Electromyography of the Facial Musculature as an Aid in the Early Diagnosis of Acoustic Neuroma

Technical Note

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The early diagnosis of acoustic neuromas has been materially benefited by the development of more sophisticated methods of examination of the auditory nerve. The differential study of acoustic phenomena offers considerable evidence regarding the site and extent of cochlear nerve involvement. Vestibular testing has been materially improved by the use of electronystagmography, and evaluation of the facial nerve through the use of electric taste determination, the Schirmer tear tests, and conduction time studies. More sophisticated x-ray examinations now include not only plain films and arteriography but tomography and Pantopaque posterior fossa myelography.

Weddell, et al., in 1944 were the first to apply electromyography to the study of facial nerve paralysis. They cited the findings in various states of injury and disease of the facial nerve and suggested the use of this technique as an aid in diagnosis, treatment, and prognosis. No tumor cases were included in this survey.

The intimate relationship of the seventh and eighth nerves in the posterior fossa and porus acusticus, when combined with available knowledge of the growth characteristics of the acoustic neuroma, suggest that lower motor neuron involvement of the facial nerve must be an early concomitant of the growth of an acoustic neuroma.

The following case illustrates the value of electromyographic studies in the early diagnosis of acoustic neuroma and the specific identification of damage to the seventh nerve.

Case Report

This 35-year-old woman had experienced progressive hearing loss on the left since 1959, complicated by episodes of dizziness with vertigo for the last year, plus staggering and inability to walk in the dark. She had also noted some tinnitus in the left ear. Recent examinations by an otolaryngologist had revealed complete loss of audiometric and caloric responses in the left ear.

Examination. The patient was well oriented and alert, with a prominent nystagmus on gaze to the left, and a diminished left corneal reflex. There was mild pastpointing with the left hand, and the Romberg showed unsteadiness but no tendency to fall consistently in any direction. The gait was wider based than normal. There was no evidence of facial paralysis or abnormality of taste or lacrimation. Multiple electromyographic samplings of facial muscles innervated by the lower, middle, and upper divisions of the left facial nerve demonstrated denervation fibrillations and positive sharp waves in all areas tested. The right side of the face showed only normal electromyographic responses. Posterior fossa contrast x-ray studies demonstrated a persistent deformity on the left side at the level of the petrous ridge.

Operation. At left suboccipital craniotomy, a soft, walnut-sized tumor was found in the left cerebellopontine angle. The facial nerve was seen passing in an upward and cephalad direction over the tumor. The ninth, tenth, and eleventh nerves were observed to be intact. The tumor (acoustic neuroma) was removed and the facial nerve was not sacrificed.

The postoperative course was uneventful. The electromyographic examination of this patient proved of value in revealing involvement of the left facial nerve that had not been suggested by the history, neurological examination, or any other specific test. When combined with the left-sided eighth nerve signs and x-ray studies, a clear indication of the acoustic tumor on this side was available.

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Summary
It is our feeling that the electromyographic examination of the facial nerve, a test which can be carried out as an office procedure, is a useful aid not only in the diagnosis of acoustic neuroma but in the decision as to whether exploration should or should not be carried out.

References

Technical Suggestions

A Simple Device to Immobilize a Needle During Ventriculography

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Sufficient immobilization of a needle during ventricular puncture is a difficult task. If air, positive-contrast media, or radioisotopes have to be injected, or during manipulations for pressure measurements, the needle is liable to be displaced. Moving the needle entails the risk of hemorrhage and damage to the brain tissue.

For the last year we have been using for immobilization a small device (Fig. 1) made of perspex, which can easily be gas-sterilized. From top to bottom runs a small, 2 mm diameter canal, which makes a 15° angle with the central axis of the instrument (Fig. 2). This canal accepts 19-gauge ventricular puncture needles. Perpendicular to the needle canal is a screw, which upon tightening keeps the needle from slipping. The undersurface of the device is slightly concave to follow the contours of the skull.

Before puncturing the ventricle, the device is slipped over the needle. As soon as the puncture is accomplished, the instrument is lowered; since the needle canal is oblique, the device seeks its best position against the skull of the patient. When this proper position is reached, the screw is tightened and one hand can keep the needle immobile in position. If desirable, the needle-instrument assembly can be taped to the skull, where it can remain in position for some time.

![Fig. 1. Device to immobilize the needle after ventricular puncture through a fontanel.](image1)

![Fig. 2. Diagram of needle immobilization device](image2)