

Computer-based quantification of traditional Chinese-, ear- and Korean hand acupuncture: Needle-induced changes of regional cerebral blood flow velocity

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The purpose of this randomized, placebo-controlled, cross-over study was to investigate mean blood flow velocity (v_{ba}) of the ophthalmic (OA) and the middle cerebral (MCA) artery during traditional Chinese acupuncture (TCA), ear acupuncture (EA), Korean hand acupuncture (KHA) and placebo needling (PN) by simultaneous and continuous transcranial Doppler sonographic monitoring. We examined 20 healthy volunteers 19–45 years old (mean age \pm SD, 26.2 \pm 6.0 years). v_{ba} in OA was significantly increased during needling vision-related acupoints of TCA ($p < 0.001$), EA ($p < 0.05$) and KHA ($p < 0.05$), whereas nonsignificant alterations occurred in v_{ba} of MCA. All subjects showed insignificant changes in mean arterial blood pressure. The study design does not allow to evaluate why and how the different acupuncture methods have an effect on the brain and eye, however it proves that acupuncture can provide scientifically measurable effects. [Neurol Res 2002; 24: 377–380]

Keywords: Acupuncture; transcranial Doppler sonography (TCD); cerebral blood flow velocity; ear acupuncture; Korean hand acupuncture

INTRODUCTION

Acupuncture is based on the experiences of traditional Chinese medicine and produces specific and reproducible effects on cerebral blood flow velocity. This has been demonstrated in several studies recently^{1–7}. Using transcranial Doppler (TCD) ultrasound in conjunction with special probe holder constructions it is possible to noninvasively and continuously assess blood flow profiles in the major intracranial arteries^{5,7}.

The aim of this study was to simultaneously and continuously measure cerebral blood flow velocity in the middle cerebral artery (MCA), as well as in the ophthalmic artery (OA) in healthy volunteers before, during and after manual traditional Chinese acupuncture, ear acupuncture and Korean hand acupuncture by means of needling vision-related acupoints.

MATERIALS AND METHODS

A total of 20 healthy volunteers (14 females, 6 males; mean (\pm SD) age 26.2 \pm 6.0 years, range 21–45) were examined. The study protocol was approved by the ethics committee of the University of Graz (11-017ex00/01) and all subjects gave written informed consent.

The test persons were positioned on a bed in the biomedical engineering lab with eyes closed. None of the volunteers had visual deficits and all were free of neurological or psychological disorders and were not

taking any medication. They were paid for their participation.

Blood flow velocity was measured continuously and simultaneously at the OA and the MCA by transcranial Doppler sonography using a new probe holder construction^{5,4,6}.

After a 10 min resting period one of the acupuncture schemes (Figure 1, upper panel A–D) was selected in a randomized cross-over study design. Scheme A consisted of two traditional Chinese acupoints: UB.2 Zanzhu (Location: In the depression of the medial end of the eyebrow. Method: Puncture transversely 0.5–0.8 cun) and Ex.3 Yuyao (Location: At the midpoint of the eyebrow. Method: Puncture transversely 0.3–0.5 cun). Scheme B used two ear acupoints (liver and eye; compare Figure 1, ear map). Scheme C contained two vision-related acupoints from Korean hand acupuncture (E2) and one from Chinese hand acupuncture (Yan Dian). Scheme D consisted of one 'placebo point' (lateral from the radius 6 cun above the carpal fold; compare Figure 1, upper panel, right, D) on the forearm.

The acupoints were punctured with sterile, single-use needles after local desinfection of the skin. We used three different types of needles. Schemes A and D: 0.25 \times 25 mm, Huan Qiu, Suzhou, China; Scheme B: 0.2 \times 13 mm, European Marco Polo Comp., Albi, France; Scheme C: 0.1 \times 8 mm, Sooji-Chim, Korea.

Stimulation was achieved by rotation with lifting and thrusting of needles. A toning technique was used.

We evaluated mean blood flow velocity (v_{ba} , cm sec⁻¹) simultaneously and continuously in the OA and MCA using a new construction (compare Figure 1,

