CASE REPORT

Lateral Transmaxillosphenoidal Approach to the Lateral Compartment of the Cavernous Sinus: Technical Case Report

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ABSTRACT

This article outlines the surgical technique and the indications for the lateral transmaxillosphenoidal approach, which is illustrated by an index case. A 27-year-old woman presented with a trigeminal sensory deficit caused by a dermoid tumor occupying the lateral compartment of her right cavernous sinus. A lateral transmaxillosphenoidal approach was performed, and the tumor was removed lateral to the intracavernous carotid artery (ICA) and medial to intracavernous cranial nerves. The lateral transmaxillosphenoidal approach is similar to the transmaxillosphenoidal approach used for the removal of pituitary adenomas invading the medial compartment of the cavernous sinus. By opening the lateral wall of the sphenoid sinus just above and laterally to the carotid artery, tumor can be removed medial to the intracavernous cranial nerves and lateral to the ICA.

KEYWORDS: Cavernous sinus, transmaxillosphenoidal surgery, sellar and parasellar tumors

Surgical approaches to tumors invading the cavernous sinus are determined by the nature and site of origin. It is accepted that tumors that arise from intracranial structures (e.g., meningiomas or schwannomas) should be approached transcranially.[1–6] On the other hand, those arising in the pituitary gland or parasellar region are better approached either with the microsurgical transmaxillosphenoidal technique[7] or by endoscopic transsphenoidal techniques.[8,9]

We present a variation of the transmaxillosphenoidal approach previously described[7] for the

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Figure 1 Postcontrast coronal magnetic resonance (MR) T1-weighted image shows hyperintense tissue with fat signal intensity inside the right cavernous sinus with slight medialization of internal intracavernous carotid artery.

resection of pituitary adenomas invading the medial compartment of the cavernous sinus. The lateral transmaxillosphenoidal approach allowed us to debulk a dermoid tumor of the lateral compartment of the cavernous sinus.

CASE REPORT

The patient, a 27-year-old woman, developed a sensory deficit of the ophthalmic division of her right trigeminal nerve over a period of 12 months. A magnetic resonance imaging (MRI) scan showed a tumor of the lateral compartment of her right cavernous sinus (Fig. 1). The appearance in selected sequences suggested a dermoid as the most likely diagnosis (Fig. 2). Preoperative imaging studies were completed with three-dimensional (3-D) reconstructions. These allowed us to undertake a virtual navigation of the sphenoid sinus. In this way, we were able to better appreciate the relationship between the tumor and the ICA (Fig. 3).

Figure 2 Postcontrast axial magnetic resonance (MR) T1-weighted image, with ''fat suppression'' MR technique, confirms the presence of a tissue with fat signal intensity (hypointense in this sequence) inside the right cavernous sinus, compatible with dermoid tumor.

Operative Technique

An endonasal, transmaxillosphenoidal surgical approach was made[7] through the ipsilateral nostril. Adequate exposure was obtained using an

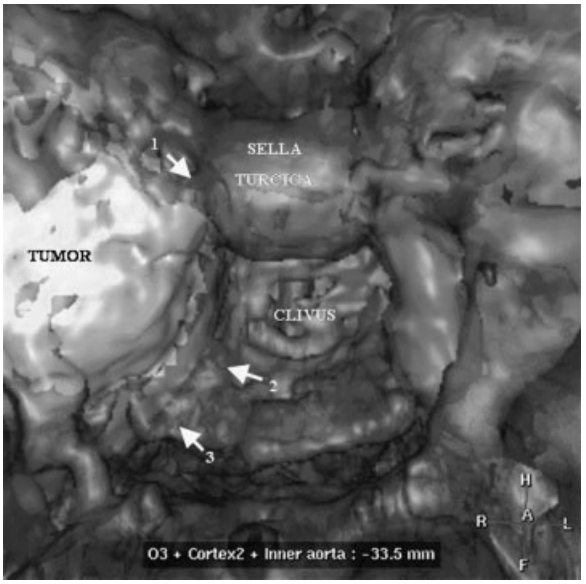

Figure 3 Volume rendering reconstruction magnetic resonance imaging (MRI): virtual endoscopic view of the sphenoidal sinus shows the relationship between tumor and internal carotid artery: yellow, tumor; red, internal carotid artery (1, medial loop; 2, lateral loop; 3, posterior loop); brown, sella turcica, clivus.

asymmetric retractor with the shorter blade placed in the maxillary sinus. The lateral wall of the sphenoid sinus was removed, and the carotid prominence was completely exposed. An opening was made in the lateral wall of the sphenoid sinus, superior and lateral to the intracavernous carotid artery. The dura was then opened and soft tumor herniated through it. The tumor had the features of a typical dermoid in that it contained cutaneous adnexa, mainly hair. It was easily removed by suction and curettage. As the removal progressed, bleeding of the cavernous sinus became increasingly copious but finally was satisfactorily controlled.

