# Endoscopic Resection of Sinonasal and Ventral Skull Base Malignancies

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**KEYWORDS**

• Transnasal endoscopic • Anterior skull base • Tumors • Sinonasal tumors
• Endoscopic anterior skull base resection • Paranasal sinus

**KEY POINTS**

- Ventral skull base tumors are rare head and neck tumors that present with nonspecific symptoms.
- The principles of endoscopic skull base surgery involve extensive surgical planning and a multidisciplinary approach.
- Preoperative assessment is essential to guide surgical approach.
- Transnasal endoscopic resection (TER) is a safe and effective surgical option in appropriately selected cases in the presence of an experienced surgical team.

**Video content accompanies this article at http://www.oto.theclinics.com.**

## INTRODUCTION

Sinonasal and ventral skull base malignancies represent 3% of all head and neck cancers.[1] Their incidence is 0.83 per 100,000 patients.[2] They usually present with nonspecific symptoms, such as nasal obstruction, epistaxis, and facial pain.

Contemporary management of sinonasal and ventral skull base tumors involves an oncologically sound and multidisciplinary approach. When surgery is indicated, open surgical approaches have long been considered the standard of care. These approaches have been associated, however, with multiple morbidities, including external surgical scarring, wound complications, prolonged brain retraction with all its sequelae, and long postoperative recovery times, resulting in extended hospital length of stays. Postoperative complications with external surgical approaches

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have been reported as high as 50%, with postoperative mortality at approximately 4% in most published series.[3] This has led to an interest in alternative surgical approaches that would give similar results with less morbidity and in a minimally invasive manner.

Interest in the endonasal approach for management of skull base tumors goes back to the late nineteenth century.[4] In the 1990s, endoscopic-assisted craniofacial resection (CFR) was described.[5] Similar to a traditional CFR, the tumor is approached superiorly through a bicoronal frontal craniotomy, but the sinonasal surgical component is approached inferiorly through a transnasal endoscopic approach. Although somewhat controversial, some investigators have advocated total endoscopic control of tumors (gross tumor removal without microscopic margins), short of a significant dural resection but combined with adjuvant stereotactic radiosurgery.[6]

Over the past 2 decades, the management of chronic sinus disease has shifted from using the open approaches, or transnasal microscopes, to the use of the endoscopes. The wide adaptation of this technique resulted from improved comfort endoscopically navigating the complex anatomy of the parnanasal sinuses, orbit, and skull base. In addition, new technologies, such as intraoperative navigation, have led to the expansion of endoscopic sinus surgery to include the management of neoplasms.[7] Furthermore, improvement in skull base reconstruction techniques, such as using the pedicled nasoseptal flap as well as alloplastic graft techniques, has improved clinical outcomes from endoscopic skull base surgery with a reduction in hospitalization.[8]

The endoscopic approach had been criticized initially for what was perceived as a non–en bloc resection with piecemeal tumor removal that may theoretically result in tumor seeding.[4] Subsequent studies have shown, however, that positive resection margins, and not en bloc resection, is the most significant risk factor for tumor recurrence.[9–11] It has been shown in different studies that endoscopic transnasal resections carries comparable rates of negative margins to open CFR.[11–13]

Casiano and colleagues[14] reported the first purely TER of the anterior skull base (ASB) for esthesioneuroblastoma that included resection of the entire anterior ventral skull base (as described in the traditional CFR) with overlying dura. Since then, several studies have compared endoscopic with open approaches in the management of different sinonasal tumors.[12,13,15] Although many of these studies are limited due to selection bias in that more advanced and aggressive tumors are more likely to have been treated with an open approach, it shows a growing body of evidence that the TER method is as safe and effective as open approaches in appropriately selected patients and in experienced hands as long as oncologic principles are adhered to. This article presents Dr Casiano's technique of endoscopic anterior ventral skull base resection and reconstruction.[16,17]

## PREOPERATIVE IMAGING

Imaging studies should be carefully reviewed with a neuroradiologist, who is an important part of the multidisciplinary team. MR imaging usually helps demonstrates the relationship of the tumor to the surrounding soft tissue and neural structures. CT scan and CT angiogram are used to evaluate bony involvement and vascular relationships, respectively.[18] Intraoperative navigation with CT and MR imaging fusion may be used for more extended ASB resections posteriorly adjacent to the internal carotid artery or optic nerves. Intraoperative navigation is not routinely used, however, by Dr Casiano for ASB resection.