Extent Of Resection and BMI Change After Endoscopic Craniopharyngioma Surgery: A Combined Adult-Pediatric Cohort

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Background

The relationship between extent of surgical resection on control and postoperative body mass index (BMI) change in craniopharyngioma remains unclear across ages. More extensive resection may be associated with greater postoperative weight gain, whereas hypothalamus-sparing approaches may reduce this risk without clearly compromising tumor control.

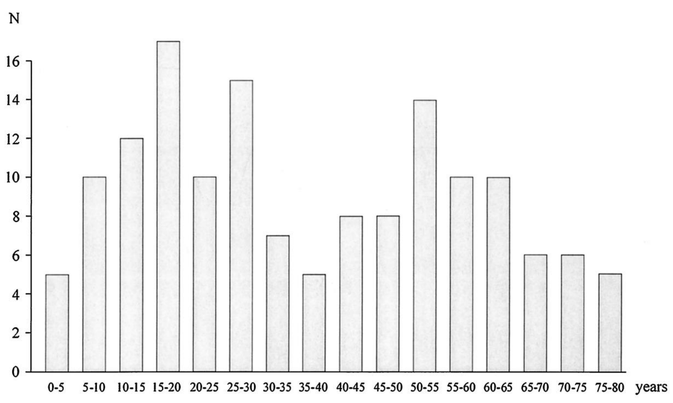
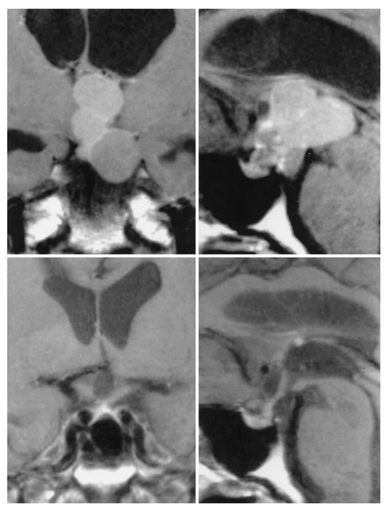


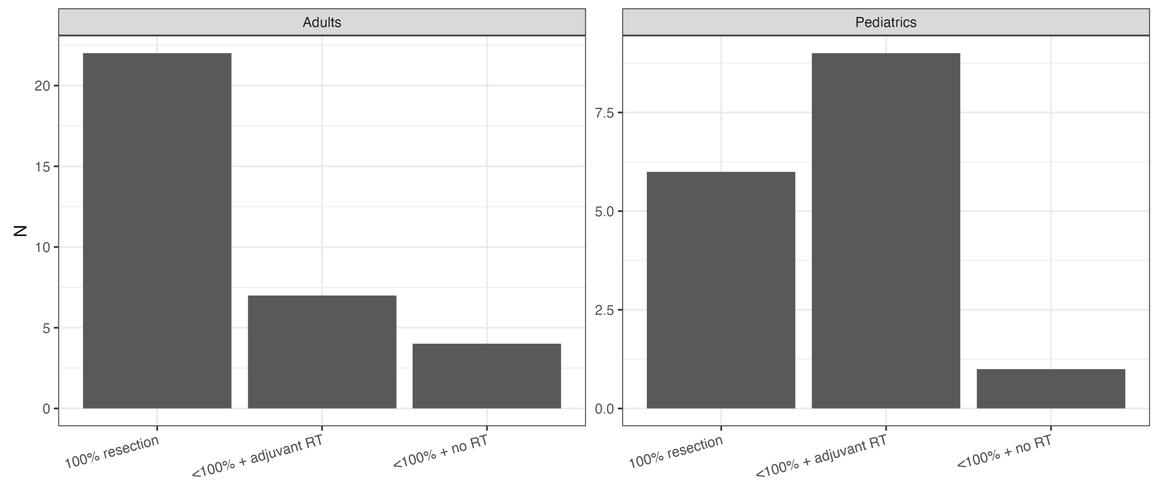
FIG. 1. Bar graph depicting the age distribution of 148 patients with newly diagnosed craniopharyngioma.



