# Endoscopic Endonasal Approach in Pediatric Optic Pathway-Hypothalamic Glioma: Case Report and Systematic Review

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## Introduction

Optic pathway–hypothalamic gliomas (OPHGs) are predominantly classified as low-grade astrocytomas and can be found anywhere along the optic pathway but are often present in the chiasmatic-hypothalamic region. The endonasal endoscopic approaches (EEAs) show promise in achieving the gross-total resection (GTR) of OPHG without the requirement for brain manipulation or retraction. This approach is considered direct and safe in managing OPHG.[1] Here, we present a patient with an OPHG who was successfully treated with an EEEA resection and complementary chemotherapy. Additionally, we also present a systematic review focused on EEA for OPHG.

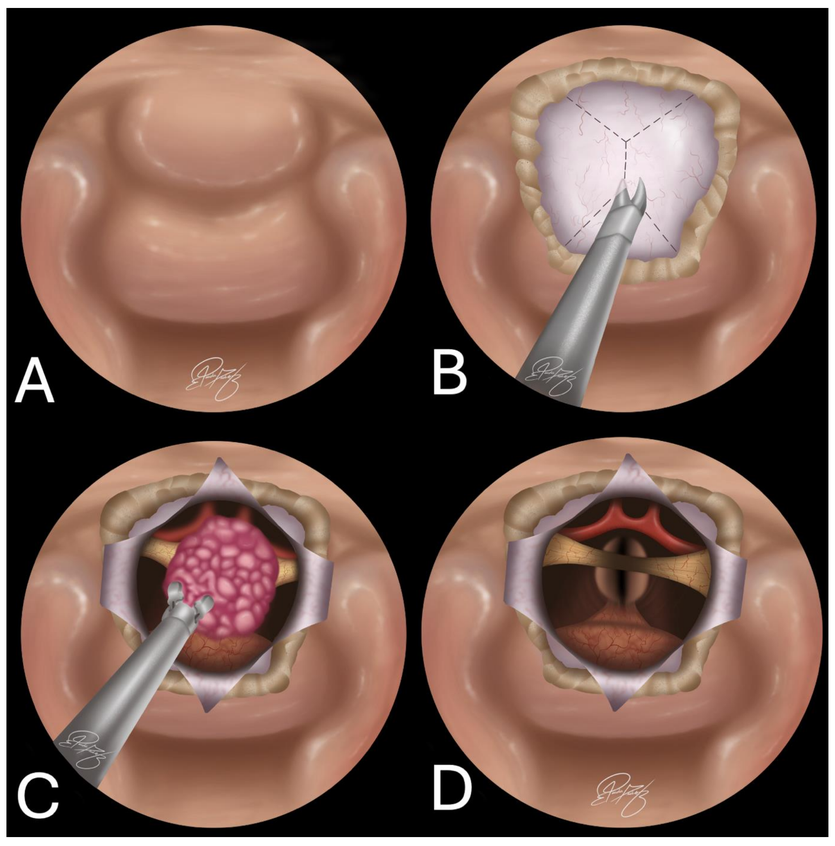


**Figure 1. Graphical illustration demonstrating the step-by-step surgical resection technique**. (A) Endoscopic endonasal exposure of the sella, tuberculum sellae, and planum sphenoidale. (B) Bone resection of the front of the sella, the tuberculum sellae, and the planum sphenoidale. (C) Dura opening with exposure of the tumor in front and below the anterior cerebral arteries and the optic chiasm. (D) Resection cavity, with exposure of the anterior cerebral artery complex, the optic nerves and optic chiasm, the third ventricle, and the pituitary stalk and gland in the most inferior aspect of the cavity.

