The Appropriate Surgical Approach to a Greater Petrosal Nerve Schwannoma in the Setting of Temporal Lobe Edema

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Key words
- Greater petrosal nerve
- Schwannoma
- Surgical approach

Abbreviations and Acronyms
CT: Computed tomography
GG: Geniculate ganglion
GPN: Greater petrosal nerve
ICA: Internal carotid artery
MRI: Magnetic resonance imaging

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BACKGROUND: **Facial nerve schwannomas are rare lesions that constitute only 0.8% of all intrapetrous mass lesions. The least frequent lesions are tumors originating in the greater petrosal nerve (GPN). We present a case of a GPN schwannoma with temporal lobe edema in which the patient was operated on using an extradural and intradural approach to prevent complications.**

CASE DESCRIPTION: **A 66-year-old woman with vertigo and abnormal magnetic resonance imaging findings was referred to our department. Computed tomography scan revealed an isodense subtemporal mass with partial rim calcification and petrosal bone apex erosion. Magnetic resonance imaging confirmed a 22-mm left middle fossa lesion with heterogeneous enhancement and edema of the temporal lobe. A left temporal craniotomy to the middle fossa was performed. The initial extradural exploration revealed the tumor to be in the Glasscock triangle, mainly involving the location of the GPN. The tumor was removed through an intradural approach in piecemeal fashion. Finally, using an extradural and intradural middle fossa approach, the tumor was totally removed, leaving the capsule on the middle fossa floor with continuous facial nerve monitoring. The postoperative course was uneventful without complications of xerophthalmia and facial palsy.**

CONCLUSIONS: **GPN schwannomas are very rare lesions. The extradural and intradural middle fossa approach was used to preserve the tumor capsule around the GPN. Using this technique, one can safely protect the geniculate ganglion and the GPN.**

INTRODUCTION

Schwannomas of the facial nerve (cranial nerve VII) can occur anywhere along the course of this nerve. Facial nerve schwannomas are rare lesions that constitute only 0.8% of all intrapetrous mass lesions.[1-3] The labyrinthine, tympanic, and vertical segments are the most common sites.[4,5] Tumors originating in and restricted to the greater petrosal nerve (GPN) are the least frequent. The GPN dissociates at the geniculate ganglion (GG) of the facial nerve and runs anteromedially to exit the superior surface of the temporal bone via the GPN hiatus. The extradural region in the middle fossa usually can be managed via a middle fossa approach. Xerophthalmia and facial nerve paralysis are the most common complications after surgery.[1,5-10]

We present a case of GPN schwannoma associated with temporal lobe edema in which the patient was operated on by an extradural and intradural middle fossa approach. To the best of our knowledge, GPN schwannomas associated with temporal lobe edema have not been reported previously. We report this rare case to discuss the appropriate surgical approach to prevent complications.

CASE DESCRIPTION

A 66-year-old woman presented with vertigo in October 2012 and underwent magnetic resonance imaging (MRI). She was referred to our department with abnormal MRI findings. She was neurologically intact on examination and had no facial paresis or eye dryness. Auditory brainstem evoked response showed normal responses.

A computed tomography (CT) scan revealed an isodense subtemporal mass with partial calcification of the rim and erosion of the petrosal bone apex. MRI confirmed a 22-mm left middle fossa lesion located on the petrous bone, isointense on T1-weighted images and hyperintense on T2-weighted images, with heterogeneous enhancement, causing edema of the temporal lobe (Figure 1—3).

A left temporal craniotomy was performed for a middle fossa approach. The temporal lobe was retracted extradurally, and dissection was made toward the periosteal dura mater of the temporal lobe. The initial extradural exploration revealed the tumor to be in the Glasscock triangle, mainly involving the location of the GPN. The tumor was covered with epineurium and adhesive to the petrous bone and meningeal dura mater. The GPN could not be observed directly because it was under the mass. For safe internal debulking, the mass was intradurally removed in a piecemeal fashion. The tumor was pale yellow in color and soft. Finally, the tumor was totally removed, leaving the capsule on the middle fossa

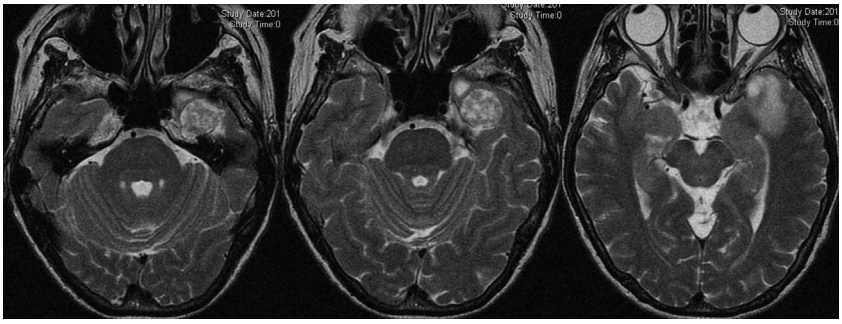

Figure 1. Axial T2-weighted magnetic resonance imaging shows a tumor located at the middle fossa with associated hyperintensity consistent with temporal lobe edema.

