Original Article

Microsurgical Excision of Olfactory Groove Meningeomas, Comparative Studies of Different Surgical Approaches

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Abstract

To review the surgical approaches, techniques, outcomes, and recurrence rates in a series of 6 olfactory groove meningioma (OGM) patients operated from January 2010 to April 2011. Methods: Six patients underwent craniotomy and micro-neurosurgical removal of olfactory groove meningioma maximum. Tumor diameter varied from 5 to 8.5 cm among six cases, 2 cases underwent glabellar mini craniotomy another 2 by bifrontal approach and rest of them were by frontolateral approach. Result: Total removal was possible in all cases. Histopathology revealed typical meningioma (WHO grade 1). there was no operative mortality and no permanent focal neurological deficit except anosmia. One patient developed leak and two cases meningitis which was resolved by lumber drain and antibiotic therapy. No tumor recurrence within six months of followup.

For the removal of large olfactory groove meningiomas we used three different surgical approaches: frontolateral approaches, bifrontal approach and glabellar mini craniotomy. We consider the frontolateral approach is an alternative, if not superior, to standard bifrontal approaches.

Introduction

Olfactory groove meningiomas (OGMs) account for 4.5 to 13% of all intercranial meningiomas[1]. Olfactory groove meningiomas arise in the midline over the cribriform plate and frontosphenoidal suture[1,2]. It is well known that most of these tumors occupy the floor of the anterior cranial fossa, extending all the way from the crista galli to the tuberculum sellae[1,2,3].

The main distinguishing feature is the location of the optic apparatus in relation to the tumor. OGMs push the optic nerves and the chiasm downward and posteriorly as they grow. Tuberculum sellae meningiomas elevate the chiasm and displace the optic nerve superolaterally; thus, the tumor occupies a subchiasmal position[4,5]. These benign, slow-growing tumors frequently achieve large size before detection Diagnosed at a late stage, they usually have already reached a large size[2] and are highly vascularized and covered by stretched and swollen brain parenchyma[5,6]. the tumor is very large and/or infiltrates or involves surrounding structures, making its removal challenging. Several surgical approaches can be applied for tumor removal[6]. Traditionally, bifrontal craniotomy has been used with subfrontal approach to the tumor. More recently, some surgeons have used a pterional approach. More aggressive approaches have been proposed for resection of OGMs expanding into the paranasal sinuses and orbits, including transbasal, extended transphenoidal, and fronto-orbital approaches, bifrontal craniotomy combined with orbital or nasal osteotomies, and craniofacial resection[6,7]. Therefore, various approaches have been used for surgical removal of these lesions. Olivecrona and Urban in 1954 and Cushing and Eisenhardt in 1985 described a unilateral frontal craniotomy followed by partial resection of the frontal lobe in order to expose the tumor. Dandy[6] used an even larger approach by performing a bifrontal craniotomy plus partial bifrontal lobectomy[7,8].

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Materials and Methods

From January 2010 through May 2011, our neurosurgical tem operated on 6 patients with OGM tumors in Bangabandhu Sheikh Mujib Medical University Hospital, and some private hospitals. Demographic data are presented in Table 1. There was a significant female predominance (4 patients out of 6). Patient age ranged from 30 to 65 years.

Table 1: Demographic data of 6 patients operated for olfactory groove meningioma

Characteristic	No. of patient
Sex	
Male	2
Female	4
Age (yr)	
Median	45
Range	30-65

Headache was the most common symptom to these patients. Anosmia and mental and personality changes were the next common manifestation. Visual impairment were found only in two cases associated with papilledema (Table-2). All patient underwent preoperative and postoperative CT scan and or MRI of brain.

Table- 2: Demographic study of age, symptoms, CT/MRI findings and size of the tumor.

Sl NO.	Age/Sex	Presenting symptoms	CT/MRI findings the tumor	Maximum diameter o
1.	35/F	1. Headache 2. Vomiting 3. Anosmia	Olfactory groove meningeoma	5 cm
2.	55/M	1. Headache 2. Vomiting 3. Anosmia 4. Visual blurring 5. Irrelevant talking	Olfactory groove meningeoma	6.5cm
3.	65/F	1. Headache 2. Vomiting 3. Anosmia 4. Irrelevant talking	Olfactory groove meningeoma	8.5 cm
4.	35/F	1. Headache 2. vomiting	Olfactory groove meningeoma	6 cm
5.	30/F	1. headache 2. vomiting 3. visual blurring	Olfactory groove meningeoma	8 cm
6.	55/M	1. headache 2. vomiting 3. Anosmia	Olfactory groove meningeoma	8 cm

Radiological features

Maximum tumor diameter was 8.5 cm (range from 5-8.5 cm). Intercranial tumor with extension to ethmoidal sinuses were found in two cases. Hyperostosis of the ethmoid sinus was found in one case.

Surgical techniques

In all the cases surgery was performed with the help of an operating microscope and microsugical instrumentation. Tumors were operated on through the Glabellar mini craniotomy (2 cases), frontolateral (2 cases)and bifrontal approaches(2 cases). Bifrontal approach was choosen for larger diameter of the tumor.

Followup

All the six patients were followed-up with early postoperative CT scan and neurological evaluation. The follow up period were ranged from 1 month to six months. Visual acuity was assessed both pre and post operatively. No recurrence of tumor found within this short period of follow up.

