

Visual Evoked Potentials And Acupuncture

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Citation

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Abstract

Visual evoked potentials (VEP) are of particular importance for the objectivization of organic and functional defects in the visual system. This study presents, for the first time, the use of systematic VEP-monitoring in connection with manual acupuncture and laserpuncture in 40 healthy volunteers. We were not able to find significant changes in latency or in the amplitudes of VEP's during acupuncture.

INTRODUCTION

Visual evoked potentials (VEP) are of particular importance for the objectivization of organic and functional defects in the visual system [1]. For this reason the function of the primary visual pathway, which is not directly influenced by the brain stem, has to be examined. In connection with pathologic states of consciousness, especially somatosensory [2] and auditory [3] evoked potentials (EPs) are described; in both cases, the primary pathway passes through the brain stem and the EPs are altered characteristically during comatose states [1,3, 4, 5].

This study presents, for the first time, the use of systematic VEP-monitoring in connection with manual acupuncture and laserpuncture in 40 healthy volunteers.

METHODS AND MATERIALS

VOLUNTEERS

Forty healthy volunteers aged between 20 and 45 years (mean age + SD: 24.8 + 4.7 years), 27 female and 13 male, took part in this study. None of the volunteers had striking ophthalmologic findings or were taking central nervous system effective medication at the time of examination. All test persons had an inconspicuous psychologic and neurologic status and anamnesis. The study was approved by the Ethic Committee at the University of Graz (11-017, 00/01).

STIMULATION, REGISTRATION AND EVALUATION PARAMETERS

Registration of VEPs was done with equipment from Axon Systems Inc., Hauppauge, N.Y., USA. Recording of bioelectrically evoked brain activity was performed from Oz

to Fz using a grounding electrode GND between Oz and Fz in accordance with the international 10:20 system. (Fig. 1).

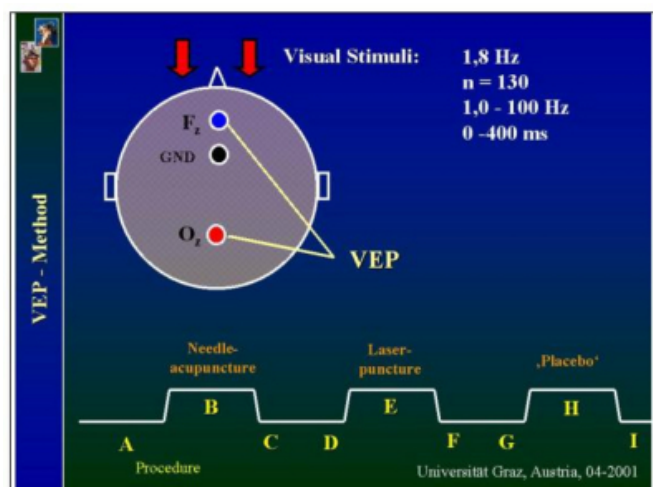
We used new EEG-cable electrodes [6] and adhered them with conductive paste (Grass EC2). Electrode impedance was always below 2 kOhm. In order to examine the visual system, light stimulation with a stimulus frequency of 1.8 Hz was applied at 3 second intervals by special spectacles having 6 integrated "high-intensity-lamps".

Filters were set at 1.0 to 100 Hz and n=130 stimuli were averaged. The analysis window comprised 0 to 400 ms and the stimulus was presented binocularly with closed eyes.

The absolute latency of components N75 (L1), P100 (L2) and N140 (L3) as well as the amplitudes N75/P100 (A1) and P100/N140 (A2) were used as evaluation parameters.

Figure 1

Fig. 1: Schematic illustration of the recording and stimulation method of VEP (above) and measurement procedure (below).



ACUPUNCTURE AND PROCEDURE

Guangming (G.37)

Localisation: 2 cun under the middle connecting line to point Gb.34 and the most prominent point of the lateral malleolus.

Depth: 1 - 2 cun vertically

Indication: Pain in at the left lateral side of the lower leg, visual impairment.

Taichong (Le.3)

Localisation: At the proximal angle between Os metatarsale I and II, where the corpus und base regions of both bones approach one another.

Depth: 0.5 - 1 cun vertically

Indication: Lateral head pain – migraine headaches, muscular overstraining, muscle cramps, spasmolytic effect, opens eyes.

Zhiyin (Bl.67)

Localisation: Lateral corner of the nail of the 5th toe.

Depth: 0.1 cun vertically

Indication: Headache, rotation of child in breech or lateral presentation, clears eyes and vision.

