

Atypical Rathke's Cleft Cyst Associated with Ossification

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Summary: We report a case of symptomatic Rathke's cleft cyst with ossification. CT scans showed curvilinear calcification on the wall of the cyst. MR images revealed a cystic sellar lesion with a nodular solid mass extending to the floor of the third ventricle. This case shows that calcification of the suprasellar cyst does not always suggest craniopharyngioma. Rathke's cysts should be histologically differentiated from craniopharyngiomas because their treatments are different.

Symptomatic Rathke's cleft cysts are rare epithelial cysts that have been recognized increasingly on MR images (1–3). Calcification is rare in Rathke's cleft cysts, and its presence is used as a pre-surgical diagnostic clue in the diagnosis of craniopharyngioma. We present a case of Rathke's cleft cyst associated with mature ossification. Because extensive surgical removal or adjuvant therapy is not necessary for Rathke's cleft cysts, careful diagnosis should be made on calcified sellar lesions.

Case Report

A 23-year-old woman had suffered from secondary amenorrhea for a year. A gynecologist prescribed for her a regimen of human-chorionic gonadotropin–human-menopausal gonadotropin that restored regular menstruation. Endocrinologic examination showed normal base values except for low luteinizing hormone levels. MR imaging of the brain revealed a cyst in the sella with suprasellar extension.

Neurologic examination revealed no visual disturbance. She had no features of abnormal pituitary function. Her blood hormone levels were as follows: growth hormone 1.8 g/l (normal <5.0 g/l); prolactin 7.3 g/l (normal <15.0 g/l); thyrotropin 1.0 mU/l (normal 0.1–4.0 mU/l); luteinizing hormone 4.00 IU/l (normal 15–67 IU/l); follicle-stimulating hormone 8.50 IU/l (normal 20–40 IU/l); adrenocorticotropic hormone 16.3 pg/ml (normal 4.4–48.0 pg/ml); and cortisol 10.8 nmol/L (normal 3.2–13.9 nmol/L). A skull radiograph showed slight enlargement of the sella, but no calcification in or around the sella. A precontrast CT scan revealed a cystic lesion with a linear crescent-like calcification along the wall of the cyst in the suprasellar cistern (Fig 1A). A postcontrast CT scan showed thinning enhancement (Fig 1B). MR images showed a cyst of homogeneous high-intensity signal in the sella and suprasellar

regions and a solid mass of slightly increased intensity in the anteroventral portion in the cyst (Fig 1C, D).

Preoperative diagnosis was an intrasellar craniopharyngioma or a Rathke's cleft cyst. In 1994, the patient underwent pituitary surgery; a transsphenoidal approach was applied. Thick, yellow fluid and small, solid fragments were removed from the cyst. The cavity was thoroughly irrigated. The diaphragma sellae was covered with calcification and did not appear to have descended into the sella during surgery. Only a small part of the cyst wall was removed from the floor of the sella. Histologic examination revealed nonspecific degenerative tissue with xanthogranulomatous change. We had suggested the preoperative diagnosis of craniopharyngioma because of the CT findings of calcification and from the intraoperative observation of the sella, but we reserved complete transcranial resection or irradiation therapy because of inconclusive histopathologic findings.

The patient was discharged and regular follow-up MR imaging was scheduled. She received another course of treatment that was identical to that of her preoperative gonadotropin regimen. The cyst recurred 2 years after the first surgery, and MR imaging showed a gradual increase in size (Fig 1E). On admission, she had no abnormal neurologic findings. Endocrinologic examination showed similar results to the previous hospitalization. Skull radiography revealed a thin linear calcification in the suprasellar region.

Transsphenoidal surgery was performed 4 years after the patient's initial operation. The cyst contained thick, yellow fluid with glistening particles. A plate of bone was firmly attached to the diaphragma in the anterior part of the sella. Approximately half of the calcification along the cyst wall was removed from the cavity (Fig 1F). A part of the capsule was removed from the sellar floor. Neither anterior nor posterior lobes of the pituitary gland were identified in the sella. The diaphragma sellae did not descend into the sella. Dissection on the posterior wall of the cyst caused CSF leakage, which was controlled with an autologous fat implant. The patient's postoperative course was uneventful, and she was discharged for further gynecologic treatment.