Results

Total tumor removal (Simpsons Grade 1 or 2) was achieved in most of the cases, 6 patients. CSF leak was found in one case. There is no mortality in six cases (Table-3). Two patients developed meningitis and one case developed C.S.F. rhinorrhoea along with meningitis. This patient was treated by antibiotic therapy and lumber drain for C.S.F. leak. Small subdural hygroma was developed in one case. Small amount of tumor bed haematoma in one case. Steven jhonson syndrome was developed in one case following phenytoin therapy.

Table-3: Outcome according to surgical approach.

Sl NO.	Approach	Extent of tumor removal	Complication	Outcome
1.	Glabellar minicraniotomy	Gross total	Meningitis	GOS 5
2.	Glabellar minicraniotomy	Gross total	Impaired consciousness for three days	GOS 5
3.	Bifrontal craniotomy	Gross total	NIL	GOS 5
4.	Fronto lateral craniotomy	Gross total	NIL	GOS 5
5.	Bifrontal craniotomy	Gross total	Meningitis	GOS 5
6.	Fronto lateral Craniotomy	Gross total	NIL	GOS 5

Discussion

The bifrontal approach, proposed earlier by Tonnis is recommended for removal of large frontobasal tumors, and so it is advocated for large olfactory groove meningiomas[9] (Figure-1). For many years, bifrontal craniotomy followed by subfrontal access to the tumor have been considered standard approaches for OGM resection. Mortality rates in the literature vary from 0% to 17% and even 22.7% in the old literature. Complications include postoperative epilepsy, postoperative hematoma, hemiparesis, visual and mental deterioration, bone flap infection, and CSF leak. Surgical approaches have continued to evolve over time[10].

Bifrontal Craniotomy with Subfrontal Approach

The advantage of the bilateral subfrontal approach, wide symmetrical anterior cranial fossa exposure. This approach provides excellent opportunity for radical tumor resection, drilling of hyperostosis in the cribriform plate area, planum sphenoidale and tuberculum sellae, and unroofing of optic nerves when necessary (Fig-2,3). Disadvantages are also well known. The frontal sinuses are usually opened resulting CSF leak and possibilities of meningitis. The most important structures-the optic apparatus, carotids, and the anterior communicating complex-come into view after the end of surgical removal. The superior sagittal sinus should be divided, compromising venous drainage from the frontal lobes and thus contributing to diffuse bifrontal cerebral edema. Preservation of the both olfactory tracts are not possible.

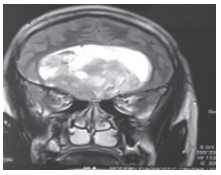

Fig: 1 MRI shows huge of factory groove meningioma

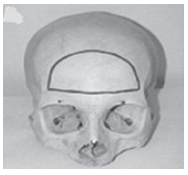

Fig:2 Shows extent of bifrontal craniotomy

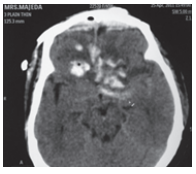

Fig:3 Postoperative evidence of tumorbed haemoragic cutution.

Frontolateral Craniotomy with Subfrontal Approach

This approach has the advantage of sparing the contralateral frontal lobe and the ligation superior sagittal sinus. The disadvantages includes small opening with a very narrow view (Fig-4, 5, 6, 7).

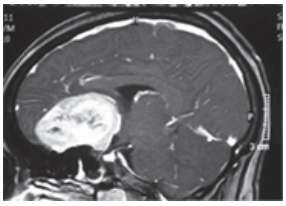

Fig:4 MRI shows huge olfactory groove meningioma in sagittal image.

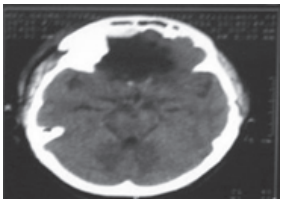

Fig:5 Postoperative evidence of complete tumor removal.

Fig:6 Scar for frontolateral approach

Fig:7 extent of bone removal in frontolateral apporach

Glabellar mini craniotomy approach

This is a modified approach for anterior skull base where both the frontal sinuses are exposed through a linear incision connecting the two eyebrows over the nasion. Again the disadvantages are CSF leak, meningitis. Superior sinus is incised hence chance of brain swelling may take place (Fig-8, 9, 10, 11).

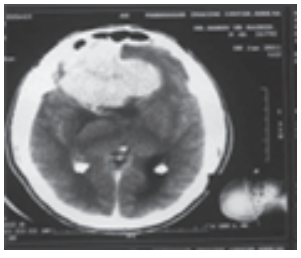

Fig:8 CT shows brilliant contrast enhancing olfactory groove meningioma

Fig:9 Scar following glabellar mini craniotomy

Fig:10 extent of bone removal

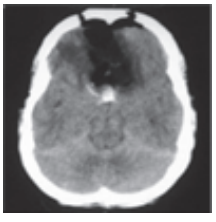

Fig:11 postoperative evidence of no residual tumor and small haematoma in the tumorbed

For the removal of large olfactory groove meningiomas we used three different surgical approaches: frontolateral approaches, bifrontal approach and glabellar mini craniotomy. The frontolateral approach permitted, even in large meningiomas, high rates of total tumor resection with low recurrence rates and less brain exposure. The use of microsurgical techniques allowed total removal of the large OGMs. With low rates of mortality and morbility. We consider the frontolateral approach as an alternative, if not superior, to standard bifrontal approaches. This is backed by our experience with a series of some 6 patients and the following advantages:

* Unilateral approach
* Preservation of the frontal sinus
* Unilateral brain retracting spatula
* Preservation of frontal venous drainage
* Early exposure and decompression of the neurovascular complex
* Possible preservation of the contralateral olfactory nerve in certain cases.

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