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Original Article (BRAIN)

# Clinical Outcome and Complication of Anterior Cranial Fossa Meningiomas in Tertiary Care Hospital of KPK

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#### ABSTRACT

**Objectives:** We examined the surgical outcome and complications of anterior cranial Fossa meningiomas.

**Materials and Methods:** A prospective study was conducted at the Department of Neurosurgery Prime Teaching Hospital, Peshawar, KPK, Pakistan from June 2019 to June 2021. A total of 31 patients were selected through non-probability consecutive sampling. After clinical examination and radiological findings, the patients were diagnosed with anterior cranial Fossa meningiomas. Microsurgical Trans cranial approaches did. Clinical outcomes and complications were documented. Tumor anterior cranial fossa meningiomas. A low Karnofsky performance scale index was used to analyze the functional impairment of the patients.

**Results:** 9 (29.03%) were male and 22 (70.96%) patients were female. The mean age of presentation was 42 ± 5 years. Headache 25 (80.6%) and Visual loss were the main presenting symptoms 24 (77.5%), and Tuberculum sellae meningioma patients 08 (25.08%). The most common approach was Bifrontal craniotomy for OGM in 9 patients and two small OGM were operated on utilizing frontolateral craniotomy. The rest of the cases were operated through Pterional craniotomy. Tuberculamsalle meningiomas surgery results in a visual improvement in 6 patients (75%), Complete tumor resection was achieved in 22 (70.9%) patients and subtotal resection is achieved in 6 (19.3%) patients. In a few patients 03 (9.67%) only safe debulking and biopsy were taken. Postoperative hemorrhage was in 4 (12.9%) patients.

**Conclusion:** Transcranial approach for microsurgical resection of anterior cranial fossa meningiomas is an effective and feasible approach in terms of visual outcome and extent of resection.

Keywords: Anterior cranial Fossa Meningioma, Bifrontal Craniotomy, Front-lateral craniotomy.

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# **DOI:** 10.36552/pjns.v26i2.671 **INTRODUCTION**

Skull base meningiomas are slow-growing complex benign lesions that constitute 25% of all meningiomas<sup>1</sup> Anterior skull base meningiomas are classified into olfactory groove meningioma (OGM), tuberculum sellae, planum sphenoidale, cavernous sinus meningiomas, anterior clinoidal, and dorsum sellaemeniongiomas.<sup>2</sup> The annual incidence of anterior skull base meningiomas is 13 per 100,000 which occur mostly in adults during their fourth and fifth decades with peak incidence during the sixth decade. Females are more commonly affected than males with a ratio of 7:1.3 Meningiomas of the anterior skull base are located around prime structures such as optic chiasm, optic nerve, and pituitary stalk therefore their symptoms vary from visual disturbances, raised intracranial pressure, multiple cranial nerve involvement, bony hyperostosis, and involvement of surrounding intracranial structures.<sup>4</sup> Olfactory groove meningiomas comprise 4 - 13% of all meningiomas. Olfactory groove intracranial meningioma arises mostly from the cribriform plate which may extend into the nasal cavity, sinuses, and orbits leading to unilateral or bilateral decreased smell sensation or complete anosmia. Surgically these meningiomas can be resected via. a transcranial approach or recent advances also include endoscopic removal of these tumors.<sup>5</sup> Sphenoid wing meningiomas are the third most common tumors but are difficult to resect because of the involvement of the carotid artery, optic nerve, and oculomotor nerve. These tumors most commonly involve the lesser wing of the sphenoid and may involve dura extending into sinuses and superior orbital fissures therefore partially followed thev are resected bv radiotherapy.<sup>6</sup> Tubercullamsellaemeningiomas comprise 5 - 10% of all intracranial tumors primarily arising from chiasmatic sulcus and limbus sphenoidale with loss of vision being the most common presenting symptom, however, resection of these tumors has a high mortality rate accounting for 0 to 7% because of involvement of major intracranial blood vessels but the transcranial approach remains the preferred choice in comparison to endoscopic approach.<sup>7</sup> Meningiomas arising from cavernous sinus arise primarily or may invade it secondarily from outside. It may involve the contents of cavernous sinus including carotids, ophthalmic and maxillary nerve therefore their resection is associated with high morbidity rate<sup>8</sup>. Planum sphenoidale are rare tumors that most commonly present with headaches in addition to the decreased vision which are removed surgically radiotherapy.<sup>9</sup> by Clinoid followed wing meningiomas account for less than 10% of supratentorial meningiomas which are resected microsurgically but have high post-op mortality because of their locality to the internal carotid artery, cavernous sinus, and optic canal.<sup>10</sup> Several surgical approaches used for anterior skull base meningiomas include pterional, bifrontal, frontalorbitozygomatic, fronto-lateral, transbasal approaches. However, with the advent of endoscopy transnasal, transethmoidal, transsphenoidal, and transmaxillary approaches have also been reported.<sup>11</sup> Post-op complications reported for anterior skull base meningiomas included CSF leak, meningitis, bone flap infections, and pneumocephalus.<sup>12</sup>

The rationale of this study was to help and add to the information that how much Open craniotomy is helpful in anterior cranial Fossa meningiomas in terms of visual improvement and neurology. This study will highlight the importance of surgery in anterior cranial Fossa meningiomas in form of improvement in signs and symptoms. We will recommend future research work and other recommendations to improve skills and craniotomy techniques. A very limited amount of work has been done in our setup. In our setup, these patients present late when the lesion is quite big. So our study will help us in comparing results to international studies.

