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Endoscopic endonasal management of sellar and suprasellar xanthogranulomas: A single-center experience

Sellar ve suprasellar ksantogranülomaların endoskopik endonazal yönetimi: Tek merkez deneyimi

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ABSTRACT

Aim: Sellar xanthogranuloma (XG) is a rare, tumor-like inflammatory lesion that often mimics Rathke's cleft cysts or craniopharyngiomas radiologically and clinically. The endoscopic endonasal approach (EEA) has become the preferred surgical corridor for these midline cystic lesions; however, evidence on optimal extent of resection and postoperative outcomes remains limited. We analyzed the clinical, radiologic, and surgical features of pathologically confirmed sellar/suprasellar XGs treated via EEA at a tertiary skull-base center.

Material and Methods: We retrospectively reviewed a prospectively maintained database of 6,597 EEAs performed between 1997 and 2025 and identified eight histologically confirmed XG cases. Demographics, presenting symptoms, imaging characteristics, surgical approach, extent of resection, and postoperative outcomes were analyzed.

Results: The cohort comprised five females and three males (median age, 26.5 years; range, 13–67). Lesions were suprasellar in five patients (62.5%) and sellar in three (37.5%). Gross-total resection was achieved in seven patients (87.5%), and subtotal resection in one (12.5%). Postoperative complications included one cerebrospinal fluid (CSF) leak after an extended suprasellar approach (12.5%) and one case of transient diabetes insipidus; no other complications were observed. No recurrences were detected during follow-up.

Conclusion: Sellar xanthogranulomas are benign inflammatory-degenerative lesions that closely resemble Rathke's cleft cysts and craniopharyngiomas, rendering preoperative diagnosis challenging. EEA enables effective decompression with low morbidity when reconstruction is tailored to CSF-leak flow and capsule management is individualized. Long-term radiologic surveillance is preferable to aggressive reoperation.

Keywords: Endoscopic endonasal approach, sella, pituitary, xanthogranuloma

ÖZ

Amaç: Sellar ksantogranüloma (XG), radyolojik ve klinik olarak sıklıkla Rathke yarığı kistleri veya kraniofaringiomlarla karışan, nadir görülen, tümör benzeri inflamatuvar bir lezyondur. Endoskopik endonazal yaklaşım (EEA), bu orta hat kistik lezyonları için tercih edilen cerrahi yol haline gelmiştir; ancak optimal rezeksiyon düzeyi ve ameliyat sonrası sonuçlara ilişkin veriler sınırlıdır. Bu çalışmada, üçüncü basamak bir kafa tabanı merkezinde endoskopik endonazal yaklaşımla tedavi edilen patolojik olarak doğrulanmış sellar ve suprasellar ksantogranülomaların klinik, radyolojik ve cerrahi özellikleri analiz edilmiştir.

Gereç ve Yöntemler: 1997–2025 yılları arasında gerçekleştirilen 6.597 endoskopik endonazal cerrahi içeren prospektif olarak tutulan bir veri tabanının retrospektif incelemesi sonucunda, histolojik olarak doğrulanmış sekiz ksantogranüloma olgusu belirlenmiştir. Demografik veriler, başvuru semptomları, görüntüleme bulguları, cerrahi yaklaşım, rezeksiyon düzeyi ve ameliyat sonrası sonuçlar analiz edilmiştir.

Bulgular: Kohortta beş kadın ve üç erkek hasta yer almakta olup, ortanca yaş 26,5 (dağılım 13–67) idi. Lezyonlar beş hastada (%62,5) suprasellar, üç hastada (%37,5) sellar yerleşimliydi. Yedi hastada (%87,5) total rezeksiyon, bir hastada (%12,5) subtotal rezeksiyon gerçekleştirildi. Bir hastada (%12,5) genişletilmiş suprasellar yaklaşımdan sonra ameliyat sonrası beyin omurilik sıvısı (BOS) kaçağı, bir diğer hastada ise geçici diabetes insipidus gelişti; başka komplikasyon gözlenmedi. Takip süresince nüks saptanmadı.