Histologic study of the cyst wall revealed a layer of columnar epithelial cells with cilia, leading to the diagnosis of Rathke's cleft cyst (Fig 1G). The columnar cells covered the connective tissue with nonspecific inflammatory cells. These tissues have no calcification or bone formation. Histologic examination also showed a plate of mature bone without neoplastic cells (Fig 1H).

Discussion

Rathke's cleft cyst may arise between the anterior and intermediate lobes of the pituitary gland if the lumen of Rathke's pouch, which develops as an out-pouching of stomodeum, is not obliterated by the twelfth week of gestation (3). Other authors have suggested an origin arising from neuroepithelium, endoderm, or reverse metaplasia (3, 4). Histopathologically, the cyst is composed of a layer of cuboidal or columnar epithelium on a basement membrane without neoplastic transfor-

Received October 29, 1998; accepted after revision March 10, 1999.

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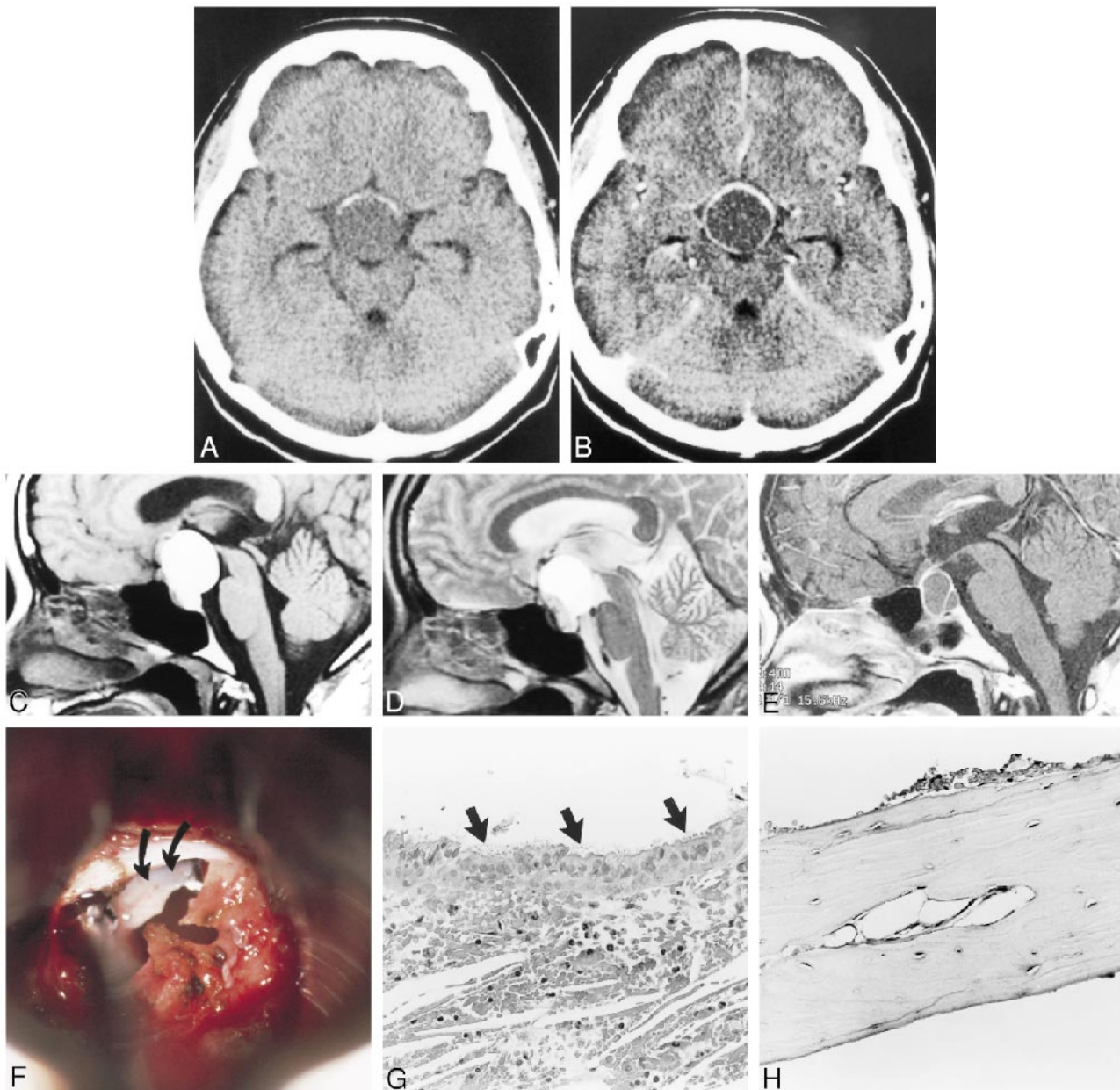


FIG 1. Calcification in Rathke's cleft cyst in a 23-year-old woman.

