Summary
Acupuncture therapy for rehabilitation following stroke is very popular in China and has also been investigated in the West, notably in Scandinavia. The traditional method is body acupuncture using yang meridian points. Yin meridians are probably more beneficial when treatment has been delayed for some months after the stroke. Scalp acupuncture, either the Japanese Yamamoto New Scalp Acupuncture, a microsystem which requires great accuracy, or a Chinese variety such as the Zhu approach or the Shanghai scalp technique, has become very popular and published work has demonstrated superiority to traditional body acupuncture. Additionally, a new technique, Xingnao Kaiqiao, has been developed that uses strongly stimulated body points to induce twitching in the affected limbs. This method seems to have given good results in large-scale usage and is not difficult to learn. However, all of these acupuncture techniques require many sessions of treatment and are thus, with perhaps the exception of Yamamoto scalp acupuncture, heavily labour intensive. None the less, the benefits in terms of cost savings as well as effective return to an independent life-style are clear.

Key words
Acupuncture, Cerebro-vascular accident, Scalp acupuncture, Stroke therapy.

Introduction
In China treatment of stroke with acupuncture is common and is performed more intensively than in other countries, giving daily treatment for 20 to 60 days with periodic breaks of 3 days to prevent the body from adapting to the stimulus. Articles published from China and Japan are uniform in recommending, even mandating, that acupuncture therapy should be given as soon as is feasible following a stroke caused by either cerebral circulation blockage or haemorrhage, although most articles suggest waiting two weeks following haemorrhagic stroke before acupuncture is given, since likely actions of needle treatment include vessel dilation, decrease in platelet aggregation, and increased ancillary circulation.

The only recent works on stroke from countries with a Western medical orientation that I could find in my search of the literature come from Scandinavia. Johansson, et al (1,2) published a long term, randomised study of 78 stroke victims, well balanced for age, extent and side of stroke, comparing acupuncture plus standard rehabilitation to rehabilitation only. A simple body therapy approach was used, with 6 points on the paretic side and 4 on the opposite. After treatment the acupuncture therapy patients scored a Bethel’s Living Index of 90 versus 71 for the controls. A saving of £14,000 per patient was seen over 3 years from decreased hospital and nursing costs. Backing Johansson’s study, Sallstrom, et al (3) studied hemiparetic stroke patients at a median of 40 days post stroke, randomising to two groups: 24 were treated with acupuncture and 21 controls were given the usual therapy. The acupuncture group had needling added to their rehabilitation therapy 3 to 4 times weekly for 6 weeks, using classical body acupuncture: mainly major, yang, meridian points. Scoring with a combination of Motor Assessment Scale, Sunnaas, Index of ADL, and Nottingham Health Profile revealed significantly greater improvement in the acupuncture group at 6 weeks, and the quality of life was notably better.

In the USA it has been difficult to persuade neurologists and rehabilitation physicians even to evaluate acupuncture for this disorder; a randomised, controlled study could easily be done considering the large number of stroke patients treated in our larger rehabilitation units. Based on Johansson’s data, 40 in each group
should provide statistically valid information. An early MRI or CT scan, preferably with a later one as well, would help to evaluate the extent of cerebral damage. An initial, thorough, physical examination recording the extent of damage and residual ability should form the basis for later evaluations. The FIM Instrument (Functional Independence Measure) from the Guide for Uniform Data Set for Medical Rehabilitation might be used as one parameter for following progress. Evaluation by speech and swallowing therapists is another, and machinery is now available for patients to test muscle strength and range of movement objectively. Bethel’s Living Index could be utilised to help confirm Johansson’s data, though some variation in response might be expected with different acupuncture approaches.

There is a problem with the substantial amount of therapist’s time involved in stroke therapy. Treatment is daily in China and Japan, with possibly 40 sessions, which might explain the excellent results published, though credence is diminished in the Chinese studies, since only highly positive articles seem to be published in their medical literature.

Most acupuncturists I have read or spoken with who treat stroke patients indicate that a minimum of 3 treatment sessions per week is important. This is emphasised by Holly Gahn in California, who has extensive experience in stroke therapy and teaches seminars on the subject. In clinical trials, to obviate the therapist-patient interaction factor, it would be desirable for the acupuncturist to spend a similar time with patients in the control group. Patients should have occupational and physical movement therapy concurrently with their acupuncture treatment to obtain maximum benefit.

