Subfrontal Schwannoma

—Case Report—

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Abstract

A rare case of subfrontal schwannoma occurred in a 33-year-old male with the chief complaint of headache. Computed tomography demonstrated a low-density mass in the subfrontal region. Magnetic resonance imaging indicated the mass extension into the ethmoidal sinus. The tumor was totally removed via a subfrontal approach. The histological diagnosis was schwannoma. The most likely origin of the tumor is the meningeal branches or anterior ethmoidal nerve.

Key words: neurinoma, schwannoma, tumor localization, magnetic resonance imaging, immunohistochemistry

Introduction

Schwannomas are neoplastic Schwann cells and may arise from any nerve with a Schwann cell sheath. Schwannomas account for about 8% of all primary intracranial tumors. The overwhelming majority originate from the VIIIth cranial nerve, and a few from the Vth cranial nerve. Association with von Recklinghausen's disease may involve the Xth, XIth, and occasionally other motor nerves. The tumor usually originates between the exit from the leptomeninges and the entrance to the dura mater.

We describe a subfrontal schwannoma in a 33-year-old male, with an interesting computed tomography (CT) and magnetic resonance (MR) imaging appearance, and discuss the histogenesis of the tumor.

Case Report

A 33-year-old male was referred to our hospital in January, 1990 complaining of headache persisting since November, 1989. He was completely well until the onset. There was no family history of von Recklinghausen's disease. General physical examination found no abnormalities or stigmata of neurofibromatosis. Neurological examination was normal except for left olfactory impairment. Fundoscopy showed no papilledema. Routine laboratory tests were within normal limits. Plain skull x-ray films revealed no remarkable changes.

Precontrast CT scans demonstrated a low-density mass in the midline of the anterior cranial fossa (Fig. 1 left). Postcontrast CT scans showed the rim of the mass to be heterogeneously enhanced (Fig. 1 right). The mass was hypointense at the frontal base on the T1-weighted coronal MR images (Fig. 2 left), and hyperintense extending into the left ethmoidal sinus on the T2-weighted coronal images (Fig. 2 right). There was little surrounding edema. T1-weighted coronal and sagittal images with gadolinium-diethylenetriaminepenta-acetic acid (Gd-DTPA) showed heterogeneous enhancement of the lesion (Fig. 3). Bilateral internal and external carotid angiograms revealed no feeding artery or tumor stain. The preoperative diagnosis was meningioma of the left olfactory groove.

A bifrontal craniotomy was performed. The falx cerebri was incised from the crista galli and the tips of the bilateral frontal lobes were retracted laterally...
to expose the capsule of the tumor. The tumor was slightly yellowish and smooth with some surface vessels. It had displaced the falkx to the right, but the right olfactory bulb appeared intact. The left olfactory bulb was fanned and thin due to tumor compres-
sion. The capsule was incised. The tumor content was yellowish with variable consistency, and was debulked by suction. The tumor was attached to the left olfactory groove. Tumor removal from the floor of the anterior cranial fossa showed tumor extension through a 1.5 cm defect of the floor into the left ethmoidal sinus. Removal of the tumor in the ethmoidal sinus exposed the mucous membrane of the paranasal sinus. The skull base was reconstructed in three layers: the bony defect with the inner table of the frontal bone flap; the dural defect with a dural flap taken from the convexity dura, which was patched with lyophilized dura; and the frontal base covered intradurally with a galeal pericranial flap.

Postoperatively, he developed bacterial meningitis which improved with antibiotics. Emotional lability and irritability lasted for 1 week.

Histological examination of the tumor sample found mainly loosely arranged spindle cells (Fig. 4 upper). Immunoperoxidase staining for S-100 protein was diffusely positive (Fig. 4 lower). Staining for Leu-7 and 2-E was focally positive. The histological

Fig. 1 Preoperative pre- (left) and postcontrast (right) axial CT scans, demonstrating a mass in the subfrontal region.

Fig. 2 left: T1-weighted coronal MR image, demonstrating a hypointense lesion at the frontal base. right: T1-weighted coronal MR image, showing a hyperintense lesion with extension into the ethmoidal sinus.

Fig. 3 Gd-DTPA-enhanced T1-weighted coronal (left) and sagittal (right) MR images, showing a heterogeneous enhancing lesion.

Fig. 4 upper: Photomicrograph of the tumor sample, showing spindle cells arranged in fasciculi. x 200. lower: Photomicrograph, showing positive immunohistochemical staining for S-100 protein. x 200.

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diagnosis was schwannoma.

**Discussion**

Subfrontal schwannoma is extremely rare, with only 12 cases previously reported (Table 1). Three were associated with von Recklinghausen’s neurofibromatosis. Ages ranged from 17 to 63 years (average, 32 yrs), with a male preponderance of 3:1. In contrast, acoustic schwannoma is more common in females in the 4th and 5th decades. Nine cases of subfrontal schwannoma including ours were attached to the olfactory groove, and one to the anterior cranial fossa. Four cases had invaded the ethmoidal sinus or orbital cavity. Schwannomas are slowly growing tumors characterized by expansion and thinning of the confining bone around the cavities and foramina. In our case, the tumor had thinned the frontal bone and extended into the ethmoidal sinus. Only one case of intranasal schwannoma has extended into the intracranial compartment. In that case, the tumor part in the intranasal compartment was larger than the intracranial part.

The most puzzling question is the origin. Schwannomas in the central nervous system are very rare. The olfactory nerves and bulbs are encased by glial cells. Christin and Naville suggested the olfactory bulb as the origin, as bilateral olfactory schwannomas had apparently arisen in the olfactory bulbs. Nelson and Rennes demonstrated Schwann cells along nerve fibers around large arteries in the subarachnoid space, which New considered the source of intracerebral schwannoma. Russell and Rubinstein suggested that either Schwann cells sheathing the small nerve twigs innervating the meninges or ectopic cells within the neural parenchyma were the origin of intracerebral schwannomas. General innervation of the anterior cranial fossa and olfactory groove is by meningeal branches of the trigeminal nerve and anterior ethmoidal nerve. Our case showed no adhesion of the tumor to the olfactory nerve, like in the case of Nagao et al. Therefore, the most likely origin of our case is the meningeal branches or anterior ethmoidal nerve. A subfrontal tumor with or without extension into the paranasal sinus includes schwannoma in the differential diagnoses.

**References**

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