The acupuncture points used, represent corresponding points for vision, according to Traditional Chinese Medicine (Fig. 2). These points were needled after local disinfection of the

skin, with sterile single-use needles 25 x 0.25 mm (Huan Qiu, Suzhou, China).

Figure 2

Fig. 2: Acupuncture points used in this study.



Laserpuncture was performed with a “Profilaser” series PL (Silberbauer, Vienna/Austria; 670 nm, 50 mW). Each point was stimulated by the same person for a duration of 20 seconds. This device belongs to the laser class 3b. The appropriate laser protection glasses were used.

“Placebo-needling” was performed at points which according to Traditional Chinese Medicine, were whether located on meridians or were actual acupuncture points (between the proximal approaching area of metatarsal bones 3 and 4).

The following measurement procedure was selected (compare Fig. 1):

(A) 2 minutes before to needling, (B) 2 minutes after applying needles and during stimulation, (C) 2 minutes after removing needles, (D) 2 minutes before laserpuncture, (E) immediately after 20 seconds of laserpuncture, (F) 2 minutes after completing laserpuncture, (G) 2 minutes before needling placebo-points, immediately after applying the needle at the placebo points and (I) 2 minutes after removing the needles at the placebo points. Between measurement phases A-B-C (acupuncture), D-E-F (laserpuncture) and G-H-I (“Placebo needling”), 5-minute resting periods were made. The modalities (A-B-C, D-E-F and G-H-I) were applied in a randomized manner.

STATISTIC ANALYSIS

Data was tested with Kruskal-Wallis one way ANOVA using the statistic program SigmaStat (Jandel Scientific Corp., Erkrath, Germany). The level of significance was p <

0.05.

RESULTS

Figure 3 shows a typical example of VEPs from a 22-year-old volunteer. In addition to the absolute latencies (N55, P103 and N127) the amplitudes from N55/P103 and P103/N127 are registered as evaluation parameters.

Figure 3

Fig. 3: Visual evoked potentials from a 22-year-old volunteer. The absolute latencies (L1, L2 and L3) and amplitudes (A1 and A2) are registered as evaluation parameters.

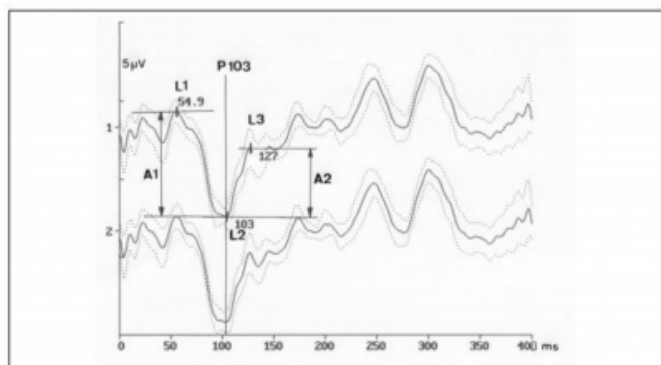
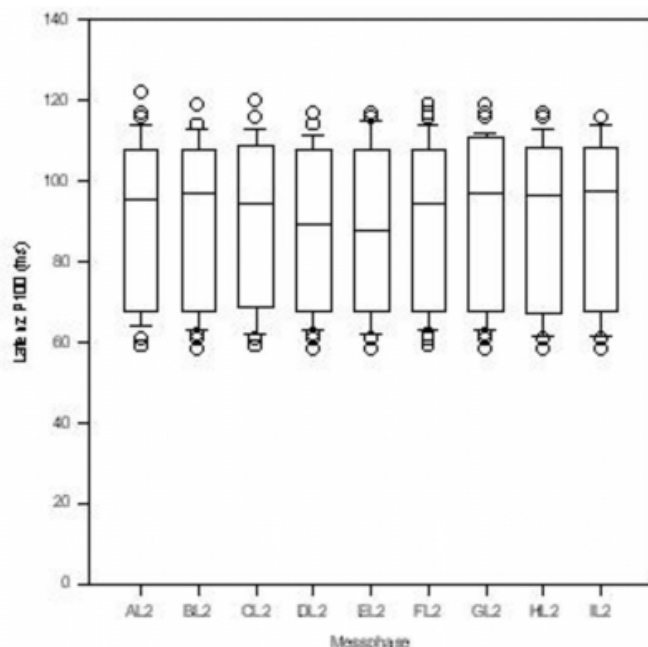


Figure 4 graphically documents the results of latency of the P100-component (L2) from all 40 volunteers in a box-plot-illustration. No ($p=1.0$) changes in latency (L1, L2 and L3) during the individual measurement phases occurred.

