Paradoxical Response to Peripheral Hypoglossal Nerve Section

Case Report

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Characteristically, after the hypoglossal nerve is cut, the tongue when protruded from the mouth deviates to the side of the lesion.\(^5,6,7,8,9\) The reason for this is that the posterior fibers of the genioglossus muscle on the normal side draw the tongue to the abnormal side because of lack of resistance.\(^5\)

A case has been found in which section of this nerve has resulted in paradoxical findings.

Case Report

A 56-year-old white woman was admitted to Duke Hospital on March 3, 1966, complaining of decreased hearing in her right ear, decreased sensation on the right side of her face, staggering gait, generalized headache, and intermittent double and blurred vision associated with nausea and vomiting. She had been seen at another hospital where x-ray films had been normal. However, she had been found to have an elevated cerebrospinal fluid protein, a hydrocephalic sweep of the anterior cerebral arteries in the arteriograms, and dilated ventricles in a pneumoencephalogram. She was sent to Duke for evaluation of communicating hydrocephalus of undetermined etiology.

Examination. On admission, blood pressure was 122/80 and pulse, 74. The patient was noted to have bilateral papilledema, no corneal sensation in the right eye, decreased sensation to pinprick over the cutaneous area of distribution of division 2 and 3 of the trigeminal nerve on the right side, severe deafness in the right ear, and a right lateral gaze nystagmus with a rotatory component. She also demonstrated a broad-based unsteady gait. The hypoglossal, facial, spinal accessory, vagus, glossopharyngeal, and motor divisions of the trigeminal nerves were all normal to testing. A brain scan revealed abnormal tracer uptake in the posterior fossa on the right side.

First Operation. On March 7, 1966, the patient had a complete removal of an acoustic neuroma. There were no observable abnormalities of the other cranial nerves or cerebellum. The facial nerve was left anatomically intact. Her postoperative course was entirely benign except for the complete loss of function of the right facial nerve. The facial electromyogram on June 28, 1966, did not reveal any evidence of return of function to the right side of the face.

Second Operation. On June 30, 1966, a right facial-hypoglossal nerve anastomosis was performed. The hypoglossal nerve was identified as it crossed the carotid vessels, and the facial nerve was identified between the stylus process and the mastoid. By January 18, 1967, the patient was noted to move the muscles of her face when she moved her tongue. Muscle tone had also returned to her facial musculature.

It was discovered on January 19, 1968, however, that this patient's tongue movements were not what one would expect. At rest in the mouth, the tongue tended to deviate slightly to the left side and there was a slight tremor of the right side of the tongue, and to much lesser degree, of the left side. There was slight narrowing of the right lateral margin, but no gross atrophy to palpation or observation. No furrowing was noted of the surface of the tongue on either side.

When asked to protrude her tongue straight out, it deviated to the left side (Fig. 1 left), and the tremor increased in amplitude to a greater degree on the right side than the left side. When asked to protrude the tongue to the left, she did so well (Fig. 1 center), with the same tremor response. But when she was asked to protrude her tongue to the right side, she seemingly could not (Fig. 1 right), and the tremor response was

Received for publication June 17, 1968.
Revision received September 27, 1968.
the same as with the other protrusions. With any movement of her tongue, her right facial muscles contracted.

The other neurological findings of significance were absence of taste on the right anterior side of the tongue, and normal motor functions of the 5th, 9th, 10th, and 11th cranial nerves.

An electromyogram of the tongue performed on April 17, 1968, revealed no evidence of denervation fibrillation potentials at rest, and normal interference pattern and motor units on protrusion. This was performed with the needle in three locations on each side.

The electromyogram of the right side of the face on the same day showed minimal denervation fibrillation at rest in the frontalis, orbicularis oculi, orbicularis oris, and mentalis muscles. No motor units were noted during attempted contraction of the face. However, upon talking or protruding the tongue, there were numerous motor units present, both simple and complex, throughout all muscles tested.

**Discussion**

The tongue function in this case, as noted by several examiners, was normal prior to the anastomosis. Sixteen months after right hypoglossal nerve section one would expect atrophy of the right side of the tongue, gross fasciculations of the right side of the tongue, furrowing or folding of the surface from the atrophy, slight deviation of the tongue at rest in the mouth to the left side, and deviation of the tongue to the right side upon protrusion.

Part of this has occurred in this case. The tongue does tend to deviate to the left side at rest, suggesting loss of right styloglossus tone. There is a tremor or fasciculation type of movement noted primarily on the right side, and a slight suggestion of atrophy of the right lateral margin of the tongue.

However, what is unusual is that the tongue deviates to the left side on protrusion, there is no good evidence of atrophy of the right side of the tongue, and the electromyogram of the tongue is normal. The fact that the right hypoglossal nerve is anatomically innervating the right side of the face has been verified by electromyogram testing. The facial paresis plays no part here in appraising tongue function, as can be seen in the photographs.

If the early baseline clinical findings of the tongue immediately following the second operative procedure were known, explanation of the present peculiar findings could per-