## Methods and Materials

This study was reported following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines. A systematic literature search was conducted, including English and Spanish-published case reports discussing OPHG that underwent EEA for tumor resection, covering the time from January 2007 (date of first reported case) up to June 2024. Several databases were utilized, including PubMed, Lilacs, and Embase. Several related keywords were used, such as “optic glioma,” “optic chiasm,” “hypothalamus,” “optic pathway–hypothalamic glioma,” “endoscopic endonasal,” and “endoscopic transsphenoidal” with the boolean operators “AND” / ”OR”. All case reports or case series of the optic pathway (optic nerve and optic chiasm) or hypothalamic glioma associated with EEA for pediatric and adult patients were included.

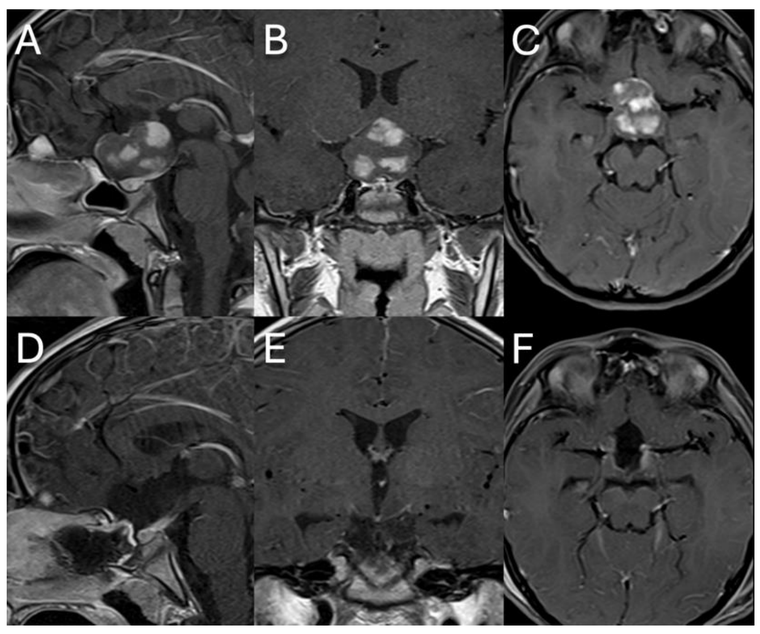


**Figure 2. Pre- and postoperative MRI. (A)** Sagittal, **(B)** coronal, and **(C)** axial preoperative enhanced images of the sella demonstrating a lobulated tumor extending into the sellar and suprasellar regions with heterogeneous enhancement, measuring 27 x 27 x 30 cm. In the sagittal view, there is a posterior displacement of the pituitary stalk, inferior compression of the pituitary gland, and extension to the floor of the third ventricle (**C**) Sagittal, (**D**) coronal, and (**F**) axial postoperative enhanced imaging showing a safe near-total resection of the tumor, while preserving structurally the hypothalamus bilaterally, as well as the pituitary gland and the infundibulum.

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## Illustrative Case and Results

An 8-year-old female patient presented to the neurosurgery clinic with a history of 6 years of progressive visual loss. The patient underwent ophthalmological evaluation, and the visual fields demonstrated a complete visual defect. The patient underwent a satisfactory endoscopic endonasal near-total resection of the tumor. The histopathology results were consistent with an optic pathway–hypothalamic pilocytic astrocytoma.

In the systematic review of the literature on the EEA for OPHG, a total of 9 studies were found. The exact number of cases was 30, including our case. Patients ranged from 4 to 46 years, with an average age of 26.8 years. The distribution included 14 females and 15 males. Eren Yilmaz et al.[2] included 10 patients with a mean age of 20.6 years. The predominant symptom was visual impairment. Post-EEA surgery, five patients experienced an improvement in their visual impairment, and none exhibited any postoperative worsening of vision. And there were no cases of postoperative panhypopituitarism. STR was performed on 5 patients, while NTR was performed on the other 5. Four out of the five patients who underwent NTR did not need additional treatment during the follow-up period.

