Bai* (22.04) and several other local points utilized in varying combinations rotated at regular intervals of treatment periods without electro-stimulation. The electro-stimulated points were alternated when the point areas displayed bruising, redness or caused any discomfort to the patient.

The second groups of points used with electro-stimulation were between *Zusanli* (St 36) and *Tai Chong* (LIV 3), alternated with *Yanglingquan* (GB 34), for the treatment of leg paralysis. As with the electro acupuncture of the treatment for arm paralysis, accompanying local points were, once again, utilized in varied combinations regularly rotated at intervals as supportive channel points without the use of electro-acupuncture. The subject points utilizing electro acupuncture were alternated with any observance of bruising, redness or discomfort to the patient.

Electro stimulation was conducted using a "Pantheon" brand electro-stimulator device, model 8c pro, set on a constant mode with a continuous frequency of 2 Hz. The individual channel level settings were set to a level of 4.5 out of 6 (450 microamperes out of 600) until sensation began to develop on the affected limbs. Thereafter, the levels were only raised until the patient found them uncomfortable, usually between 3 and 4. The Milliampere channels at the rear of the unit were utilized for the wire leads during

treatment. It should also be noted that in order to avoid any potential contraindications, the patient's caretaker was asked if she had a pacemaker or other electrical medical devices implanted prior to any treatment. The patient had none. Because of the location of the intended electro-stimulation, there was no concern of any electrical current in the vicinity of her heart or across her body's midline, which are also indicated as potential contraindications.

In addition to the electro-stimulated points, accompanying local points were also utilized without electro-stimulation. These varying combinations of points were drawn from a specific group consisting of the following points: SJ-3, 4, 5, 6, & 17, St-40 & 41, LI-11 & 12, SI-3, 4, 5, 6 & 7, GB-20, 31, 39 & 41, Spl-6 & 9, Liv-4 & 5, UB-11, 39, 40, 60, 62, 64, 65 & 66, PC- 6, Kid-3, Da Bai, Ba Xie, Tung's: Jian Zhong<sup>5,9</sup> & Auricular: Shen Men. Each of these points, in part or singularly, addressed the specific condition of the patient subject.

Scalp protocol consisted of needling the left side of the patient's scalp along the full length of the motor and sensory lines using "MAC" brand needles sized .25 (32) x 40mm (1.5"). The "relay" method<sup>4</sup> of needle placement was used in order to utilize as much of the motor and sensory line surface area as possible while rotating the needles every 10 minutes.

The desired outcome goal was to establish the positive affects that the electro-stimulation of these specific subject points had on the recovery, partial or complete, of hemiplegia of the limbs from stroke in conjunction with standard scalp acupuncture protocol. While each group of selected points retained local channel points as a

supportive treatment, only the selected points for electro-stimulation remained constant throughout the length of the study, as these were the main subjects for this paper.

The acupuncture points chosen for electro-stimulation were selected for their treatment actions and affective functions relevant to the test subjects needs. The following bulleted list is indicative of the specific points selected for electro-stimulation and their respective treatment criteria according to their indicated textbook references.

- LI-10: Weakness and impairment of the upper limbs<sup>11</sup>, activates channel, pain & immobility of arm, hemiplegia, contraction & inflexibility of elbow, invigorate & regulate circulation of qi & blood in upper limbs as a whole, often combined with LI-15 & LI-4 in the “chain & lock” point combo method, often alternated with LI-11 in treatment of chronic and long-standing disorder of the channels such as hemiplegia & atrophy disorder, to avoid over-needling the same few points<sup>6</sup>.
- LI-4: Expels/disperses wind, hemiplegia<sup>6, 10</sup>, activates channel, restores yang, atrophy disorder of the four limbs, contraction of the fingers<sup>6</sup>. Weakness and impairment of the upper limbs<sup>11</sup>.
- St-36: Hemiplegia<sup>6, 10, 11</sup>, activates the channel, inability to speak, wind-stroke, chronic painful obstruction, disorders of the lower limb as a whole, especially atrophy disorder and hemiplegia, frequently combined in the “chain & lock method” with other points of the stomach yangming channel such as St-31 and St-41, For feebleness of the legs it can be