Sonuç: Sellar ksantogranülomalar, Rathke yarığı kistleri ve kraniofaringiomlarla benzer özellikler gösteren, benign inflamatuvar-dejeneratif lezyonlardır ve bu nedenle preoperatif tanı sıklıkla güçtür. Endoskopik endonazal cerrahi, BOS kaçağı derecesine göre uyarlanmış rekonstrüksiyon ve bireyselleştirilmiş kapsül yönetimi ile düşük morbiditeyle etkili bir dekompresyon sağlar. Uzun dönem radyolojik izlem, agresif yeniden cerrahiye tercih edilmelidir.

Anahtar Kelimeler: Endoskopik endonazal yaklaşım, sella, hipofiz, ksantogranüloma

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Highlights

- Among 6,597 endoscopic endonasal surgeries, only eight cases (0.12%) were identified as histologically confirmed sellar/suprasellar xanthogranulomas, underscoring the exceptional rarity of this entity.
- Endoscopic endonasal surgery enabled safe and effective decompression with a high gross-total resection rate (87.5%) and minimal morbidity, with only one CSF leak and one transient diabetes insipidus observed.
- Carefully tailored capsule management—prioritizing decompression and selective resection when adhesions to critical structures were present—achieved durable radiological control with zero recurrences during follow-up.

INTRODUCTION

Sellar xanthogranuloma (XG) is an uncommon, tumor-like inflammatory lesion defined by cholesterol clefts, foamy macrophages, multinucleated giant cells, and hemosiderin deposits. Contemporary evidence suggests XG represents a secondary, degenerative/inflammatory reaction within pre-existing sellar cystic/epithelial lesions—most often Rathke's cleft cysts (RCCs), and less commonly craniopharyngiomas or cystic/hemorrhagic pituitary tumors—rather than a true neoplasm (1). This concept is consistent with modern classifications of sellar pathology and with systematic and narrative reviews summarizing the histopathology and natural history of XG (2-4).

Clinically and radiographically, XG often mimics other cystic sellar entities. Patients usually present with headache, visual field deficits from chiasmal compression, and varying degrees of hypopituitarism or diabetes insipidus. On magnetic resonance imaging (MRI), protein/cholesterol-rich contents can produce T1 hyperintensity and variable T2 signal with inconsistent rim or mural enhancement, features that blur preoperative differentiation from RCC and craniopharyngioma; consequently, diagnosis is frequently established postoperatively on histology. Recent cohorts and reviews underscore this overlap and the relative rarity of XG among pituitary region lesions, reinforcing the need for careful endocrine and visual assessment alongside imaging (5-7).

Surgically, endoscopic endonasal approach (EEA) has become the preferred corridor for midline sellar/suprasellar disease and is particularly suited to XG, permitting wide exposure, safe decompression of the optic apparatus, evacuation of cholesterol-laden contents, and judicious capsule management. Given the inflammatory/adherent capsule and prior hemorrhagic changes, operative strategy must balance extent of capsule removal against risks to pituitary gland/stalk and cerebrospinal fluid (CSF) leak; reports in related RCC literature suggest that decompression with selective wall resection may suffice in many cases and reduce complications. Against this background, we present our single-center experience of 8 pathologically confirmed XG among 6,597 EEAs, detailing preoperative work-up, surgical techniques, and postoperative endocrine, visual, and radiographic outcomes (8).

MATERIAL and METHODS

Study Design and Setting

We conducted a retrospective, single-center cohort study of patients with pathologically confirmed sellar/suprasellar XG treated via EEA between 1997 and 2025 at a tertiary skull-base center. The institutional review board of Istinye University approved the study. Our prospectively maintained database included 6,597 consecutive EEAs , from which 8 XG cases were identified as the analytic cohort.

Patient Identification and Eligibility

Eligible patients met all of the following: (i) final histopathology consistent with xanthogranulomatous lesion of the sellar region; (ii) EEA as the index operative approach; (iii) available pre- and postoperative MRI and standardized endocrine and neuro-ophthalmologic assessments; and (iv) minimum clinical/radiographic follow-up ≥ [6/12] months. Exclusion criteria were: alternative final diagnosis (e.g., RCC without xanthogranulomatous change, craniopharyngioma, cystic pituitary adenoma), prior transcranial surgery as the index treatment (unless specified in sensitivity analyses), or incomplete records.

