Section: Neurosurgery

Original Research Article

# CLINICAL STUDY OF POSTERIOR FOSSA MENINGIOMAS - OUR EXPERIENCE AT A TERTIARY HOSPITAL

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***Received*** *: 27/03/2025*
***Received in revised form*** *: 13/05/2025*
***Accepted*** *: 02/06/2025*

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**DOI:** 10.70034/ijmedph.2025.2.349

**Source of Support:** Nil,
**Conflict of Interest:** None declared

**Int J Med Pub Health**
2025; 15 (2); 1951-1955

**ABSTRACT**

**Background:** Microsurgical resection is the treatment of choice for Posterior Fossa Meningiomas. Their site, location, and proximity to important structures makes excision a challenge. Present study was aimed to highlight the technical difficulties encountered during excision of these tumors and discuss their modes of management.

**Materials and Methods:** We retrospectively reviewed the data of patients diagnosed with meningioma who underwent surgical excision for Posterior Fossa Meningiomas between April 2004 to Oct 2011.

**Results:** In present study, 32 cases of surgically treated posterior fossa meningiomas were studied. Majority were from 30-50 years age group (53.1 %) & majority were female (75 %). Most common tumor location was C P angle meningioma (31.2 %) followed by cerebellar convexity (18.8 %), lateral tentorial (12.5 %), foramen magnum (12.5 %), petroclival (12.5 %), jugular foramen (6.3 %) & unclassified (entire clivus incisural, others) (6.3 %). CSF Diversion procedure was required in 14 cases. In present study, majority tumors were excised grossly (71.88 %) while others were excised subtotally (21.88 %) & partially (9.38 %). Complications observed in study patients were cranial nerve dysfunction (21.88 %), ataxia (12.5 %), CSF leakage & Pseudomeningocoele (12.5 %), stupor and coma (3.13 %), sinus thrombosis (3.13 %), meningitis (3.13 %) & long tract deficit (3.13 %). Mortality was noted in 1 (3.13 %) case. In present study good recovery was observed in 22 (66.5%) patients. Common Histopathological variants were Fibrous (31.25 %), Transitional (21.88 %) & Meningothelial (18.75 %). On follow up of average 2 years, 5 (15%) patients had recurrence, patients were managed by re-excision (2 patients), radiotherapy (1 patient) & observation (2 patients).

**Conclusion:** Although post-op morbidity is high, safe radical excision decreases the recurrence rate and improves over all outcome in Posterior fossa meningiomas.

**Keywords:** Posterior fossa meningiomas, capsular resection, fibrous tumors, recurrence rate

## INTRODUCTION

Meningiomas are most common benign intracranial tumors which develop from arachnoid cap cells. These extra-axial tumors are relatively slow growing.1,2 Cerebral convexity, the parasagittal/falcine area, the sphenoid wing, the tuberculum sellae, and the posterior fossa are the most frequently occurring sites for these tumors. The clinical symptoms of these tumors correlate with the location of the tumors or to raised intra-cranial pressure. Radiological diagnosis is generally made once the tumor reaches a considerable volume as they grow slowly.[1-3]

Intracranial meningiomas constitute more than one-third of all brain tumors.[4] They are slow-growing

tumors, with most having an indolent, longstanding clinical course. Meningioma surgeries are among the most common elective neurosurgical procedures done worldwide. Most tumors are benign, and a gross total resection (GTR) is the surgical goal wherever possible.[5]

Microsurgical resection is the treatment of choice for Posterior Fossa Meningiomas. Their site, location, and proximity to important structures makes excision a challenge. The surgical approach for each tumor is tailored depending on its size and location for a safe and effective maximum tumor resection.[6,7] Present study was aimed to highlight the technical difficulties encountered during excision of these tumors and discuss their modes of management.

## MATERIALS AND METHODS

Present study was retrospective study, conducted in department of neurosurgery, at Grant Medical College & Sir J.J. Group of hospitals, Mumbai, India. Study period was from April 2004- Oct 2011. Study was approved by institutional ethical committee.

We retrospectively reviewed the data of patients diagnosed with meningioma who underwent surgical excision for Posterior Fossa Meningiomas between April 2004 to Oct 2011.

