Endoscopic endonasal approach to anterior skull base meningiomas

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Since the seminal report of Weiss 5 describing use of the transnasal approach to tuberculum meningiomas, a concatenation of the superb expertise brought forward with endoscopic equipment and techniques refined by our colleagues specializing in otolaryngology/head and neck surgery and a corresponding interest by neurosurgeons in the development of transfacial approaches to intradural pathological conditions of the anterior skull base have led to an increasing interest in the use of this approach.1 The paper by Liu et al.3 in this issue of Neurosurgical Focus nicely describes the state of the art, state of technology, and limitations of the transnasal surgical approach to olfactory groove meningiomas. The authors also provide a technical overview of the procedure as done at their institution.

Advantages of the Approach

Standard tenets of skull base meningioma surgery include 1) removal of bone to avoid or minimize retraction of the brain for tumor access, and 2) early devascularization of the tumor at its point of attachment. The endonasal approach achieves these goals precisely. Removal of hyperostotic bone with the approach also facilitates a Simpson4 Grade I resection (removal of the tumor and its bony attachment). The tumor is immediately apparent if the opening is well placed; we have used image guidance (Stealth, Medtronic) for this purpose to tailor our opening accordingly. Furthermore, the approach can address any tumor extension into the adjacent sinuses, which in the past may have been neglected by neurosurgeons. Finally, with this endonasal route, facial incisions are avoided.

Disadvantages of the Approach

The major disadvantage of the midline exposure provided by the endonasal approach is the limitations placed laterally by the orbits. Tumor extension laterally over the superior roof of the orbits may limit the visualization of tumor removal; the authors address this by noting that the tumor may be reduced by intratumoral debulking followed by extracapsular dissection, a standard meningioma resection technique. Although this is true, the challenge is not so much the ability to achieve resection of the mass of tumor, which often naturally delivers itself through the opening, but one of adequate removal of the tumor’s dural and bone attachment laterally. The orbits provide a barrier to thorough removal of bone and dura of the anterior skull base beyond the projection the papyracea and the fovea ethmoidalis, which may hinder the removal of the tumor attachment on the superior orbital wall. I personally believe that the bar should be set higher for meningiomas of the anterior skull base than a Simpson Grade I removal. We routinely strive to attain a Simpson Grade 0 (2-cm margin of normal dura; Kinjo et al.2) if anatomically feasible for meningioma resection in any location. This should be achievable in most cases if the region of attachment is the olfactory groove. If the approach limits the possibility of achieving a Grade 0 resection because of lateral extension of the tumor over the orbits, then a transcranial approach is chosen. These tumors can be removed with facility from a limited unilateral frontal or frontotemporal approach with minimal morbidity, with equal or reduced length of stay in the hospital in comparison with an endonasal approach. It is our firm belief that the resection should not be compromised on the basis of the approach used in any case. It also remains to be determined whether the endonasal approach will provide as much durable tumor control as contemporary transcranial approaches for this reason.

The risk associated with creating any large defect in the anterior skull base is CSF leak. With improved closure techniques, including the vascularized nasoseptal flap, this risk has been reduced from roughly 25% in studies reported in the early endoscopic literature to closer to 5% in the contemporary literature. This is still a significant deterrent to use of the endonasal approach. By definition, the opening will always be larger when approaching the tumor from below than the defect created by a Simpson Grade I removal from above. Closure is critical, and the authors describe a technique that has been successful in their hands. The risks of morbidity and mortality associated with a potential CSF leak should not be downplayed during the critical appraisal of these approaches. It is a morbid and potentially lethal complication. We too have found that the use of dermal allograft (AlloDerm, LifeCell Corp.) has facilitated closure of all endonasal leaks, and this material is routinely used in other skull base locations by our group.
Another lesser disadvantage with the endonasal endoscopic approach is that important cranial nerves and arteries are identified later in the dissection than when the transcranial approach is used. They are identified near the end of tumor removal and may already have been manipulated if they are adherent to the tumor. The surgeon must pay particular attention to those tumors with surrounding T2-weighted image hyperintensity, in which the pia–arachnoid may have been breached by the tumor, and the extracapsular dissection plane well described by the authors is not present.

In conclusion, the authors have emphasized that the endonasal approach to removal of olfactory groove meningiomas is feasible and provides excellent outcome in well-selected cases (based on size and location). It is a superior approach in lesions with sinus extension (or can be a supplement to a transcranial approach). As the technology and closure techniques improve, it should become routine in training programs and skull base centers. The work of Dr. Liu and others will help refine the indications and advantages for these approaches for meningioma patients. It should be emphasized that the goal of meningioma surgery is resection with the lowest Simpson grade that can be safely achieved, and the choice of approach—when both approaches are safe in experienced hands—should be made with this goal in mind. (DOI: 10.3171/2011.3.FOCUS1174)

Disclosure

The author reports no conflicts of interest concerning the materials or methods used in this study or the findings specified in this paper.

References