

Combined Endoscopic and Open Approaches in the Management of Sinonasal and Ventral Skull Base Malignancies



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KEYWORDS

- Skull base malignancy • Skull base defect • Skull base surgery
- Sinonasal malignancy • Endoscopic endonasal surgery • Craniotomy • Transbasal
- Nasoseptal flap

KEY POINTS

- The use of combined transcranial and endoscopic endonasal approaches or so-called cranionasal approaches to the anterior ventral skull base and paranasal sinuses remain an important option in the surgical treatment of sinonasal and ventral skull base malignancies.
- The modified 1-piece extended transbasal approach provides wide panoramic exposure to tumor that invades the frontal lobes, orbital roofs, and cribriform plate without using a transfacial incision or orbital bar removal.

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- The endoscopic endonasal approach can be combined with the transbasal approach for secondary inspection from below after tumor removal from the transcranial exposure, further resection of tumor within the sinonasal cavity, and reconstruction with a vascularized pedicled nasoseptal flap, if needed.
- Skull base reconstruction can be performed using a simultaneous pericranial flap from above and a nasoseptal flap from below (double flap), especially when postoperative adjuvant radiation therapy is anticipated.

Abbreviations

CTA	Computed tomography angiography
EEA	Endoscopic endonasal approach
CSF	Cerebrospinal fluid

INTRODUCTION

Since the conception of the bifrontal craniotomy by Frazier in 1913,¹ Derome² and Tessier and colleagues³ popularized the transbasal approach to the anterior ventral skull base. Numerous modifications of the transbasal approach have been developed, each adding varying degrees of bone removal of the supraorbital bar, orbital roof and wall, lateral orbital rims, nasal bones, and paranasal sinuses (frontal, ethmoid, and sphenoid sinuses). In 1988, Raveh and Vuillemin,^{4,5} described the subcranial approach for the removal of fronto-orbital and anteroposterior skull base tumors, which entailed nasal and orbital osteotomies and minimal frontal lobe retraction. In 1991, Kawakami and colleagues,⁶ presented the extensive transbasal approach, performing en bloc bilateral orbital roof and frontal sinus osteotomy. This allowed for access to tumors extending laterally into the anterior cranial fossa. Sekhar and colleagues⁷ discussed the extended frontal approach in 1992, which added an orbito-frontal or orbitofrontoethmoidal osteotomy. These transbasal modifications have allowed for increased posterior and inferior surgical view toward the clivus with less frontal lobe retraction. These midline subfrontal approaches to the anterior ventral skull base and paranasal sinuses remain critical in the treatment of anterior ventral skull base and sinonasal malignancies.

In the past decade the role of the pure endoscopic endonasal approach (EEA) has gained increasing popularity, driven by continuous advances in endoscopic instrumentation, intraoperative image guidance, and surgical technique. Resections with negative margins via a purely EEA have been successfully performed for tumors confined to the nasal cavity and paranasal sinuses with radiologic evidence of normal cribriform plate and upper ethmoid sinuses.⁸

However, limitations of the pure EEA arise when there is significant intracranial extension or considerable extension beyond the lamina papyracea.^{8,9} For instance, when en bloc resection of the tumor including the cribriform plate is necessary, it may be best accomplished with an anterior craniotomy.^{8,10} Thus, open approaches remain an integral component in our surgical armamentarium. In the bifrontal transbasal approach, one can access the cribriform plate and perform a total ethmoidectomy, sphenoidotomy, and midline clivectomy down to the craniovertebral junction. Traditionally, the transbasal approach was often combined with a transfacial approach (combined craniofacial approaches) to treat a vast majority of sinonasal skull base malignancies. This combined approach allowed for access to tumors residing beneath the orbit in the superolateral aspect of the maxillary sinus, where the bifrontal

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