What form should acupuncture take for stroke treatment? There are a number of promising approaches: Xingn ao Kaiqiao therapy, Yamamoto new scalp acupuncture (YNSA), the Chinese scalp approach of Zhu (a 1cm area from GV.20 to the frontal hairline) and Jiao Shun-fa’s (Shanghai) scalp technique, or body acupuncture: either jiaji and Governing vessel centered, or yang meridians, especially Yangming and Shaoyang, or emphasising the yin meridians. Different approaches have been studied at different centres, depending on the expertise and interest of the available acupuncture therapist. If we find that several of the approaches prove superior to standard rehabilitation care, then one could be compared to another to determine which is best, and for what types of people or conditions. The following comments discuss published techniques and results.

**Published work**

**Xingn ao Kaiqiao**

A new acupuncture technique, Xingn ao Kaiqiao, known as consciousness awakening, or activating brain and opening orifices acupuncture seems to be finding increasing favour in a number of centres in China. Professor Shi Xuemin of Tianjin College of TCM initiated and taught this approach. In a study of 3,200 hemiplegic stroke patients (4) a 58% cure rate and 90% effective overall improvement rate is claimed. First, PC.6 is stimulated for one minute with reducing movement: up, down, and simultaneously rotating the needles bilaterally. Then GV.26 is needled with bird pecking until tears come to the eyes. Following that, a needle at SP.6 on the affected side is vigorously manipulated until the “leg twitches 3 times”. With the affected leg raised and stretched, BL.40 is punctured with lifting and thrusting, again until the leg twitches 3 times. The affected arm is needle at HT.1 (taken as 1.5 cun distal to the axilla, away from the hair and sweat glands but along the Heart meridian brachial plexus area) until the arm twitches 3 times. Then the arm is flexed and LU.5 needleed similarly until the limb jerks 3 times. Treatment is completed with LI.4, putting the tip of the needle to the metacarpophalangeal head to make clenched fingers relax. If the patient is in coma, GV.26, Ting points (especially KI.1), ST.40 (to decrease phlegm) and LR.3 are used, plus salt and moxa on CV.8. If pseudobulbar palsy is present with choking on food and drink, and simultaneous crying and laughing, PC.6 and GV.26 are treated as above, adding GB.20 aimed towards the larynx, and TE.17 and GB.12, with rapid fine twirling on all three bilaterally. “Many can eat well within a week” with daily or twice daily treatment. The Tianjin School compared this technique with combined scalp temporo-vertex line needling at high frequency and standard yang meridian therapy (LI.4,11 and 15, TE.5, GB.34 and 30, ST.40, and GB 39 on the affected side) and had excellent results in 76% vs 36% (5).

Bai and Jiang (6) studied 40 patients with hemiplegia following cerebro-vascular accident (CVA) who were treated with acupuncture using the Xingn ao Kaiqiao technique, and compared the results with 40 treated in the neurology department with Western medical techniques; ages and extent of symptoms were matched. Dysphasia decreased in 92% of the acupuncture...
group vs 5% in controls; facial palsy decreased in 100% vs 6%, limb paralysis was much better in 41% compared to 31%, as was dysphagia in 70% compared to 8%. All differences were statistically significant at P<0.05.

Shi, et al (7) treated 325 patients with pseudobulbar palsy, a severe complication of cerebral apoplexy that is characterised by dysphagia, dysarthria, and abnormal mental activity; patients often die of pneumonia and malnutrition. At the Tianjin College of Traditional Chinese Medicine, Shi Xuemen and co-workers have treated this large number of cases since 1980. Patient data indicates two strokes or more in 89%, 77% with infarction, 23% with hemorrhage, and 75% treated within 60 days of the event. One third had lung infection at the start of therapy, and half were being fed by nasogastric tube. Diminished palatal reflexes were seen in all, and pharyngeal reflexes were reduced or absent in 51%. They were treated by the Xingnao Kaiqiao technique. Fengchi (GB.20), Yifeng (TE.17) or Wangu (GB.12) were vigorously stimulated with reinforcing aimed toward the larynx for one minute. Then SP.6 was needled with reinforcing lifting and thrusting for one minute, followed by bird-pecking needling of GV.26 until tears were brought to the eyes. Last, Neiguan (PC.6) was treated with lifting, thrusting and rotation for one minute. The last 2 points should be repeated only every 2 to 3 days, with daily treatment to the other points. Evaluation after 3 courses of 15 days duration showed 69% essentially cured. Patients could eat and drink normally within one or two weeks, and throat secretions were decreased. Dysphonia and dysarthria were slower to respond. A better response was noted in those treated within 60 days of their stroke, but the difference was not statistically significant.