A, Presurgical axial CT scan of head shows crescent-like calcification in wall of suprasellar cyst.

B, Postcontrast CT scan reveals thin-ring enhancement of wall of cyst.

C, Presurgical sagittal T1-weighted MR image (400/15/2 [TR/TE/excitations]) shows hyperintense cyst with small nodule in inferior wall of cavity. Character of cyst wall is not apparent on this image.

D, Sagittal T2-weighted MR image (5000/90/1) depicts a small, nodular lesion in the anterior ventral portion of cyst. Note that cyst wall is not well defined on MR images.

E, T1-weighted MR image (400/14/2), after contrast administration prior to second surgery, shows an intra- and suprasellar cyst with enhancing thin wall and septum.

F, Intraoperative photograph shows a bony plate (*curved arrows*) in cystic cavity underneath incised dura of sellar floor (transsphenoidal approach).

G, Photomicrographs of biopsy specimen. Cyst is lined by a layer of columnar cells with cilia (*arrows*) (hematoxylin-eosin-stained section, $\times 200$).

H, Photomicrographs of a plate of mature bone removed from cyst cavity in hematoxylin-eosin-stained section ($\times 200$).

mation (5). The CT feature of Rathke's cleft cyst consists of a low-density, well-circumscribed, nonenhancing sellar mass with suprasellar extension. Several unusual findings have been reported: precontrast iso- or hyperdense and mixed lesions, cyst wall enhancement, and cyst wall calcification

(1, 6). On MR images, Rathke's cleft cysts show various signal intensities (2, 3, 6). Because of their frequent presentation and characteristically benign nature, Rathke's cleft cysts should be included in the differential diagnosis of any sellar or suprasellar cyst.

The majority of sellar cysts are craniopharyngiomas, Rathke's cleft cysts, cystic pituitary adenomas, and arachnoid cysts. Preoperative differential diagnosis is important, because the appropriate treatment for these lesions differs according to type. Calcification is considered an important clue to differentiate craniopharyngiomas from other cystic lesions.

Craniopharyngiomas have a high frequency of calcification on CT scans (7). Ossification and teeth formations have been reported in several cases of adamantinuous-type craniopharyngioma (8, 9). On the other hand, calcification was reported in only 0.2% to 8% of pituitary adenomas in radiologic studies (10), and ossification in adenomas was reported in two cases (11, 12). Though Rathke's cleft cysts are long-standing benign cysts, they rarely present with histologic findings of calcification or bone formation. It should be recognized, however, that a small percentage of Rathke's cleft cysts may have mural calcification. Eight cases with calcification have been reported in the literature (13–18), and two of those eight, along with our case, presented with histologic findings of bone formation (16, 18).

Calcification in suprasellar tumors has been classified into three types according to the shape and histologic distribution: nodular or floccular, more common cystic or curvilinear, and mixed (19). The calcification in the Rathke's cleft cysts of all reported cases, including ours, is exclusively curvilinear in shape, except for one speck-like calcification in a 74-year-old man (15). Alternatively, the majority of craniopharyngiomas have floccular-type calcification (19). Therefore, the shape of calcification may help differentiate between Rathke's cleft cyst and craniopharyngioma.

Mural calcification may represent nonspecific deposits originating from meningeal tissue or epithelial lining of the cysts. On the other hand, bone formation may be caused by osteoid metaplasia in mesenchymal cells by inflammatory, chemical, or mechanical stimulation (12). Chronic degenerative change and mechanical stimulation in the cyst might cause metaplastic ossification of the wall, as in the present case.