combined with UB-40 & UB-57, for leg Qi combine with GB-39 & Spl-6, for inability to walk combine with Liv-3 & Liv-4 and for wind-stroke with one-sided withering & incessant pain combine with LI-15, GB-39, Kid-3, LI-11 & UB-60<sup>6</sup>. Strengthens weak & deficient conditions, and general weakness<sup>10</sup>.

- Liv-3: Opens channels<sup>10</sup>. Extinguishes wind, contraction of the sinews of the hands and feet, flaccidity and weakness of the legs, inability to walk, contraction of the five fingers, promotes free flow of liver Qi, for leg flaccidity combine with GB-34, St-42 & GB-40, for inability to walk combine with ST-36 & Liv-4<sup>6</sup>.
- GB-34: Hemiplegia<sup>6, 11</sup>, strengthens sinews and bones, paralysis of lower limb, numbness of lower limb<sup>10</sup> and weakness of the lower extremities<sup>11</sup>. Hui meeting point of the sinews, benefits sinews and joints, activates channel, contraction of the sinews of the foot, stiffness & tightness of the muscles and joints, stiffness of neck and shoulders, atrophy disorder and painful obstruction of the lower limb, cold painful obstruction of the hip and knee, spreads liver qi, for one-sided hemiplegia combine with GB-30 & LI-11, for leg flaccidity combine with ST-42, Liv-3 and GB-40<sup>6</sup>.
- Ling Gu: Hemiplegia<sup>5, 9</sup>, hemiparalysis of nerves, regulate and supplement Qi, warming and activating Yang, often combined with Da Bai on the unaffected side & GB-31 for hemiplegia, when combined with scalp

acupuncture the therapeutic effect could be strengthened, good for foot weakness, treats liver and tendon diseases<sup>5</sup>.

The specific acupuncture needling sequence consisted of placing needles in the scalp motor line area then the sensory line area. Following the scalp, the points selected for electro-stimulation of the arm were placed followed by the supporting non-electro-stimulated points. The same sequence was then applied to the leg points. Once all the needles were inserted, arm electro-stimulation was begun followed by the leg electro-stimulation as well.

In order to gather the data necessary to support the topic of my study, as described in the previous section, an actual test subject whose treatments for this condition were recorded for nine months between the dates of August 14, 2015 and May 5, 2016.

The subject of this study is a 78 year-old female currently residing in a convalescent healthcare facility. The patient suffered a stroke two and a half years prior to this course of treatment, in March of 2013, and was confined to a wheelchair with complete right side hemiplegia. The legal representative, her eldest daughter, was unaware of the specific type of stroke she suffered except that the attending physician explained it as an artery that ruptured in her brain. She also referred to the patient having a long history of high blood pressure. A copy of a summary report from the convalescent facility dated November 26, 2015 reveals “Hemiplegia and Hemiparesis following unspecific cerebrovascular disease affecting the left dominant side” and “Essential (Primary) Hypertension” in the diagnosis category. This summary report diagnosis and the description given to the daughter by the attending physician would support the

probability of a hemorrhagic type stroke in the left side of the patient's brain. It is unsure when the hypertension diagnosis was first established, but her daughter did mention that the patient was already on hypertensive medication when the stroke occurred. A measurement at the time of her initial treatment established that her blood pressure readings were at one hundred-fifteen over seventy-five.