RESULTS

The patient was discharged on the seventh postoperative day. She sustained a temporary sixth nerve palsy that resolved completely over a period of 5 months. At a follow-up examination after 1 year, the patient has no cranial nerve deficits and the residual tumor has not increased in size. Although removal of the tumor was incomplete, as demonstrated by the postoperative MRI scan (Fig. 4), it was adequate for the patient's need.

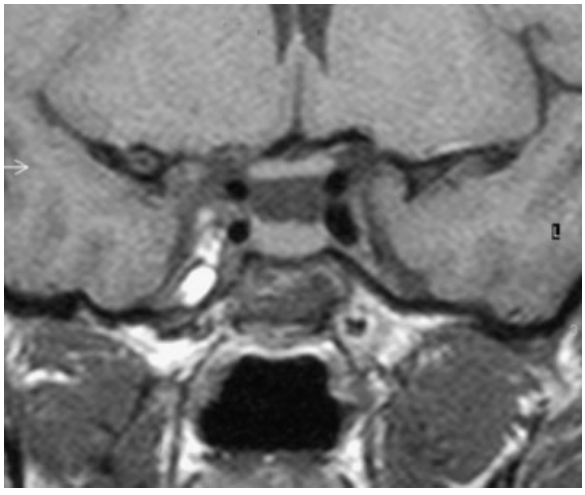

Figure 4 Postoperative coronal magnetic resonance (MR) T1-weighted image shows a small tumor remnant with fat signal intensity inside the right cavernous sinus.

DISCUSSION

The transcranial approach is the route of choice for tumors invading the lateral compartment of the cavernous sinus, such as meningiomas or neurinomas, because the best surgical results can only be achieved following the direction of tumor growth and sparing cranial nerves and major vessels.[1–6]

The transmaxillosphenoidal approach, as described by Inoue et al[10] in cadaver and by Fraioli et al[7] in vivo, can be used to remove tumors that arise inferomedially. It is especially useful for pituitary adenomas that invade the medial compartment of the cavernous sinus and displace ICA laterally. In this way, the medial compartment of the cavernous sinus, which is a virtual space between the carotid artery and the pituitary gland, is exosed.[11] Sometimes invasive pituitary adenomas do not displace the carotid artery laterally because they invade both the lateral and the medial compartment of the cavernous sinus. In this situation, the transmaxillosphenoidal approach would be unwise and even dangerous as tumor removal requires the manipulation of the ICA.

On the other hand in some circumstances, the lateral transmaxillosphenoidal approach allows tumor removal medial to intracavernous cranial nerves and lateral to the carotid artery when it has not been displaced laterally by the tumor, as in our patient. In fact, this approach becomes even more attractive if the ICA has been displaced medially. Many tumors can arise and grow in the lateral compartment of the cavernous sinus displacing the cranial nerves laterally without changing the course of the carotid artery. Examples of these are dysembryogenetic tumors, such as the dermoid reported here, invasive pituitary adenomas, cavernomas, angiofibromas, hemangiomas, and other, rarer tumors.[1,4,5,12–15]

In such cases, both transcranial and the standard transmaxillosphenoidal approaches are difficult and potentially dangerous because the first one needs manipulation of the cranial nerves lying in the lateral wall of the cavernous sinus laterally to the tumor, whereas the second demands

mobilization of the intracavernous carotid artery as it lies medial to the tumor. These limitations can be overcome by the transfacial, transmaxillary approach to the anterior and lateral compartments of the cavernous sinus,[16–18] as can an endoscopic approach that allows direct visualization of the deeper anatomic structures and might even be less dangerous.[8]

After consideration of former experiences, we prefer the lateral transmaxillosphenoidal approach. It has enabled us to remove a dermoid of the lateral compartment of the cavernous sinus satisfactorily and has the advantage of a direct approach through the lateral wall of the sphenoidal sinus.

CONCLUSIONS

This report of a lateral transmaxillosphenoidal approach, used by us to remove a dermoid of the lateral compartment of the cavernous sinus, could be helpful for those cases in which the tumors are located medially to the intracavernous cranial nerves and laterally to the ICA. This approach allows the preservation of the intracavernous cranial nerves, which might be damaged by a transcranial approach. Obviously, transcranial surgery is indicated when the tumor takes origin from intracranial compartment and it is lateral to the cranial nerves.

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