

# Operative Management of Olfactory Groove Meningioma: Five Years' Experience

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## ABSTRACT

**Objective:** To analyze patients operated for olfactory groove meningioma during five years' times.

**Methods:** This observational study was conducted in the department of neurosurgery, postgraduate medical institute lady reading hospital Peshawar. The clinical records of the patients were analyzed and data regarding clinical presentation, imaging studies, surgical and histological records, discharge letters and follow-up were noted.

**Results:** A total of 168 patients with meningiomas were operated between January 2007 and December 2011 in the department. There were 24 patients with olfactory groove meningiomas, including 18 women and 6 men with a mean age of 52.6 years (range, 26-75 years). Most patients presented with headache 22 (91.6%) followed by decrease vision in 12 (50%) cases and mental disturbance in 6 (25%) patients. Most of the patients 7 (29.2%) had either large or giant 14 (58.3%) meningioma. There were 23 patients operated through the bifrontal and 1 through the frontolateral approach. Total tumor removal (Simpson Grade 1 or 2) was achieved in most cases 21 (87.5%). Perioperative mortality was in one patient and morbidity in 33.3% cases. The overall recurrence rate was 4.2% (1 out of 24) during the study period.

**Conclusion:** Olfactory groove meningiomas were removed mainly through bifrontal approach. Through this approach even large tumors could be removed with low recurrence rate but had high mortality rate. However for some small meningioma frontolateral resection could be achieved which provides quick access to the tumor with less brain exposure with a low morbidity rate and no mortality but had high recurrence.

**Key Words:** Intracranial meningioma, olfactory groove meningioma, bifrontal craniotomy, anterior skull base.

## INTRODUCTION

Olfactory groove meningiomas (OGMs) account for 8 to 13% of all intracranial meningiomas.<sup>1,2</sup> It arises from the cribriform plate and can be differentiated from tuberculum sellae meningiomas as it arises more anterior in the skull base and displace the optic nerve and chiasm inferiorly rather than superiorly.<sup>3,4</sup> Because of their location and minimal clinical symptoms, these tumors can go undetected, and present as large and insidious masses in the anterior skull base.<sup>5</sup>

These are slow – growing tumors, often bilateral rather than unilateral, but asymmetrical in growth. They may produce progressive compression of the frontal lobes and project backward towards the Sella,

and if large enough, they can affect vision by compressing the optic nerve and chiasm.<sup>5,6</sup>

Surgical removal is the treatment of choice for such lesions and is often performed through the bifrontal, unilateral subfrontal (frontolateral), or pterional approach.<sup>7</sup> Extensive resection of all underlying involved bone is a complement to radical removal of these lesions. Reconstruction with a vascularized pericranial flap to prevent cerebrospinal fluid leakage is crucial.<sup>8</sup> Radiosurgery can be offered to meningiomas having no mass effect (size less than 3 cm) or inoperable.

Olfactory groove meningiomas have a high rate of late recurrence (average, 23%). The sites of these

recurrences are the cranial base and paranasal sinuses. It is more with atypical or malignant meningioma. Recurrence is more common because of conservative handling of the underlying invaded bone.<sup>8</sup> With current microsurgical techniques, the results of olfactory groove meningioma resection are excellent, with a high rate of total resection and a low incidence of complications. All hyperostotic bone should be removed with the dura of the anterior skull base to minimize the risk of recurrence.<sup>3</sup>

As there is limited local study on olfactory groove meningioma, this study will help to understand clinical presentation, management and possible complications in patients with such lesion.

**MATERIAL AND METHODS**

This observational study was conducted in neurosurgery department, Lady Reading Hospital, Peshawar from January 2007 to December 2011. All the patients operated for olfactory groove meningioma were included in the study. The patients with olfactory groove meningioma having kernofkey’s score less than 70 or recurrent meningioma were excluded from this study. The clinical record of the patients was evaluated. CT and MRI brain with contrast was done in all the patients. After taking approval from the hospital ethical committee, Consent was taken from the patients or their relatives. The demographic and clinical data of the patients was entered in a specifically designed Performa. This data was analyzed using SPSS version 11.

**RESULTS**

**Gender of Patients:** We had total of 24 patients with olfactory groove meningioma out of which 18 were women and 6men with male to female ratio of 3:1 (Table 1).

**Table 1:** Sex Incidence.

Sex	No.	Percentage
Male	6	33.4%
Female	18	66.6%
Total	24	100

**Age of Patients:** The age of patients ranged from 26 to 75 years. The mean age was 52.6 years.

**Clinical Features:** Headache was the most common complaint observed in 22 patients (91.6%). Twelve (50%) patients with decrease vision and 6 (25%) patients had mental status changes. Urinary incontinence and seizures was seen in 3 and 2 patients respectively (Table 2).

