Time Course of the Cerebral Slow Potential Changes Caused by Rhythmic Flash Stimulation

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The slow potential (SP) changes elicited in the cerebrum by rhythmic flash stimulation were led from the scalp above the rabbit visual cortex in awaked resting state. The time course of SP changes caused by rhythmic flash stimulation was traced at the same time as the summated average responses of evoked EEG responses, that is, visually evoked responses (VERs). The negative shifts of the cerebral SP changes were observed to be augmented gradually, as the counts of stimulation increased. In the VERs, the same tendency was recognized as the time course of the negative shifts of the cerebral SP. The relationship between the negative shifts of the cerebral SP changes and VERs was discussed.

Slow potential; cerebrum; visually evoked response

It has been reported by a number of investigators since Arduini et al. (1957) that the slow potential changes were elicited in the cerebral cortex during sensory and central stimulation. However, so far as the time course of slow potential changes induced in the cerebrum by photic stimulation is concerned, few informations are available. Therefore, the present experiments were attempted to clarify the time course of the cerebral slow potential changes led from the rabbit scalp above the visual cortex by rhythmic flash stimulation at about 1 Hz.

The slow potential (SP) changes between the cerebrum and extracerebral point of rabbits were recorded by means of the SP recording technique (Ozaki et al. 1965, 1967) through calomel non-polarizable electrodes and DC chopper amplifiers during rhythmic flash stimulation. The potential difference between exploring and indifferent calomel electrodes was adjusted at a zero level before stimulation, as described in our previous report (Ozaki et al. 1967). The electroencephalograms (EEGs) were recorded simultaneously with the cerebral SP changes mentioned above. In addition to the EEGs, the visually evoked responses (VERs) were also obtained by the Average Response Computer, ARC (AR-201, San-ai Sokki Co., Tokyo) and, if necessary, the digital computer for data processing, Mediac (MC-401, San-ai Sokki Co., Tokyo).

When the left eye of a rabbit in awaked resting state was stimulated with rhythmic flash stimulation of about 1 Hz, the SP in the cerebrum began to deflect upwards from the base line gradually after the onset of stimulation. This negative shifts of cerebral SP caused by photic stimulation were augmented as the counts of stimulation increased. After the end of stimulation, they returned to the base line gradually as shown in Fig. 1. The VERs, i.e. the summated average responses of evoked EEG responses which synchronized with the stimulating frequency, were also observed to be augmented in amplitude of early and late components, as the counts of stimulation increased. In nembutalized state, on the
Fig. 1. SP (slow potential, LO-N lead), EEG (electroencephalogram, LO-N lead), AR (average responses of evoked EEG responses) and PS (photic signals) during rhythmic flash stimulation of 1 Hz in an awake rabbit. In this Figure shifts above baseline are negative. A, B, C, D, E and F show continuous tracings before and during flash stimulation. The vertical line or right angle indicates 100 μV in the SP, 50 μV in the EEG and 10 μV in the AR, respectively.

other hand, there were found no marked negative shifts of the cerebral SP changes caused by rhythmic flash stimulation. The late components of the VERs were considerably decreased in amplitude or almost completely abolished, whereas the early components of them were observed to be considerably augmented in amplitude. These results suggest a close relationship between the negative shifts of the cerebral SP and the late components of the VERs, which were both evoked by rhythmic flash stimulation.

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References