



Case Report

Rathke's cleft cyst with xanthogranulomatous change: A case report and review of the literature

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ABSTRACT

Background: Rathke's cleft cysts (RCCs) are benign, typically asymptomatic sellar lesions found incidentally in adults, with a dramatically lower incidence in pediatric patients (<18 years). We present a case of RCC with xanthogranulomatous change (XGC) – an even less common subtype of RCC – treated by endoscopic endonasal surgical resection. This is the second reported instance of an RCC with XGC occurring in a pediatric patient.

Case Description: The patient is a 17-year-old male with delayed puberty who presented with bitemporal hemianopsia and was found to have a 2.6 cm lesion, initially thought to be a craniopharyngioma. He subsequently underwent uncomplicated transphenoidal endoscopic endonasal resection. Histology confirmed the diagnosis of RCC and demonstrated marked degenerative XGCs with squamous metaplasia. The patient tolerated the procedure well with improvement in visual symptoms.

Conclusion: RCC with XGC is a very rare pathology, particularly in the pediatric population. These lesions, while benign, can manifest clinically with significant symptoms. While treatment paradigms are not fully established with a small cohort of cases, endoscopic endonasal approaches have made surgical resection of these lesions a safe and effective treatment strategy, even in the pediatric population.

Keywords: Rathke's cleft cyst, Skull base endoscopy, Xanthogranulomatous change

INTRODUCTION

Rathke's cleft cysts (RCCs) are rare and benign sellar lesions that are derived from remnants of the Rathke's pouch, an embryonic structure that gives rise to the anterior pituitary gland, pars intermedia, and pars tuberalis.^[18] These lesions are primarily asymptomatic and found incidentally in adults in up to 33% of postmortem cases.^[3,11,16,21] The incidence in pediatric patients, as determined by postmortem and imaging studies, is thought to be smaller at approximately 1.2%.^[19] These are distinct from even rarer primary xanthogranulomas, which appear histologically similar but lack an accompanying adenomatous primary such as an RCC or craniopharyngioma (CP).^[2,4,5,12,14,17]

In exceptional circumstances, RCCs can undergo xanthogranulomatous change (XGC), where leakage of cyst contents can lead to a granulomatous reaction characterized by cholesterol clefts, hemosiderin deposits, giant multinucleated cells, and inflammatory milieu along with

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infiltration of foamy or lipid-laden macrophages.^[8,20] Almost all RCCs that undergo XGC are reported in adults; reports of symptomatic RCC with secondary XGC in pediatric patients (<18 years) are exceedingly rare with only one other pathology-confirmed case reported.^[1,7] Here, we report the second known instance of an RCC with XGC occurring in a pediatric patient, additionally offering intraoperative imaging and postoperative pathology to aid with diagnostic correlation.

CASE REPORT

A 17-year-old male presented to our neurosurgery clinic with progressive vision loss. He had initially been evaluated by a pediatric endocrinologist for delayed puberty as suggested by a high-pitched voice and feminine features. His hormonal work-up revealed panhypopituitarism. Preoperative Humphrey visual field testing demonstrated bitemporal visual field loss.

Further, magnetic resonance imaging (MRI) evaluation identified a 2.6 cm mass in the suprasellar region, noted to be hyperintense on T1 and T2 sequences with a nonenhancing, T1 hypointense nodule [Figure 1]. There was mass effect on the optic chiasm without extension into the cavernous sinus. The computed tomography scan did not show any calcifications [Figure 2].

Differential diagnosis included proteinaceous CP, cystic degeneration of a pituitary macroadenoma, and less likely RCC.

Given the vision changes, the patient and family consented to resection of the lesion through a transsphenoidal endoscopic endonasal approach. Since the presumptive diagnosis was that of a CP, we discussed with the patient that there was a distinct possibility that the pituitary stalk would have to be sacrificed to obtain gross total resection of the lesion.

The sella was accessed through the standard transsphenoidal approach with stereotactic navigation. After dural opening, the tumor was found to be firm and with a thick capsule. Sharp dissection and radiofrequency ablation were required to debulk the tumor. The tumor center yielded classic motor oil-like fluid as well as large cholesterol granulations that were histopathologically evaluated. There were dense adhesions of the tumor capsule to bilateral optic nerves and chiasm [Figure 3].

The capsule was sharply dissected away from the neural structures. We could now clearly visualize that the tumor capsule emanated from and had infiltrated the pituitary stalk. To achieve gross total resection, the stalk was truncated and the lesion was removed. Closure was performed using fat graft as inlay, followed by fascia lata wedged into the sellar opening using a MEDPOR (Stryker) graft, creating a gasket seal. This skull base reconstruction was then layered with a pedicled nasoseptal flap. The patient tolerated the procedure well.

