Cortical activation by Yamamoto new scalp acupuncture in the treatment of patients with a stroke: a sham-controlled study using functional MRI

Yamamoto new scalp acupuncture (YNSA) was first introduced 37 years ago.1 Today, it is the most frequently used microsystem in acupuncture next to auriculotherapy. Benefits associated with YNSA have been shown in uncontrolled studies in patients after stroke,2 in patients with musculoskeletal pain3 4 and in emergency medicine.5

In the Western world stroke is still the leading cause of disability in adults, often in the form of hemiparesis. The goal of this study was to correlate the effect of YNSA in patients with hemiparetic stroke to cortical activation visualised by functional magnetic resonance imaging (fMRI)6.

METHODS
The neurological correlates of YNSA were studied in 17 patients with ischaemic stroke in the right hemisphere who had residual paresis of the left hand, and in 19 healthy volunteers. A new acupuncture needle for MRI developed by Schockert was used in this study. Similar to the principle of an indwelling venous cannula, the needle is positioned in the acupoint, the steel cylinder removed and the remaining plastic part is fixed in the acupoint by a plaster. The size of the plastic part remaining in the acupoint corresponds approximately to an acupuncture needle of dimensions 0.30 × 30 mm.7

All participants signed a consent form before the treatment.

Magnetic resonance imaging
The fMRI study was performed in a 1.5 T Philips MRI system (TR 3000 ms, TE 50 ms, FA 90) in a box-car design. Patients were treated lying down and were instructed through video goggles to open or close their left hand. The fMRI paradigm was: five conditions with 120 s duration each: 3 s closing of the fist, 2 s opening of the fist, 30 s break. Three runs of fMRI were performed: no acupuncture, sham acupuncture (patient is blinded: acupressure without insertion of a needle), real acupuncture. The data were analysed using an SPM2 evaluation program. All patients and volunteers were first subjected to sham acupuncture and then to YNSA. The sham acupuncture consisted of a single application of pressure by a finger nail in the centre of an imaginary line between TE23 and GB14. In the genuine YNSA, needles were applied to the Yin points of the basal ganglia, cerebellum and basic point C (figure 1).

Yamamoto new scalp acupuncture
The method is based on a somatotopae on the scalp. In the same way as with ear or...
mouth acupuncture, the entire organism is projected here on a defined area of the scalp. The locomotor system is at the boundary between the forehead and hair, whereas the internal organs are represented via Ypsilon points on both temples. Each Ypsilon point (Ypsilon stands as abbreviation for the name Yamamoto) represents one meridian. Scalp acupuncture distinguishes a Yin somatotopography at the front of the scalp and a Yang somatotopy at the back of the scalp. With the aid of the special YNSA neck diagnosis technique, the associated Ypsilon points on the temples or the corresponding cranial nerve points are found by identifying pressure-sensitive points on the neck. Each meridian has a corresponding pressure point on the neck and an associated treatment point in the region of the temples. If, for example, the kidney point on the neck is sensitive to pressure, the needle is applied to the corresponding Ypsilon point on the temple. If the needle has been correctly positioned the pressure sensitivity in the neck is reduced and provides verification for correct positioning of the needle. For treatment of pain the acupuncture needles were applied ipsilaterally at these basic points while for the treatment of paresis the needles were applied contralaterally to the paretic side.

**RESULTS**

Of the 17 investigated patients, only five could be evaluated owing to motion artefacts. Because the lesions were non-homogeneous, no group analysis was performed as cortical activation was different in each patient. Generally, in contrast to the sham acupuncture, genuine acupuncture was accompanied by significant cortical activation in the motor, premotor and supplemental motor cortex. Eight of 17 patients felt subjectively better after the YNSA. The patients experienced a reduction of spasm and an improvement of the movement of the paralysed upper extremities. The five patients whose data were evaluated all showed subjectively clinical benefit after the YNSA treatment.

**Data analysis in healthy subjects**

Data from 13 healthy volunteers could be evaluated without artefacts. In these subjects it was possible to perform a group analysis. In contrast to the patients, the volunteers displayed a decrease in cortical activation during YNSA.

Without acupuncture and with sham acupuncture, cortical activation was shown in the motor cortex, cingulate gyrus and occipital lobe. With genuine acupuncture, however, no activation occurred in the cingulate gyrus. The cingulate gyrus is part of the limbic system, a multimodal area with important afferent and efferent connections, which is involved in planning of complex and difficult movements. Theoretically, a lack of activation in the cingulate gyrus could be a training effect or the result of selective inhibition of this area by YNSA. Without acupuncture or with sham acupuncture cortical activation was seen close to the region of the vertex of the scalp, where GV20 is situated. This activation is not seen after genuine acupuncture. So it is conceivable that this is a specific YNSA effect.

**DISCUSSION**

The effects look promising but might be the result of generalised stimulation. The reliability of the data analysis must also be verified. The design of the study shows methodological deficits. For studies in the future the documentation has to be done even more thoroughly with objective methods of measurement.

The following practical problems were seen during the conduct of this study: patients were lying down still in the scanner for about 1 h. This was very tiring and difficult for the patients. In addition, it is conceivable that patients had major concentration problems during the third block (genuine acupuncture).

We consider that the results of this study could potentially support the use of YNSA as an adjunctive measure in stroke rehabilitation.

In view of the fact that eight patients felt subjectively better after the treatment and in view of the changes in the cortical activations in the motor, premotor and supplemental motor cortex it seems that this benefit justifies the hypothesis that the YNSA treatment itself had a positive influence and is the cause of the positive effects described by the patients.

As stroke is the leading cause of disability in the Western world we think that further larger controlled clinical trials and fMRI studies should be carried out with more participants to investigate the phenomenon we have seen in this study.

**Correspondence to** Dr T Schockert, General and Integrative Medicine, Acupuncture, Emergency Medicine, Naturopathy, Sports Medicine, Witten/Herdecke Private University, Alfred Herrhausenstrasse 5G, 58446 Witten, Germany; thomas-schockert@gmx.net

**Competing interests** None.

**Ethics approval** This study was approved by the ethics committee of Aachen University (Professor Dr Martin Reim).

**Figure 1** Yamamoto new scalp acupuncture basic points with brain points.
Letters

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