Superficial greater petrosal neuropathy

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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 homogenously 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.

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.
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. 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. 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


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