Dura-Based Giant Intracranial Schwannoma in the Middle Fossa
—Case Report—

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Abstract

A 49-year-old female presented with a rare giant schwannoma arising from the dura mater of the middle fossa manifesting as loss of left visual acuity. Magnetic resonance imaging revealed a heterogeneously enhanced giant mass in the left middle fossa. Surgery via the transsylvian approach confirmed the origin of the tumor between the left internal carotid artery and the trigeminal nerve in the lateral wall of the cavernous sinus. Elongated abducens nerve was confirmed, but no tumor adhesion to the abducens nerve was found. The tumor was closely attached to the dura mater of the middle fossa and the lateral wall of the cavernous sinus. The histological diagnosis was schwannoma. Both left oculomotor and abducens nerve paresis occurred immediately after the operation but gradually resolved over 3 months. The operative findings indicated that this schwannoma may have arisen from the meningeal branch of the trigeminal nerve in the dura mater of the middle fossa.

Key words: giant schwannoma, dura-based tumor, middle fossa

Introduction

Schwannomas account for 8% of intracranial tumors. Most schwannomas arise from the sensory nerves such as the vestibular nerve and, less frequently, the trigeminal nerve. Schwannomas arising from the oculomotor, trochlear, and abducens nerves, and the dura mater are very rare, with only 28 cases, 20 cases, 12 cases, and 15 cases, respectively. We describe a giant intracranial schwannoma originating from the dura and located in the middle fossa.

Case Report

A 49-year-old female presented with a history of loss of left visual acuity since July 2004. Magnetic resonance (MR) imaging showed a large tumor, so she was referred to our hospital. Neurological examination revealed impairment of visual acuity (0.2) and bilateral papilledema, but no other neurological symptoms. Physical and biochemical blood examinations showed no abnormality. Computed tomography showed a giant tumor with heterogeneous enhancement in the middle fossa. The tumor had destroyed skull base structures such as the left anterior clinoid process and petrous bone. MR imaging showed a giant tumor, 6 × 6 × 7 cm, with heterogeneous signal intensities on T1-weighted and T2-weighted images (Fig. 1). The tumor had displaced the cavernous sinus to the opposite side and destroyed its structure, and had compressed the brain stem to the right. Left carotid angiography showed that the middle cerebral artery was displaced supramedially, and the cavernous segment of the internal carotid artery to the opposite side. Surgery was performed using the left pterional approach. The tumor consisted of soft yellowish and hard whitish masses. The volume of the tumor was reduced, and the dura mater of the middle fossa was exposed with the intradural approach. The dura mater of the middle fossa was torn by the tumor so that the nerve fiber of the trigeminal nerve could be confirmed. The tumor had adhered to the dura mater of the middle fossa, but the tumor was not connected directly to the trigeminal nerve. An elon-
gated nerve resembling the abducens nerve was then confirmed between the left internal carotid artery and the trigeminal nerve, that is, in the compressed cavernous sinus. The tumor had not adhered to the abducens nerve. The tumor was mainly attached to the dura mater in the lateral wall of the cavernous sinus.

Histological examination identified schwannoma with mixed Antoni type A and type B patterns (Fig. 2). Immediately after the operation, left oculomotor and abducens nerve pareses were present, which gradually improved over 3 months. Follow-up MR imaging after 1 year showed no recurrence of the tumor.

Discussion

The present case of giant intracranial schwannoma in the middle fossa had two possibilities for the tumor origin, the abducens nerve and the dura mater in the middle fossa. The intraoperative findings showed that the base side of the tumor was located between the trigeminal nerve and the internal carotid artery in the lateral wall of the cavernous sinus. The abducens nerve is the only nerve located inside the cavernous sinus, whereas the oculomotor, trochlear, and ophthalmic nerves (V1) run in the lateral wall of the cavernous sinus. The carotid artery is located in the medial side of the cavernous sinus. Postoperative neurological examination revealed transient left abducens nerve paresis, which later resolved. The intraoperative examination found elongated abducens nerve, likely to be the cause of the abducens nerve paresis, but no adhesion of the tumor to the left abducens nerve. Therefore, the tumor was not likely to originate from the abducens nerve.

