Original Article

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Recurrence Predictors in Operated Cases of Craniopharyngioma.

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Abstract

Introduction: Craniopharyngiomas are benign tumors that develop in the sellar and suprasellar region of the brain. Their location often leads to significant health complications due to the pressure exerted on nearby critical structures. Surgical removal remains the cornerstone of treatment. One of the major challenges is the high rate of recurrence, which affects approximately 30% to 40% of patients, even after seemingly successful surgery. Gaining these insights of causes of recurrence is crucial for guiding treatment choices and planning effective long-term follow-up care.

Objectives: To identify the recurrence predictors of craniopharyngioma and correlate it with other factors.

Methods: This observational study was carried out at a tertiary care center over a four-year period, from January 2020 to January 2024 that included 25 patients who underwent surgical removal of craniopharyngiomas. Based on their postoperative follow-up, patients were divided into two groups: those who experienced tumor recurrence and those who did not. Data were collected based on each patient's demographics, symptoms, imaging findings, tumor subtype, and the presence of β-catenin expression through immunohistochemistry.

Results: In this study, the overall recurrence rate of craniopharyngiomas was 40%. Recurrence was notably higher in certain subgroups like in males (68%). Tumors with calcifications on imaging were also more likely to recur (88%). A strong association was also observed between beta-catenin expression and the likelihood of recurrence. In contrast, no significant link was found between recurrence and factors such as gender, preoperative hormonal status.

Conclusion: Our findings suggest that younger age at diagnosis, the presence of calcification are all significantly associated with a higher risk of tumor recurrence. Additionally, positive β-catenin immunoreactivity emerged as a potential biomarker for identifying tumors with more aggressive behavior.

Keywords: craniopharyngioma, recurrence, calcification

Introduction

Craniopharyngiomas are rare epithelial brain tumors, making up about 2–5% of all intracranial tumors[1]. While they are classified as World Health Organization (WHO) Grade I due to their benign appearance under the microscope, their location near vital structures including the optic chiasma, hypothalamus, pituitary gland, and major blood vessels often leads to complex clinical challenges. These tumors tend to appear in two distinct age groups: children between 5 and 14 years old, and adults between 50 and 74 years[2].

Surgical removal remains the primary treatment approach. When gross total resection is possible, it offers the best chance for long-term disease control. However, this can come at a significant cost, as it carries a high risk of damaging nearby structures, potentially resulting in serious complications like hypothalamic injury and lifelong hormonal imbalances. For many patients, a more balanced strategy, subtotal resection followed by targeted radiotherapy3 is often preferred. This approach aims to manage the disease effectively while minimizing long-term neurological and endocrine side effects. Despite advances in both surgical techniques and postoperative care, recurrence remains a major concern, affecting up to 40% of patients[4]. In light of these challenges, this study focuses on identifying key clinical, radiological, pathological, and molecular predictors of recurrence in patients treated at a tertiary care center, with the goal of improving treatment planning and long-term outcomes[5]. A range of factors have been linked to this risk, including the patient's age, the tumor's structure and location, how much of it could be safely removed, and certain molecular features particularly β-catenin expression[6].

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Methods & Materials

An observational study conducted in the tertiary level centre for the period of 4 years from Jan 2020 to Jan 2024.

Inclusion Criteria:
- Patients aged 1–70 years operated for craniopharyngioma between Jan 2020 to Jan 2024.
- Both transcranial and endoscopic approaches included.
- Patients with adequate follow-up data and postoperative imaging.

Exclusion Criteria:
- Patients lost to follow-up or deceased before evaluation.
- Patients unwilling to participate.

Data Collection:
Total number of included patients were 25 in number. Patients were divided into two groups based on follow-up MRI findings: those with tumor recurrence and those without. Recurrence was defined as a 25% or greater increase in tumor volume compared to the immediate postoperative MRI. For all patients, demographic information, presenting symptoms, imaging features (including tumor size and presence of calcification), intraoperative findings, and histopathological details—such as beta-catenin expression—were carefully documented.

Statistical Analysis: Data were analyzed using SPSSv23. Descriptive statistics were applied. Associations were tested using chi-square tests and correlation analysis, with significance value at $p<0.05$.

