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Clinical study on microsurgical treatment for craniopharyngioma in a single consecutive institutional series of 335 patients

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ABSTRACT

Objectives: The optimal management of craniopharyngioma is still controversial. The aim of this study is to explore microsurgical outcomes of craniopharyngioma in 335 cases.

Patients and Methods: Clinical data of 335 consecutive patients with craniopharyngioma between March 2011 and March 2017 were retrospectively analyzed.

Results: Gross total resection (GTR) was achieved in 265 cases (79.1%), subtotal resection (STR) was obtained in 70 cases (20.9%). The GTR rate was 81.93% in pediatric group and 78.17% in adult group respectively, no significant difference regarding the GTR rate was found in adult group compared with in pediatric group ($p > 0.05$). However, there was a noticeable difference in the elevated hypothalamic obesity in children group compared with in adult group after operation ($p < 0.05$). Multivariate analysis indicated that the tumor recurrence and surgical times played a negative role in the resection extent, the odds ratio and 95% confidence interval of the tumor recurrence and surgical times is [0.306 (0.155–0.603), ($p < 0.01$)] and [2.135 (1.101–4.142), ($p < 0.05$)] respectively. There was significant difference on panhypopituitarism between GTR and STR group ($p < 0.05$). However, No significant difference regarding the postoperative visual dysfunction and indepent quality of life respectively between GTR and STR group was found ($p > 0.05$). Additionally, there were no statistically significant differences for recurrence-free curves between GTR and STR plus adjuvant radiotherapy ($p > 0.05$).

Conclusions: Present findings demonstrated that tumor recurrence and surgical times contribute to negative total resection for craniopharyngioma. Postoperative precise adjuvant radiotherapy was considered in selected cases if pursuit of GTR was rather dangerous under disadvantageous removal factors.

1. Introduction

The optimal management of patients with craniopharyngioma remains controversial and a formidable challenge due to lesion involved in vital structures such as hypothalamus, pituitary stalk, ophthalmological systems and circle of willis. The debate focuses upon those advocating radical resection for surgical cure due to craniopharyngioma being a benign tumor. Since the excellent surgical outcomes for complete resection of craniopharyngioma were obtained by Yasargil MG et al. [1] in 1990, more and more neurosurgeons still attempt for radical removal of craniopharyngioma in the primary operation, Hoffman HJ et al. [2] reported that over 60% of craniopharyngiomas in childhood can be totally resected with minimal significant morbidity and mortality. Subsequently, Zhang YQ et al. [3] proposed that surgical remove of craniopharyngioma as much as possible in 2008. Lee EJ et al. [4] recently advocated that the complete removal of a craniopharyngioma at first surgery can provide a chance for a cure with acceptable morbidity and mortality risks.

However, recent evidence revealed that Gross total resection (GTR) for craniopharyngioma was associated with increased rate of new endocrine dysfunction and panhypopituitarism as well as new neurological deficits [5]. Moreover, no significant difference was observed in the 5- and 10-year overall survival (OS) and progression-free survival (PFS) between total resection and subtotal resection (STR) following by adjuvant radiotherapy (AR) [6]. Large national database also exhibited that utilization of adjuvant radiotherapy had increased from 18% in

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Table 1
Demographic data on 335 cases with Craniopharyngioma.