The second possibility is that the tumor originated from the dura mater in the middle fossa, especially in the lateral wall of the cavernous sinus. The intraoperative examination found that the tumor had destroyed the underlying dura mater and was strongly adherent to the surrounding dura mater, particularly in the lateral wall of the cavernous sinus. Therefore, the tumor probably grew in the lateral direction into the middle fossa, and the medial direction into the intracavernous region (Fig. 3). As a result, the base side of the tumor was located between the trigeminal nerve and the inter-
Fig. 3  Diagram showing the development of the tumor. IC: internal carotid artery, PG: pituitary gland, SS: sphenoid sinus, black circle: origin of tumor, large arrow: expansion to the middle fossa, small arrow: expansion to the intracavernous region.

Table 1  Cases of dura-based intracranial schwannoma

<table>
<thead>
<tr>
<th>Author (Year)</th>
<th>Age (yrs)/Sex</th>
<th>Location</th>
<th>Size (cm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Harano et al. (1974)⁸</td>
<td>26/F</td>
<td>anterior fossa</td>
<td>4</td>
</tr>
<tr>
<td>Hockley and Hendrick (1975)⁹</td>
<td>11/M</td>
<td>temporal</td>
<td>unknown</td>
</tr>
<tr>
<td>Goebel et al. (1979)⁸</td>
<td>25/F</td>
<td>presellar</td>
<td>2.5</td>
</tr>
<tr>
<td>Vaquero et al. (1980)¹¹</td>
<td>17/F</td>
<td>anterior falk</td>
<td>2</td>
</tr>
<tr>
<td>Vassilouthis and Richardson (1980)¹²</td>
<td>17/M</td>
<td>anterior falk</td>
<td>4.5</td>
</tr>
<tr>
<td>Bruni et al. (1984)⁹</td>
<td>39/M</td>
<td>parasagittal</td>
<td>4</td>
</tr>
<tr>
<td>Russell and Rubinstein (1989)¹³</td>
<td>17/M</td>
<td>frontal</td>
<td>unknown</td>
</tr>
<tr>
<td>Nagao et al. (1991)¹³</td>
<td>63/M</td>
<td>subfrontal</td>
<td>5</td>
</tr>
<tr>
<td>Frim et al. (1992)¹⁰</td>
<td>11/F</td>
<td>temporal</td>
<td>3</td>
</tr>
<tr>
<td>Ghosh and Chandy (1992)¹⁰</td>
<td>27/M</td>
<td>parasagittal</td>
<td>2</td>
</tr>
<tr>
<td>Huang et al. (1997)¹¹</td>
<td>33/M</td>
<td>subfrontal</td>
<td>5</td>
</tr>
<tr>
<td>Horgan et al. (1998)¹⁰</td>
<td>27/M</td>
<td>torcular</td>
<td>2.5</td>
</tr>
<tr>
<td>Oikawa et al. (2002)¹⁷</td>
<td>41/F</td>
<td>tentorial</td>
<td>3.5</td>
</tr>
<tr>
<td>Funiu et al. (2003)¹⁰</td>
<td>77/M</td>
<td>temporal</td>
<td>3</td>
</tr>
<tr>
<td>Present case</td>
<td>49/F</td>
<td>temporal</td>
<td>7</td>
</tr>
</tbody>
</table>

*No description.

Intracranial schwannomas rarely arise from locations other than the cranial nerves such as the vestibular nerve. Only 15 tumors originating from the dura mater have been reported (Table 1).¹³-⁶,⁸-¹¹,¹³,¹⁷,¹⁸,²¹,²² Various intracranial schwannomas unrelated to cranial nerves have all been adherent to the dura mater.¹³-¹ⁱ,¹³,¹⁷,¹⁸,²¹,²² Therefore, these tumors are thought to arise from the dura mater.

Dura-based intracranial schwannoma was first reported in a case of schwannoma widely attached to the dura mater along the torcular in a 27-year-old man.¹⁰ The present case is the largest dura-based intracranial schwannoma known so far. There are various hypotheses about the origin of intracranial schwannomas unrelated to the cranial nerves. Developmental theories involve the transform of ectodermal Schwann cells from mesenchymal pial cells and multipotential mesenchymal cells.²-⁴,¹¹,¹⁷,¹⁸ Nondevelopmental theories suggest that intracranial schwannomas arise from normal Schwann cells present in the adjacent normal structures, for example, Schwann cells in the perivascular nerve plexuses around large arteries and meningeal branches of the trigeminal nerve, etc.²-⁴,¹¹,¹⁷-¹⁹

In the present case, the tumor had not adhered to the nerves, parenchyma, or arteries, but had adhered to the dura mater in the middle fossa. Therefore, this tumor may have arisen from the meningeal branch of the trigeminal nerve in the dura mater of the middle fossa.

References


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