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Case Report

Co-localization of anterior clinoidal meningioma with craniopharyngioma: a rare case report

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Abstract: Co-localization of anterior clinoidal meningioma with craniopharyngioma is an extremely rare condition and only two cases were reported in the literature till date with the subject. Complete surgical resection plays a critical role for better prognosis in these patients. Accurate preoperative evaluation and an appropriate surgical approach are essential for treatment of these patients. However, the preoperative diagnosis of this disease still remains a challenge due to its rarity. To better identify and manage the co-localization, we herein reported a 61-year-old female with co-localization of clinoidal meningioma and craniopharyngioma in the sellar region and discussed the radiological features and the necessary surgical approaches that assist in treating it. Although very confusing, the co-localization can be identified by MRI. For complete resection of tumors, the pterional approach and fronto-orbito-zygomatic approach are recommended. Compared to the transcranial approaches, the endonasal endoscopic approach is considered more appropriate when the anterior clinoidal meningioma is small, present in the midline and below the optic nerve.

Keywords: Co-localization, craniopharyngioma, anterior clinoidal meningioma, surgical approaches, MRI

Introduction

Co-localization of anterior clinoidal meningioma with craniopharyngioma (CP) is an extremely rare condition and only two similar cases have been published so far [1, 2]. Both the anterior clinoidal meningioma and the craniopharyngioma are rare benign intracranial tumors [3, 4], and they have different origins, locations and growth characteristics. Anterior clinoidal meningioma arises from the dura of the skull base and is located in the region of anterior clinoidal process (ACP) [5]. CP originates from the pituitary stalk and usually presents as a solid-cystic mixed mass in the sellar region [4]. The best therapeutic strategy for ACP meningioma and CP is gross-total resection (GTR) as it can prevent recurrence [3-5]. However, GTR of both the tumors remains to be a challenging surgery even for the most experienced hands [3-5]. For ACP meningioma, the main surgical obstacles included shield of the middle sphenoid ridge, encased internal carotid artery and invasion of the cavernous sinus [3, 6]. For CP, the tumor residues often occur due to entangled optic nerve and hypothalamus, especially in adamantinomatous CP [7]. As these pose different surgical problems, an accurate preoperative evaluation and an appropriate surgical approach are extremely important when considering co-localization. Besides this, the preoperative diagnosis also remains a challenge due to its rare condition type. To better identify and manage the co-localization, we herein presented a case of a 61-year-old female with co-localization of ACP meningioma with CP, reviewed the literature, and discussed the radiological features as well as the required surgical approaches.

Case report

A 61-year-old female with repeated headaches for 3 years and developed visual impairment in the right eye for 1 month was presented to our hospital. Neurological examination and all hormonal tests were normal. Contrast-enhanced head MRI indicated a solid-cystic mixed mass