The patient had no voluntary motor functions of her right arm or right leg. There was no response to pain stimuli in either limb. The radial and dorsalis pedis arteries of both limbs displayed a deeper and weaker pulse when compared to the opposite side limbs and the skin tone was slightly more pale. Speech was also impaired as she was unable to form any discernable words and her efforts only produced irregular mouth movements with occasional labored sounds. There was enough control over the mouth to maintain the lips closed and no visible disfigurements or drooping of the face or mouth, but attempts to speak were accompanied by episodes of drooling from the affected side. In order to gauge the amount of cognitive communication skills the patient possessed, she was asked a series of questions to ascertain how effectively she could understand and respond to them. Among them were requests to point to various objects when asked, to indicate her age and how many children she had. She was asked to nod or shake her head to "yes" and "no" questions as well as move unaffected limbs. She displayed a good comprehension of the questions asked and her responses indicated an effort to communicate her requests. But there were also occasional episodes of obvious frustration when her efforts were not clearly understood and she would regularly refuse to continue.

Prior to this particular stroke, she'd suffered a previous stroke approximately one year before in early 2012. It is unknown, specifically, what type of stroke it was other than it affected the same side of her body. That first incident left her with a slight leg impairment of the right side as well. Although not paralyzed, a cane was necessary in order to walk. Her family indicated no other physical impairment resulting from the first stroke incident.

It should also be noted that there is currently a metal plate surgically implanted on the lateral side of her right tibia. This is the result of a traffic accident several years prior where she was struck by a car while crossing the street in front of her home. The precise location of this plate is not known but, according to her caretakers, it is placed approximately one to two inches below *Zusanli* (St 36). The reasoning behind it's possible relevance in this study and it's inclusion in the patient's information is its close proximity to one of the subject points of this study. Although improbable, because this plate is located on the leg being treated, and its close proximity to *Zusanli* (St 36), there may be a slight possibility that the electrical charge generated by the e-stim machine may be conducted by this metal thereby affecting the surrounding tissue.

The subject sought out acupuncture treatment prior to receiving treatment from me at my office. The prior course of treatment was used as a comparison period for the evaluation of improvement during the treatment period of this study with the subject. Prior to the observed treatments, the subject received five to six months of acupuncture before the previous practitioner informed them that there was nothing more he could do to help her condition.

As described by the subject's caretaker the treatment always consisted of scalp acupuncture combined with regular acupuncture of the affected leg and arm. After this course of treatment the caretaker and her siblings concluded that there was no change at all in the subject's condition.

In contrast to the previous practitioner's treatment it was decided to add electro-stimulation of the points described in the previous section to the same type of treatment that was previously provided by the other practitioner. Not only did the results show that muscle tone and mobility was improved, but tactile sensation response was also re-established when it was previously non-existent.

For the scalp acupuncture methods and locations, those as described in the book: *Chinese Scalp Acupuncture*<sup>4</sup> were used for the duration of this study. The text *The Clinical Practice of Chinese Medicine: Stroke & Parkinson's Disease*<sup>8</sup> was also utilized as an adjunct source of information for the development of other potential treatment and TCM diagnosis purposes, in this case Wind Stroke with accompanying Kidney Deficiency. Tung's acupuncture locations were relied upon from *Lectures on Tung's Acupuncture: Points Study*<sup>5</sup>, and *Top Tung Acupuncture Points: Clinical Handbook*<sup>9</sup>. All other local channel points were the same locations as described in *A Manual of Acupuncture*<sup>6</sup>, *Acupuncture: A Comprehensive Text*<sup>10</sup> and *Chinese Acupuncture and Moxibustion*<sup>11</sup> common textbooks for acupuncture location, point description and application used in many Chinese medicine universities.



### III. RESULTS

At the onset of treatment a series of tests were conducted in order to establish a baseline showing the extent of the patient's capabilities. The resulting data collected showed that the hemiplegia affecting the patient's right side prevented motor skills of any kind of the arm or leg, including the shoulder and hip. She experienced no tactile stimulation from pain or tickle stimuli. Swallowing and speech was also greatly diminished.

