

A STUDY OF EVOKED ELECTROMYOGRAPHY OF THE INFERIOR ORBICULARIS ORIS MUSCLE IN MAN

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Abstract

The facial nerves on one side in normal persons were stimulated by bipolar concentric needle electrode, and the evoked potentials were picked up to determine the conduction speed, extent and recorded potentials of the inferior orbicularis oris muscle. Evoked potentials were recorded up to 1.5 to 2.5 cm across the midline of the lower lip. The conduction speed reduced abruptly and the amplitude became small.

INTRODUCTION

The human lips are formed by union of the mesenchyme of five facial processes; the upper lip with two maxillary processes, and one frontal process and the lower lip with two mandibular processes. Although the orbicularis oris muscle is controlled by the branches of the right and left facial nerves, it serves as a sphincter and coordinates function.

During recent years, the efforts devoted in the reconstruction of lips includes not only the cosmetic appearance, but also their function as well. In order to achieve functional reconstruction of the lips, it is necessary to have a good knowledge of their normal anatomy and physiology. There have been a number of reports on the electromyographic findings of the superior orbicularis oris muscle.^{1,5)} The authors have also reported on the results of their study of evoked electromyography (EMG) of this muscle¹⁾, and in this report will present their findings on their study of the inferior muscle.

METHODS

The facial nerve was stimulated below the ear through a bipolar surface electrode, set at supramaximum output. The maximum voltage of the stimulator was 150 volts. The stimulus was a rectangular pulse of 0.3 msec duration, with a frequency of one per second. A bipolar concentric needle

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electrode was used as the recording electrode; it was moved at 5 mm intervals, successively, from the midline of the lower lip to the contralateral side until the evoked potential could no longer be recorded. The latency was measured as the distance between the artifact wave of the stimulus and the first deflection of the evoked potential.

RESULTS

The ten facial nerves in 5 normal adults were studied. The limit of evoked potential recordings on the contralateral side following facial nerve stimulation and the number of subjects are shown in Fig. 1. The evoked potentials of the lower lip extended 1.5–2.5 cm beyond the midline.

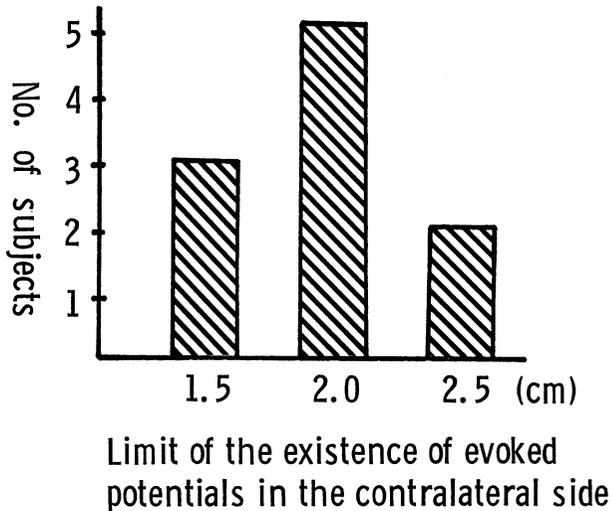


Fig. 1. The extent of evoked potential recordings on the contralateral side following facial nerve stimulation and the number of subjects involved.

The mean values of latency at the respective pick-up points of the ten facial nerves are shown in Table 1. In Fig. 2 is shown the results by location of the recording electrodes on the horizontal axis and latency on the vertical axis. The latency of the evoked potential on the stimulated side was short, but after passing the midline to the contralateral side, it became long. As the speed of conduction decreased, the voltage of the potential decreased, and a point where it could no longer be recorded was reached. These findings in the lower lip were similar to the results obtained for the upper lip.¹⁾

Pick up Point (cm)	Means \pm S. D. (msec)
Stimulated side	
1.0	3.65 \pm 0.91
0.5	3.72 \pm 0.92
midline	4.20 \pm 0.71
0.5	4.35 \pm 0.94
1.0	5.80 \pm 1.13
1.5	8.26 \pm 1.81
2.0	10.58 \pm 1.56
2.5	14.00 \pm 2.82
Contralateral side	

Table 1. Results of conduction studies in 10 facial nerves. The mean latency time at each recording electrode site is shown.