Scalp acupuncture
A second widely used acupuncture technique for stroke involves scalp acupuncture. Toshikatsu Yamamoto has developed a particular form of microsystem scalp acupuncture (YNSA) that he practises at his own hospital in Japan and teaches internationally. It involves point selection through abdominal or neck test zone palpation, with extremely accurate fine needling of the appropriate scalp points (8). He has stated that he finds 45 to 52% of patients with hemiplegia obtain excellent results (defined as being self-sufficient, with excellent motor, sensory, and aphasia improvement), and a further 35% show definite improvement (9). Ideally, treatment should begin within 10 days of stroke onset, waiting 14 days for the 10 to 15% who have haemorrhagic stroke.

As a very different alternative to the Japanese Yamamoto technique, there are Chinese approaches to scalp acupuncture, either using electrical stimulation at higher (100Hz or more) frequencies or rapid, 200 per minute, twirling manipulation of the needles. The Zhu method concentrates the thin needles on the central scalp from forehead to the centre of the head. The technique of Jiao Shun-fa, also known as Shanghai scalp acupuncture, applies needles to lines of energy on the scalp. Most practitioners treat the side of the disorder, opposite the side of paralysis (due to the crossover of motor cortex pathways in the lower brain). The paralysed side will occasionally be treated, and sometimes both sides.

Hu Jin-sheng has summarised the Shanghai method nicely in two articles (10,11). The midpoint of the scalp sagittal line from glabella to external occipital protuberance, and a line from the midpoint of the upper border of the eyebrow to the occipital protuberance are used as reference lines. The motor cortex upper point is 0.5cm posterior to the sagittal midpoint, and the lower point falls at the intersection of the eyebrow-occipital line and the hairline. The upper fifth corresponds to the leg, the middle two fifths to the upper limb, and lower two fifths to the face (also representing motor aphasia and dysarthria). The sensory area is a line parallel and 1.5cm posterior to the motor line and is used for pain and paraesthesia following stroke. There are also chorea tremor regions, vasomotor and praxia areas, 3 speech areas, vertigo and aural zones, and hemianopia areas, as well as others. Manual needling is done at 200rpm, forward and backward, to achieve needling sensation that might also be felt in the affected body part. This is done 3 times, 5 to 10 minutes apart. The patient is asked to try and move the affected body part during treatment, or may be assisted to move by a relative or staff. The World Health Organisation (WHO) has developed from this method the currently recognised 14 scalp acupuncture lines, designated MS-1 to MS-14. This WHO approach is discussed in an article by Steven Aung (12).

Wang and Liu of the Tianjin school (5) combined the two above approaches, Xingnao Kaiqiao and Shanghai scalp acupuncture, to treat 116 cases in 3 countries. They compared the result to 52 cases treated with traditional body acupuncture, using mainly yang points:
Li.4,10,11 and 15, GB.30,31 and 34, BL.36 and 60, ST.36,40 and 41, GB.34, and LR.3 and 7-10 each time, with CV.23 for speech paralysis. The combined treatment group had a much higher improvement rate than the control, body acupuncture, group: 62% vs 17% (no notable symptoms, and achieving an independent lifestyle), and results were often seen within 1 or 2 ten day courses, while the control group required 3 or more.

In her seminars Holly Gahn claims that Shanghai scalp acupuncture works well. She alternates needling Eding zone (needles pointed posteriorly at GV.20 and 24, a half to one centimetre from the midline, and 3 sets crossed from the sides of a one inch strip paralleling a line between GV.20 and 24).