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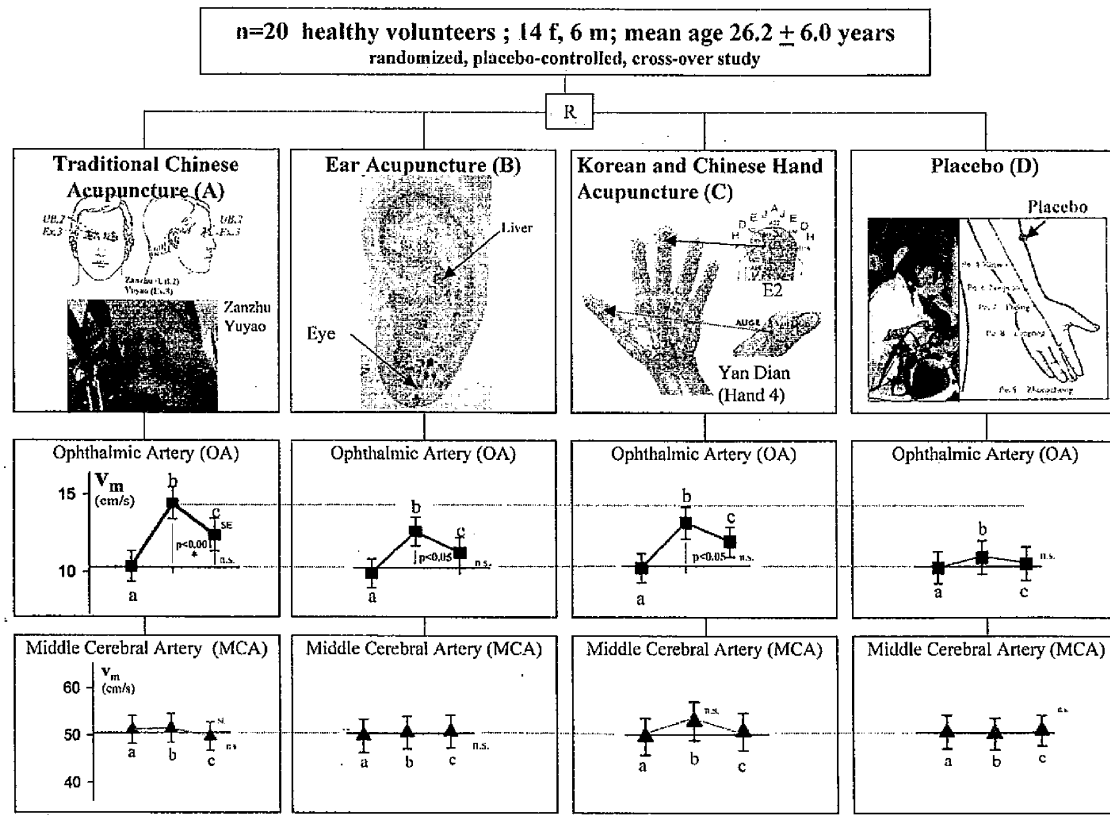


Figure 1: Healthy volunteers, acupuncture schemes, and graphical results a: before, b: during and c: after acupuncture using four acupuncture schemes in 20 persons in a cross-over design

upper panel, A and D) and a Multi-Dop T device (DWL Electronic Systems GmbH, Sipplingen, Germany).

Each person was studied with four different acupuncture schemes (A–D). The choice of the measuring procedure was randomized and the interval between the phases A–D was at least 20 min.

The data were tested with analysis of variance (one-way repeated-measure ANOVA) using SigmaStat (Jandel Scientific Corp., Erkrath, Germany). As *post hoc* analysis Friedman repeated measures analysis of variance on ranks was used. The results were given as means ± standard error (SE). Changes were considered significant at a *p*-value < 0.05.

RESULTS

Figure 1 summarizes the demographic data, the different acupuncture schemes and results of v_m in the OA and MCA.

Note the highly significant ($p < 0.001$) increase of v_m in the OA during (b) acupuncture after needling the traditional Chinese acupoints Zanzhu and Yuyao

(scheme A). At the same time almost no changes in v_m were seen in the MCA. Also significant changes ($p < 0.05$) of v_m in OA were found after ear acupuncture and Korean and Chinese hand acupuncture. Only slight, nonsignificant changes occurred after placebo needling. The mean arterial blood pressure was not significantly changed during or after acupuncture or placebo needling.

Figure 2 shows a typical example of the trend of v_m in the ophthalmic and the middle cerebral artery before and after needling the two acupoints Zanzhu and Yuyao.

DISCUSSION

Among the various modalities of integrative medicine, acupuncture is regarded as one of the better studied. Hundreds of randomized controlled trials on acupuncture have been published⁸. Positive effects on cerebral blood flow due to acupuncture have also been repeated and corroborated^{1–7}. However there is no study in scientific literature which shows a comparison of different acupuncture methods (traditional Chinese-,