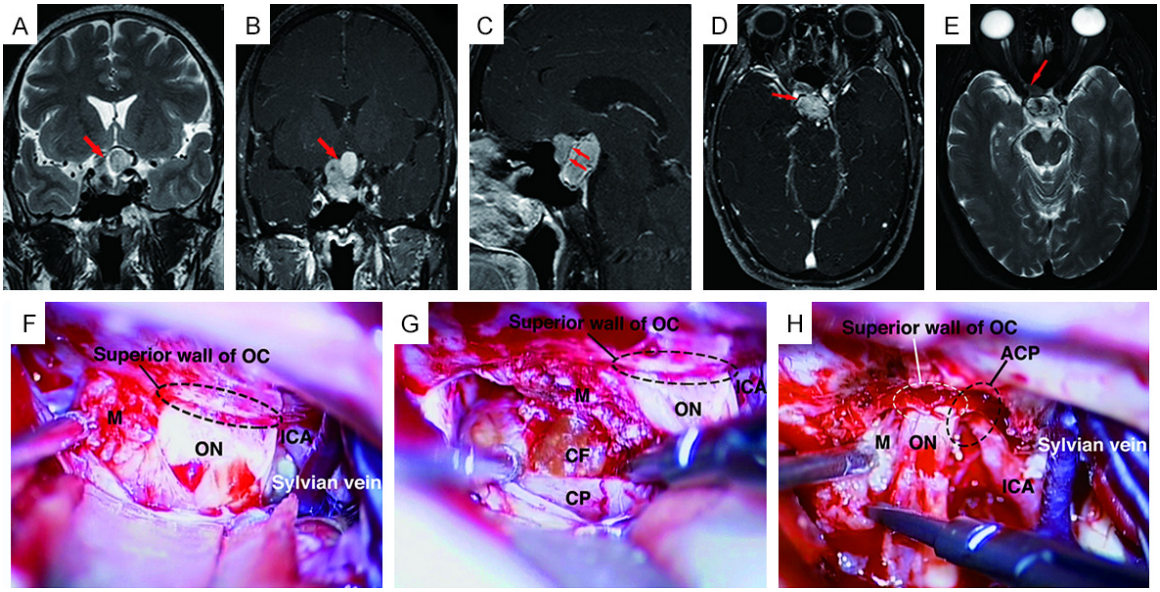

Figure 1. Preoperative head MRI and operative images. Coronal T2-weighted imaging (A) indicated a solid-cystic mass located in the sellar region (red arrow). Enhanced T1-weighted imaging (B-D) suggested that the mass was heterogeneously enhanced. Enhanced sagittal (C) and axial (D) T1-weighted images showing a black line (no-enhancement area) in the mass (red arrows). Axial (E) T2-weighted imaging showed that the mass is extended into the right optic canal (red arrow). Intraoperative image (F) of tumors before resection. Intraoperative image of (G) craniopharyngioma after partial resection of the meningioma. Intraoperative image (H) displayed unroofing of the right optic canal and performed clinoidectomy to decompress the right optic nerve and remove the meningioma in the optic canal. M, Meningioma, ON, Optic nerve, OC, Optic canal, ICA, Internal carotid artery, CP, Craniopharyngioma, CF, Cystic fluid, ACP, Anterior clinoid process.

of 2.8×1.7 cm with a heterogeneous enhancement in the sellar region (**Figure 1A-E**). Based on the patient's symptoms and imaging findings, CP was highly suspected. The patient requested surgery to remove it and underwent craniotomy through unilateral subfrontal approach. During operation, the surgeon found a suspected meningioma located in the front of the optic chiasm, middle and inferior of the right optic nerve (ON) (**Figure 1F**). After partially removing the meningioma, the CP was exposed (**Figure 1G**). The solid-cystic mixed CP with scattered calcification was located at inferior and middle of the meningioma. The surgeon carefully separated the CP from the surrounding tissue and completely removed it. The ACP origin of the meningioma and the right optical canal (OC) invasion were then found. To further expose it, the surgeon has cut the dura open by drilling a part of the superior wall of the right OC and ACP (**Figure 1H**). The residual meningioma and the dural attachment were completely resected, and postoperative CT showed complete removal of the two tumors (**Figure 2A**). Histopathological examination confirmed the diagnosis of the World Health Organization (WHO) grade I meningioma (**Figure 2B**) and adamantinomatous CP (**Figure 2C**). After undergoing operation, the patient developed severe diabetes insipidus without any other endocrine dysfunctions. Since the GTR of both tumors was obtained, she did not receive further radiosurgery. After six months, contrast-enhanced MRI confirmed no tumor recurrence (**Figure 2D-F**). Currently, she is well, showed significant improvement in diabetes insipidus and has modest visual improvement.

In this case report, all procedures performed in patients were conducted in accordance with the ethical standards of the institution and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. For this type of studies, formal consent is not required.