Wang, et al (13) studied 110 patients with hemiplegia, 76 caused by cerebral infarct and 34 by hemorrhage. They started scalp acupuncture at between 1 and 3 weeks of the cerebral damage using contralateral scalp zones, later combined with major body points: Stomach, Bladder, Spleen, Kidney, and Liver "as indicated individually". Needles were rapidly rotated manually, then 150 to 200Hz electrical stimulation was given to the cranial needles and 100Hz to body points. Ten day courses with 3 day rests were used. In general, amelioration occurred within 10 to 20 treatments, at which time body acupuncture would be added, using the major points depending on TCM diagnosis. A very good response was claimed in 29 of the patients and 57 became “markedly self functioning”. Lesions were often in basal ganglia and thalamus areas, with higher (external capsule) lesions resulting in better acupuncture recovery: most of the 29 very good responses were in this group. Five cases with no effective response had multiple deep lesions on CT scan. Total improvement was over 90% if acupuncture was begun within 4 weeks of the stroke.

Naeser (14) studied seven patients only, 10 to 78 months post stroke, who were treated with infrared diode laser to acupoints. Five of seven improved well, as measured by limb mobility and strength. All who responded had CT scans revealing lesions less than 50% of white matter motorways and had little involvement of deep periventricular white matter. This study, limited by few patients and the prolonged time from stroke to therapy, still excited considerable interest as it was done in the USA and showed patient gain with a simple and relatively weak stimulus. It also pointed to the importance of knowing the extent of the lesion one is dealing with. The study was said to be ongoing, but limited by lack of funding.

Zhang (15), studied 88 hemiplegic stroke patients who were divided into two groups and treated with scalp acupuncture or body limb points (Yangming and Shaoyang meridians). The families worked the limbs and patients did Qi-gong breathing during needling. Therapy was 6 days weekly for 4 weeks. Ten of 44 with scalp acupuncture and 7 of 44 with body points returned to normal and a further 19 and 11, respectively, were much improved.

Liu and Wang (16) treated 80 patients with scalp acupuncture and compared them to 80 treated with body points; 63 (78%) in the scalp acupuncture group became essentially normal (able to function fully) vs 25 (31%) in the body point group, and 15% and 44%, respectively, were notably improved. Diagnoses were based on history, examination, and CT scan. Four courses of 12 daily treatments were given, with 3 day rests between courses. This study, like all studies from China, shows a higher degree of improvement with therapy than would be given credence in the West; or could this be due to superior skill combined with the extended period of therapy that Western physicians would be loath to apply for financial reasons? The rests between the usual 10 day therapy courses are deemed essential, as long-term daily acupuncture is thought to cause a decreased body response to the signal input from needling.

Shi and Song (17) used scalp acupuncture for 100 patients and the results were compared to 50 patients treated with body point acupuncture. Up to 7 courses, each of 10 days duration were given. Scalp zones contralateral to the affected side were used: 46% of patients were effectively cured and a further 38% significantly improved with scalp acupuncture, compared to 3% and 1% for body point therapy. The average requirement was 17.5 sessions in the scalp group vs 51 for the body point group; 84% of the scalp acupuncture patients showed some noticeable response with the first treatment. An immediate, positive response is likely to be a good encouragement to continue therapy, and an average of 17.5 sessions would certainly be reasonable if anything approaching these results can be obtained. However, 51 sessions would not be tolerated by fee-payers and would wear down even the most kind hearted Western therapist.

Body acupuncture

Liang and Zhao (18) treated 101 patients with acupuncture and compared them to 38 patients...
treated with Western medical approaches. The acupuncture patients, treated with limb points and a new foot point did measurably better.

Most practitioners who use body acupuncture alone work on the yang meridians for stroke patients; a few use the yin points, and some experts recommend the yang during the first few months after a stroke and the yin later when symptoms have become settled and of long duration.

Basic science research
There have been a number of scientific research papers in the Chinese acupuncture literature in recent years that provide physiologically based reasons why acupuncture might help stroke rehabilitation. Zhang, et al (19) did a biochemical study of 2 compounds in stroke patients. Endothelin, a vasoconstrictor, induces arteriosclerosis and hypertension. Thromboxane A2, a potent vasoconstrictor synthesised in platelets, breaks down to TXB2. Prostacyclin (PG12) is a potent vasodilator, synthesised in endothelium, that metabolises to 6-keto-PGF1a. The authors compared 20 apoplexy patients with 20 normal people. They recorded average endothelin levels of 81 in patients prior to acupuncture treatment and 69 after a course of acupuncture, compared to a level of 53 in the normal population. TXB2 averaged 28,195 in healthy subjects, 52,000 after stroke, and 24,642 following acupuncture treatment, a decrease to normal range for this vasoconstrictor metabolite. The ratio of this vasoconstrictor to the vasodilator metabolite 6-keto-PGF1a was 0.76 in normal persons and 2.79 after stroke, with a decrease toward normal to 1.66 after acupuncture. Acupuncture of Yangming, Shaoyang, and Taiyang channels appears to enhance vasodilatation and blood flow.