If a Rathke's cleft cyst is symptomatic, it should be treated carefully with simple evacuation, irrigation, and biopsy via a transsphenoidal route to avoid postoperative pituitary insufficiency. Craniopharyngiomas, however, require a different treat-

ment strategy, including the choice of meticulous dissection from the hypothalamus and other surrounding structures or irradiation or both. Our case demonstrates that although a coexisting cyst and calcification may lead to speculation of a craniopharyngioma by either radiologic or intraoperative findings, the diagnosis and decision for extensive surgery must be made on the basis of histopathologic analysis.

References

1. Kucharczyk W, Peck WW, Kelly WM, Norman D, Newton TH. **Rathke cleft cysts: CT, MR imaging and pathologic features.** *Radiology* 1987;165:491–495
2. Nakasu Y, Isozumi T, Nakasu S, Handa J. **Rathke's cleft cyst: Computed tomographic scan and magnetic resonance imaging.** *Acta Neurochir (Wien)* 1990;103:99–104
3. Ross DA, Norman D, Wilson CB. **Radiological characteristics and results of surgical management of Rathke's cysts in 43 patients.** *Neurosurgery* 1992;30:173–179
4. Voelker JL, Campbell RL, Muller J. **Clinical, radiographic, and pathological features of symptomatic Rathke's cleft cysts.** *J Neurosurg* 1991;74:535–544
5. Keyaki A, Hirano A, Llena JF. **Asymptomatic and symptomatic Rathke's cleft cysts. Histological study of 45 cases.** *Neurol Med Chir (Tokyo)* 1989;29:88–93
6. El-Mahdy W, Powell M. **Transsphenoidal management of 28 symptomatic Rathke's cleft cysts, with special reference to visual and hormonal recovery.** *Neurosurgery* 1998;42:7–17
7. Eldevik OP, Blaivas M, Gabrielsen TO, Hald JK, Chandler WF. **Craniopharyngioma: radiologic and histologic findings and recurrence.** *AJNR Am J Neuroradiol* 1996;17:1427–1439
8. Alvarez-Garijo JA, Froufe A, Taboada D, Vila M. **Successful surgical treatment of an odontogenic ossified craniopharyngioma.** *J Neurosurg* 1981;55:832–835
9. Palaoglu S, Akbay A, Mocan G, et al. **Ossified adamantinuous type craniopharyngiomas. A series of 13 patients.** *Acta Neurochir (Wien)* 1994;127:166–169
10. Horiuchi T, Tanaka Y, Kobayashi S, Yokoh A, Unoki T. **Total capsular calcification in a prolactinoma. Case report.** *Neurol Med Chir (Tokyo)* 1996;36:729–732
11. Mukada K, Ohta M, Uozumi T, Arita K, Kurisu K, Inai K. **Ossified prolactinoma: case report.** *Neurosurgery* 1987;20:473–475
12. Palaoglu S, Bavbek M, Peker S, Onol B, Sungur A, Erben A. **Ossified somatotropinoma.** *Surg Neurol* 1994;41:143–146
13. Worster-Drought C, Dickson WEC, Archer BWC. **Dyspituitarism of the Lorain type, associated with a pituitary cyst arising from Rathke's cleft and secondary lesions in the hypothalamic region and ventricles.** *Brain* 1927;50:704–718
14. Bayoumi ML. **Rathke's cleft and its cysts.** *Edinburgh Med J* 1948;55:745–749
15. Naiken VS, Tellem M, Meranze DR. **Pituitary cyst of Rathke's cleft origin with hypopituitarism.** *J Neurosurg* 1961;18:703–708
16. Adelman LS, Post KD. **Calcification in Rathke's cleft cysts (Letter).** *J Neurosurg* 1977;47:641
17. Tajika Y, Kubo O, Kamiya M, et al. **Clinico-pathological features of 5 cases of pituitary cyst including Rathke's cleft cyst.** *Neurol Surg (Tokyo)* 1982;10:1055–1064
18. Matsumori K, Okada T, Nakayama K, Miyasaka Y, Beppu T. **A case of calcified prolactinoma combined with Rathke's cleft cyst.** *Neurol Surg (Tokyo)* 1984;12:833–838
19. Burrows EH. **Pathologic intracranial calcification: Neoplasms.** In: Newton TH, Potts DG. *Radiology of the skull and brain*, Vol.1. Book 2, *The skull*. St Louis, MO: Mosby; 1971: 848–873