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Tentorial meningiomas: Surgical options, clinical feature and management experience in 43 patients

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ABSTRACT

Objective: To investigate the optimal treatments and the prognostic factors of the tentorial meningiomas (TMs).
Methods: The data of clinical symptom, imaging examination, surgical approaches as well as the influence factors of gross total resection (GTR) of 43 TMs cases were analyzed retrospectively.
Result: Imaging examinations of computer tomography (CT) and magnetic resonance image (MRI) were performed in all 43 cases. The angiographies such as computer tomography angiography (CTA), digital subtraction angiography (DSA), magnetic resonance angiography (MRA) and magnetic resonance venography (MRV) were obtained in part of these cases. The TMs can be classified into 2 types as superior/inferior to the tentorium, and subtypes as medial/lateral, anterior/middle/posterior according its location and the origination of the tumor. Six different surgical approaches were utilized in the study mainly depending on the tumor location and the surgeon's preference. CT scan was performed in all patients 6 h after the operation. Follow-up MRI with contrast was also obtained 3 months later. Simpson's grade of excision was applied. GTR was defined as Simpson grade I and II, and was acquired in 34 cases, in which Simpson grade I resection was accomplished in 15 cases, and subtotal resection (STR) was defined as more than 90% of the tumor volume was removed and was acquired in 7 cases; histopathology revealed 34 benign (grade I), 8 atypical (grade II), and 1 malignant (grade III) cases.
Conclusion: Elaborate imaging examination, microsurgical skills as well as the choices of approaches and management of the sinus involved are the main prognostic factors of the TMs.

1. Introduction

Tentorial meningiomas (TM) are complex entities with an intricate relationship to surrounding structures, and the onset age mostly ranges from 40 s to 50 s. Approximately 60–70% of cases occur in women [1]. They grow slowly and may be present for 2 years before producing symptoms. With improvement in neuroimaging and microsurgical concept, there has been a steady improvement in the results [2]. In this study, we report our surgical experience with TMs of different kinds.

2. Material and methods

2.1. Cases

A retrospective study including 43 patients diagnosed with TMs was included in the study provided by two centers (FuXing hospital affiliated to Capital Medical University and YuHuangDing hospital affiliated to Medical College of Qingdao University) in 5 years (2008–2013). Data obtained from the files of the patients were analyzed: 36 of the patients were females and 7 were males; the ages ranged from 27 to 78 years with a mean of 52.2 years; the total duration of the symptom in our patients had a wide range from 1 day to 6 years (median duration: 1.33 ± 0.26 months).

2.2. Symptoms

Typical signs were always absent in early stage; headache (83.7%), vertigo (58.1%), vomiting (41.9%), blurring of vision (30.2%) were the most common symptoms. Some patients present with

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Table 1
Symptoms at presentation in patients with tentorial meningiomas ($n = 43$).

Characteristics	C (Nu.) or time	R% or (Ave)
Age (years)	27–78	52.186
Sex		
Female	36	83.7
Male	7	16.3
The presymptoms duration	1 day to 6 years	1.33 ± 0.26 years
Symptoms and signs		
Headache	36	83.7
Vertigo	4	9.3
Blurring of vision	13	30.2
Diplopia	3	7.0
Visual field defect	1	2.3
Gait ataxia	12	27.9
Hearing loss	4	9.3
Tinnitus	1	2.3
Dysphagia	5	11.6
Vomiting	18	41.9
Facial numbness	6	13.9
Seizures	2	4.6
Facial paralysis	2	4.6
Unconsciousness	2	4.6
Transient aphasia	1	2.3
Previous resection	3	7.0
Neuroimaging evaluation		
Angiographic evaluation	40	93.0
MRI	43	100
CT	43	100

Angiographic evaluation: CTA/MRA/MRV/DSA.

the symptoms of seizure, disturbance of consciousness and cranial nerve VII/VIII defect. Physical examination on admission was disclosed (list in Table 1).