Results

Patient Demographics and Recurrence:
The study included patients with a mean age of 15.5 years, ranging from 5 to 56 years, and a notable male predominance of 17 in number(68%). Tumor recurrence was observed in 40% of cases (10 out of 25 patients), highlighting the ongoing challenge of long-term disease control despite treatment.

Variables	Age	Recurrence	No recurrence	p value
	<5 years	0	2(13.33%)	
	5-15 years	7(78.5%)	8(53.33%)	0.3
	>15 years	3(21.5%)	5(33.33%)	
Variables		Recurrence+	Recurrence-	Chi-square
Gender	Male	7	10	0.004
	Female	3	5	

Clinical Profile:
The most common presenting symptoms were headache (72%) and vomiting (60%), reflecting the tumor's mass effect. More than half of the patients experienced visual impairment (52%) and growth retardation (40%). These findings underscore the significant impact of craniopharyngiomas on both neurological and endocrine function, particularly in growing children.

Symptoms	Total cases recurrence (n:10)	Total cases non	Total Percentage
Headache	8	10	72%
Vomiting	7	8	60%
Visual deterioration	5	8	52%
Growth retardation	6	4	40%

Radiological Features:
Imaging revealed calcifications in the vast majority of patients (88%), and notably, all patients with recurrent tumors had calcified lesions.

Variables		Recurrence+	Recurrence-	Chi-	p value
Calcifications	Calcifications +(n=22)	10	12		
	Calcifications - (n=3)	0	3	0.6	0.4

Intraoperative Findings:
Surgical observations revealed a high rate of stalk invasion (68%) and vascular encasement (32%), both of which can complicate complete tumor removal.

Variables	Percentage	Recurrence+	Recurrence-	p value
Stalk invasion. 68%	8	9		0.8
Vascular invasion	32%	2	6	0.2

Histopathology and Molecular Markers:
The adamantinomatous subtype was the dominant histological type in this cohort. Importantly, positive beta-catenin immunoreactivity showed a strong correlation with tumor recurrence, supporting its potential role as a molecular marker for more aggressive disease.

Variables		Recurrence+	Recurrence-	p value
Beta nuclear catenin	0(Negative)	1	6	
	1+(Weak staining)	1	6	0.2
	2+(Moderate staining)	3	2	
	3+(Strong staining)	5	1	

No statistically significant associations were found between recurrence and patient age, gender, preoperative hormonal status, or the need for cerebrospinal fluid shunting.

Discussion

Our study found a tumour recurrence rate of 40%, which is consistent with previously reported figures from international studies. Although the association was not statistically significant,

we observed that younger children (under 10 years of age)6 were over represented among those who experienced recurrence suggesting that age may play a role in tumour behaviour and outcomes[7].

Certain tumour characteristics were more clearly linked to recurrence. Calcification, especially the speckled pattern showed significant associations with recurrence, reinforcing the notion that such features may hinder complete surgical removal and contribute to regrowth. Stalk invasion was also more common in recurrent cases8, although this trend did not reach statistical significance.

On the molecular level, our analysis showed a strong correlation between β-catenin expression and tumour recurrence9. This finding supports growing evidence that molecular markers can help predict tumour aggressiveness and long-term outcomes[10].

When compared with the global literature, our results suggest that while the extent of surgical resection continues to be a critical factor in disease control, molecular insights particularly β-catenin status may add significant prognostic value. These findings highlight the importance of a comprehensive approach that combines clinical, radiological, and molecular information to better assess recurrence risk and tailor long-term management plans for patients with craniopharyngioma.

Conclusion

Although craniopharyngiomas are benign, they continue to present significant challenges for treatment because of their high likelihood of recurrence and adhered to complex adjacent structures. Our study highlights that certain feature specifically calcifications to be important predictors of tumour recurrence. Furthermore, the presence of β-catenin expression appears to be a promising biomarker for identifying tumours with more aggressive behaviour.

Patients who show these high-risk characteristics may benefit from closer monitoring and more personalized treatment plans, which could include the use of adjuvant radiotherapy to help reduce the chance of recurrence. To build on these findings, larger multicentre studies are needed to confirm these associations and to help develop treatment protocols that incorporate molecular markers, moving toward more tailored and effective care for patients with craniopharyngioma.