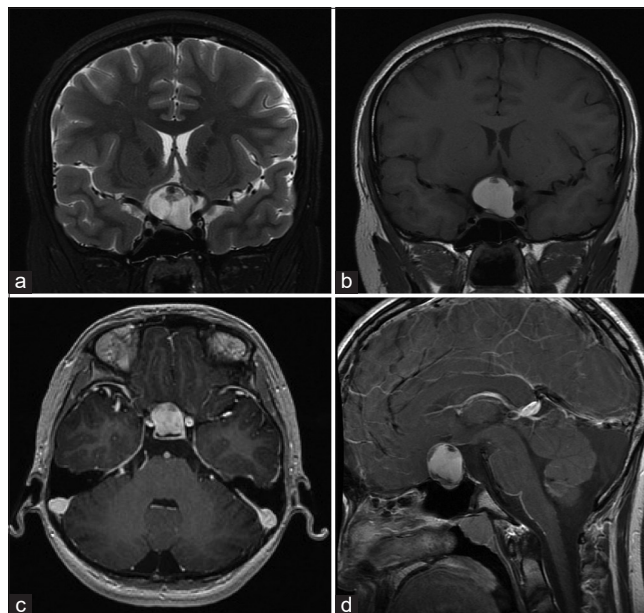


Figure 1: Preoperative imaging (a) coronal T2-weighted magnetic resonance imaging (MRI) shows a hyperintense mass measuring $2.4 \times 2.6 \times 1.9$ cm in the sellar and suprasellar region. (b) Coronal T1-weighted MRI shows a hyperintense mass with a hypointense, nonenhancing nodule. Postcontrast T1-weighted MRI in the axial (c) and sagittal (d) planes shows a heterogeneously enhancing mass.

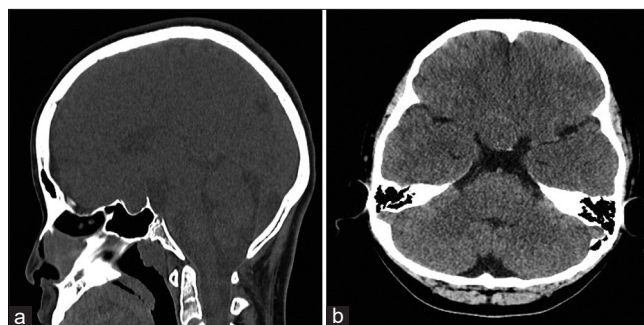


Figure 2: Preoperative imaging noncontrast computed tomography image in sagittal (a) and axial (b) planes shows a sellar mass extending into the suprasellar region. No calcifications are seen in the lesion.

Postoperative Humphrey visual field testing demonstrated visual improvement after resection of the lesion and decompression of the chiasm. In addition to his preoperative hormone replacement regimen, he continued to require desmopressin acetate tablets at his 1-year postoperative follow-up. His postoperative 3-month MRI shows gross total resection of the lesion with decompression of the optic chiasm. The residual fat graft as well as the MEDPOR (Stryker) skull base reconstruction can also be visualized [Figure 4].

Pathology showed a dense fibrous walled cyst with a focal residual internal epithelial lining consisting of squamous

cells, whose membrane stained positive on beta-catenin stain [Figure 5] and occasional ciliated epithelial cells which stained positive for cytokeratin AE1 and AE3 [Figure 6].

There were marked degenerative changes with lymphocytic and histiocytic inflammation, hemosiderin deposition, cholesterol clefts, and multinucleated giant cells. The histiocytes stained positive for CD68 and many contained a foamy cytoplasm that highlighted on periodic acid-Schiff diastase stain, which was consistent with them being muciphages. These features in summary were consistent with a RCC with marked XGC and squamous metaplasia.

DISCUSSION

We present the second reported occurrence of a suprasellar RCC with XGC in a pediatric patient [Table 1]. The advances

