

Endoscopic Endonasal Surgery for Sinonasal and Skull Base Lesions in the Pediatric Population



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KEYWORDS

• Pediatric • Endoscopic • Endonasal • Skull base surgery • Cranial • Reconstruction

KEY POINTS

- Endoscopic endonasal approaches to the skull base can be used safely to manage sinonasal and skull base lesions in pediatric patients.
- Understanding the age-dependent pneumatization patterns of the paranasal sinuses, particularly the sphenoid sinus, is critical for planning a safe endonasal approach in pediatric patients.
- Techniques to minimize and control intraoperative blood loss are critical in pediatric patients owing to their overall lower blood volume compared with adult patients.

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Disclosures: Dr C.H. Snyderman is a consultant for SPIWay, LLC and Dr P.A. Gardner is a consultant for Integra LifeSciences.

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- The potential size of a nasoseptal flap is smaller in pediatric patients, and careful pre-operative and intraoperative planning helps to ensure the appropriateness of its use for skull base reconstruction.
- Teamwork, surgeon experience, and surgical navigation are all important for safe and effective pediatric endoscopic skull base surgery.



A video of an endoscopy demonstrating a congenital skull base lesion accompanies this article <http://www.oto.theclinics.com/>

INTRODUCTION

Pediatric sinonasal and skull base lesions encompass a diverse range of pathologies and conditions that have a myriad of presentations, depending on the child's age, location of the lesion, and disease-specific characteristics. The diagnosis and management of these lesions can be complex and demands an understanding of sinonasal and skull base embryology, developmental anatomy, location-specific symptoms, and disease-specific characteristics and behavior. Comprehensive and safe management of these lesions requires a team approach of medical and surgical services with extensive training and experience. Surgical management in particular demands extensive clinical training supplemented by cadaveric dissection to gain the requisite knowledge of the 3-dimensional anatomy, specialized instrumentation, and teamwork necessary for optimal outcomes and safety.

Historically, skull base surgery was only performed by open, external approaches and craniotomies to reach various areas of the cranial base. These procedures are well-described, have a role in contemporary surgery, and have been safely performed in adult and pediatric patients.^{1,2} Transnasal approaches to the skull base developed later, using a microscope for visualization and driven largely by advances with pituitary surgery.³ More recently, endoscopic endonasal approaches (EEAs) to the skull base have developed, driven partially by advances in instrumentation and experience related to endoscopic sinus surgery and pituitary surgery.⁴

EEAs to the skull base, initially employed for adult pituitary surgery, are now also used to safely approach varied pathologies in more distant skull base locations in the coronal and sagittal planes.⁵⁻⁷ As technology, instrumentation, and surgeon experience have progressed, endoscopic endonasal techniques are being used more often in pediatric skull base surgery, as demonstrated by the increasing number of publications on this topic related to pediatric patients as case reports⁸⁻¹² and even some case series.¹³⁻¹⁵ This review aims to illustrate the current state of diagnosis and management of pediatric sinonasal and skull base lesions, particularly related to EEAs, resection, and reconstruction.

EMBRYOLOGY AND DEVELOPMENT

A working knowledge of sinonasal and skull base embryology is important for understanding how this complex anatomy forms leading up to birth, and serves as a basis for understanding how this anatomy grows and develops from birth to adulthood. Errors in normal embryologic development lead to some of the pathologies encountered by the skull base surgeon. Descriptions of the embryologic basis of specific lesions are discussed later in the section detailing individual lesions and pathologies. Although

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