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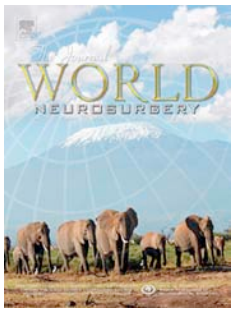

Perspective for: "Endoscopic Endonasal Resection of Suprasellar Meningiomas: The Importance of Case Selection and Experience in Determining Extent of Resection, Visual improvement and Complications."

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Commentary

Suprasellar and parasellar meningiomas can be challenging lesions whose management continues to inspire considerable debate. The surgeon approaching tumors in this region must be prepared to contend with the highly congested neurovascular anatomy of the region distorted by tumor usually emanating from the anterior fossa dura, with varying degrees of hyperostosis and, in some cases, paranasal sinus entry. As they enlarge they displace the optic nerves and chiasm; the displacement of the optic chiasm and nerves – or encasement, in some instances -- has to be anticipated, and insinuation into one or both optic canals must be presumed so that one's surgical approach may allow the appropriate exploration of the canals if indicated. One must be able to handle tumor in the canal in any quadrant – not just the medial corridor, which tends to receive more attention in the literature. They may also impinge on the pituitary stalk posteriorly, as well as the basilar artery, and can extend to the interpeduncular space. Their relationship to the carotids, their bifurcation, and the anterior cerebral arteries and branches – and corresponding lenticulostriates – must be well understood. Cerebral edema may complicate the surgical approach and may also make it more challenging to ensure a delicate dissection of the olfactory tracts off either the tumor or the base of the frontal lobe, which is necessary to avoid their avulsion.

The technical feasibility of resecting the spectrum of tumors in this space through a combination of microsurgical techniques and transcranial skull base approaches is well established. The evolution, refinement, and promulgation of fronto-basal and fronto-lateral approaches allows the successful resection of the great majority of these tumors, although today resection is not enough: the goal of preserving or restoring vision or stabilizing and reversing other associated deficits are twin priorities to that of radiographic resection, particularly as these are by and large benign tumors.

There are generally 4 categories of surgical approach used today: conventional (eg, pterional, bifrontal); open skull base (eg, supra-orbital, cranio-orbitozygomatic or COZ); minimally invasive transcranial (eg, eyebrow or keyhole approaches); and endonasal endoscopic skull base approaches. Although each tumor type bears individual consideration, we commonly use the supra-orbital and cranio-orbitozygomatic approaches when we feel an endonasal approach is ill-advised. The supra-orbital approach, with a frontal craniotomy and the superior and lateral orbit removed all in one piece, minimizes frontal lobe retraction in providing unobstructed access to the floor of the anterior fossa from the planum to the sella. The COZ approach affords wide exposure of the entire cavernous sinus, proximal and distal carotid artery, and minimal cerebral retraction. Both approaches allow excellent access to both optic nerves and the chiasm; moreover, one can decompress both optic canals and explore all quadrants of each. In our center, in particular, we prefer the supra-orbital approach for lesions in this region without a

significant extension lateral to the carotid artery or without overly superior extension; otherwise, we attack these lesions through a cranio-orbitozygomatic approach. Tumor, dura, and bone may all be removed through these approaches, with appropriate vascular control and access to the optic apparatus enabled. Both afford an expansive view of the region such that Simpson Grade I resections should be the expectation. Cerebrospinal fluid (CSF) leaks are rare.

It is against the backdrop of the successful application of transcranial approaches to these lesions that endonasal approaches to suprasellar meningiomas have proliferated, particularly in the last 15 years. Core principles of endonasal approaches – which are fundamentally skull base approaches—include maximal bone removal for exposure; the avoidance of brain retraction; preparation for reconstruction; bimanual dissection; and control of the carotid artery in its paraclival or cavernous segments.

The authors, from one of the leading centers practicing extended endonasal surgery in a team-based manner, report on a modest volume of patients with small to medium anterior fossa meningiomas. They divided the patients temporally – an initial group of patients (8) and a more recent group (12) in which their approach had matured. All of their outcome metrics were improved when they compared results between groups: gross total resection (GTR) improved from 63% to 92%; visual improvement rates went from 75 to 89%; and CSF leak rates dropped from 25% to 0. They minimize the importance of the "cortical cuff" and report that their endonasal approach affords appropriate access to the optic canal. Moreover, they report no leaks in their last 12 patients, which is sure to prompt some discussion. Their rates of CSF leak in 12 cases are the lowest in the literature; our extended endonasal leak rate across pathologies is 9.3%, although this has improved with vascularized flap use. In our center we continue to use fat liberally in concert with inlay dural repair and vascularized nasoseptal or extended nasoseptal flap and have not experienced great difficulty in discriminating fat from tumor with contemporary imaging. We occasionally employ lumbar drainage to diminish CSF pressure on the reconstruction during healing for 1-2 days. CSF leak rates will likely continue to be higher after endonasal surgery when compared with open skull base approaches.

The rates of resection are laudable but extent of resection is still better reported as Simpson grade, as it remains the gold standard for communicating the extent of resection of involved tissue in meningiomas. The term "GTR" may be construed as at best a grade II resection, although this was unlikely the authors' intention. The discussion of optic canal involvement is balanced, but case selection will likely bias case inclusion to those tumors featuring minimal or just medial optic canal insinuation, which is beautifully addressed endonasally. Optic nerve encasement or suspicion of lateral canal involvement is more easily dealt with transcranially. In my hands, tenacious adherence of a vessel to tumor is better dealt with using careful bimanual dissection through a microscopic open skull base approach, as is vascular repair and reconstruction in the event of an injury. The authors do not comment on olfaction in their cases, nor do they mention hyperostosis or paranasal sinus entry, both of which are very nicely handled through an endonasal approach.

Lastly, the authors comment that these approaches should complement transcranial approaches; approach selection ideally is rendered by one equally comfortable with any route of attack. While not essential, it is appealing to consider that either mode of treatment in each of these instances could be offered by the same practitioner. We have entered the same dimension in skull base neurosurgery; that is, the current skull base neurosurgeon ideally is armed with the tools to deliver optimal surgical care of skull base lesions by offering the spectrum of endonasal, minimally invasive, or open skull base approaches. Although multiple factors enter the decision of whether to attack from above or below – tumor characteristics and direction of extent, the nature of the optic apparatus involvement and vascular relationships, among others -- should there be equipoise regarding the optimal strategy, a surgeon's fundamental comfort level with the respective approaches is ultimately decisive.

Papers such as this one are of vital importance to practicing neurosurgeons – it is not always critical to wait until the largest number or most esoteric tumor type has been conquered to publish. Honest appraisals of the evolution of a team's development – including successes and failures and learned insight – are instructive for all of us.