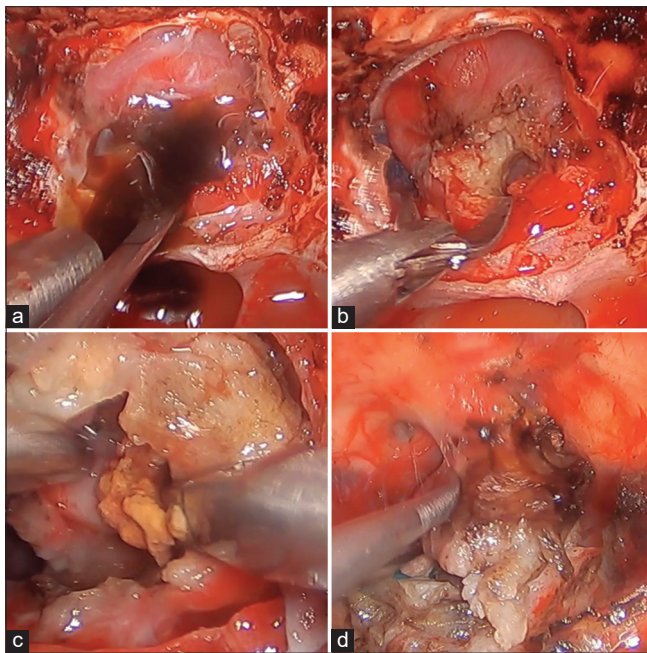


Figure 3: Intraoperative imaging intraoperative images of tumor texture and behavior, including (a) motor oil drainage, (b) thick, fibrous cystic capsule, (c) cholesterol granuloma, and (d) adhesion to the optic chiasm.

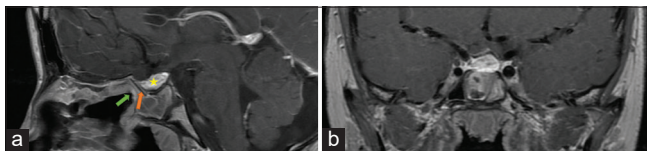


Figure 4: Postoperative imaging postcontrast axial T1-weighted image in sagittal (a) and coronal (b) planes shows gross total resection of the tumor with decompression of the optic chiasm. The residual fat graft is noted in the inferior portion of the resection cavity (yellow star). The orange arrow in Figure 4a shows the placement of the Medpor graft, and the green arrow points to the layering of the pedicled nasoseptal flap for a multilayered closure.

in endoscopic management of anterior skull base tumors and intraoperative visualization allowed us to surgically treat this lesion in this patient. It is our hope that features described in this case may guide future presurgical and intraoperative planning.

Pathophysiology and presentation

Paulus *et al.* first postulated that XGCs were distinct entities, rather than degenerative changes of adamantinomatous craniopharyngiomas (ACs). In their retrospective analysis, they went on to report that patients with XGCs had histology consistent with massive cholesterol granuloma reactions,

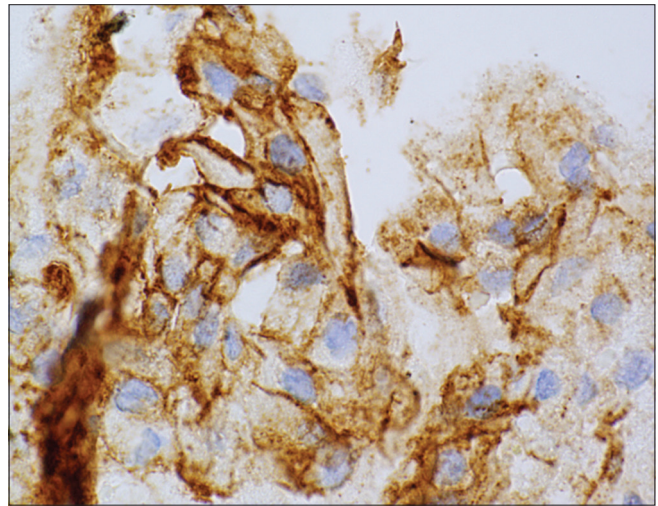


Figure 5: Beta-catenin immunostaining at $\times 100$ demonstrating dense fibrous walled cyst with squamous cells.

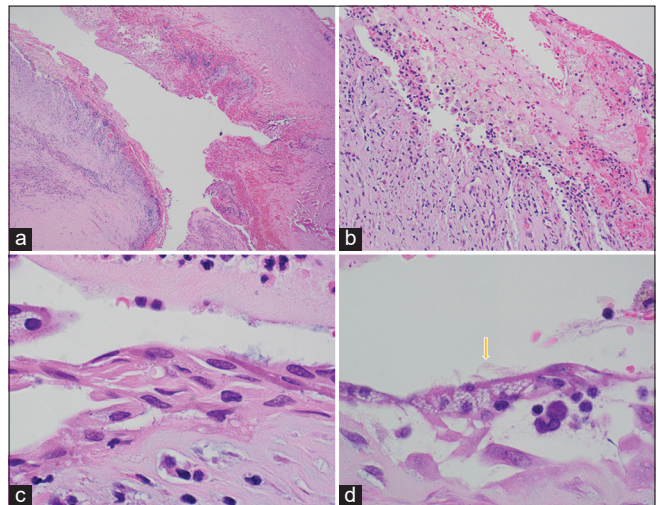


Figure 6: Hematoxylin and eosin staining at $\times 4$ (a), $\times 20$ (b), $\times 100$ (c), and $\times 1000$ (d) demonstrating marked degenerative changes, lymphocytic/histiocytic inflammation, hemosiderin pigment, cholesterol clefts, and multinucleate giant cells. (d) Orange arrow shows the ciliated epithelial cells.