Discussion

Co-localization of meningioma with CP is an extremely rare condition, and only two cases have been reported so far. The details of the

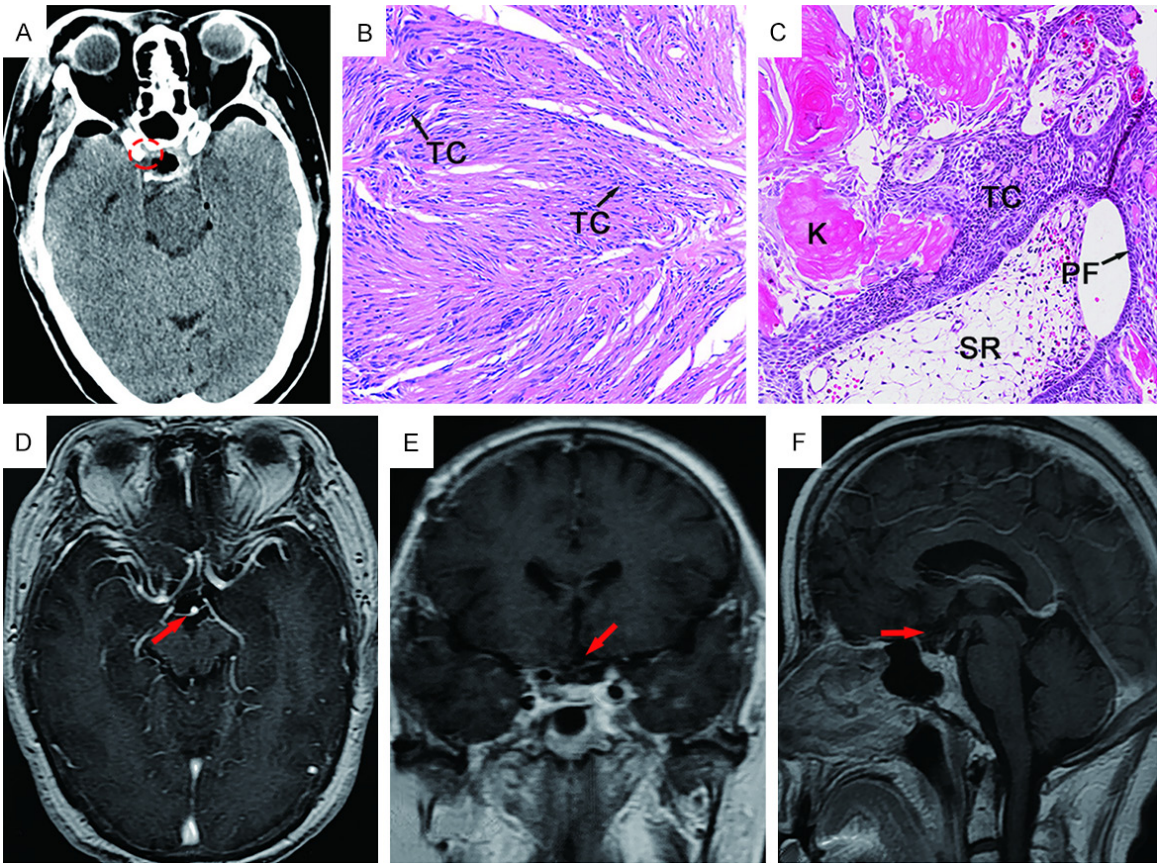

Figure 2. Repeated CT (A) showed that the tumors were completely resected, and the anterior clinoid process was partially removed (red circle). The HE stained micrographs under 100 times magnification confirmed the diagnosis of WHO grade I meningioma (B) and adamantinomatous craniopharyngioma (C). Repeated enhanced T1-weighted imaging (D-F) after 6 months of surgery indicated no tumor recurrence in the sellar region (red arrows). TC, Tumor cell, K, Keratin, PF, Picket-fench, SR, Stellate reticulum.

two cases were summarized in **Table 1** [1, 2]. In two cases, the meningioma originated from the anterior skull fossa of large size and without OC invasion. However, in our case report, the meningioma arose from the ACP region with OC invasion. Due to the origin and location of the ACP region, preoperative imaging has been more deceptive, and the diagnosis and treatment also remained more challenging.

