

Relationship Between Oculomotor Nucleus and Lateral Geniculate Body Monophasic Waves

Characteristic EEG waves related to eye movement have been observed in the pons¹⁻³, oculomotor nucleus (OMN)⁴, lateral geniculate body (LG)⁴⁻⁶, and occipital cortex⁷ of the cat. These monophasic waves (MP) have been detected during rapid eye movement sleep as well as in the alert animal^{8,9}. It has been shown that LG MP waves persist after eye removal¹⁰ or bilateral section of the optic nerve¹¹, but are abolished by certain brainstem lesions¹². The present experiments were performed in order to study the time interval between OMN and LG MP waves.

The spontaneous electrical activity of the LG and OMN was recorded in 5 alert cats with chronically implanted bipolar concentric electrodes. The signals were amplified with a 6-channel electroencephalograph and displayed on a dual-beam oscilloscope and photographed. The placement of electrodes in the oculomotor nucleus was confirmed histologically.

ments similar to those which accompanied MP waves recorded from the same electrode.

All oculomotor MP waves were followed by geniculate MP waves, whereas some of the geniculate MP waves were not preceded by oculomotor ones. The reason might be found in the location of the electrode in the oculomotor nucleus. Depending on where the electrode was located, the initiation of a downward-upward or lateral movement would be recorded.

In contrast to a previous report³ that the interval between pontine and LG PGO waves never exceeds 5 msec in the cat, we have observed 175 msec delays between OMN and LG PGO waves. Our findings in the cat are in accord with a recent report¹³ of a delay of at least 50 msec between pontine activity and LG waves in the monkey. This result suggests that MP waves which occur almost simultaneously in the lateral geniculate body and the visual cortex may be initiated from the OMN¹⁴.

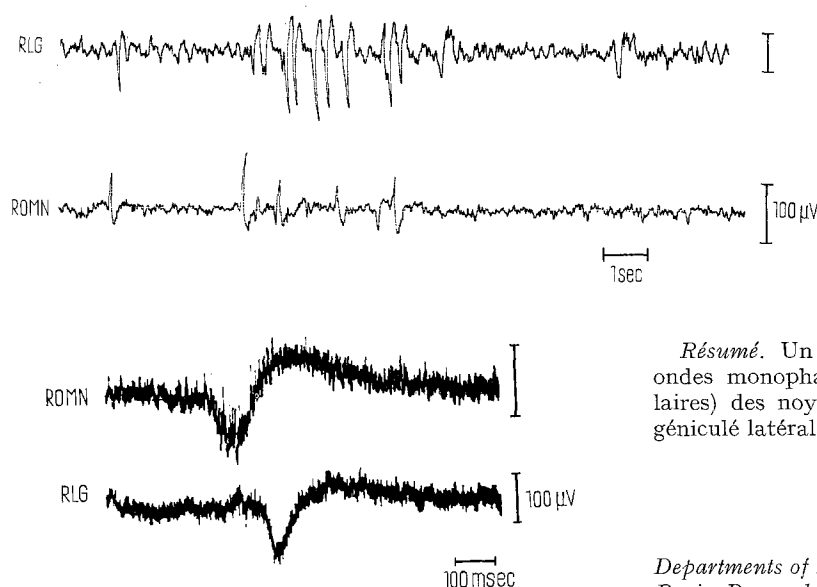


Fig. 2. Monophasic waves recorded from right oculomotor nucleus (ROMN) and right lateral geniculate body (RLG) of an alert cat showing a delay of 140 msec between the onsets of the OMN and LG waves.

Fig. 1. Spontaneous EEG recorded from an alert cat with electrodes in the right lateral geniculate body (RLG) and the right oculomotor nucleus (ROMN).

Résumé. Un délai de 175 ± 65 S.D. msec entre les ondes monophasiques (précédant les mouvements oculaires) des noyaux oculomoteurs du pont et du noyau géniculé latéral a été observé chez le chat éveillé.

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Figure 1 illustrates the electrical activity of LG and OMN of an alert cat, with characteristic monophasic waves which appear first in the OMN. Figure 2 shows the delay between the onset of individual OMN and LG monophasic waves. The mean delay observed for 27 pairs of events was 175 msec with a standard deviation of 65 msec. The range of observed delays was 65 to 325 msec.

Attempts to measure a delay between LG and occipital cortex PGO waves failed. We conclude that the onset of PGO waves occurs almost simultaneously (± 10 msec) in the LG and primary visual cortex.

An MP wave in the LG preceded every eye movement. In contrast, MP waves in the OMN occurred only in conjunction with (and preceding) a specific direction of rotation of the eyeball. The OMN MP preceded the eye movement, depending on the location of the recording electrode so that, for instance, a cat in which OMN MP waves were recorded for downward eye movements showed no OMN MP waves for eye movements in any other direction. Electrical stimulation in the OMN with trains of pulses at 50–200 Hz, 0.5 V, elicited eye move-

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