Operative Techniques in Otolaryngology (2010) 21, 66-73

ELSEVIER

Operative Techniques in

Otolaryngology

The expanded endonasal approach for the treatment of anterior skull base tumors

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KEYWORDS
Anterior cranial base;
Endoscopic skull base surgery;
Olfactory neuroblastoma;
Esthesioneuroblastoma

Traditional approaches for the resection of tumors that involve the anterior cranial base used facial and scalp incisions, a craniotomy, and facial osteotomies. These approaches required frontal lobe retraction and sometimes resulted in cosmetic and functional deficits. With the advances in optics, surgical instrumentation, and image-guided surgery, the expanded endonasal approach (EEA) has provided a less intrusive corridor to the anterior skull base without compromising the goals of oncological resection. Our extensive experience with this approach has enabled us to perform a "craniofacial resection" for anterior skull base tumors without resorting to external incisions or a craniotomy. This report details the operative technique for a completely endoscopic endonasal resection of the anterior skull base that may be used for the resection of both benign and malignant tumors.

For the last several decades, complete extirpation of anterior skull base tumors required an anterior craniofacial resection. This approach consists of a bifrontal craniotomy and supraorbital or facial osteotomies through facial incisions (eg, Weber-Ferguson, lateral rhinotomy, and midface degloving).[1,2] Although it is oncologically effective, the approach mandates some degree of frontal lobe retraction and manipulation, which may result in frontal lobe dysfunction. Convalescence takes weeks and is associated with postoperative pain and visible scars. Furthermore, complications from wound infections and inadequate healing may lead to bone malunion, loss of craniorbital bone grafts, and potential facial disfigurement.[3]

Alternatively, the sinonasal cavity provides an ideal corridor for the surgical treatment of anterior cranial base tumors. This direct approach to the ventral aspect of the skull base obviates the need for frontal lobe retraction. Furthermore, facial incisions, osteotomies, and bone grafts are unnecessary for exposure, which greatly decreases postoperative pain and eliminates facial scarring. The development of the surgical rod lens endoscope and customized endoscopic instrumentation has enabled technologies that allow a completely endonasal approach.

Functional endoscopic sinus surgery demonstrates the tremendous advantage of excellent visualization (ie, resolution of magnified image, field of view) and precise dissection offered by endoscopy; however, transgression beyond the bony skull base was initially prohibited.[4,5] Fear of intracranial injury and bleeding, cerebrospinal fluid (CSF) leakage, and the potential for ascending meningitis justified the dogma. As instrumentation, experience, and optical technology progressed, skull base lesions such as encephalocoeles and CSF fistulas were repaired endoscopically and the advantages of the transnasal approach

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doi:10.1016/j.otot.2009.10.002

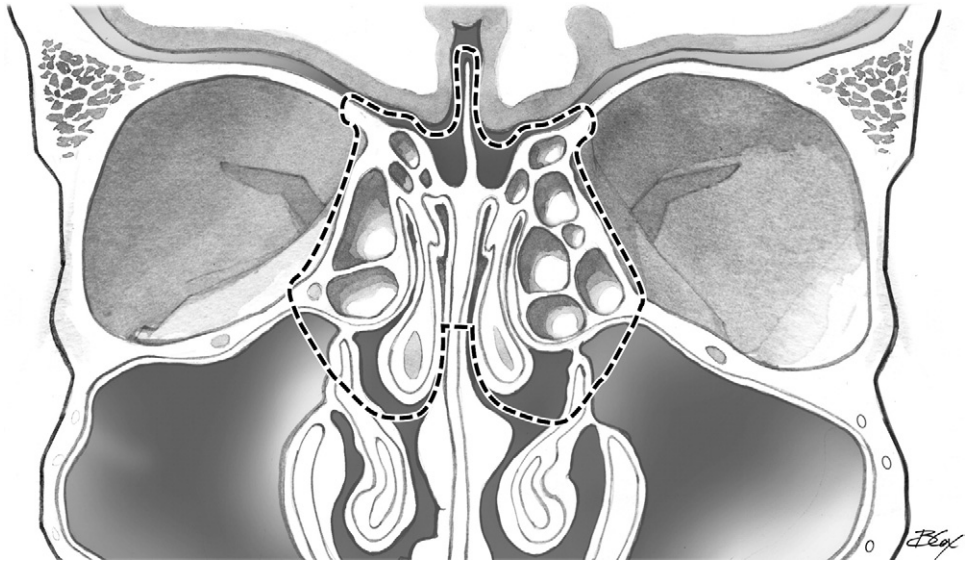

Figure 1 Both traditional open and endoscopic anterior craniofacial resection achieve equivalent bony resection of the skull base, including fovea ethmoidalis, cribriform plate, ethmoid air cells, and superior septum. The medial orbital walls may be included if necessary.