Although very confusing, the clues of co-localization were found by preoperative imaging in all 3 cases. The origins and growth patterns are different between the skull base meningioma and CP. The skull base meningiomas arise from the dura and extend along the skull base. Differently, the CPs originate from the pituitary stalk and usually grow along the anatomical space of the intrasellar-suprasellar-third ventricle axis [8]. Besides, the two tumors demonstrated different signals and enhancement characteristics on MRI. CP often presents heterogeneous signal and enhancement due to the combination of solid, cystic and calcified components [8]. However, meningioma showed similar signals to the adjacent brain tissue on T1-weighted or T2-weighted imaging and is usually enhanced homogeneously [9]. In our case, a black line (no-enhancement area) indicated that the boundary between the two tumors was found on contrast-enhanced T1-weighted imaging (**Figure 1C**, **1D**). The OC invasion was detected on T2-weighted imaging (**Figure 1E**) and is also regarded as a supportive evidence for meningioma [8, 10].

For co-localization, the surgical goal is to complete the tumor resection. Although the subfrontal approach was performed and GTR was done in our case, this approach is not suggested for all types of co-localizations of ACP meningiomas with CP. CPs are midline tumors

Table 1. Case series summary of co-localization of meningioma with craniopharyngioma

Case No.	Author	Years	Gender/ age (yrs)	Duration of symptoms	Clinical manifestation	Location of meningioma	Location of craniopharyngioma	Approach	Resection degree	Histology	Follow-up (months)	Outcome
1	Puppa	2010	F/81	1 month	Left visual impairment; Headache	Anterior cranial fossa	Intrasellar and supsellar region	Fronto-temporal craniotomy	GTR	Meningioma; Adamantinomatous CP	1	Alive
2	Maiuri	2005	F/61	3 months	Bilateral visual impairment; Headache	Anterior cranial fossa; Supsellar region	Supsellar region; Third ventricle	Petrional craniotomy	STR	Meningioma; Adamantinomatous CP	NA	Death

F, Female; yrs, years; GTR, Gross total resection; STR, Subtotal resection; CP, Craniopharyngioma; NA, Not available.

observed in the sellar region and numerous approaches, including subfrontal, interhemisperical and pterional approaches, are effective and safe to remove them [7]. In contrast, ACP meningiomas are usually lateral tumors that extend along the skull base to the planum sphenoidale, lateral sphenoid ridge, optic canal, sellar region and cavernous sinus [3, 5]. Although the subfrontal approach offers a good view for suprasellar region, the subchiasmtic visual field and exposure of the sphenoid ridge are insufficient [7]. For ACP meningiomas with lateral, posterior or inferior extension, this approach might increase the risk of residual tumors. In contrast, the pterional approach and fronto-orbito-zygomatic approach provides a wider overview on the structures present between the middle sphenoid ridge and sellar region. These are most frequently used in the excising ACP meningiomas and are worth recommended [3, 5].

Currently, the endonasal endoscopic approach (EEA) is increasingly used for resection of CPs and anterior midline skull base meningiomas [11, 12]. In our case, EEA is considered superior over the transcranial approach. The ACP meningioma was mostly located in the medial and inferior region of the right ON. Moreover, it invades the right OC with a small volume and demonstrates no close adhesion with ON. EEA provides a direct view of the lesion without brain retraction, effective optic pathway decompression and control of tumor blood supply initially [7, 11]. However, for ACP meningiomas with wide dural attachment or with lateral extension, the overview of EEA is very limited and complete tumor resection remains difficult [11, 13, 14]. Additionally, the high rate of postoperative cerebrospinal fluid leak owing to extensive destruction of the skull base is considered a non-negligible problem [7, 11, 15].

In conclusion, co-localization of ACP meningioma and CP is an extremely rare condition and can be easily ignored. Although very confusing, the co-localization can be identified by MRI. The pterional approach and frontoorbitozygomatic approach are recommended for complete resection of tumors. Compared to transcranial approaches, EEA is regarded more appropriate when the ACP meningioma is small, and present in the midline and below the ON.

Disclosure of conflict of interest

None.

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