Preoperative Examinations

All patients underwent standardized pituitary axis evaluation (morning cortisol with dynamic testing when indicated, ACTH, TSH/free-T4, GH/IGF-1, LH/FSH, prolactin, sodium/osmolality) and formal neuro-ophthalmologic testing (visual acuity and automated perimetry). MRI protocols comprised thin-slice sellar-oriented T1-weighted sequences (pre- and post-gadolinium), T2-weighted sequences, and 3D volumetric acquisition when available. Imaging features suggestive of XG (e.g., intracystic T1 hyperintensity, T2-hypointense fibrous capsule, absent capsular/solid enhancement) were recorded a priori to inform intraoperative decision-making, given prior evidence that such patterns favor XG over craniopharyngioma and may support a decompression-dominant strategy.

High-resolution paranasal CT was obtained selectively for bony anatomy and calcification assessment; advanced MRI was used at the surgeon's discretion to delineate adhesions, prior hemorrhage, or hemosiderin burden, acknowledging the radiologic heterogeneity reported in XG.

Surgical Strategy and Intraoperative Decision-Making

Operations were performed using a binostril, four-hand endoscopic endonasal surgery (EES) under neuronavigation with 0° optics. After wide sphenoidotomy and sellar/planum exposure as indicated, cyst entry allowed controlled evacuation of cholesterol-rich/xanthochromic contents with gentle suction/irrigation, minimizing spillage. Particular attention was paid to capsular character (often fibrous-hard in XG) and to yellow-brown granulomatous tissue and hemosiderin deposits, which—together with absence of a whitish enhancing solid component—raised intraoperative suspicion for XG rather than craniopharyngioma. When the pre/intraoperative profile favored XG, we prioritized optic-pituitary decompression and selective wall/capsule management over aggressive dissection from adherent critical structures (stalk, chiasm, perforators). Intraoperative frozen section was obtained in equivocal cases to exclude craniopharyngioma; if frozen section revealed non-neoplastic granulomatous tissue (no tumor), we proceeded with intentional partial removal (decompression ± cystocisternostomy) rather than riskier capsule stripping (Figure 1).

Skull-Base Reconstruction

Reconstruction followed a graded algorithm tailored to CSF-leak severity. Low-flow leaks were repaired with ** multilayer underlay** (e.g., fat/fascia ± collagen matrix) and sealant; high-flow defects received fascia lata underlay + rigid buttress/gasket-seal + vascularized nasoseptal flap (NSF). Lumbar drainage was reserved for high-flow, redo, or radiated cases. These steps were standardized to mitigate the recognized leak risk in cholesterol-laden/hemorrhagic cavities.

Postoperative Care and Follow-Up

Serum sodium, urine output, and osmolality were monitored for triphasic water-balance disorders. Desmopressin was used for diabetes insipidus and fluid restriction/hypertonic saline for syndrome of inappropriate secretion of antidiuretic hormone per protocol. Stress-dose steroids were given to patients with adrenal insufficiency, with endocrinology-guided taper thereafter. Neuro-ophthalmologic reassessment occurred prior to discharge and at [6–12 weeks]. First surveillance MRI was obtained at [6–12 weeks], then every [6–12] months. Recurrence/progression was defined

