Modern Surgery for Anterior Skull Base Meningiomas

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Meningiomas of the anterior skull base represent about 10% of all intracranial menigiomas and commonly arise from two areas. Anterior tumors originate from the olfactory groove while posterior tumors are anchored to the planum sphenoidale. Their insidious growth produces subtle clinical manifestations and tumors are often formidable at the time of presentation. Patients exhibit slow, progressive cognitive deterioration, typically followed by visual changes and seizures.

Bifrontal craniotomy represents the conventional surgical approach. Although it provides ample tumor exposure, significant brain retraction and collateral tissue trauma are unavoidable with this technique.

At the Baylor University Medical Center Skull Base Center, we have developed two focused approaches to anterior fossa skull base meningiomas contingent on the anatomy of tumor origin. Anterior tumors arising from the olfactory groove are best exposed via the focused transfrontal sinus approach (TFSA), where the craniotomy is performed via a frontal sinus osteoplastic flap. Posterior tumors originating from the planum sphenoidale are best accessed via the focused orbitozygomatic approach (FOZA).

Both surgical approaches maximize exposure, permitting resection of these large tumors, while minimizing brain manipulation and collateral tissue trauma so patients recover faster.

CASE STUDY
Case #1: 63-year-old man presented with three years of insidious cognitive dysfunction (impulsiveness and memory loss), and a new headache. He denied visual changes. MRI showed a large olfactory groove meningioma causing bifrontal edema and extending into the ethmoid sinus. Using the innovative TFSA, a bicoronal incision was followed by a frontal sinus osteoplastic flap. Removal of the posterior table of the frontal sinus completed the craniotomy. The tumor was next debulked and subsequently peeled away from the frontal lobe with no brain retraction or neural manipulation. The tumor was then followed into the ethmoid sinuses resulting in a complete resection. The skull base defect was repaired in layers with a free xenograft directly sutured to the dural edges followed by an overlay vascularized pericranial flap.

He did well after surgery and was discharged home on POD #3. After several months, his cognitive function fully recovered to baseline and he was able to return to employment. Follow-up MRI reveals no recurrent tumor and significant improvement in the bifrontal lobe edema as evident by resolved T2 and FLAIR signal changes.

Case #2: 58 year-old woman presents with a four-year history of progressive cognitive deterioration culminating with a seizure. She was oriented to only herself. MRI demonstrated a 7 x 6 cm meningioma arising from the planum sphenoidale with associated bifrontal lobe edema. The patient underwent a FOZA with extradural dissection to dissociate the origin of the tumor at the planum and control its vascular supply. The dura was opened at the base of the tumor and the lesion was progressively dissected away from the critical anatomical structures. The patient was discharged home on POD #7. At
26-month follow-up, the patient is living independently and has returned to work. Post-op MRI demonstrates complete resection of the tumor and significant improvement of the bifrontal lobe T2 and FLAIR signal changes.

**DISCUSSION**

At Baylor University Medical Center at Dallas, we use two different minimally invasive approaches according to the anterior or posterior location of the tumor. Anterior fossa meningiomas can be challenging lesions; successful surgical management, however, is possible with a multidisciplinary team and the addition of innovative minimally invasive skull base approaches.

Large meningioma arising from the planum sphenoidale. Note the significant amount of bifrontal brain edema associated with the tumor (yellow arrows) and the posterior location of the tumor with frontal lobe brain between the tumor and the frontal sinus (blue arrow).

Axial T1 MRI with contrast on the right shows the resection of the tumor. Note on the T2-weighted image on the left with significant improvement of the pre-op bifrontal brain edema and re-expansion of the brain after tumor resection.

**Case 2 · Pre-op MRI**

**Case 2 · Post-op MRI**

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