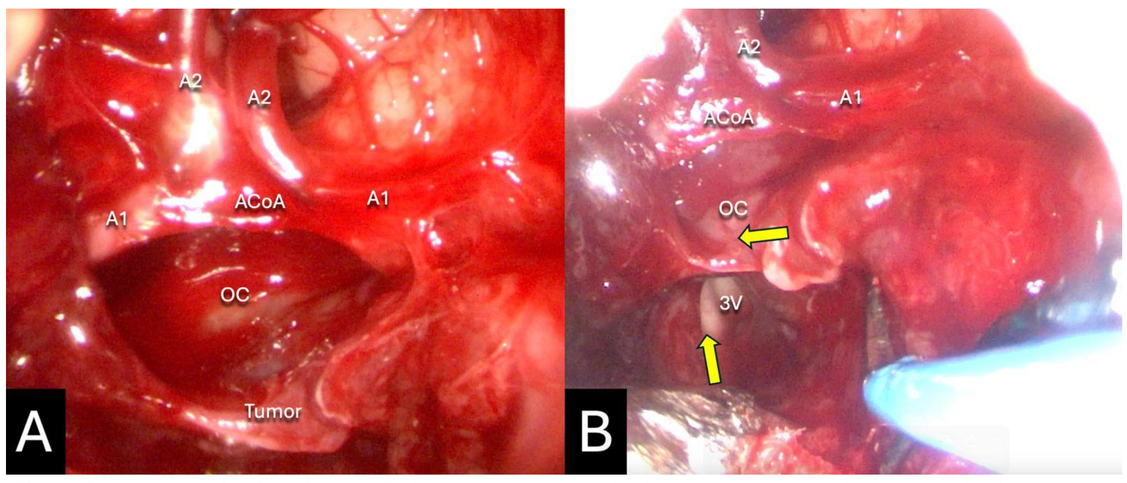


**Figure 3. Intraoperative imaging. (A, B)** Endonasal endoscopic views show the anterior communicating complex above the tumor resection. Infiltration of the optic chiasm and the inferior aspect of the left hypothalamus was observed (yellow arrows). (B) The third ventricle was observed after tumor resection. A1 = A1 segment of the anterior cerebral artery, A2 = A2 segment of the anterior cerebral artery, ACoA = anterior communicating artery, OC = optic chiasm, 3V = third ventricle.

## Discussion

The EEA offers direct access to the hypothalamic region without the need for brain retraction, parenchymal incision, or vascular manipulation.[1,3] We believe that the enhanced visualization offered with the EEA contributes to improved endocrine outcomes, as observed in its efficacy for various pathologies. The EEA utilizes the infrachiasmatic corridor, ensuring a surgical environment characterized by safety due to minimal neurovascular manipulation.[4] Yielding favorable results in terms of tumor resection and visual outcomes. This approach not only reduces the risk of optic nerve injury but also offers a panoramic view along the tumor's growth pathways. Studies have indicated that the EEA alleviates symptoms associated with the tumor mass effect. These findings suggest that the EEA is used to achieve varying degrees of tumor removal tailored to individual patient needs, tumor characteristics, and extent.[1,4] Overall, the EEA stands out for its safety profile, comprehensive neuroanatomical visualization capabilities, symptom-relieving potential, and aesthetic advantages, making it a preferred choice in selected cases of OPGH.[1,5] In Low-income economies, where access to adequate healthcare coverage and access to pediatric oncology is limited, EEA assessment of the tumor is reasonable in order to improve symptoms promptly.

## Conclusions

The limited research on EEA for OPGHs reflects their historical management through traditional transcranial approaches. Surgical decision-making for OPGHs must weigh the potential benefits of tumor resection against the risks of neurovascular damage and clinical functional impairment. Studies documenting EEA outcomes highlight its efficacy in achieving varying degrees of tumor removal while minimizing optic nerve injury and improving visual outcomes. However, challenges such as limited visualization and the potential for incomplete resection underscore the complexity of surgical management.

## Contact

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