During the second month of regular treatments slight signs of improvement began to appear. Very slight movements of the toes were observed while conducting a Babinski test. Voluntary efforts of the patient also produced small visible signs of muscle contraction in the forearm and elbow. It was also observed that the patient was able to involuntarily lift the arm slightly during yawning.

Examination after the seventh visit showed some response to pain stimuli from pinching of the skin on the arm and leg as well as gentle tickling on the sole of the foot. Not all locations of the foot sole elicited response, as was the case of pain stimuli of the arm and leg. Only the outer side of the forearm along the Small Intestine channel and the inner part of the lower leg along the Spleen channel elicited any response. Voluntary efforts to move these limbs remained, essentially, the same.

At the time of the twenty-first treatment the patient's vocalization skills had improved enough that her spoken words were clearly more audible and recognizable. Conversation with her still had to be lead for her to follow with her response. As she struggled to begin word pronunciation, if someone began to say the words with her she would be able to finish speaking them. Swallowing was also improved with less incidents of choking.

Seven months into the patient's treatment on her forty-first visit she was able to voluntarily raise her right arm to a 90-degree angle. She was unable to lift the weight of her arm without the aid of the practitioner's forearm as a guide to slide her wrist against. Without this assistance the patient's arm would drag along the surface of her own torso and get stuck on her own clothing.

At the forty-ninth exam and treatment the practitioner's forearm was anchored against the popliteal crease of her right leg. She was instructed to raise her foot up in order to measure the degree of lower leg straightening. The results were three to four jerky motions, each increasing the degree of height achieved. At the last and greatest degree of lift, the patient went from a ninety-degree position to a forty-five degree position. Although not able to suspend her leg for more than a few seconds, she was able to repeat this degree of lift three more times.

By the conclusion of her ninth-months of treatments the patient was able to raise her right arm to a ninety-degree angle and engage the muscles of her upper arm and shoulder in order to demonstrate a mild shrugging movement. Her right leg continued to respond to different stimuli with the movement of all her toes and her lower leg continued to reach the 45-degree level of rising. Usage of her upper thigh and hip muscles increased as she was able to push against the practitioner's hand when her leg was held bent towards her. Two separate attempts were made to have her stand, which yielded a few seconds where she supported her own weight. Only once was a step forward achieved.

#### IV. DISCUSSION

According to the National Stroke Association, following a stroke, as many as nine out of ten patients will experience accompanying paralysis of one sort or another. Among these conditions are hemiparesis/hemiplegia, spasticity/stiff muscles, dysphasia, weakness, balance problems, etc.<sup>1</sup>. Also, according to the CDC website regarding stroke statistics<sup>2</sup> more than 795,000 Americans will suffer from a stroke, costing and estimated 34 billion dollars each year in healthcare costs, medications and days missed from work. Currently, from a western perspective, treatment of paralysis resulting from stroke center around physical therapy involving the “re-training” of paralyzed limbs through assisted movement<sup>7</sup>. Treatment, though, is often conducted as early as possible for the most desirable results. As time progresses the probability of recovery wanes without therapeutic intervention. In an article on the Medscape website<sup>3</sup> the author states that, in terms of upper extremity dysfunctions, as many as 70% of affected patients that show some recovery of hand functions by the fourth week will, likely, make good or full recovery. But this is usually within a period of three months after the initial onset. It should also be noted that the author states that, although, these first three months reflect the majority of recovery, continued recovery becomes less measureable after six months from the original onset. As little as 5% will continue to demonstrate measurable improvement by the twelfth month.

The effectiveness of therapeutic treatment beyond the twelve-month mark diminishes to an almost non-existent level. The need for viable treatment beyond this timeframe can greatly enhance the quality of life for thousands of stroke related hemiplegia sufferers in this country and others. While eastern medical scalp acupuncture has proven to be an

effective tool beyond the twelve month threshold it, too, finds that the longer the time period from initial onset, the less likely probability for full recovery. It is for this reason adjunct modalities are crucial as a supportive method to existing scalp acupuncture for patients beyond that time period where probable success is diminished. The use of electro-acupuncture at specific point locations, and combinations, can help stimulate muscular inactivity concurrently with scalp acupuncture to help re-establish function beyond the time limitations of current practices.