became apparent.[6,7] With further experience and the advent of intraoperative image navigation, complete endoscopic approaches for benign and malignant skull base tumors are possible without compromising therapeutic objectives. Together with the concomitant development of vascularized reconstructive techniques,[8] skull base surgery has thus evolved a more "minimally-invasive" approach resulting in decreased surgical morbidity and an improved quality of life.

In this study, we report our current technique for performing an endoscopic anterior skull base resection that is based on the fundamental principles of the EEA. Our method employs 2 surgeons, an otolaryngologist and a neurosurgeon, working simultaneously throughout all phases of the surgery. Bimanual dissection is achieved through a binarial approach. Wide endonasal exposure and a partial septectomy are integral. Although vascular structures may be mobilized, cranial nerves are not manipulated; therefore the lateral limits of the dissection are determined by the location and proximity of the surrounding cranial nerves. Because the frontal lobe constitutes the deepest aspect of the endonasal approach, a sequential layered resection of the

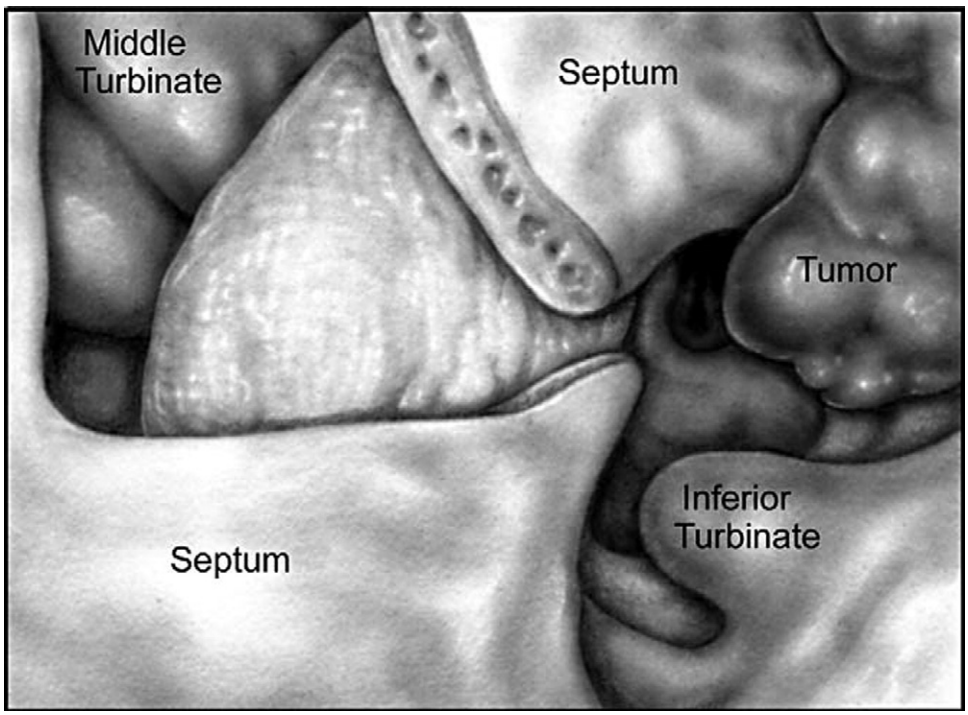

Figure 2 Circumferential septal incisions allow the tumor to be removed in continuity with the superior septum. The nasal septum is divided anteriorly at the level of the nasofrontal recess and is disarticulated posteriorly off the sphenoid rostrum. The inferior cut connects these 2 incisions and leaves the superior septum attached to only the cribriform plate.