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Radiological features of craniopharyngiomas located in the posterior fossa

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ABSTRACT

Background and purpose: Posterior fossa craniopharyngiomas (PFCP) constitute 1.6–4% of all craniopharyngiomas and have long been neglected. The purpose of our study was to investigate neuroimaging features of this unique modality in a cohort of 7 cases.

Methods: CT and/or MR imaging features (with and without contrast enhancement) of 7 patients who underwent craniotomies for histologically proved PFCP were reviewed and analyzed retrospectively. Surgical management was also reviewed.

Results: All PFCPs arised from sellar/suprasellar region and extended into unilateral cerebellopontine angle in 6 cases, and bilateral in 1 case. Seven tumors were of retrochiasmatic origin and 5 of 7 were of retrostalk growth pattern with location in the ventral area of brain stem. On CT scans, tumors were isodense in solid component and hypodense in cystic component with (4/7) or without calcification (3 /7) and destruction in sellae turcia (2/7). Tumors demonstrated cyst formation (7/7) with hypointense on T1-weighted imaging and hyperintense on T2-weighted imaging in 5 cases, hyperintense both on T1- and T2-weighted imaging in 2 cases. The solid components and capsule revealed mild to moderate inhomogeneous enhancement after administration of contrast agents. Total tumor removal was accomplished in 5 cases, subtotal removal and partial removal in 1 case respectively.

Conclusions: PFCPs are well demarcated, contrast-enhanced tumors, typically with cystic parts or purely cyst. Most of PFCPs demonstrate a retrostalk growth pattern and characteristic connection. Tumor with cystic component arises from sellar region and then extends to posterior fossa, which should be strongly suspected as a PFCP. The combined supra- and infratentorial approach is an ideal choice for surgical management of PFCP.

1. Introduction

Craniopharyngiomas (CP) are rare, benign, slow-glowing, epithelial tumors with an incidence of 4–6% of all primary intracranial tumors [1,2]. Craniopharyngiomas arise from embryologic squamous cell residuals or metaplasia from adenohypophysis and can occur anywhere along the path of the crainopharyngeal duct and mainly located within the sellar/parasellar region [1–7]. Although the tumors mainly locate in the area, they associate with an unpredictable growth pattern, such as extending into anterior fossa, middle fossa, sinus, third ventricle, cerebellopontine angle (CPA), foramen magnum, or even posterior fossa [1,8–15].

Much attention has been given to diagnosis and management of sellar/suprasellar CPs because of their high morbidity and mortality [2,16–20]. Conversely, craniopharyngiomas of posterior fossa (PFCP), representing approximately 1.6–4% of all CPs, have been neglected, probably because of its extremely low prevalence [21]. With the application of magnetic resonance imaging (MRI), the incidence of PFCP shows an increasing tendency. PFCPs have obviously different neuroimaging features from their sellar/supersellar counterparts, which are of importance for us to make correct preoperative diagnosis. However, apart from sporadic case reports, there is no article systemically investigating imaging features of PFCP [10,22–24]. In this paper, we reviewed 7 cases with PFCP treated at our department in the past 13 years. Typical computed tomography (CT) and MRI features were reported and discussed. Associated clinical data and differential diagnoses are also discussed.

2. Methods

2.1. Patients

From January 1995 to December 2007 (13 yrs), 437 patients were microsurgically resected for craniopharyngiomas in our institution,

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and 7 cases of craniopharyngiomas in posterior fossa were identified. The definitive diagnosis of CP was pathologically proved through surgical specimen. PFCP disconnected to sellar area was excluded in this study. Radiological files of all 7 patients were available, however, types of CT and MRI scanners varied.

2.2. Imaging

In all patients, axial plain and contrast-enhanced CT scans with section thickness ranging from 2–5 mm were available, and CT scans with bone algorithm were available in 4 of these patients. MR images were available in all patients, including noncontrast T1- and T2-weighted sequences and contrast-enhanced T1-weighted sequences in all patients. The parameters of the T1-weighted imaging were 450–550/15–22/2–4(repetition time/echo time/excitations). The T2-weighted imaging obtained using conventional spin-echo sequences with parameters of 2500/100, 40/2 in 5 patients, and fast spin-echo sequences with parameters of 3500/95/2 and 4000/20/2 in 2 patients, respectively. MR section thickness was 2–5 mm, and intersection thickness ranged from 1–2 mm. All patients were followed-up with MR imaging or CT scans.

All images were evaluated independently by a senior neurosurgeon and a senior neuroradiologist in this study. Consensus was reached concerning neuroimaging features, and there were no significant disagreements. Important parameters were investigated, and special characteristics were emphasized. The parameters included: size, location, growth pattern, origin, calcification, signal intensity, component of tumor, and pattern and extention of contrast enhancement.