Historical microscopic series, including the work by Fahlbusch et al., reported combined adult and pediatric data but emphasized analyzing these groups separately because of differences in presentation and long-term outcomes. Pediatric studies have documented substantial postoperative weight gain and associated it with tumor position and degree of hypothalamic involvement. Few studies have examined postoperative weight change using systematic metrics such as CDC BMI categories. We evaluated oncologic, visual, and BMI outcomes across adult and pediatric patients undergoing endoscopic endonasal surgery for craniopharyngioma.

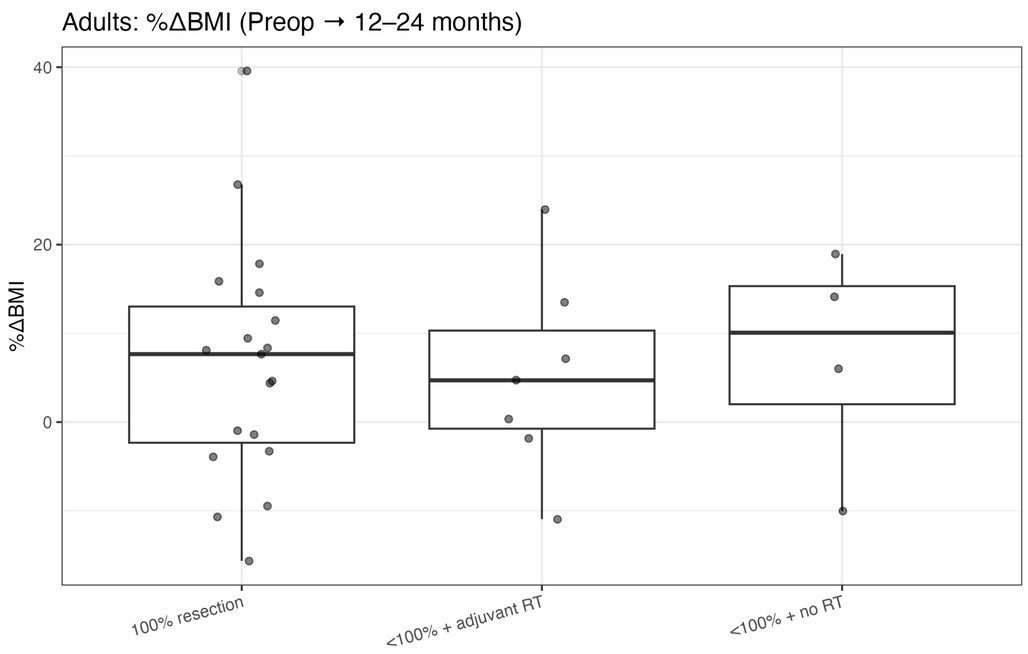
Methods

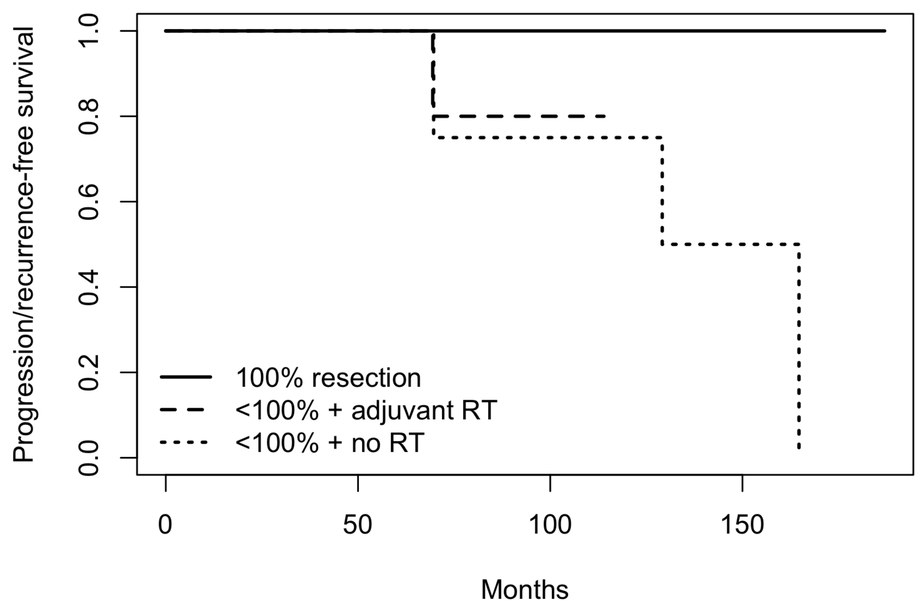
This was a single-institution retrospective cohort of 49 purely endoscopic cases treated from 2007 to 2024 (33 adults and 16 pediatric). Gross total resection (GTR) was defined as 100% radiographic resection. Incomplete techniques combined near-total (>95%), subtotal (90–95%), and partial resections(<90%) with fenestrations. Patients were categorized into three management groups: GTR, incomplete with adjuvant radiation, and incomplete without radiation.