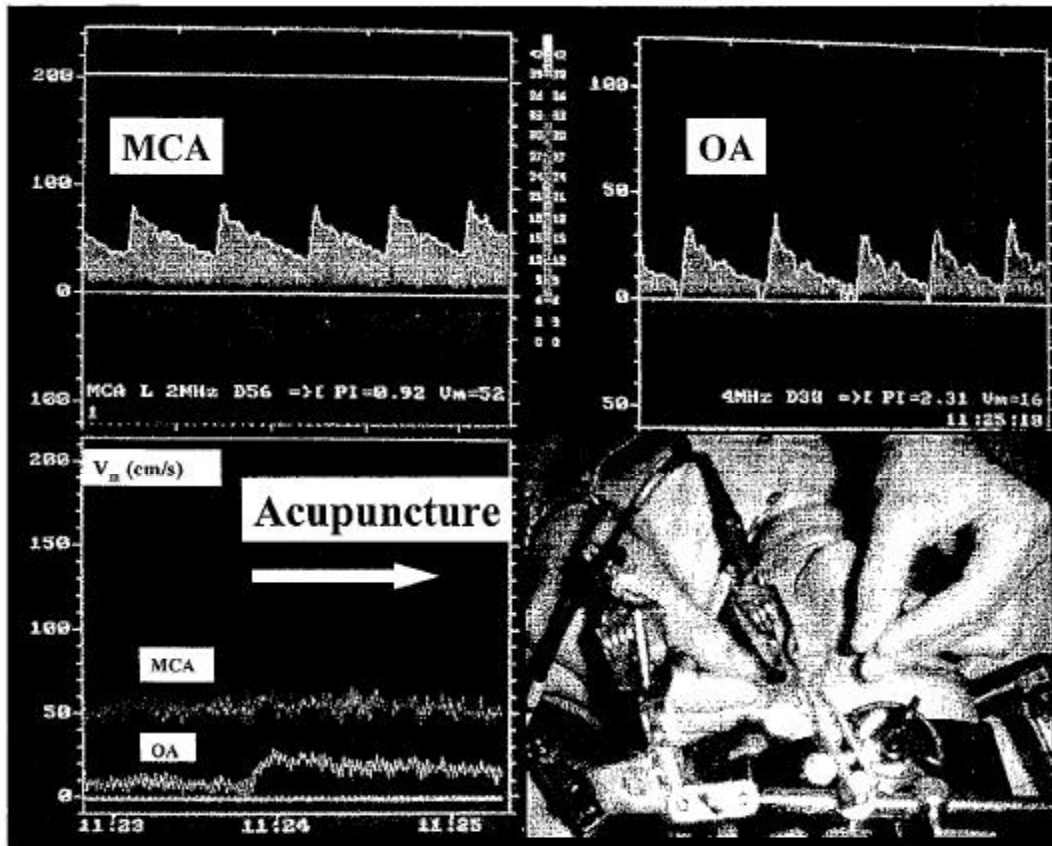


Figure 2: Blood flow profiles and trend of mean velocity in the ophthalmic (OA) and middle cerebral artery (MCA) before and after acupuncture (scheme A; compare Figure 1). Note the specific increase of v_m in the OA at the beginning of acupuncture (arrow)

ear- or Korean hand acupuncture) in connection with objectivation of effects of cerebral blood flow velocity.

It is almost certain that traditional Chinese acupuncture has been known and used in Western medicine since the 17th century. However ear acupuncture has been developed largely outside China. It is quite clear that there are some ancient Chinese manuscripts that mention the use of the external ear for acupuncture, but classical Chinese acupuncture applies to the body rather than the ear. The detailed ear map that is now being used by most acupuncturists was developed by Dr Paul Nogier in France in the early 1950s. One of his earliest findings was that if there was pain in the body then the equivalent part of the ear also became painful. The picture of a pirate with a gold ear ring through his ear lobe is a well remembered childhood image; according to folklore the gold ring is supposed to increase the visual ability of the pirate, so that he can see ships to plunder before he is seen by them. The ear ring usually

seems to be placed in the eye point on ear lobe 9 (Figure 1, upper panel, B).

The past fifteen years have allowed further development in the theory and practice of Korean hand acupuncture. Similar principles underlying traditional 'body acupuncture' are also found in Korean hand acupuncture. However, the needles are much smaller and their depth of penetration is much shallower. In addition there are no vital structures in the region of treatment points that can be damaged inadvertently, so that possible complications of pneumothorax or organ damage, occasionally encountered in traditional acupuncture, are never seen with hand acupuncture¹⁰.

Our preliminary results using different methods of acupuncture (traditional Chinese, ear and Korean and Chinese hand) showed that there was little influence on blood flow velocity of middle cerebral artery needling specific vision-related acupoints. However, mean blood flow velocity of the ophthalmic artery increased

significantly after needling vision-related acupoints. The effect was more pronounced ($p < 0.001$) using two points (Zanzhu and Yuyao) from traditional Chinese 'body acupuncture' than using ear- or hand acupuncture. Nevertheless the effects were also significant ($p < 0.05$) in ear- and hand acupuncture. Placebo needling on the other hand shows only minor changes in cerebral blood flow velocity. The method used in this study is not able to evaluate why and how the different acupuncture methods have an effect on the brain and eye, however it proves that acupuncture can provide scientifically measurable effects¹¹.

CONCLUSION

We found specific significant alterations in blood flow velocity of the ophthalmic artery after needling vision-related acupoints on the body, ear, and hand, but the study design does not allow to draw conclusions regarding the underlying mechanisms.

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