Table 1: Literature review histopathologically confirmed cases of Rathke's cleft cysts with xanthogranulomatous change in pediatric patients.

Study	Patients (n)	Age	Gender	Symptoms	Location	Modality: radiographic features	Treatment	Follow-up time (months)/ outcome	Notes
Kurisaka <i>et al.</i> (1998)	1	8	F	Headache, apoplexy	Suprasellar with extension into the suprasellar cistern	Hyperintense on T1/2, hemorrhage	TSS	6 months; no residual symptoms	Cholesterol granuloma
Present study	1	17	M	Delayed puberty, bitemporal vision loss	Suprasellar	Hyperintense on T1/T2 with hypointense nodule on TI	Transsphe noidal endoscopic endonasal	1.5 months; no neurologic deficits	Marked degenerative (xanthogranulomatous) changes, squamous metaplasia

F: Female, M: Male, TSS: Transsphenoidal surgery

uncharacteristic of degenerative AC. In additional contrast, XGCs were predominantly associated with the second and third decades of life and with favorable outcomes.^[15] Rather than a degenerative process, the current proposed mechanism for XGC development is a secondary granulomatous reaction to an associated RCC.^[10] The current thinking is that the intermittent leakage of cyst contents may incite cyclical inflammation which results in a fibrous capsule with dense adhesions to surrounding neurovascular structures. The histological hallmarks of XGCs include cholesterol clefts, hemosiderin deposits, and uniquely, foamy or lipid-laden macrophages.^[8,20]

Thus, xanthogranuloma in the sellar region is suspected of being a terminal stage resulting from a secondary reaction caused by repeated inflammatory change, hemorrhage, and degeneration of a RCC.^[2] Perhaps, its rarity within the pediatric population is secondary to the amount of time needed to develop a sufficiently large inflammatory nidus.

Clinical presentation is highly variable, as physical and neurological examination is dependent on time associated tolerance of the surrounding pituitary and optic anatomy. This is particularly challenging in pediatric populations given their fluctuating pubertal hormone levels.^[4] Our patients' diagnosis was likely confounded by overlap with his pubertal development. Kurisaka *et al.*, meanwhile, presented an 8-year-old female with headaches and apoplexy.^[7]

Medical and surgical management

Medical management of RCC with XGC while often can compensate for endocrinopathies may not adequately address the underlying cause and compression of neurovascular structures in the sellar region. Nakasu *et al.* outlined the medical management of a 23-year-old female with secondary amenorrhea using human chorionic gonadotropin-human menopausal gonadotropin. Although the patient's secondary amenorrhea resolved as a result of the medical intervention,

she continued to have persistently low luteinizing hormone levels. Further workup through MRI identified an RCC. The authors' proceeded with surgical management, ultimately resolving this patient's endocrinopathy.^[13]

As evidenced by our own experience, as well as other reports in the literature, endoscopic skull base surgery has gained credence as an option to address midline anterior skull base pathology in the pediatric population.^[4,12,15] This approach has managed to successfully navigate the narrow, anatomic corridors while still achieving gross total resection. While large case series are limited in the pediatric population, follow-up series in adults have shown excellent tumor control rates for various subsets of RCC with this approach.^[4,8,9]

Because of clinically significant change in vision, our patient underwent endoscopic endonasal transsphenoidal approach for resection of this lesion. We achieved gross total resection without complications, and there was no recurrence or neurologic sequelae at 1-year follow-up. The other pediatric case in the literature was also treated endonasally and remained recurrence free at 6 months. It must be emphasized that because of the restrictive pediatric endonasal anatomy, as well as the nature of this pathology that leads to dense fibrous adhesions to neurovascular structures, endonasal resection should be limited to centers with multidisciplinary teams (neurosurgery, otolaryngology, endocrine, neuro-ophthalmology, and neuropathology) well versed in minimal access endoscopic techniques, as well as neurocritical care of the child.

The previous studies of the general pediatric RCC population have found 10-year survival rates to range from between 83% and 98% after complete resection. This drops to 20–70% over 10 years with recurrence.^[6]

CONCLUSION

XGCs in RCCs are extremely rare granulomatous inflammatory reactions, particularly in the pediatric

population. Clinical presentation will commonly affect vision and hormonal balance, inconsistently in children and teenagers. Surgical intervention remains an essential for tumor control, with the literature suggesting an excellent prognosis in cases where gross total resection can be achieved. Although the inflammatory components likely introduce fibrotic and adherent features, the lesion remains amenable to endoscopic endonasal resection in centers proficient in minimal access skull base endoscopy.

Declaration of patient consent

Patient's consent not required as patients identity is not disclosed or compromised.

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Conflicts of interest

There are no conflicts of interest.

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