Figure 4

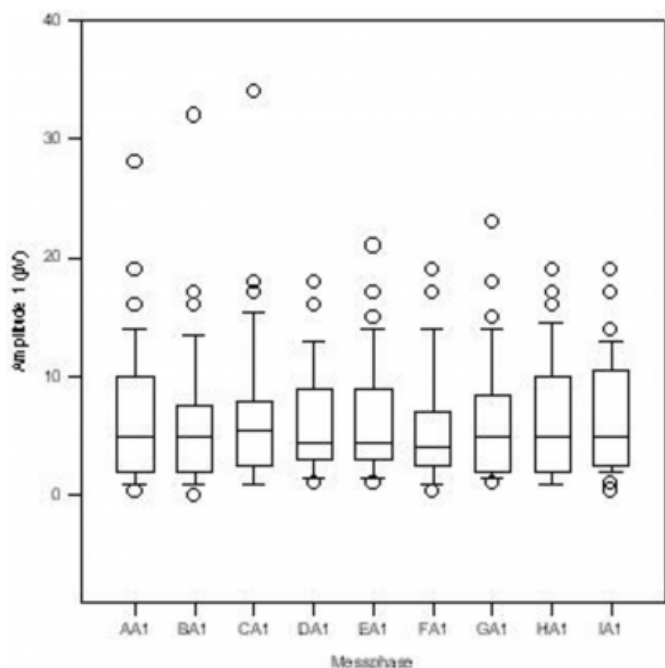
Fig. 4: Absolute latency “P100” of visual evoked potentials at different measurement times “AL2 to IL2, compare Fig. 1). Box-plot-illustration: The horizontal line in the box indicates the position of the median. The ends of the box define the 25th and 75th percentile, the error bars mark the 10th and the 90th percentile.



The amplitude values ($A1 = N75/P100$) from the 40 volunteers investigated in this study are shown in Figure 5. Only minor and no significant changes ($p=0.948$) during the different measurement phases occurred. Evaluation of the amplitude A2 ($p=0.998$) yielded similar results. However, we note that alterations in latency as well as amplitude during the placebo measurement were the slightest.

Figure 5

Fig. 5: Amplitude A1 (N75/P100) of visual evoked potentials at different measurement times (AA1 to IA1, compare Fig. 1). For further information see Fig. 4.



DISCUSSION

Investigation of visual evoked potentials are primarily performed by neurologic and ophthalmologic problems concerning the substantial and functional integrity of the visual system. It is also used for diagnosis of comatose states, especially in combination with multi-modal techniques [1,3-5]. No extensive systematic studies regarding acupuncture and VEP exist in literature.

In an animal study with rabbits, Shen et al. [7] investigated VEP as an integral part of a multi-modal series in combination with somatosensory and auditory evoked potentials during acupuncture. The authors of this Chinese article described a significant decrease in amplitude of all components.

Scientific studies with humans concerning VEP and acupuncture has only been performed on 12 hemianoptic patients [8]. In this study Poletti et al. [8] describe that the VEP amplitudes located ipsilateral to the occipital lesion after periorbital acupuncture were pronounced. A further publication [9] describes changes in VEPs in patients suffering from endogenous depression. Duan et al. [10] even attempted to objectivize the connection between the amplitude of the P100 component and different acupuncture points on different meridians. The authors described that a

connection between all meridians to the visual system exists, however the needling of placebo points shows no changes in VEP. The extent of these alterations should be variable. Only the acupuncture points located on the bladder meridian indicated activation of VEP's, however the stimulation of acupuncture points on other meridians showed inhibitory effects on VEPs [10].

In the present study including 40 healthy volunteers, we were not able to find significant changes in latency or in the amplitudes of VEP's. The fact that the amplitudes of VEP's can slightly decrease after reduction in concentration but the latencies remain unchanged, must be considered in this study. This mainly applies to latencies > 200 ms, which were not registered or evaluated in our study. In addition, continuous VEP monitoring for more than 3 minutes without pausing could falsify measurement results. This could also be the reason for the different final values among the single measurement phases (A, D and G in Fig. 4 and 5). Three different acupuncture points on different meridians were used simultaneously. Thus a correlation with other studies in which blood flow velocity after manual stimulation of acupuncture needles significantly increases in the posterior cerebral artery, is not really possible. On the other hand it is conceivable that at variable time differences, between reproducible and significant changes in cerebral blood flow velocity and alteration in VEP's occur and/or modulation may not be objectivizable due to limitations based on the present technical equipment available.

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