DISCUSSION

The upper lip is formed by the time the fetus becomes four and half weeks old because the mesoderm migrates over the head and around the head on either side to reinforce the branchial membranes. Thus, the mesoderm reaches the lip through these three routes, but it is said that facial anomalies such as unilateral cleft lip, bilateral cleft lip, median cleft lip and Treacher-Collins syndrome develop depending upon the degree and route of impairment in mesodermal delivery.⁶⁾ However, it has not yet been fully ascertained as to how the superior orbicularis oris muscle which is the terminal for the three routes of the mesoderm is formed.

The authors have demonstrated by evoked EMG that there is no electrophysiological difference between the superior and inferior orbicularis oris muscles. The development of the orbicularis oris muscle cannot be discussed on the basis of our study alone, but as no findings to indicate the presence of muscular tissue in the prolabium of patients with bilateral cleft lip can be demonstrated either histologically or electrophysiologically,^{7,8)} it is felt this supports the theory that the superior orbicularis oris muscle is formed by the mesoderm migrating from both sides to the center of the lip.

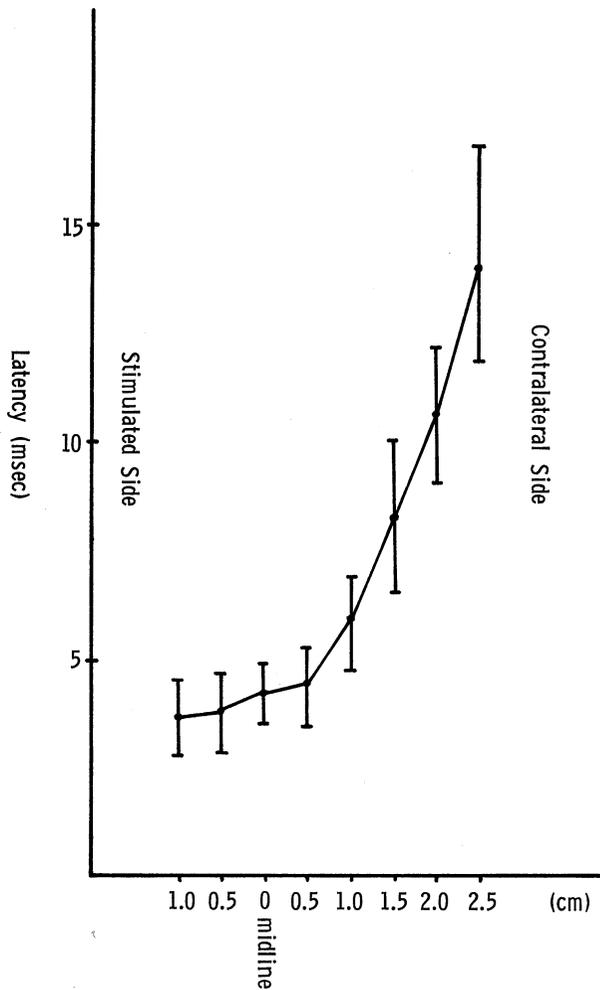


Fig. 2. The relationship between latency and the needle electrode site is indicated.

SUMMARY

It has been pointed out that stimulation of facial nerves produces evoked potentials which extend to the contralateral side of the midline of the upper lip.

The facial nerves on one side in normal persons were stimulated by a bipolar concentric needle electrode, and the evoked potentials were picked up to determine the conduction speed, extent and recorded potentials of the inferior orbicularis oris muscles. The results obtained showed that the findings were

similar to those reported earlier by the authors on the superior orbicularis oris muscle.

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