Shi, et al (20) randomised sixty stroke patients to Xingnao Kaiqiao or traditional acupuncture. The former produced superior results. Blood and plasma viscosity was reduced and HDL-C lipids were elevated significantly in the Xingnao Kaiqiao group after treatment. A study of nailfold circulation showed a notable decrease in deformed capillary loops and an increase in capillary flow. This indicated that successful acupuncture treatment was accompanied by increased blood flow and decreased viscosity physiologically.

Wei (21) evaluated rats given transient middle cerebral artery occlusion, with and without electroacupuncture (EA). EA applied during ischaemia and during reperfusion were both effective in inducing a rise in Basic Fibroblast Growth Factor (BFGF), which might be a positive effect for acupuncture in stroke through protecting cells against the effect of low oxygen levels. If EA was given during reperfusion, the cerebral oedema lessened in addition. BFGF is both an angiogenic polypeptide and a potent mitogen. It promotes neuron survival in vitro against hypoxia-ischaemia. The actual extent of infarction of tissue was halved using EA protection.

Chen (22) studied cerebral thrombosis patients, with 34 of 70 having hemiplegia, and a variety of sequelae among the rest. They were treated with acupuncture points GB.20, GV.16, LI.4 and 11, SP.10, ST.36, and LR.3 for a 40 day course: 33% were basically cured and a further 44% improved significantly to be capable of basic self care. Nailfold and bulbar conjunctiva circulation were studied using special instruments. After therapy, microcirculation showed clearer capillary loops, more normal artery/vein ratios, significantly less erythrocyte aggregation and less local exudation, with increased blood flow rate. Chen believes acupuncture dilates microcirculation, relieves spasm and platelet and granulocyte aggregation to produce the clinical improvement seen in stroke patients.

Yang, et al (23) studied PGI2 and TXA2. PGI2 is a vasodilator and platelet aggregation inhibitor from vascular endothelial cells that rapidly metabolises to 6-keto-PGF1alpha. TXA2 is a vasoconstrictor and platelet aggregator synthesised in platelet mitochondria which converts to TXB2. Before acupuncture treatment of dementia, TXB2 was elevated (303 vs 104 in normal controls) and 6-keto-PGF1alpha was deficient (81 vs 128 in controls). Patients with marked improvement from acupuncture treatment have both compounds returned markedly toward normal levels, with less shift in those showing less improvement and none in non-responders.

Discussion
Acupuncture may protect from the consequences of stroke by a number of mechanisms. Through the release of beta-endorphin and other endogenous opioids there should be an improvement in mood and a greater willingness to exercise the affected limbs because of reduced pain. There is a reduction in platelet clotting, lessening the effects of further vascular obstruction. Also there is an increase in vasodilator agents together with a decrease in
vasoconstrictors, allowing improved blood flow to damaged areas of the brain and a reduction in oedema. Were I to recommend an acupuncture treatment for stroke, at present I would tend toward the Xingnao Kaiqiao approach, perhaps adding Chinese scalp acupuncture if no progress was evident within 8 to 10 treatments given daily, or at the very least three times weekly. Yamamoto’s technique for stroke has the advantage of simplicity, speed, and ability to treat a group of patients together. It is, however, an art I have yet fully to master, and appears to require great precision in finding YNSA points and in the examination of abdomen or neck points. A large, randomised, controlled study, performed in the West, of correctly used YNSA compared to a control group traditionally treated would be useful. If the result is superior for Yamamoto acupuncture, as I suspect it will be, then a second study could be done to compare YNSA with Chinese scalp acupuncture, Xingnao Kaiqiao, and traditional limb point stroke acupuncture. The traditional body point approach using Yangming and Shaoyang meridians appears much more heavily used in work done in China than either yin meridian work or use of the Jiaji and Governing vessel points. One paper did suggest yin meridian work might be more effective when therapy is begun late following stroke, particularly after 6 months have passed.

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