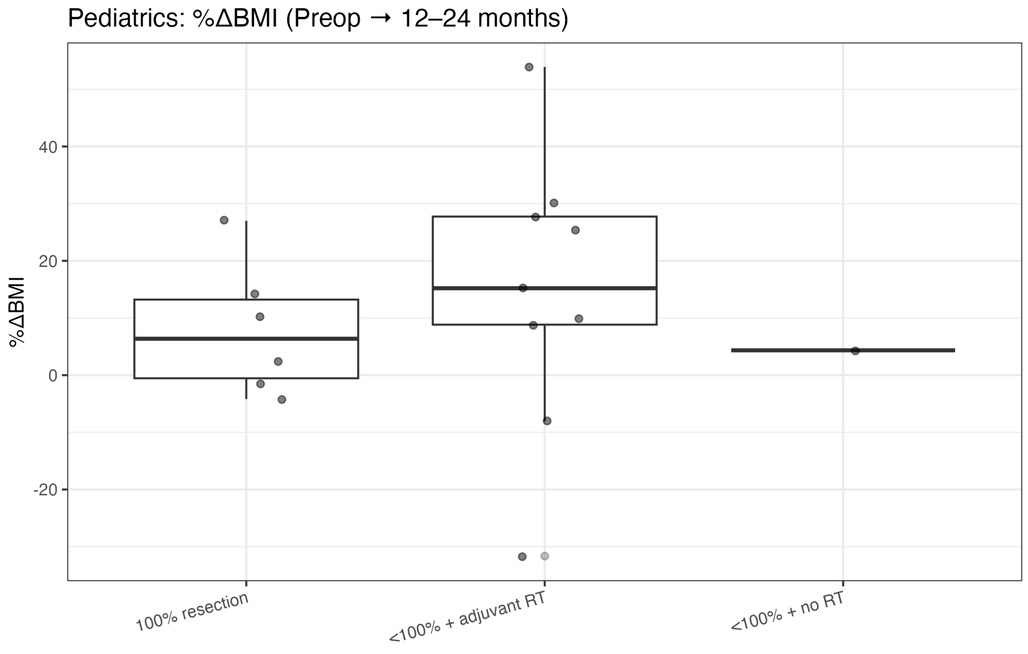
BMI change was assessed from preoperative to 12–24 months and to most-recent follow-up using four complementary strategies: (1) continuous ΔBMI (kg/m²) and percent ΔBMI, (2) categorical percent-change bins (≥10% gain, 5 to <10% gain, stable −5% to <+5%, ≥5% loss), (3) binary >5% gain vs other, and (4) CDC BMI category transitions. Preoperative MRIs were additionally categorized by presumed site of origin (subdiaphragmatic vs supradiaphragmatic), and this variable was analyzed for association with postoperative BMI change.

