STUDIES OF TRIGEMINAL NERVE POTENTIALS
OVERREACTION TO TACTILE FACIAL STIMULATION IN ACUTE LABORATORY PREPARATIONS*

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Evoked trigeminal nerve potentials in normal cats and monkeys have been reported. Alterations of trigeminal nerve potentials associated with chronic overreaction to tactile facial stimulation in cats have also been described. However, these chronic animals took 3 to 4 months to prepare and large numbers of animals were required in order to obtain a significant number of good preparations for subsequent recordings.

A new preparation therefore seemed desirable in which during the course of an acute experiment overreaction to tactile facial stimulation could be produced and simultaneous records could be obtained of evoked trigeminal nerve potentials. This report describes electrophysiologic recordings of trigeminal nerve potentials from 60 cats in which overreaction to tactile facial stimulation was produced during the course of acute experiments.

TECHNIQUE

Adult cats weighing 2–4 kg. were anesthetized with 12.5 to 37.5 mg. of thiamylal sodium (Surital) given intrathoracically and endotracheal ether. The medulla and upper cervical cord were exposed. The posterior root, gasserian ganglion, and peripheral divisions of the trigeminal nerve were exposed in the middle fossa. A segment of the infraorbital nerve was then exposed. Anesthesia was discontinued after the surgical preparation.

Recordings were begun 1 to 1½ hrs. after ether anesthesia was discontinued. The animals were responsive to stimulation but lay quietly on the supporting table. Rectal temperatures remained normal during recording periods. Succinylcholine chloride (Anectine) was not used as in earlier studies since exaggerated facial and body movement in response to light stroking or touching of facial fur were the primary indices of overreaction.

Bipolar steel needle electrodes with uninsulated tips (60 to 80 μ) 1 to 2 mm. apart were inserted into the 2nd division of the trigeminal nerve in the middle fossa. Nichrome wire bipolar electrodes with exposed tips up to 60 μ and offset 1 mm. from each other were inserted into spinal V caudal to the obex of the 4th ventricle with a micromanipulator. Recordings from these electrodes were obtained on a dual beam oscilloscope with coupled amplifiers of conventional capacity.

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Stimulating electrodes were placed on the infraorbital nerve. Monophasic stimuli (Grass stimulator Model No. S4C) of 0.01 msec. duration were raised from threshold voltage to that voltage required to evoke a maximum afferent response in the 2nd division of the trigeminal nerve in the middle fossa. The stimulus required to evoke a maximum response was used in these studies unless otherwise indicated.

Overreaction to tactile facial stimulation was produced by applying strychnine or thio-carbohydrazide over the surface of spinal V, 1 to 3 mm. caudal to the obex of the 4th ventricle. Strychnine dilutions of 1 per cent and 5 per cent were effective but a tiny crystal of strychnine under a 2 mm. pledget of cottonoid gave prompt and lasting results. It could be readily removed by irrigation.

The overreaction to tactile and electrical stimulation was graded + to +++++ during the protocol. Cursory efforts were made to record this overreaction using electrodes in the upper and lower eyelids, the tip of the ear, and in the interscapular region. These electrodes were led to a 4-channel Grass electroencephalographic machine (Model No. III D) for recording of movement and muscle activity.

RESULTS

Since Anectine could not be used in this study (movement being the primary index to overreaction) it was necessary to exclude any artifact caused by movement or muscular contractions which might be recorded directly or by remote pickup in the recording nerve electrode (Fig. 1). Monitor electrodes were therefore inserted into the temporalis muscle, cervical paraspinal muscles, forehead, cheek, and chin muscles, cervical strap muscles, periosteum at the foramen rotundum, petrous ridge and sphenoid wing, and into the hippocampus and cerebral peduncle. From

Fig. 1. (A) Recording obtained from electrodes placed in the 2nd division of the trigeminal nerve in the middle fossa (1), cervical paraspinal muscles (2), facial muscles of forehead (3), and chin (4), periosteum of the petrous ridge (5) and foramen rotundum (6), cervical strap muscles (7), and hippocampus (8).

(B) Recordings from 2nd trigeminal divisions in the middle fossa (1), temporalis muscle (2) and cerebral peduncle (3).

(C) Recordings from 2nd division of the trigeminal in the middle fossa before (1) and after (2) section of all the motor cranial nerve outflow on the ipsilateral side from the 3rd, 4th, motor 5th (with the 3rd division), 7th, and lower cranial nerves inferiorly to include the motor roots of the upper cervical segments. Stimuli in each instance were delivered to the infraorbital nerve. Calibration indices are for 250 µV and 5 msec. in this and each succeeding illustration unless otherwise stated.