floor with continuous facial nerve monitoring during identification of the GPN to preserve facial nerve function. The original site of the tumor capsule, which should be periosteal dura mater, was left to preserve the GPN and GG. It was adherent to the petrous bone and petrous segment on the internal carotid artery (ICA). The petrous segment was recognized by Doppler probe. The tumor was covered by thin bone. The petrous bone adjacent to the GPN was eroded and invaded by tumor (Figure 4).

Postoperative CT and MRI scans showed no enhancing lesion and improving temporal lobe edema (Figure 5). Histologic evaluation revealed a typical biphasic schwannoma containing Antoni A and B tissue types (Figure 6). The postoperative course was uneventful without complications of xerophthalmia and facial palsy.

DISCUSSION

GPN schwannomas are very rare subtypes of facial nerve schwannomas. This is the first patient known to us with associated temporal lobe edema, likely venous compression or involvement beyond the tumor capsule. During the period 1939–2014, only 14 reports describing 24 GPN schwannomas were published in the English literature.[1,2,4-9,11-16] The average age of the patients (39 years) and the female prevalence (15:9) are consistent with the available data concerning the same lesions in other anatomic sites (Table 1).

Surgical Anatomy

The GPN, which arises from the GG, innervates the lacrimal gland and the mucous membrane of the nasal cavity and the palate as major secretory fibers. It exits its bony canal at the facial hiatus and courses anteromedially along the middle fossa floor forming the medial border of the Glasscock triangle and lateral border of the Kawase triangle. The GPN lies in the major petrosal groove and is covered by a layer of connective tissue. The connective tissue is continuous with the periosteum as periosteal dura mater.

In the middle fossa, the GPN runs within the interdural space of the temporal lobe between periosteal dura mater and meningeal dura mater.[5] Critical points include the petrous segment of the ICA and the cochlea. The C6 carotid is exposed laterally under GPN. The cochlea is present just medial to the GG, 9 mm from the malleus head and 2 mm from the genu of C6.[10] Anatomically speaking, schwannomas arising from the GPN occur as middle fossa masses (Figure 4).

Clinical Symptoms

In previously published reports of schwannomas (Table 1),[1,2,4-9,11-16] the preoperative symptoms frequently observed were facial palsy and hearing disturbance. Patients may present with cochlear nerve symptoms without facial nerve deficit when there is either damage to the inner ear or compression of the cochlear nerve in the meatus. The GPN contains the parasympathetic fibers to the lacrimal gland. This anatomic feature does not mean that the patient will present with xerophthalmia.[9] It is difficult to determine whether a tumor originates from the GPN based solely on these symptoms. However, Schirmer test

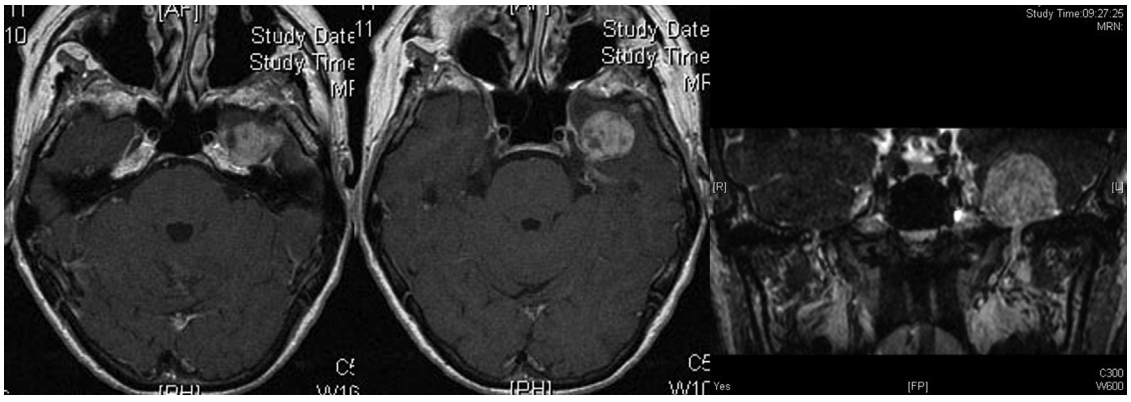

Figure 2. Axial view and coronal view T1-weighted magnetic resonance imaging shows contrast enhancement of the tumor contiguous with the greater petrosal nerve.

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