#### **MATERIAL AND METHODS**

#### **Study Design and Setting**

Prospective Study observational study of 3 years from June 2019 to June 2021 was carried out in the department of Prime Teaching Hospital Peshawar Pakistan, after taking consent from the ethical committee. A total of 31 patients were included in the study.

#### **Inclusion Criteria**

Both genders, from age 10 to 70 years had diagnosed cases of anterior skull base meningiomas and agreed to trans-cranial surgery.

#### **Exclusion Criteria**

Recurrent tumors and tumors operated through an endoscopic approach and patients with low Karnofsky performance scores were excluded from this study.

# Approaches for Anterior Skull Base Meningiomas

Olfactory groove meningioma (OGM) with complete loss of olfaction and huge lesion are operated through the bifrontal craniotomy approach, while tumors of medium or small size or where preservation of olfaction was required were operated through the frontotemporal approach.

Planum, tuberculum sellae meningioma, and anterior clinoid meningioma were operated through a pterional approach. CT angiogram was obtained where cavernous sinus or carotid was encased.

### **Data Collection**

Anterior skull base meningiomas were diagnosed after History and detailed clinical examination and Radiological Findings of MRI Brain with Contrast and are confirmed after biopsy and histopathology, surgical outcome and complications were documented. Data was entered into specifically designed Performa and analyzed Through Statistical IBM Software SPSS version 23.

#### RESULTS

#### Age and Gender Distribution

Out of 31 patients, 9 (29.03%) were male and 22 (70.96%) were female. The mean age of presentation was  $42 \pm 5$  years.

#### **Presenting Symptoms**

Headache 25 (80.6%) and Visual loss were the main presenting symptoms 24 (77.5%), and Tuberculum sellae meningioma patients were 08 (25.08%).

#### **Surgical Approaches**

The most common approach was Bifrontal craniotomy for OGM in 9 patients and 02 OGM were operated on utilizing frontolateral craniotomy. The rest of the cases were operated through Pterional craniotomy.

### **The Extent of Resection**

Complete tumor resection was achieved in 22 (70.9%) patients and subtotal resection is achieved in 6 (19.3%) patients. In a few patients 03 (9.67%) only safe debulking and biopsy were taken.

### **Visual Outcome**

In our study, tuberculum sellae meningiomas surgery resulted in a visual improvement in 6 patients (75%), In Olfactory Groove meningiomas out of 11 patients 7 patientsvisions improved, 3 static, and 1 patient deteriorated after surgery.

Postoperative hemorrhage was present in 4 (12.9%) patients.

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Table 1: Presenting Signs and Symptoms.			
Presenting Signs and Symptoms	Frequency and percentages		
Headache	25 (80.6%)		
Visual loss	24 (77.5%)		
Papilledema	14 (45.16%)		
Anosmia	08 (25.8%)		
Seizures	07 (22.5%)		
Optic atrophy	05 (16.2%)		
Foster Kennedy Syndrome	02 (6.4%)		

<b>Table 2:</b> Distribution by Location.	
Origin of Tumor	Number of Cases
Olfactory groove Tuberculum sellae Planum sphenoidale Anterior clinoidal meningioma Others cavernous sinus meningioma, sphenoid wing meningioma	11 (35.48%) 08 (25.80%) 06 (19.35%) 03 (9.67%) 03 (9.67%)

#### Table 3: Surgical Outcomes.

Tumor	No. of	Gross total	Post OP Visual status		
	Patients	Resection	Improved	Static	Deteriorated
Olfactory groove	11	72.72%	7 (63.6%)	3 (27.3%)	1 (9.09%)
Tuberculum sellae	8	75%	6 (75%)	2 (25%)	0
Planum sphenoidale	6	83.3%	5 (83.4%)	1 (16.6%)	0
Anterior clinoidal meningioma	3	25%	2 (66.7%)	0	1 (33.4%)
Other cavernous sinus meningiomas, Sphenoid wing meningiomas	3	25%	1(33.4%)	0	2 (66.7%)

Table 4:       Complications.					
Complications	No. of Patients	Percentages	Outcomes		
Postoperative Hemorrhage	04	12.9%	2 patients need evacuation of hematoma		
CSF leak	03	9.6%	1 patient needed intervention and 2 were conservatively managed		
Superficial wound infection	01	3.22%	debridement of wound		
Mortality	02	6.45%	1 anterior clinoidal, and 1 cavernous sinus meningiomas		
Neuro deficit	05	16.12%	permanent weakness in 2 patients		

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Figure 1.

Figure 2

The picture shows planum sphenoidale meningiomas before (Figure 1) and after surgical tumor removal (Figure 2) (Images used with patient family permission).