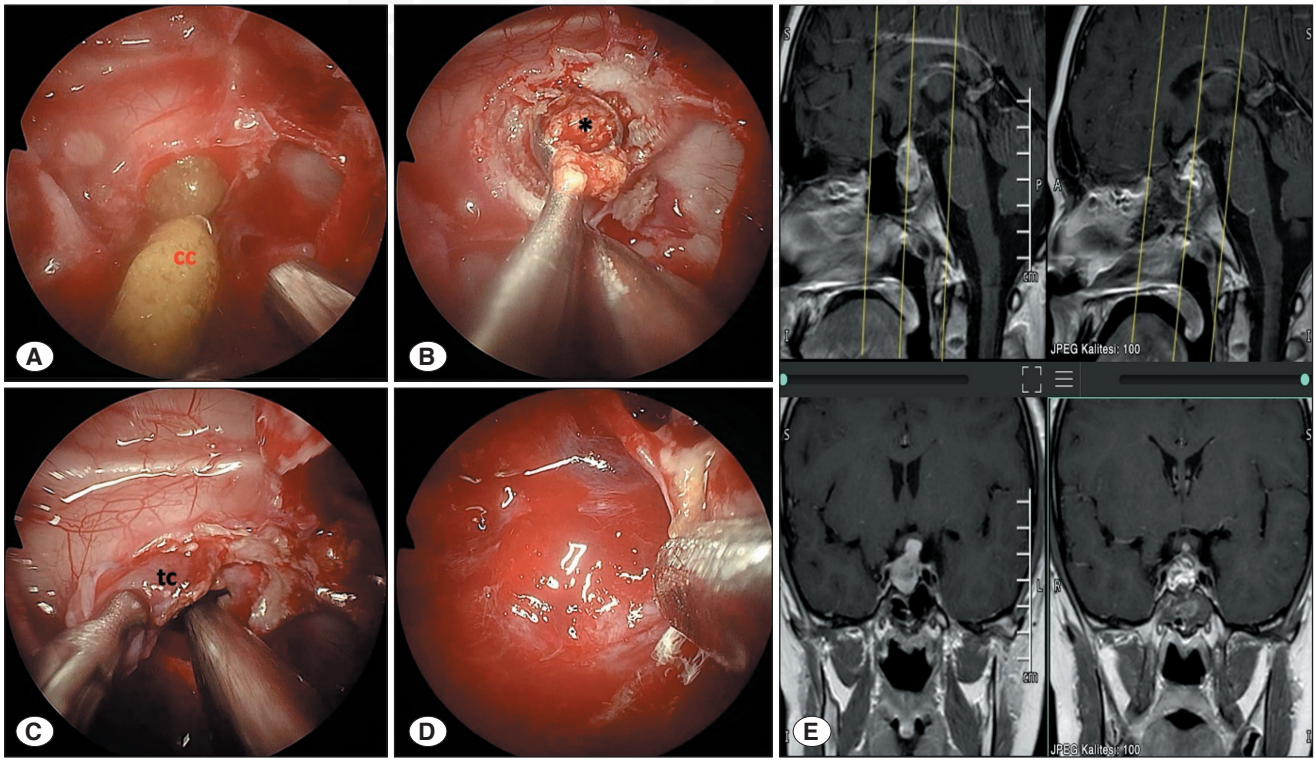

Figure 1: A 13-year-old patient presenting with headache. **A)** Intraoperative view during endoscopic endonasal surgery showing aspiration of yellowish cystic content following sellar puncture. **B)** Removal of calcified components of the lesion using a curette. **C)** Dissection of the cyst capsule and excision using a punch. **D)** Visualization of the intrasellar space after complete tumor removal. **E)** Preoperative and postoperative MR images demonstrating gross total resection of the lesion.

as radiographic re-accumulation or growth requiring intervention, cognizant that intentional decompression without total capsule excision can achieve durable control in XG.

Outcomes and Definitions

Primary endpoint: clinical–radiographic control after EES (symptom relief, absence of re-intervention). Secondary endpoints: visual outcomes (acuity/fields), endocrine outcomes (new deficits or recovery of axes), CSF-leak rate, sinonasal morbidity, cranial neuropathies, and other complications. Capsule strategy was categorized as decompression only, partial capsule resection, or near-total/total. Imaging variables captured known XG discriminators (intracystic T1 hyperintensity, T2-hypointense capsule, lack of enhancement, calcification status) for exploratory associations with outcomes.

This study was approved by the Institutional Review Board of Istinye University. All procedures were performed in accordance with the ethical standards of the institutional and national research committees and with the 1964 Helsinki declaration and its later amendments. (01.08.2025 – Number: 2025-253)

RESULTS

Patient Characteristics

Among 6,597 EEAs 8 patients had pathologically confirmed sellar/suprasellar XG. The median age was 26.5 years (range, 13–67), and 5/8 (62.5%) were female. Presenting symptoms included headache in 3/8 (37.5%), visual loss in 3/8 (37.5%), polyuria/polydipsia in 1/8 (12.5%), and dysmenorrhea in 1/8 (12.5%). Lesions were suprasellar in 5/8 (62.5%) and sellar in 3/8 (37.5%). The maximum diameter had a median of 19.5 mm (range, 14–28 mm). This distribution—predominantly midline sellar/suprasellar cystic lesions with visual and/or endocrine-related presentations—is in keeping with prior series that describe XG as rare, heterogeneous, and frequently radiologically indistinguishable from RCC or craniopharyngioma.