Variable	Number of cases (%)
Age groups	
1–17 years	83 (24.78%)
18–59 years	219 (65.37%)
60–70years	33 (9.85%)
Gender	
Male	185 (55.22%)
Female	150(44.78%)
Tumor Locations	
Purely intrasellar-infradiaphragmatic	19 (5.67%)
Intra-and suprasellar, infra-and supradiaphragmatic	8 (2.39%)
Supradiaphragmatic,parachiasmatic,extraventricular	256 (76.42%)
Intra-and extraventricular	26(7.76%)
Paraventricular in respect to the third ventricle	14(4.18%)
Purely Intraventricular	12 (3.58%)
Tumor Size	
≤2 cm	64 (19.10%)
2–4 cm	194 (57.91%)
4–6 cm	62 (18.51%)
≥6	15 (4.48%)
Tumor features	
Solid	49(14.63%)
Cystic	52(15.52%)
Mixture (Solid and cystic)	234(69.85%)
Calcification	
With	144(42.99%)
Without	191(57.01%)
Symptoms	
Headache, vomiting	174 (51.94%)
Visual disturbance	232(69.25%)
Dizziness	64(19.10%)
Menstrual disorder	29(8.66%)
Diabetes insipidus	33(9.85%)
Developmental delay	24 (7.16%)
Memory decline	15(4.48%)
Muscle weakness	13 (3.88%)
Hypaphrodisia	11 (3.28%)
Epilepsy	4 (1.19%)
Drowsiness	12 (3.58%)
Hydrocephalus	
With	52 (15.52%)
Without	283 (84.48%)
Endocrine level	
Abnormal	214(63.88%)
Normal	121(36.12%)
Surgical Approach	
Transsphenoidal approach	24 (7.16%)
Transcranial approach	311(92.84%)
Pterional	145(46.62%)
SI	151(45.07%)
CII	8(2.39%)
Combined	7(2.09%)
Surgical times	
First operation	298(88.96%)
Repeated operation	37(11.04%)
Surgical resection	
Total resection	265(79.10%)
Subtotal resection	70(20.89%)
Complications	
Diabetes insipidus	282(84.18%)
Electrolyte disturbance	267(79.70%)
Transient subcutaneous effusion	14(4.18%)
Cranial Nerve injury	24(7.16%)
Intracranial hemotoma	8(2.39%)
CSF Leakage	7(2.09%)
Intracranial infection	5(1.49%)
Epilepsy	11(3.28%)
Radiotherapy	
Total resection group	6(2.26%)
Subtotal resection group	64(91.4%)
Follow-up	
Recurrence	39(11.64%)
Death	9 (2.69%)

Abbreviation: SI: subfrontal interhemispheric; CII: callosal-interseptal-interforniceal, CSF: cerebrospinal fluid.

2004–2007 to 24% in 2008–2012 following limited surgery for craniopharyngioma in USA. Limited surgery plus radiotherapy was associated with significantly improved OS compared to limited surgery [7]. The similar shift tendency towards more adjuvant radiotherapy following conservative surgery occurred in United Kingdom, the prevalence of serious hormone deficiency after STR + AR had remarkably decreased currently [8]. Hence, Surgery for craniopharygngioma, especially in childhood and adolescence, has evolved from an era of aggressive strategies to a more individually tailored therapy that avoids immediate treatment-related and long-term morbidity [9].

The aim of present study was to evaluate our management outcomes regarding craniopharyngioma between GTR and STR + AR. In addition, the related factors which influence upon surgical resection extent and microsurgical results were also analyzed.

2. Materials and methods

2.1. Participants

A total of 335 consecutive patients with craniopharyngioma underwent surgical treatment in our neurosurgical center between March 2011 and March 2017. All patients gave written informed consent for the surgery and for use of data and sample for research purpose prior to the surgery. Institutional review board gave a waiver to this retrospective study. There were 185 males and 150 females, whose age ranged from 1 to 70 years, with a mean of 35.4 years. There were 83 pediatric and 252 adult craniopharyngioma respectively. The primary operation was performed in 298 patients, recurrent operations including second or third operations were adopted in 37 cases. According to the standard of Gerganov V [10], an extensive craniopharyngioma is a tumor that extends into multiple compartments (subarachnoid spaces) and attains a size larger than 4 cm, there were 77 cases which belong to extensive craniopharyngioma. All patients underwent neurological, ophthalmological and endocrinological examinations. 232 patients were found to have visual disturbance and 85 cases presented with deficit of visual field. Severe visual impairment included unilateral blindness in 12 patients and bilateral blindness in 2 patients respectively, in addition, four patients presented with diplopia. Increased intracranial hypertension such as headache and vomiting was found in 174 cases, hydrocephalus was noted in 52 patients. The detailed clinical manifestations were shown in Table 1. Postoperative hypothalamic obesity was defined as a body mass index greater than 25 kg/m^2, according to the standard of World Health Organization.

2.2. Endocrinology blood testing

The endocrinological investigations were assessed in all patients at our hospital as a routine test. Multiple measurement of plasma antidiuretic hormone, growth hormone, prolactin, adrenocorticotrophic hormone (ACTH), cortisol, 24 h urinary free cortisol, free thyroxine (T_3 &T_4), thyroid-stimulating hormone (TSH). Postoperative endocrinological examinations revealed a completely normal status in 121 patients, the others had one or two or three hormone deficits in 214 cases, partial panhypopituitarism was found in 47 patients.