2.3. Imaging examinations

Angiographic evaluation (CTA/MRA/MRV/DSA) provides useful informations on the arterial supply (which is mainly from the tentorial branches of the internal carotid arteries and occasionally from the middle meningeal arteries) and the important relationships of the tumor with the deep venous system and the degree or infiltration of occlusion of the sinus. CT scans showed a roundish homogeneous mass with an isodense or slightly hyperdense signal. The MR was performed to evaluate the size and location of the tumor, its relationship to the surrounding structures, the amount of ventricular dilatation as well as the blood supply and the venous drainage. MRI showed a round, generally uniform mass isointense or hyperintense on T1-weighted sequences. T2-weighted sequences showed hyperintense lesions, markedly enhanced after the injection of gadolinium. Preoperative neuroimaging studies in patients disclosed biventricular or triventricular hydrocephalus accompanied in 8 cases by signs of transependymal resorption. Preoperative embolization can be used to decrease the blood supply especially from the external carotid artery, meningohypophyseal trunk and ascending pharyngeal artery, while DSA revealed total obstruction of the transverse sinus in two patients.

2.4. Classification

Pathology of meningiomas was classified according to the WHO [3] into three groups: benign (grade I), atypical (grade II) and malignant (grade III). The TMs can be classified into two types as superior/inferior with sole or predominant of their volume to the tentorium, and subtypes such as medial/lateral, anterior/middle/posterior according to their location and the base of the tumors. The maximum tumor diameters ranged from 3.0 to 8.0 cm (median size: 4.5 ± 1.48 cm). The surgical approaches adopted in our patients were based upon the site of the lesion, its position on the tentorium, its anatomic relationship to the surrounding neurovascular structures. The surgical approaches undertaken were as follows: modified pterional approaches in 3 cases, subtemporal approach in 10 cases, suboccipital retrosigmoid approach in 12 cases, suboccipital transtentorial approach in 7 cases, infratentorial supracerebellar approach in 7 cases and combined superior–inferior tentorial approach in 4 cases.

2.5. Tumor resection

The extent of excision was categorized according to Simpson's grading system for tumor removal [4], and the criteria were based on follow-up MR 3 months later and also the surgeon's observation during the procedure. GTR was defined as no residual tumor was found on the MR images, with equality to Simpson grade I and II and STR was defined as more than 90% of the tumor volume was removed. Partial resection(PR): tumor residual less than 50% but larger than 10%. One quantitative and therefore objective criterion used for the assessment of biological behavior is the Ki-67 (MIB-1) proliferation index, the marker most actively studied in meningiomas so far.

3. Result

Surgical procedure was done in all patients by the senior author (Jun Yang). No patient died during the process. GTR was acquired in 34 cases (Fig. 1), in which Simpson grade I resection was accomplished in 15 cases, STR was acquired in 7 cases, and PR was acquired in 2 cases.

The surgical approaches include Modified pterion, subtemporal, suboccipital retrosigmoid, suboccipital transtentorial, infratentorial supracerebellar and combined superior–inferior tentorial approach.

Almost all symptoms in this group released in a certain degree. The most significant improvements were also in the abatement of the following symptoms: headache in 35 cases, vertigo in 20 cases, gait ataxia in 8 cases, blurring of vision in 12 cases, hearing loss in 2 cases. 3 cases had a transient worsening of the aphasia and 1 case had a transient worsening of the cortical blindness after surgery, and complications include meningitis, cortical blindness, transient aphasia, transient blurred vision, the hematoma, cerebrospinal fluid leak, and cranial nerve palsy (listed in Table 3).

There are three types of pathology according to WHO, namely I, II, and III, corresponding to a negative or positive ki-67 with a mean dose of 3.2%, positive ki-67 with a mean dose of 7.6%, and a positive ki-67 with a mean dose of 15% respectively. The pathology of the lesion revealed benign (grade I) in 34 cases, atypical (grade II) in 8 cases and malignant (grade III) in 1 case (listed in Table 3).

All patients underwent clinical assessment about 3 months after operation as expressed by the Karnofsky scale ranging from 50 to 100 with a mean value of 89.3 (listed in Table 3), and yearly thereafter. Clinical and radiological follow-up assessment 1 year after discharge was available for 43 patients (100%) with follow-up ranging from 1 month to 5 years (mean follow-up: 2.1 ± 0.45 years). It showed that 35 patients resumed their previous activities with no obvious symptoms, six returned to previous activity level with major cranial nerve palsy, and one patient required permanent assistance. Five patients had recurrence in which reoperation was performed in 4 cases. No patient has been lost to late follow-up. Improvement in symptoms of raised intracranial pressure occurred in all the patients. The updated follow-up was done by phone calls, letter correspondence and out-patient review yearly. We reserved postoperative radiotherapy for six patients with residual tumors involving the sinus or engulfing critical neurovascular structures or