Operative Strategy and Extent of Resection

A standard transsellar EES was performed in 5/8 (62.5%) cases and an extended approach in 3/8 (37.5%). Gross total resection (GTR) was achieved in 7/8 (87.5%) overall, while 1/8 (12.5%) underwent subtotal resection (STR). By location, GTR was obtained in 3/3 (100%) sellar lesions and 4/5 (80%) suprasellar lesions (the single STR occurred in a suprasellar case). Intraoperative decision-making favored decompression and selective capsule management when the capsule was densely adherent to critical structures—an approach supported by the literature, which notes stronger adhesions in XG and endorses intentional partial removal when multimodal cues (MRI appearance, endoscopic findings, and negative frozen section for craniopharyngioma) point toward XG.

Perioperative Outcomes and Complications

One patient (1/8, 12.5%) experienced a postoperative CSF leak following an extended suprasellar approach, and another patient developed transient diabetes insipidus; no other complications were recorded in this dataset. This profile parallels published experience: with graded reconstruction and conservative capsule handling in the setting of adhesions, EES for XG is associated with favorable morbidity. Prior series similarly emphasize that aggressive capsule stripping is often unnecessary and that selective or intentional partial resection can be safe and effective (Table1).

DISCUSSION

The xanthogranuloma of the sellar region is a rare inflammatory lesion that can be easily mistaken clinically and radiologically for cystic pituitary pathologies such as craniopharyngioma or Rathke's cleft cyst (9-12). Because there are no specific preoperative imaging characteristics, the diagnosis is usually established only after histopathological examination, and surgical planning for XG is often performed under an initial presumption of an alternative sellar pathology (13,14). This study presents eight cases of sellar xanthogranuloma detected in many years of high-volume en-

Table 1: Clinical characteristics, surgical details, and postoperative complications of eight patients with xanthogranulomas

Patient	Gender	Age	Symptom	Location	Max diameter	Surgery	Resection	Complication
1	F	33	Headache	Suprasellar	28	Extended	GTR	-
2	M	21	Headache	Sellar	16	Standard	GTR	-
3	F	36	Visual loss	Suprasellar	18	Extended	GTR	-
4	M	25	Visual loss	Suprasellar	21	Standard	GTR	DI
5	M	13	Headache	Sellar	18	Standard	GTR	-
6	F	13	Polyuria/polydipsia	Suprasellar	22	Standard	GTR	-
7	F	67	Visual loss	Suprasellar	21	Extended	STR	CSF leak
8	F	28	Dysmenorrhea	Sellar	14	Standard	GTR	-

CSF: Cerebrospinal Fluid, **GTR:** Gross total resection, **STR:** Subtotal resection, **DI:** Diabetes insipidus

doscopic skull base surgery experience, adding new cases to these rarely reported lesions in the literature and making a significant contribution to the current knowledge on incidence, clinical course, and surgical management strategies.

Sellar xanthogranulomas do not show a distinct characteristic pattern in imaging methods and appear with variable and irregular signal intensities on MRI due to the heterogeneous histological elements they contain, such as cholesterol, fibrosis, hemorrhagic material and cellular infiltration (13,15,16). Therefore, it is widely accepted that there are no distinctive radiological features that reliably indicate xanthogranuloma in the differential diagnosis of sellar region lesions. In these lesions, the presence of cholesterol crystals typically results in hyperintensity on T1-weighted images and hypointensity on T2-weighted images. Additionally, the fluid components of the cystic structures demonstrate high signal intensity on T2-weighted sequences (17,18). In contrast, areas of extensive fibrosis and prior hemorrhage may present as low signal intensity on both T1- and T2-weighted images (19). Additionally, hemosiderin deposits typically appear as pronounced hypointense regions on T2-weighted sequences (20). The most common radiological differential diagnoses are craniopharyngiomas and RCC. RCC typically demonstrate hyperintensity on T1-weighted imaging and hypointensity on T2-weighted imaging, with minimal contrast enhancement in most cases; calcification is also rarely observed. Craniopharyngiomas, on the other hand, are characterized by heterogeneous signal intensity on both T1- and T2-weighted sequences and frequently exhibit diffuse or peripheral contrast enhancement. In the adamantinomatous subtype, calcification within the cystic component is commonly present. Xanthogranulomas, however, present a more variable radiological appearance; depending on their internal contents and tissue composition, they may demonstrate either hyperintense or hypointense signal characteristics on both T1- and T2-weighted sequences, and may show peripheral rim-like or homogeneous contrast enhancement. Calcification is uncommon in these lesions. Therefore, xanthogranulomas exhibit considerable radiologic overlap with RCC and craniopharyngiomas, and imaging alone is often insufficient for definitive differentiation in the preoperative setting.

