Superficial greater petrosal neuropathy

Sashank Prasad, MD

Thomas C. Lee, MD

E. Antonio Chiocca, MD, PhD

Joshua P. Klein, MD, PhD

Following resection of a left anterior temporal low-grade glioneuronal tumor, a 30-year-old woman noticed that when she cried the left eye did not produce tears. At baseline, her eyes did not feel dry. The Schirmer test was performed without topical anesthesia and demonstrated markedly impaired tear production on the left (figure 1).

Figure 1 Imaging and Schirmer test

Coronal T1-weighted MRI following IV administration of gadolinium contrast demonstrates a homogeneously enhancing left temporal lobe tumor with minimal mass effect (A). Following left temporal craniotomy and tumor resection, the Schirmer test demonstrated 5 mm of tearing from the right eye at 5 minutes (arrow) and less than 1 mm from the left (B). Postoperative changes, including dural enhancement extending along the floor of the left middle cranial fossa, were present (C). The right geniculate ganglion demonstrated normal gadolinium enhancement (D, arrow), but dura adjacent to the left geniculate ganglion was thickened and showed pathologic enhancement (E, arrow). Axial (F) and coronal (G) images demonstrate abnormal enhancement of the left greater superficial petrosal nerve (arrows) in the vidian canal.

Departments of Neurology (SP, JPK), Radiology (TCL, JPK), and Neurosurgery (EAC), Brigham and Women's Hospital and Harvard Medical School, Boston, MA.

Funding information and disclosures are provided at the end of the article. Full disclosure form information provided by the authors is available with the **full text of this article** at Neurology.org/cp.

Correspondence to: sprasad2@partners.org

Practical Implications

Although rare, unilateral impairment of tearing can occur with disruption of parasympathetic fibers conveyed by the superficial greater petrosal nerve to the lacrimal glands.

Figure 2 Anatomical depiction of the course of the greater superficial petrosal nerve

The nerve is seen to exit the facial canal and then traverses the middle temporal fossa. The gasserian ganglion is not shown; cut branches of V2 and V3 are seen anteriorly. The greater superficial petrosal nerve is joined by sympathetic fibers ascending with the internal carotid artery through the foramen lacerum. These fibers merge into the vidian nerve and arrive at the sphenopalatine ganglion. Postganglionic parasympathetic fibers pass into the orbit via the inferior orbital fissure and then join the lacrimal nerve to innervate the primary lacrimal gland. Image reprinted with permission from Lippincott Williams & Wilkins and Dr. Neil Miller. From: Kardon R. *Anatomy and physiology of the autonomic nervous system*. In: Miller NR, Newman NJ, Biousse V, Kerrison JB, eds. *Walsh and Hoyt's Clinical Neuro-ophthalmology*, 6th ed. Philadelphia: Lippincott Williams & Wilkins; 2005.¹

Brain MRI showed postsurgical changes in the left temporal lobe including dural enhancement in the middle cranial fossa as well as pathologic enhancement of the left superficial greater petrosal nerve within the vidian canal. After 3 months, the symptoms resolved and tear production became normal. Follow-up imaging demonstrated stable postsurgical changes without tumor progression.

DISCUSSION

The superficial greater petrosal nerve mediates reflexive tearing by supplying parasympathetic innervation to the primary lacrimal gland.¹ Its fibers arise from the superior salivatory nucleus in the pontine tegmentum and course in the nervus intermedius before joining the remainder of the facial nerve. These fibers pass through the geniculate ganglion and then exit the facial canal to become the superficial greater petrosal nerve (figure 2). This structure traverses the floor of the middle temporal fossa, passing beneath the gasserian ganglion of the trigeminal nerve, before exiting the skull through the vidian canal. Here the superficial greater petrosal nerve is joined by the deep petrosal nerve, which carries sympathetic fibers from the carotid plexus that mediate nonreflexive basal tear production by the accessory lacrimal glands.

Fibers of the superficial greater petrosal nerve synapse in the sphenopalatine ganglion, and postganglionic fibers travel with the zygomaticotemporal branch of the second trigeminal

division to reach the orbit through the inferior orbital fissure. On the lateral wall of the orbit, these fibers follow an anastomosis to the lacrimal nerve, which is a branch from the first trigeminal division, in order to innervate the lacrimal gland.

Unilateral impairment of reflexive tearing due to isolated greater superficial petrosal neuropathy is a rare finding associated with lesions of the middle temporal fossa.² Because the operation was performed without extradural dissection, we speculate that electrocoagulation of pial structures or retraction of intradural structures may have led to the impairment.

REFERENCES

1. Kardon R. Anatomy and physiology of the autonomic nervous system. In: Miller NR, Newman NJ, Biouesse V, Kerrison JB, eds. Walsh and Hoyt's Clinical Neuro-ophthalmology, 6th ed. Philadelphia: Lippincott Williams & Wilkins; 2005.
2. Thomas AJ, Elisevich K, Smith B. Transient hemifacial sensory loss with xerophthalmia following temporal lobectomy. *Can J Neurol Sci* 2000;27:251–253.

STUDY FUNDING

No targeted funding reported.

DISCLOSURES

S. Prasad has received an American Academy of Neurology Clinical Research Training Fellowship. T. Lee reports no disclosures. E.A. Chiocca serves on Scientific Advisory Boards for Ceregene Inc. and DNATrix and serves as an Associate Editor for *Neuro-oncology*. J. Klein serves on the editorial boards of *Journal of Neuroimaging*, *Frontiers in Neurocritical and Neurohospitalist Care*, *The Neurohospitalist*, and *AccessMedicine Neurology* and receives publishing royalties for *Adams and Victor's Principles of Neurology*, 10th edition (McGraw-Hill, 2014) and *Access Medicine Neurology* Web site (McGraw-Hill, 2014). Full disclosure form information provided by the authors is available with the **full text of this article at Neurology.org/cp**.

Special Case Reports Issue - Feedback Requested!

We are pleased to dedicate the December 2014 issue of *Neurology® Clinical Practice* to Case Reports. Please complete our survey to let us know what you think!