

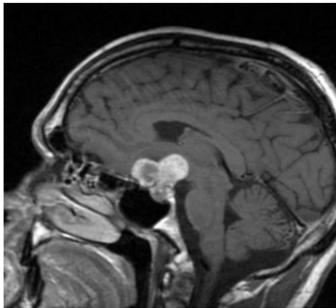
# Historical Trends in the Management of Craniopharyngioma: Results from the Multicenter RAPID Registry

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## Introduction and Objectives

Craniopharyngiomas are rare tumors of low histological malignancy arising from a remnant of the Rathke pouch in the the suprasellar region with a bimodal age distribution.<sup>1</sup> They carry risks of pituitary dysfunction via compression of surrounding structures or treatment.<sup>1</sup>



**Image 1:** Craniopharyngioma sagittal T1 MRI image<sup>2</sup>

The modern surgical management of craniopharyngioma remains unclear with significant institutional heterogeneity and evidence from small single-center studies. Over the last 20 years, there has been considerable advancement in endoscopic endonasal surgical technique, radiation technology, and our understanding of molecular biology of craniopharyngioma opening horizons to medical therapeutic options, such as BRAF inhibitors. We aimed to evaluate trends in surgical outcomes and management via a multicenter study.

Our goal is to expand upon the work done previously and examine the trends over time in craniopharyngioma surgical management from 2013-2024 using the Registry of Adenomas of the Pituitary and Related Disorders (RAPID) consortium. Secondly, we aim to analyze the incidence of endocrinological outcomes by surgical approach during this time period.

## Methods

We performed a study of the Registry of Adenomas of the Pituitary and Related Disorders (RAPID) consortium data on craniopharyngiomas across 14 academic high-volume institutions.

Trends over time in the following were analyzed,

- Extent of resection (GTR vs. STR vs. STR + RT)
- Surgical approach (Transsphenoidal vs. Transcranial)
- Pituitary stalk management (preservation vs sacrifice)
- Recurrence
- Endocrinopathies (AVP deficiency, adrenal insufficiency, growth hormone deficiency, hypothyroidism, hypogonadism)

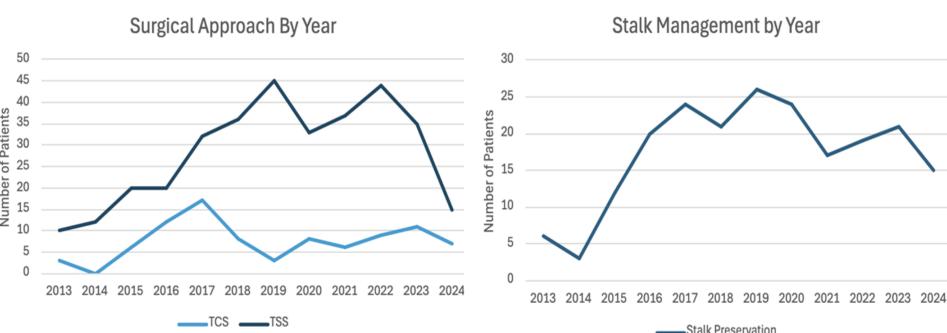
These trends were analyzed using binary logistic regression analysis in SPSS.

## Results

- 431 patients (mean age 46 years)
- 79% transsphenoidal approach resection vs. 21% transcranial approach resection
- 62% pituitary stalk preservation
- 48% GTR, 29% STR, and 23% STR + RT

### Surgical Management

There were no significant trends over time in **extent of resection**, **surgical approach**, or **pituitary stalk management**



**Figure 1 and 2:** Temporal trends in surgical approach and, stalk management for craniopharyngioma (2013–2024)



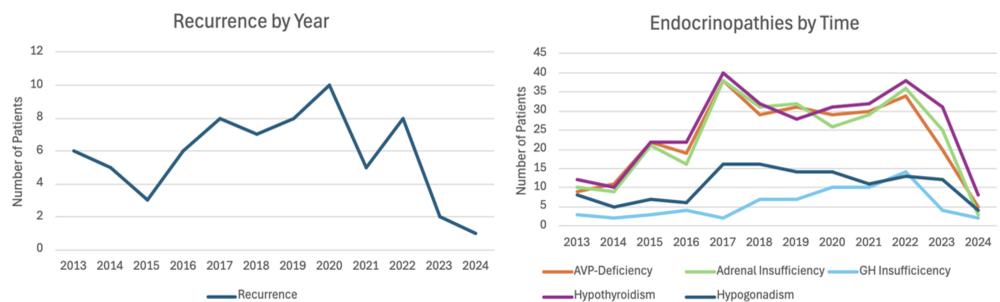
**Figure 3:** Temporal trends in resection extent for craniopharyngioma (2013–2024)

## Outcomes

**Tumor recurrence rate**, which included all groups, showed a significant decrease over time. Each additional year was associated with a 16% reduction in recurrence risk (OR 0.84,  $p < 0.001$ ).

Significant decline in postoperative **AVP-deficiency** over time, with year independently predicting lower odds of AVP-deficiency (OR 0.87 per year,  $p = 0.001$ ). A significant decrease in postoperative **adrenal insufficiency** was also observed (OR 0.91 per year,  $p = 0.024$ ).

In contrast, no significant trends were observed for postoperative **growth hormone insufficiency**, **hypothyroidism**, or **hypogonadism** (all  $p > 0.13$ ).



**Figure 4 and 5:** Temporal trends in tumor recurrence and endocrinopathies following craniopharyngioma surgery (2013–2024)

Outcome	OR per Year	p-value	Trend
<b>Tumor Recurrence</b>	0.84	<0.001	Decreased
<b>AVP-Deficiency</b>	0.87	0.001	Decreased
<b>Adrenal Insufficiency</b>	0.91	0.024	Decreased
Growth Hormone Insufficiency	1.06	0.220	No Change
Hypothyroidism	0.94	0.132	No Change
Hypogonadism	0.94	0.169	No Change
Pituitary Stalk Preservation	1.00	0.926	No Change
Surgical Approach (TSS vs TCS)	1.03	0.544	No Change
Extent of Resection (ordinal)	—	0.147	No Change

**Table 1:** Yearly trends assessed using logistic or ordinal regression with year as a continuous predictor

## Conclusions

Analysis of multicenter RAPID registry data from 2013 to 2024 demonstrates modest but consistent improvements in select clinical outcomes, including reductions in tumor recurrence and certain postoperative endocrine complications. Importantly, these improvements occurred in the setting of largely stable surgical practice patterns, with no significant temporal changes in surgical approach, extent of resection, or pituitary stalk management across institutions. These findings suggest that while incremental advances in surgical technique and perioperative care may have contributed to improved outcomes, further gains through surgical modification alone may be limited. The future evolution of craniopharyngioma management may increasingly depend on biologically driven approaches, including targeted therapies such as BRAF inhibition. Continued multicenter collaboration will be essential to define how emerging systemic therapies can be optimally integrated with established surgical and radiation paradigms.

## References

<sup>1</sup> Karsonovich T, Shafiq I, Mesfin FB. Craniopharyngioma. [Updated 2025 Feb 15]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2025. Jan-. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK519027/>

<sup>2</sup> Craniopharyngioma Tsagkm 006. Wikimedia Commons, uploaded by Wikimedia Commons contributors, <https://commons.wikimedia.org/wiki/File:Craniopharyngioma-tsaqkm-006.jpg>. Creative Commons BY-SA 3.0.