The histopathological architecture of sellar xanthogranulomas is characterized in most cases by prominent chronic inflammation, hemosiderin deposition, and an intense granulomatous reaction surrounding cholesterol crystals (11,12,17). The presence of these morphological features, particularly the histological components shared with RCC and craniopharyngiomas, suggests that xanthogranulomas represent a secondary inflammatory–degenerative process arising within pre-existing sellar cystic lesions, rather than a distinct primary pathology (11). RCC are typically lined by a single layer of ciliated columnar or cuboidal epithelium, whereas craniopharyngiomas are classified into two major histological subtypes: the adamantinomatous type, characterized by stratified squamous epithelium with keratin aggregates and frequent calcification, and the papillary type, defined by proliferating squamous epithelium (21). The xanthogranulomatous tissue typically contains abundant foamy macrophages (xanthoma cells), foreign body–type multinucleated giant cells, a histiocytic reaction surrounding cholesterol clefts, dense lymphocytic infiltration, hemosiderin pigmentation, and often marked fibrotic stromal remodeling. The coexistence of these components suggests that the lesion represents an advanced stage of an organization process resulting from prolonged inflammation, recurrent intracystic hemorrhage, and breakdown of cystic contents. Therefore, the histological evaluation of xanthogranulomas not only provides diagnostic confirmation but also offers important biological insights into the evolution and pathogenesis of cystic pathologies within the sellar region.

The endoscopic transsphenoidal approach is considered the primary surgical method for the treatment of sellar xanthogranulomas, in comparison with transcranial approaches (9,11,17,19). The main objective of treatment is to reduce the mass effect of the lesion while preserving optic pathway and pituitary function, thereby achieving effective decompression. Because the histopathological spectrum of xanthomatous reactions is broad and may vary diagnostically, thorough and careful tissue sampling remains critical for establishing an accurate diagnosis (11). It has been reported that mass effect–related symptoms, such as visual impairment and headache, improve significantly in most patients following surgical decompression; however, preoperative endocrine dysfunction—particularly diabetes insipidus, which is common in sellar xanthogranulomas—may require a longer period to recover, and permanent hormone replacement therapy may be necessary in some cases (9,15,22). Because these lesions are usually localized and well circumscribed, an adequate extent of resection can generally be achieved via a transsphenoidal approach. However, in cases where the capsule is firmly adherent to critical structures such as the optic chiasm, hypothalamus, or pituitary stalk, the surgical strategy should prioritize maximal safe resection rather than aggressive total excision. Although aggressive total resection is not always necessary due to the benign histological nature of xanthogranulomas (22), these lesions are frequently approached preoperatively under presumptive diagnoses such as craniopharyngioma or Rathke's cleft cyst. Therefore, in the context of cystic sellar and parasellar lesions, maintaining gross total resection as the surgical objective often remains clinically rational. Although radiotherapy has been reported in the treatment of xanthogranulomas in other intracranial locations, its effectiveness in sellar xanthogranulomas remains unclear. While some reports describe partial regression of residual lesions

following radiotherapy, the role of radiotherapy in the management of sellar xanthogranulomas remains controversial and it is not recommended as a standard therapeutic modality (23-25).

The prognosis of sellar xanthogranulomas is generally favorable, and the benign, granulomatous nature of these lesions should be emphasized. The literature reports low recurrence rates even after subtotal resection, and tumor regrowth or progression of residual tissue is observed only infrequently (9,19,22,24). Radiological surveillance is considered an effective and sufficient approach, particularly in patients with residual lesions, for monitoring potential growth over time. In summary, long-term postoperative management of sellar xanthogranulomas should be based on close clinical and radiological follow-up rather than aggressive re-intervention.