2.3. Approach and management

Because of mass effect and increased intracranial pressure, all patients have their tumors surgically resected. Eight craniotomies were performed in the 7 patients. A combined supra- and infratentorial approach was utilized in 5 patients. According to individual tailoring management, the fifth patient, who presented a giant and complicated tumor extending from cervicomedullary junction to corpus callosum underwent partial resection with retrosigmoid approach. Moreover, the other patient (7th), whose tumor extended to inferior clivus, underwent an orbito-zygomatic approach with total tumor removal. Two patients with residual tumor received adjuvant gamma knife therapy.

3. Results

3.1. Demographic data

During the past 13 years, 7 of 437 patients with pathologically proved craniopharyngiomas were identified as PFCP, the incidence was 1.6%. Patient age ranged from 9 to 37 years at presentation, with a mean age of 18.4 years. Patients in this series included 4 males and 3 females, and 4 children, 2 adults and 1 adolescent. The follow-up period in this study ranged from 3 months to 145 months (average 68.5 months).

3.2. Clinical presentation

The most common presenting symptoms were headache and dizziness (5 patients), followed by ataxia (4 patients), growth failure, hearing loss, blurred vision and hypothyroidism in 3 cases, respectively. Polyuria, obesity, defection of lower cranial nerve, nausea and vomiting were presented in two patients. Menses disorder, askance, diplopia, hemiparaysis and diabetes insipidus were presented in one patient each. PFCP was discovered incidentally in one patient by CT scan after a traffic accident.

3.3. Neuroimaging characteristics

In this series, the reports of MR images and CT scans were available for review in all patients. The tumors shared similar neuroimaging characteristics. All the tumors were retrochiasmatic and most were retrostalk (5/7), while pituitary stalk can be seen in 5 cases, and unidentifiable in 2 cases. The major part of 7 tumors was extended into the posterior fossa with minor parts in sellar area. Four tumors were located in the left CPA (57.14%), two in the right (28.57%), and one bilateral (14.26%). All CPs were giant tumors with mean diameter more than 5 cm at the greatest dimension, five were between 5 cm and 7 cm, one 8.5 cm (Table 1). One patient harbored a tumor of 6.5 cm in diameter assaulting bilateral CPA in her first visit to our institution and refused a craniotomy for her dread. However, tumor grew into greater

Table 1
Neuroimaging features of 7 patients with CP in posterior fossa.

Patient no.	Tumor location	Size (cm)	Composition	CT			MRI		
				P	C	Cal	T1WI	T2WI	Enhancement
1	Posterior fossa, arising from the sellar region and extending to LCPA	6	Mixed	Iso	+	+	Hyper(cyst) Iso (solid)	Hyper/Iso	Non-cystic area heterogeneous minimal enhancement
2	Posterior fossa, arising from the sellar region and extending to LCPA	7	Purely cyst	Iso	+	−	Hypo	Hyper	Non-cystic area heterogeneous moderate enhancement
3	Posterior fossa, arising from the sellar region and extending to LCPA and infraclivus	5	Mixed	Hypo(cyst) Iso (solid)	+	+	Hypo(cyst) Iso (solid)	Hyper/Iso	Non-cystic area heterogeneous moderate enhancement
4	Posterior fossa, arising from the sellar region and extending to RCPA and the foramen magnum	6	Purely cyst	Iso	−	+	Hypo	Hyper	Cystic walls uniform moderate enhancement
5	Posterior fossa, arising from the sellar region and extending to bilateral CPA and upper cervical vertebra, corpus callosum	10	Purely cyst	Hypo	Minimal	−	Hypo	Hyper	Cystic walls heterogeneous minimal enhancement
6	Posterior fossa, arising from the sellar region and extending to LCPA and infraclivus	5.5	Mixed	Hypo(cyst) Iso (solid)	Moderate	+	Hypo(cyst) Iso (solid)	Hyper	Non-cystic area heterogeneous moderate enhancement
7	Posterior fossa, arising from the sellar region and extending to RCPA and infraclivus	6	Mixed	Slight hyper(solid) hypo(cyst)	Moderate	−	Iso(solid) Hyper (cyst)	Iso/hyper	Non-cystic area heterogeneous moderate enhancement

Note: Cal, calcification; CT, computed tomography; C, contrast; F, female; Hyper, hyperintense; Hypo, hypointense; Iso, isointense; LCPA, left cerebellopontine angle; M, male; MRI, magnetic resonance imaging; P, pain; RCPA, right cerebellopontine; —, negative.