Limitations of the study:
Single centre study, which introduces various biases, emphasizing the need for future multi-centre studies.
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Conflict of interest: All authors certify that they have no affiliations with or involvement in any organizations or entity with any financial interest, or non-financial interest.

References

1. Bülow B, Attewell R, Hagmar L, Malmström P, Nordström CH, Erfurth EM. Postoperative prognosis in craniopharyngioma with respect to cardiovascular mortality, survival, and tumor recurrence. J Clin Endocrinol Metab. 1998 Nov;83(11):3897-904. doi: 10.1210/jcem.83.11.5240. PMID: 9814465.

2. Larkin S, Karavitaki N. Recent advances in molecular pathology of craniopharyngioma. F1000Res. 2017 Jul 24;6:1202. doi: 10.12688/f1000research.11549.1. PMID: 28781761; PMCID: PMC5531159.

3. Karavitaki N, Cudlip S, Adams CB, Wass JA. Craniopharyngiomas. Endocr Rev. 2006 Jun;27(4):371-97. doi: 10.1210/er.2006-0002. Epub 2006 Mar 16. PMID: 16543382.

4. Weiner HL, Wisoff JH, Rosenberg ME, Kupersmith MJ, Cohen H, Zagzag D, Shiminski-Maher T, Flamm ES, Epstein FJ, Miller DC. Craniopharyngiomas: a clinicopathological analysis of factors predictive of recurrence and functional outcome. Neurosurgery. 1994 Dec;35(6):1001-10; discussion 1010-1. doi: 10.1227/00006123-199412000-00001. PMID: 7885544.

5. Losa M, Castellino L, Pagnano A, Rossini A, Mortini P, Lanzi R. Growth Hormone Therapy Does Not Increase the Risk of Craniopharyngioma and Nonfunctioning Pituitary Adenoma Recurrence. J Clin Endocrinol Metab. 2020 May 1;105(5):dgaa089. doi: 10.1210/clinem/dgaa089. PMID: 32112101.

6. Arslanian SA, Becker DJ, Lee PA, Drash AL, Foley TP Jr. Growth hormone therapy and tumor recurrence. Findings in children with brain neoplasms and hypopituitarism. Am J Dis Child. 1985 Apr;139(4):347-50. doi: 10.1001/archpedi.1985.02140060029020. PMID: 3976624.

7. Prieto R, Pascual JM, Subhi-Issa I, Jorquera M, Yus M, Martínez R. Predictive factors for craniopharyngioma recurrence: a systematic review and illustrative case report of a rapid recurrence. World Neurosurg. 2013 May-Jun;79(5-6):733-49. doi: 10.1016/j.wneu.2012.07.033. Epub 2012 Aug 11. PMID: 22892136.

8. 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. doi: 10.3171/jns.1999.90.2.0237. PMID: 9950494.

9. Apps JR, Carreno G, Gonzalez-Meljem JM, Haston S, Guiho R, Cooper JE, Manshaei S, Jani N, Hölsken A, Pettorini B, Beynon RJ, Simpson DM, Fraser HC, Hong Y, Hallang S, Stone TJ, Virasami A, Donson AM, Jones D, Aquilina K, Spoudeas H, Joshi AR, Grundy R, Storer LCD, Korbonits M, Hilton DA, Tossell K, Thavaraj S, Ungless MA, Gil J, Buslei R, Hankinson T, Hargrave D, Goding C, Andoniadou CL, Brogan P, Jacques TS, Williams HJ, Martinez-Barbera JP. Tumour compartment transcriptomics demonstrates the activation of inflammatory and odontogenic programmes in human adamantinomatous craniopharyngioma and identifies the MAPK/ERK pathway as a novel therapeutic target. Acta Neuropathol. 2018 May;135(5):757-777. doi: 10.1007/s00401-018-1830-2. Epub 2018 Mar 14. PMID: 29541918; PMCID: PMC5904225.

10. Guadagno E, de Divitiis O, Solari D, Borrelli G, Bracale UM, Di Somma A, Cappabianca P, Del Basso De Caro M. Can