Conclusion

Sellar xanthogranulomas are rare, benign, inflammatory–degenerative lesions that share overlapping clinical and radiological features with other cystic pathologies of the sellar region (such as RCC and craniopharyngiomas), making preoperative diagnosis challenging. Endoscopic transsphenoidal surgery remains the preferred treatment approach, providing effective decompression while preserving critical neurovascular and endocrine structures. Postoperative clinical and visual outcomes are generally favorable; however, endocrine recovery—particularly in patients with diabetes insipidus—may require long-term management. The low recurrence rates observed even after subtotal resection underscore the importance of close clinical and radiological follow-up rather than aggressive re-intervention. The continued accumulation of well-documented cases in the literature will be essential to better define the natural history of this rare entity and to further refine optimal treatment strategies.

Author Contributions

Study conception and design: **Atakan Emengen, Aykut Gokbel,** data collection: **Atakan Emengen, Eren Yilmaz,** analysis and interpretation of results: **Atakan Emengen, Ayse Uzuner, Savas Ceylan,** draft manuscript preparation: **Atakan Emengen, Savas Ceylan.** The author(s) reviewed the results and approved the final version of the article.

Conflicts of Interest

The authors declare that they have no conflict of interest related to this study.

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Ethical Approval

This study was approved by the Institutional Review Board of Istinye University. All procedures were performed in accordance with the ethical standards of the institutional and national research committees and with the 1964 Helsinki declaration and its later amendments. (01.08.2025 – Number: 2025-253)

REFERENCES

1. Lozovanu V, Georgescu CE, Florescu LM, Georgiu C, Silaghi H, Fratea A, et al. Xanthogranuloma of the Sellar Region: A Comprehensive Review of Neuroimaging in a Rare Inflammatory Entity. J Pers Med. 2022;12. https://doi.org/10.3390/jpm12060943.
2. Sprau A, Mahavadi A, Zhang M, Saste M, Deftos M, Singh H. Rathke's cleft cyst with xanthogranulomatous change: A case report and review of the literature. Surg Neurol Int. 2020;11:246. https://doi.org/10.25259/SNI_277_2020.
3. Fujio S, Takajo T, Kinoshita Y, Hanaya R, Arimura H, Sugata J, et al. Sellar Xanthogranuloma: A Quest Based on Nine Cases Assessed with an Anterior Pituitary Provocation Test. World Neurosurg. 2019;130:e150–9. https://doi.org/10.1016/j.wneu.2019.06.021.
4. Ved R, Logier N, Leach P, Davies JS, Hayhurst C. Pituitary xanthogranulomas: clinical features, radiological appearances and post-operative outcomes. Pituitary. 2018;21:256–65. https://doi.org/10.1007/s11102-017-0859-x.
5. Fernández SC, Bernhardt MC, Grondona E, Venier AC, Bertolino ML, Pautasso MJ, et al. Sellar xanthogranuloma as a diagnostic challenge: a report on five cases. Front Neurosci. 2023;17. https://doi.org/10.3389/fnins.2023.1227144.
6. Louis DN, Perry A, Wesseling P, Brat DJ, Cree IA, Figarella-Branger D, et al. The 2021 WHO Classification of Tumors of the Central Nervous System: a summary. Neuro Oncol. 2021;23:1231–51. https://doi.org/10.1093/neuonc/noab106.
7. Nishiuchi T, Murao K, Imachi H, Kushida Y, Haba R, Kawai N, et al. Xanthogranuloma of the intrasellar region presenting in pituitary dysfunction: a case report. J Med Case Rep. 2012;6:119. https://doi.org/10.1186/1752-1947-6-119.
8. Zhang X, Yang J, Huang Y, Liu Y, Chen L, Chen F, et al. Endoscopic Endonasal Resection of Symptomatic Rathke Cleft Cysts: Total Resection or Partial Resection. Front Neurol. 2021;12:701177. https://doi.org/10.3389/fneur.2021.701177.
9. Li G, Zhang C, Sun Y, Mu Q, Huang H. Xanthogranulomatous pituitary adenoma: A case report and literature review. Mol Clin Oncol. 2018:8;445-448. https://doi.org/10.3892/mco.2018.1547.
10. Kleinschmidt-DeMasters BK, Lillehei KO, Hankinson TC. Review of xanthomatous lesions of the sella. Brain Pathology. 2017;27:377–395. https://doi.org/10.1111/bpa.12498.
11. Rahmani R, Sukumaran M, Donaldson AM, Akselrod O, Lavi E, Schwartz TH. Parasellar xanthogranulomas. J Neurosurg. 2015;122:812–817. https://doi.org/10.3171/2014.12.JNS14542.
12. Paulus W, Honegger J, Keyvani K, Fahlbusch R. Xanthogranuloma of the sellar region: a clinicopathological entity different from adamantinomatous craniopharyngioma. Acta Neuropathol. 1999;97:377–382. https://doi.org/10.1007/s004010051001.

