Hearing Loss Following Exploration of Cerebellopontine Angle in Treatment of Hemifacial Spasm

WILLIAM BECHER SCOVILLE, M.D.
Department of Neurosurgery, Hartford Hospital, Hartford, Connecticut

In describing a technique for partial section of the extracranial proximal seventh nerve for hemifacial spasm in 1955, the writer recommended consideration of a similar section intracranially in the cerebellopontine angle. Gardner described such an intracranial decompressive operation in 1960. Others have since performed both decompressive and selective intracranial sectioning of the seventh nerve but have not published their results.

To date no complications in hearing have been described in any of the published articles. This gives the false impression that these intracranial procedures are both justifiable and safe. Dandy reported no operative disturbance in hearing from partial sectioning of the 8th nerve even after coagulating a nearby auditory artery. Anastasio, while describing 16 cases of deliberate intracranial sectioning of the internal auditory artery for the treatment of Ménière’s disease, specifically stated that in no case was there postoperative loss of hearing. Dandy, McKenzie, and Gardner11 were impressed with the significant number of minute vascular anomalies contributing to irritative tics of the fifth, seventh, and eighth nerves. Gardner and Sava22 noted that 14 out of 19 cases of hemifacial spasm exhibited compression by redundant auditory arteries. One is led to conclude that compressive or pulsating vascular anomalies play a role in the etiology of some cranial nerve tics and that a direct intracranial approach may be safely undertaken for their relief.

The writer feels obligated to refute this impression of operative safety by presenting two personal and 15 other related cases in which unilateral hearing loss resulted from intracranial exploration in the treatment of hemifacial spasm.

Received for publication December 2, 1968. Revision received March 12, 1969.

Case Reports

Case 1. This 62-year-old hypertensive woman had intractable hemifacial spasm sufficiently severe for her to prefer facial paralysis to the twitching. Intracranial decompression of the seventh nerve in the cerebellopontine angle was carried out. There was a redundant internal auditory artery pulsating against the caudal surface of the seventh and eighth nerve bundle. The artery was gently dissected free, and a single touch of the electrocautery was made on its caudal surface to cause it to bow away rather than towards the artery. Relief of the hemifacial spasm was accompanied by total deafness and, fortunately, the gratitude of the patient.

Case 2. This 55-year-old man had a mild hemifacial spasm for which he had undergone three cosmetic facial operations and for which he had been referred for extracranial differential section of the seventh nerve. This was not felt justified, and a simple exploration of the cerebellopontine angle under local anesthesia was undertaken to determine whether there was a vascular anomaly. The internal auditory artery was not touched except for the sliding of a microsurgical blunt hook between it and the nerve bundle to rule out adhesions; none were found and a wisp of Gelfoam was left between the artery and nerve bundle. The operation proceeded unusually smoothly. However, immediate deafness followed this procedure; the hemifacial spasm was unimproved, and the patient brought suit against the writer.

Cases by Other Authors. In 1966 Gardner and Shannon reviewed 45 cases of intracranial neurolysis of the seventh nerve performed for hemifacial spasm. Thirteen patients complained of hearing loss postoperatively; in three other cases the eighth nerve was deliberately sacrificed in order to inter-
rupt all filaments of the nervus intermedius. Gardner no longer operates intracranially unless the patient will accept the risk of total unilateral deafness.

In a personal communication, Cox reported an intracranial operation on the seventh nerve in the cerebellopontine angle for hemifacial spasm, in which a moderate-sized auditory artery entered the internal auditory canal, and a large tortuous artery and vein lay on the posterior surface of the nerve bundle. The seventh nerve alone was compressed with bayonet forceps, and the operation went without complication but unilateral deafness and partial facial paralysis ensued.

Freshwater recalled in personal communication a woman with right-sided hemifacial spasm and previously impaired hearing on the same side. Exploration of the right cerebellopontine angle with the aid of the operating microscope revealed arachnoidal adhesions between the cerebellar hemisphere and the eighth nerve. The seventh nerve was crushed in continuity, and an aberrant loop of the auditory artery or anterior-inferior cerebellar artery complex which lay between the seventh and eighth nerves was dissected free. Postoperatively there was temporary complete facial nerve palsy with later return of both function and spasm; there was also a definite postoperative decrease in hearing.

**Discussion**

The arterial supply to the seventh and eighth nerves, and to the end organs of the latter, is through the internal auditory arterial branch of the anterior inferior cerebellar artery or occasionally the basilar artery. Dissection and even sectioning of this artery were described as safe procedures in Dandy's very large series, in Anastasio's 16 cases, and in Gardner's intracranial facial nerve decompressions. The unanticipated susceptibility of patients with hemifacial spasm to unilateral deafness following any decompressive or even simple exploratory operation performed in the cerebellopontine angle has been particularly distressing. With the exception of cases with acoustic neuromata, deafness almost never follows similar explorations for other types of lesions, even those in which considerably more trauma and retraction is exerted, as in the search for tumors, aneurysms, cysts, and in fifth nerve sections.

Davey, in studies on cats, noted that manipulation of the arteriolar branches to the ampullary and utricular nerves caused marked and prolonged vasospasm; he did not observe vasospasm in the arteriolar branches leading to the seventh nerve within the temporal bone. Berendes and Schallock confirmed an autonomic innervation to these small arterioles.

Rhoton, et al., and Sunderland quoted by Rhoton), studied the arterial relations of the internal auditory meatus. They demonstrated the vulnerability to occlusion of these arteries because they are "end" arteries of small diameter with redundancy to such a degree as to frequently cause complete reversal of direction so that the same artery both enters and emerges from the internal auditory meatus.

Inasmuch as the auditory artery supplies both the seventh nerve and eighth nerve end organs in the temporal bone, and anomalies of this artery have been stressed by Dandy, McKenzie, Gardner, and Sunderland, a defective or at least vulnerable blood supply must be taken under consideration in determining the etiology of hemifacial spasm. Unfortunately a direct decompressive attack on such arterial variants may adversely affect hearing even while alleviating facial spasm.

**Summary**

We have reported two cases and reviewed the related experience of others indicating that direct intracranial manipulation of the seventh and eighth cranial nerve bundle and its artery in the treatment of hemifacial spasm may result in unilateral deafness.

**References**

5. Dandy, W. E. *Pathologic changes in Mé-