**Table 2:** Clinical Features.

Clinical Feature	No.	Percentage
Headache	22	91.6%
Decrease vision	12	50%
HMF changes	6	25%
Urinary	3	12%
Seizure	2	8%

**Size of Olfactory Meningioma on MRI:** One (4.2%) patient had Small (0–2 cm in diameter), 2 (8.3%) medium (2 – 4 cm diameter), 7 (29.2%) large (4 – 6 cm diameter), and 14 (58.3%) had giant (> 6 cm in diameter) meningioma (Table 3).

**Table 3:** Size of Tumor.

Size	No.	Percentage
Small Co-2 cm	1	4.2%
Medium (2 – 4 cm)	2	8.3%
Large (4 – 6 cm)	7	29.2%
Giant (more than b)	14	58.3%

**Surgical Approach and Excision:**

Our23 patients were operated through the bifrontal and 1 through the frontolateral approach. Total tumor removal (Simpson Grade 1 or 2) was achieved in 21 cases (87.5%). While in 3patients subtotal removal of meningioma was done.

**Operative Complications and Mortality:**

One of the patients had surgical mortality. Brain swelling during surgery was observed in two patients in whom the bone flap was saved in abdominal wall and later on replaced.None of the patients had injury to the optic nerve or chiasma. Operative complications are given in (Table 4).

**Table 4:** *Operative complication.*

<b>Complications</b>	<b>No of Patients</b>	<b>Percentage</b>
Tumor bed haematoma	03	12.5%
Brain swelling	02	8.3%
CSF rhinorrhea	02	8.3%
Vascular insult (anterior cerebral artery)	01	4.2%
<b>Total morbidity</b>	<b>08</b>	<b>33.3%</b>

**Recurrence Rate:**

The overall recurrence rate was 4.2% (1 out of 24) during the study period.

**DISCUSSION**

Meningioma arises from arachnoid cap cells where ever they are present. The common locations of intracranial meningioma are falx, sphenoid bone and convexity types.<sup>9,10</sup> Olfactory groove meningiomas are comparatively rare. We studied 24 patients operated for olfactory groove meningiomas.

As Meningiomas are more common in women than men, same is the case with olfactory meningiomas.<sup>11,12</sup> We had 18female and 6male patients with male to female ratio of 1:3. Other studies have also reported that olfactory groove meningiomas are more common in women.<sup>13</sup> Hormonal difference may be responsible for olfactory groove meningiomas to be more common in women.

Olfactory groove meningiomas (like other meningiomas) are more common in the middle age group. The age ranges in our patients from 26 – 75 years with mean age of 52.6 years. The exact reason, that why these lesions are more common in middle age is not clear.

Studies have shown that, the common symptoms of olfactory groove meningiomas are headache, anosmia, or even possibly personality changes.<sup>8,11</sup> In our study the most common presentation was headache (92%).The possible cause of headache is because of dural compression or raised intracranial pressure. Compression on frontal lobe results in personality changes and on olfactory nerve results in to anosmia.The anatomic location of the olfactory groove meningioma may cause prolonged psychiatric symptoms before the onset of more overt neurologic deficits.<sup>8,11</sup> Probably this could be the reason that our 25% (6) patients presented with psychiatric illness.

In a study, a review of 59 consecutive patients with olfactory groove meningioma reported that 32 cases (54.2%) and 11 cases (18.7%) were of the large and giant classifications, respectively.<sup>6</sup> In comparison most of our patients had either large (21.4%) or giant (57.14%) meningioma. This could be because of the reason that olfactory groove meningiomas reach to significantly large size before these become clinically symptomatic.

We had 7 (50%) patients with decrease vision. Olfactory groove meningioma put downward pressure on the optic nerve and chiasm from above, thus putting the crossed fibers on stretch and causing a bitemporal hemianopia with optic atrophy.<sup>14</sup>

The most common (95.8%) approach adopted in our study was bifrontal approach. This was because that most of our patients had either large or giant meningioma and this approach allows for good exposure and facilitates better closure of the cranial base to prevent cerebral spinal fluid leaks.<sup>2,4,6</sup> In one (4.2%) patient who had small olfactory groove meningioma we did right frontolateral approach. This approach is comparatively easier, less time consuming and can be adopted for small lesions.<sup>15</sup>

The postoperative complication rate in our study was 33.3%. The common complication was postoperative intracranial hematoma in three patients (12.5%). We also had two (8.3%) patients each with brain swelling during surgery and postoperative CSF rhinorrhea. One (4.2%) of our patients had ischemic insult to the brain due to anterior cerebral artery injury. Jon Paul and colleagues<sup>4</sup> studied 19 patients with olfactory groove meningiomas with overall morbidity of almost 36% and no mortality.The high vascularity and important structures in the vicinity of these meningiomas could be the reason for higher morbidity in these patients.<sup>16</sup>

In another study 66 patients with olfactory groove meningiomas were operated. The postoperative complications were observed in 31% patients with no mortality. In this study cerebrospinal fluid leak was seen in 9% patients and osteomyelitis in 6% cases.<sup>17</sup> The results are almost comparable to our study.However only 2% patients had postoperative hematoma, which is less than (12.5%) our study. The large tumors size could be the reason that we had more cases of tumor bed haematomas.