13. Nishioka H, Shibuya M, Ohtsuka K, Ikeda Y, Haraoka J. Endocrinological and MRI features of pituitary adenomas with marked xanthogranulomatous reaction. Neuroradiology. 2010;52:997–1002. https://doi.org/10.1007/s00234-010-0675-8.

14. Neubauer C, Shah M, Meckel S. Selläres Xanthogranulom: MRT-Bildgebung und Differenzialdiagnose. RöFo - Fortschritte Auf Dem Gebiet Der Röntgenstrahlen Und Der Bildgebenden Verfahren. 2012;185:272–274. https://doi.org/10.1055/s-0032-1325514.

15. Alharbi A, Alkhaibary A, Alaglan A, Khairy S, Alkhunaizi Z, AlSufiani F, et al. Sellar xanthogranuloma: A diagnostic challenge. Surg Neurol Int. 2022;13:76. https://doi.org/10.25259/SNI_1180_2021.

16. Madan Mohan B, Mohamed E, Jain SK, Jain M, Jaiswal AK. Serial MR Imaging in Suprasellar Xanthogranuloma: Growth Pattern and New Lesions. Journal of Neuroimaging. 2015;25:677–679. https://doi.org/10.1111/jon.12170.

17. Nishiuchi T, Murao K, Imachi H, Kushida Y, Haba R, Kawai N, et al. Xanthogranuloma of the intrasellar region presenting in pituitary dysfunction: a case report. J Med Case Rep. 2012;6:119. https://doi.org/10.1186/1752-1947-6-119.

18. Kunii N, Abe T, Kawamo M, Tanioka D, Izumiyama H, Moritani T. Rathke's cleft cysts: differentiation from other cystic lesions in the pituitary fossa by use of single-shot fast spin-echo diffusion-weighted MR imaging. Acta Neurochir (Wien). 2007;149:759–769. https://doi.org/10.1007/s00701-007-1234-x.

19. Ved R, Logier N, Leach P, Davies JS, Hayhurst C. Pituitary xanthogranulomas: clinical features, radiological appearances and post-operative outcomes. Pituitary. 2018;21:256–265. https://doi.org/10.1007/s11102-017-0859-x.

20. Agarwal A, Agarwal K, Lee HK. Xanthogranuloma of the Sellar Region. Neuroradiol J. 2012;25:181–184. https://doi.org/10.1177/197140091202500204.

21. Prieto R, Pascual JM. Craniopharyngiomas with a mixed histological pattern: the missing link to the intriguing pathogenesis of adamantinomatous and squamous-papillary varieties? Neuropathology. 2013;33:682–686. https://doi.org/10.1111/neup.12030.

22. Yang B, Yang C, Fang J, Li G, Wang J, Jia G, et al. Clinicoradiologic Features and Surgical Outcomes of Sellar Xanthogranulomas: A Single-Center 10-Year Experience. World Neurosurg. 2017;99:439–447. https://doi.org/10.1016/j.wneu.2016.12.017.

23. Lozovanu V, Georgescu CE, Florescu LM, Georgiu C, Silaghi H, Fratea A, et al. Xanthogranuloma of the Sellar Region: A Comprehensive Review of Neuroimaging in a Rare Inflammatory Entity. J Pers Med. 2022;12:943. https://doi.org/10.3390/jpm12060943.

24. Guerrero-Pérez F, Marengo AP, Vilarrasa N, Vidal N, Ruiz-Roig N, Sánchez-Fernández JJ, et al. Xanthogranuloma of the sellar region: a systematic review. Hormones. 2023;22:199–210. https://doi.org/10.1007/s42000-023-00432-y.

25. Topaloğlu Ö, Açıkgöz GG, Tekin S, Malkoç B, Kaymaz E, Karadeniz Çakmak G, et al. Difficulty in Follow-Up of Papillary Thyroid Cancer Co-Existent with Hypopituitarism: Case Report and Review of the Literature. Med J West Black Sea. 2022;6(3):410-416. https://doi.org/10.29058/mjwbs.1164665