## V. CONCLUSION

In conclusion, the overall results from the nine-month treatment proved relatively effective for the treatment of this patient's hemiparalysis. While full recovery was not achieved, a great deal of progress was made in the restoration of sensory and motor functions of the affected limbs as well as vocal and swallowing capabilities. Based on the progression rate achieved up to this point, it wouldn't be unreasonable to surmise that continued treatment would likely produce continued results.

An argument can be made that the specific acupuncture points themselves, with their TCM indications, weren't responsible for the degree of recovery of this patient. Some may say that, perhaps, it was the regular muscular stimulation causing contractions from the e-stim machine that facilitated these results to occur. While this may or may not be true, it is not the subject matter of this particular case study to show the specific mechanisms that caused the results to occur. What this paper set out to show was the importance and effectiveness of electro stimulation of specific acupuncture points as a supportive treatment to scalp acupuncture for the treatment of hemiparalysis from stroke. Based on the positive results achieved, it appears that this hypothesis has been supported.

## VI. REFERENCES

- 1) “Paralysis.” National Stroke Association 2016 <<http://www.stroke.org/we-can-help/survivors/stroke-recovery/post-stroke-conditions/physical/paralysis>>
- 2) “Stroke Facts” CDC website March 24, 2015 <<http://www.cdc.gov/stroke/facts.htm>>
- 3) Auri Bruno-Petrina, Motor Recovery in Stroke Medscape April 15, 2016 <<http://emedicine.medscape.com/article/324386-overview>>
- 4) Hao, Jason Jishun & Hao, Linda Lingzhi (2011) *Chinese Scalp Acupuncture*. Boulder, CO: Blue Poppy Press
- 5) Young, Wei-Chieh (2008) *Lectures on Tung’s Acupuncture: Points Study*. Rowland Heights, CA: American Chinese Medical Culture Center
- 6) Deadmean, Peter & Al-Khafaji, Mazin (2006) *A Manual of Acupuncture*. East Sussex, England: Journal of Chinese Medicine Publications
- 7) Strange, Keith, “Physical Therapy for Stroke Patients With Right Hemiplegia” Livestrong.com Jan 8, 2015 <<http://livestrong.com/article/446736-physical-therapy-for-stroke-patients-with-right-hemiplegia/>>
- 8) Pei-Xin, Huang & Mao-Cai, Liu (2007) *The Clinical Practice of Chinese Medicine: Stroke & Parkinson’s Disease*. P. R. China: People’s Medical Publishing House
- 9) Whisnant, Brad & Bleecker, Deborah (2015) *Top Tung Acupuncture Points: Clinical Handbook*. San Bernadino, CA, Draycott Publishing, LLC
- 10) Shanghai College of Traditional Medicine, translations by O’Connor, John and Bensky, Dan (1981) *Acupuncture: A comprehensive Text*. Seattle, WA, Eastland Press
- 11) Lingyue, Deng, Yijun, Y., Shuhui, H., Xiaoping, J., Yang, L., Rufen, W., Wenjing, W., Xuetai, W., Hengze, X., Xiuling, X. and Jiuling, Y. (1999) *Chinese Acupuncture and Moxibustion*. Beijing, P.R. China, Foreign Languages Press
- 12) Mayor, David F, (2007) *Electroacupuncture: A practical Manual and Resource*. United Kingdom, Churchill Livingstone
- 13) Zhang H1, Kang T, Li L, Zhang J., “ Electro acupuncture reduces hemiplegia following acute middle cerebral artery infarction with alteration of serum NSE, S-100B and endothelin” PubMed August 2013 <<https://www.ncbi.nlm.nih.gov/pubmed/23713736>>