We had one (4.2%) patient with recurrence of the lesion. In literature the recurrence rate of olfactory groove meningiomas ranges from 5 to 41% and depends on the extent of resection and duration of follow-

up. Radical tumor removal, including the dural attachments and any involved bone, is the best way to reduce any chances of recurrence.<sup>8</sup>

## CONCLUSION

Olfactory groove meningiomas are more common in middle age female. Headache with dimness of vision are common presentations. Most of these lesions are large or giant in size at presentation. These are removed mainly through bifrontal approach. Through this approach even large tumors could be removed with low recurrence rate but had high mortality rate. However for some small meningioma frontolateral resection could be achieved which provides quick access to the tumor with less brain exposure with a low morbidity rate and no mortality but had high recurrence.

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## REFERENCES

1. Colli BO, Carlotti CG Jr, Assirati JA Jr, Santos MB, Neder L, Santos AC and et al. Olfactory groove meningiomas: surgical technique and follow-up review. *Arq Neuropsiquiatr.* 2007 Sep; 65 (3B): 795-9.
2. Nakamura M, Struck M, Roser F, Vorkapic P, Samii M. Olfactory groove meningiomas: clinical outcome and recurrence rates after tumor removal through the frontolateral and bifrontal approach. *Neurosurgery.* 2007; 60: 844–852. [PubMed]
3. Hentschel SJ, DeMonte F. Olfactory groove meningiomas. *Neurosurg Focus.* 2003 Jun 15; 14 (6): e4.
4. Pepper J, Hecht SL, Gebarski SS, Lin EM, Sullivan SE, Marentette LJ. Olfactory groove meningioma: discussion of clinical presentation and surgical outcomes following excision via the subcranial approach. *Laryngoscope.* 2011; 121: 2282–2289. [PubMed]
5. Jung JJ, Warren FA, Kahanowicz R. *Clin Ophthalmol.* 2012; 6: 339-42. Epub 2012 Mar 5. Bilateral visual loss due to a giant olfactory meningioma.
6. Ciurea AV, Iencean SM, Risea RE, Brehar FM. Olfactory groove meningiomas. A retrospective study of 59 surgical cases. *Neurosurg Rev.* 2011 Sep 30; [Epub ahead of print.]
7. Nakamura M, Struck M, Roser F, Vorkapic P, Samii M. Olfactory groove meningiomas: clinical outcome and recurrence rates after tumor removal through the frontolateral and bifrontal approach. *Neurosurgery.* 2008 Jun; 62 (6 Suppl 3): 1224-32.
8. Obeid F, Al-Mefty O. Recurrence of olfactory groove meningiomas. *Neurosurgery.* 2003 Sep; 53 (3): 534-42; discussion 542-3.
9. Kida s, Yamashima T, Kubota T, et al. A light and electron microscopic and immunohistochemical study of human arachnoid villi. *J Neurosurg* 1988; 69: 429-35.
10. Gardner PA, Kassam AB, Thomas A, Snyderman CH, Carrau RL, Mintz AH, Prevedello DM. Endoscopic endonasal resection of anterior cranial base meningiomas. *Neurosurgery.* 2008 Jul; 63 (1): 36-52; discussion 52-4.
11. Al-Mefty O (ed.). *Meningiomas.* New York, NY: Raven press; 1991.
12. de Divitiis E, Esposito F, Cappabianca P, Cavallo LM, de Divitiis O, Esposito I. Endoscopic transnasal resection of anterior cranial fossa meningiomas. *Neurosurg Focus.* 2008; 25 (6): E8.
13. Spektor S, Valarezo J, Fliss DM, Gil Z, Cohen J, Goldman J, Umansky F. Review Olfactory groove meningiomas from neurosurgical and ear, nose, and throat perspectives: approaches, techniques, and outcomes. *Neurosurgery.* 2005; 57 (4): 268-80.
14. Bakay L, Cares HL. Olfactory meningiomas report on a series of twenty – five cases. *Acta Neurochir (Wien)* 1972; 26: 1–12. [PubMed]
15. Bahy K. Validity of the frontolateral approach as a minimally invasive corridor for olfactory groove meningiomas. *Acta Neurochir (Wien).* 2009 Oct; 151 (10): 1197-205.
16. Nakamura M, Roser F, Struck M, Vorkapic P, Samii M. Tuberculum sellae meningiomas: clinical outcome considering different surgical approaches. *Neurosurgery.* 2006 Nov; 59 (5): 1019-28; discussion 1028-9.
17. Romani R, Lehecka M, Gaal E, Toninelli S, Celik O, Niemelä M, Porras M, Jääskeläinen J, Hernesniemi J. Lateral supraorbital approach applied to olfactory groove meningiomas: experience with 66 consecutive patients. *Neurosurgery.* 2009 Jul; 65 (1): 39-52; discussion 52-3.