INTEROCEPTIVE INFLUENCES ON VESTIBULAR NYSTAGMUS

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Stimulation of mechanoreceptors of the stomach and rectum affects the frequency and amplitude of rotatory nystagmus.

Reflex influences from interoceptors on vestibular function have received little study [1]. The investigation described below was carried out for this purpose.

EXPERIMENTAL METHOD

Altogether 38 experiments were carried out on adult male rabbits with electrodes implanted at the outer angle of both eyes. The animals were turned at a speed of 1 revolution in 2 sec for 20 sec, and then suddenly stopped ("stop stimulus"). Nystagmus and voluntary movements of the animal's eyes were recorded on a type 4EEG-1 four-channel electroencephalograph in a darkened, screened room. The mechanoreceptors of the stomach and rectum were stimulated by inflating a rubber balloon to a specified pressure. Rotatory and postrotatory nystagmus were recorded before and during visceral stimulation.

EXPERIMENTAL RESULTS

Stimulation of mechanoreceptors of the rectum and stomach affected the frequency and amplitude of rotatory nystagmus, and the changes in nystagmus were found to be dependent on the strength of visceral stimulation. In response to weak stimulation of the rectal (pressure inside the balloon 40-60 mm Hg) and gastric (20-30 mm Hg) mechanoreceptors, no significant changes were found in the frequency or amplitude of the nystagmic movements, although in many experiments, these values were reduced. In response to stronger stimulation of the rectal mechanoreceptors (80-100 mm Hg), the frequency of nystagmic movements was increased by $11.39 \pm 3.51\%$ ($P < 0.01$), and their amplitude was increased by $11.0 \pm 4.79\%$ ($P < 0.05$) (Fig. 1).

Some parameters of postrotatory nystagmus also were affected by interoceptive stimulation. Weak rectal stimulation, for instance, reduced the duration of the response by $14.23 \pm 0.65\%$ ($P < 0.05$), and in some experiments the rhythm of nystagmus was slowed. Stronger interoceptive stimulation as a rule was accompanied by an increase in the frequency of the nystagmic movements, on the average by $10.3 \pm 4.62\%$ ($P < 0.05$).

Strong interoceptive stimulation thus mainly strengthens nystagmus by increasing its frequency and amplitude, reflecting the increased sensitivity of the vestibular system under these conditions. During comparatively weak stimulation of the gastric and rectal mechanoreceptors, the nystagmus was usually shorter in duration and smaller in amplitude than without stimulation.

These results indicate the role of afferent visceral impulses in reflex regulation and functional "tuning" of the vestibular system. Apparently the reticular formation, which exerts both facilitatory and in-

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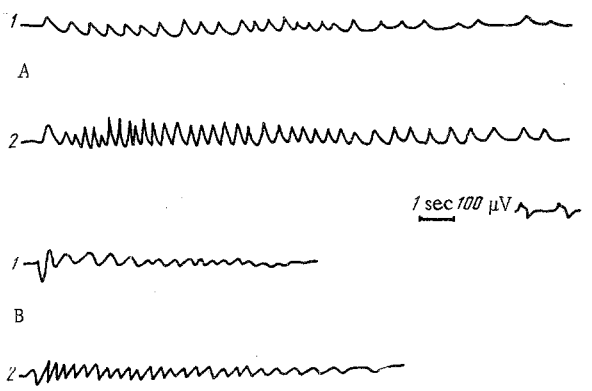

Fig. 1. Changes in vestibular nystagmus during strong (80-100 mm Hg) stimulation of rectal mechanoreceptors: A) rotatory nystagmus; B) postrotatory nystagmus; 1) before visceral stimulation; 2) during visceral stimulation.

hibitory effects on vestibular function and, in particular, on the vestibular reactions of nystagmus, plays an essential role in the mechanism of interaction between the visceral and vestibular afferent systems [4, 5]. Meanwhile, when these results are analyzed, it must be remembered that stimulation of the internal organs causes changes in function of the cerebral cortex, as a result of which vestibular nystagmus may be either inhibited or de-inhibited [2,3].

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