Figure 3.

Figure 4

MRI Sagittal view (Figure 3), and Coronal view (Figure 4) shows pre-Operative Olfactory Groove meningiomas (Images used with patient family permission)



Figure 05.

Figure 06

Figure 5 shows Bifrontal craniotomy Free Bone Flap, and Figure 6 shows souttar skin Incision closure (Images used with patient family permission).

### DISCUSSION

Surgical treatment of anterior skull base meningiomas always remained the topic of interest. Different types of skull base meningiomas are treated differently. Olfactory groove meningiomas were initially treated via a transcranial approach. A large bilateral sub-frontal flap was created for extensive lesion exposure and surgical safety. In our study, we operated on 11 patients of olfactory Groove meningiomas with 09 bifrontal craniotomies for large tumors with souttar incision, and 03 patients were operated through a frontolateral approach because of their small size. In our study, OGM (olfactory groove meningioma) surgery resulted in 72.2% gross total resection (Table 3). These results can be compared with a study conducted by Goel et al. in which he employed 129 patients out of which patients (66.7%) underwent gross total 86 resection.<sup>13</sup> Clinoidal meningiomas are complicated to treat surgically however in our study Simpson grade 1 was achieved in 25% of patients. Visual improvement was seen in 2 patients (66.6%) and 1 patient (33.3%) remained static which can be compared to a study conducted by Alam et al. in which out of 10 patients' gross total resection was achieved in 5 patients (50%) of patients and out of this visual improvement was seen in 7 patients (70%).<sup>14</sup> In our study of tuberculum sellae meningioma, out of 8 patients, gross total resection was done in 75% of patients through a pterional approach. The visual outcome was improved in 6 patients (75%) while 2 patients (25%) remained static which can be also seen in a study conducted by Carie et al. in which out of 30 patients gross total resection was done in 27 patients (90%) out of which visual improvement was seen in 17 patients (58.6%), 8patients (27.6%) were static and 4 patients (13.8%) deteriorated.<sup>15</sup> In another study conducted by Magill et al. in which pre-operative visual deficits were present in 87% of patients out of which visual improvement was seen in 47% of postoperatively 35% of patients remained static and vision deteriorated in 10% of patients.<sup>16</sup>

Spheno-clinoidal meningiomas are complicated to treat surgically because of their location in the vicinity of prime structures such as optic apparatus and internal carotid artery. In our study gross total resection was seen in 25% of patients out of which 1 patient (33.3%) improved visually postoperatively and 2 patients (66.6%) deteriorated. This is following a study conducted by Champagne et al. in which out of 12 patient's gross total resection was seen in 2 patients (16.6%) and the remaining 10 patients (83.3%) underwent partial resection. Visual deficits were seen in 9 patients (75%) out of which 4 patients (44.4%) improved and 5 patients (55.5%) remained static post-operatively.<sup>17</sup>

In our study, CSF leak is 9.6% (3 patients) of which two were managed conservatively and one (3.2%) needed surgery which can also be seen in a study carried out by Zoli et al. in which out of 57 patients CSF leak was the most common complication accounting for almost 10% of the patients.<sup>18</sup>

Neuro deficit in our study is 16.12% which is comparable to a study carried out by Beer-Furlan et al. in which out of 12 patients' improvement was seen 4 patients (33.33%), 7 patients (58.3%) had partial improvement and 1 patient (8.33%) had no improvement at all.<sup>19</sup>

In our study mortality is 6.45% which is comparable to a study carried out by Narayan et al. in which the mortality rate was found to be 5%.<sup>20</sup>

# CONCLUSION

The transcranial approach for microsurgical resection of anterior cranial fossa meningiomas is effective and feasible in terms of visual outcome and extent of resection.

# **Limitation of Study**

This is a prospective study carried out at a single tertiary care hospital. Other limitations of this study included varying treatment modalities, different surgical approaches, distinct clinical presentation, and observer alteration in terms of tumor assessment and its grading also follow-up period. Also, the lack of an angioembolization facility for large tumors in our setup limits our study. All these factors need to be taken into account while interpreting the results.

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#### **Additional Information**

**Disclosures:** Authors report no conflict of interest.

Ethical Review Board Approval: The study was conformed to the ethical review board requirements.

Human Subjects: Consent was obtained by all patients/participants in this study.

#### **Conflicts of Interest:**

In compliance with the ICMJE uniform disclosure form, all authors declare the following:

**Financial Relationships:** All authors have declared that they have no financial relationships at present or within the previous three years with any organizations that might have an interest in the submitted work.

**Other Relationships:** All authors have declared that there are no other relationships or activities that could appear to have influenced the submitted work.

Sr.#	Author's Full Name	Intellectual Contribution to Paper in Terms of:
1.	Arif Hussain	1. Study design and methodology
2.	Sajid Khan	2. Paper writing.
3.	Ramzan Hussain	3. Data collection and calculations.
4.	Aleeha Ihsan	4. Literature review and referencing.
5.	Mumtaz Ali	5. Editing and quality insurer.

### **AUTHOR CONTRIBUTIONS**