Results

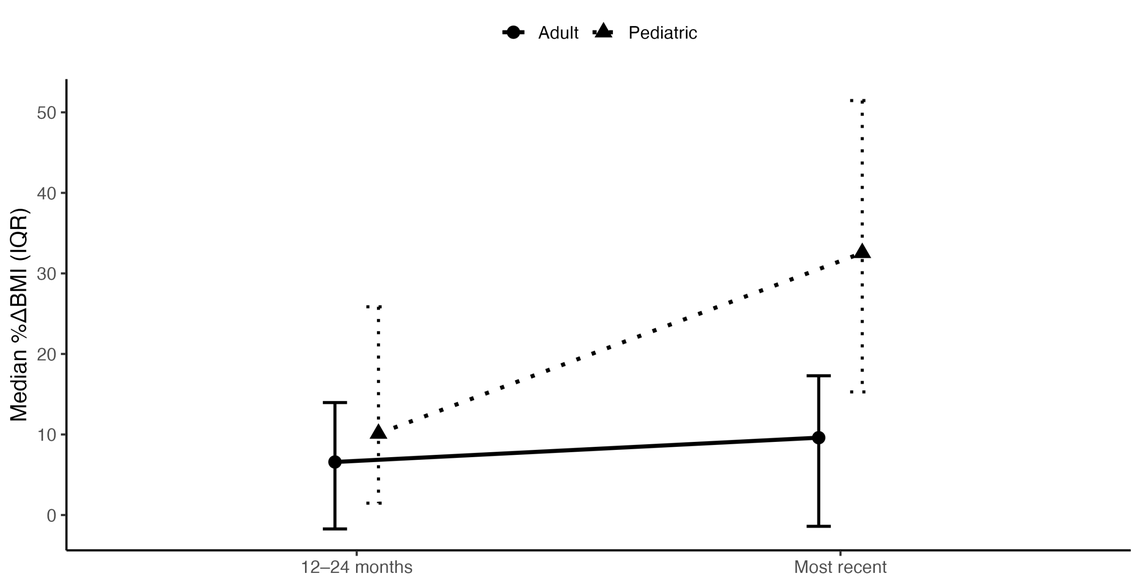




Gross-total resection was associated with superior progression-/recurrence-free survival compared with incomplete resection, particularly without radiation



Percent change in BMI from preoperative baseline to 12–24 months did not differ across management strategies in adults or pediatric patients. BMI trajectories were also not associated with presumed tumor site of origin (subdiaphragmatic vs supradiaphragmatic) in either adults or pediatric patients.



Longitudinal BMI change in adults and pediatric patients - Pediatric patients demonstrated greater postoperative BMI increases than adults at both follow-up timepoints.

Conclusion

- Adults: Gross-total resection provides superior tumor control without increasing postoperative BMI, supporting its pursuit when anatomically feasible.
- Pediatrics: Substantial postoperative BMI increases occur regardless of surgical strategy or adjuvant radiation.
- Across ages: Extent of resection and radiation exposure did not significantly influence postoperative BMI trajectories.
- Clinical implication: Pediatric patients require anticipatory counseling and long-term metabolic monitoring independent of treatment approach.

References

- Fahlbusch R, Honegger J, Paulus W, Huk W, Buchfelder M. Surgical treatment of craniopharyngiomas: experience with 168 patients. J Neurosurg. 1999 Feb;90(2):237-50.
- de Vile CJ, Grant DB, Hayward RD, Kendall BE, Neville BG, Stanhope R. Obesity in childhood craniopharyngioma: relation to post-operative hypothalamic damage shown by magnetic resonance imaging. J Clin Endocrinol Metab. 1996 Jul;81(7):2734-7.
- Lustig RH. Hypothalamic obesity after craniopharyngioma: mechanisms, diagnosis, and treatment. Front Endocrinol (Lausanne). 2011 Nov 3;2:60.
- Soldozy S, Yeghyayan M, Yağmurlu K, Norat P, Taylor DG, Kalani MYS, Jane JA, Syed HR. Endoscopic endonasal surgery outcomes for pediatric craniopharyngioma: a systematic review. Neurosurg Focus. 2020 Jan 1;48(1):E6.
- Jane JA Jr, Prevedello DM, Alden TD, Laws ER Jr. The transsphenoidal resection of pediatric craniopharyngiomas: a case series. J Neurosurg Pediatr. 2010 Jan;5(1):49-60.
- Elliott RE, Jane JA Jr, Wisoff JH. Surgical management of craniopharyngiomas in children: meta-analysis and comparison of transcranial and transsphenoidal approaches. Neurosurgery. 2011 Sep;69(3):630-43; discussion 643.