The demographic, radiographic and surgical characteristics of the patients were examined. Patients' clinical presentation, first neurological assessment and preoperative Contrast enhanced CT scan, CECT Brain/ MRI brain with contrast/ MRI angiography/ MR Venography, were all documented. All patients underwent surgical excision Every patient had a craniotomy planned out prior to surgery. The tumor was located and removed using proper surgical techniques. Complications and outcomes were analysed. Follow up details for a period of 1 month to 5 years were studied. Data was collected and compiled using Microsoft Excel, analysed using SPSS 23.0 version. Statistical analysis was done using descriptive statistics.

## RESULTS

In present study, 32 cases of surgically treated posterior fossa meningiomas were studied. Majority were from 30-50 years age group (53.1 %) & majority were female (75 %).

**Table 1: General characteristics.**

| Characteristics | No. of subjects | Percentage |
|---|---|---|
| Age group (in years) | | |
| 10- 30 | 8 | 25 |
| 30-50 | 17 | 53.1 |
| 50-70 | 7 | 21.8 |
| Gender | | |
| Male | 8 | 25 |
| Female | 24 | 75 |

In present study, most common tumor location was C P angle meningioma (31.2 %) followed by cerebellar convexity (18.8 %), lateral tentorial (12.5 %), foramen magnum (12.5 %), petroclival (12.5 %), jugular foramen (6.3 %) & unclassified (entire clivus incisural, others) (6.3 %).

**Table 2: Tumor location, Clinical presentation & surgical approach**

| Tumor location | No. of cases (n=32) (%) | Clinical presentation | Surgical Approach |
|---|---|---|---|
| C P angle meningioma | 10 (31.2 %) | 5 (30%), 7 (10%), 8 (60%) cranial neuropathies, brain stem and cerebellar compression syndrome | Retromastoid craniectomy |
| Cerebellar convexity | 6 (18.8 %) | Headache, Cerebellar syndrome, increase ICP (90 %) | Suboccipital Craniectomy |
| Lateral Tentorial | 4 (12.5 %) | headache, brain stem and cerebellar compression syndrome, 6th cranial nerve involvement (80%) | Retromastoid craniectomy |
| Foramen magnum | 4 (12.5 %) | Increase ICP 9-12 cranial neuropathies (20%), brain stem and spinal cord compression syndrome | Suboccipital craniectomy with C1 laminectomy, Far lateral approach |
| Petroclival | 4 (12.5 %) | 3-12 (65%) cranial neuropathies, brain stem and cerebellar compression syndrome | Retromastoid craniectomy / Transpetrous approach |
| Jugular foramen | 2 (6.3 %) | 9-11 cranial neuropathies (75%), brain stem compression syndrome (25%) | Retromastoid craniectomy/ Mastoidectomy |
| Unclassified (entire clivus Incisural, others) | 2 (6.3 %) | 3-12 cranial neuropathies (30%), brain stem and cerebellar compression syndrome | Combined Extended far lateral approach |

CSF Diversion procedure was required in 14 cases.

**Table 3: CSF Diversion procedure**

| Diversion procedure | No. of cases |
|---|---|
| Ventriculo-peritoneal shunt | 8 |
| Temporary ventriculostomy | 6 |

In present study, majority tumors were excised grossly (71.88 %) while others were excised subtotally (21.88 %) & partially (9.38 %).

**Table 4: Extent of excision**

| Tumor location | Gross total | Subtotal | partial |
|---|---|---|---|
| C P angle meningioma | 8 | 1 | 1 |
| Petroclival | 2 | 1 | 1 |
| Lateral Tentorial | 2 | 2 | - |
| Cerebellar convexity | 6 | - | - |
| Jugular foramen | 1 | 1 | - |
| Foramen magnum | 3 | 1 | - |
| Unclassified (entire clivus Incisural, others) | 1 | 1 | - |
| Total | 23 (71.88 %) | 7 (21.88 %) | 2 (9.38 %) |

Complications observed in study patients were cranial nerve dysfunction (21.88 %), ataxia (12.5 %), CSF leakage & Pseudomeningocoele (12.5 %), stupor and coma (3.13 %), sinus thrombosis (3.13 %), meningitis (3.13 %) & long tract deficit (3.13 %). Mortality was noted in 1 (3.13 %) case.

**Table 5: Complications**

| Characteristics | No. of subjects | Percentage |
|---|---|---|
| Cranial nerve dysfunction | 7 | 21.88 |
| Ataxia | 4 | 12.5 |
| CSF leakage & Pseudomeningocoele | 4 | 12.5 |
| Stupor and coma | 1 | 3.13 |
| Sinus thrombosis | 1 | 3.13 |
| Meningitis | 1 | 3.13 |
| Long tract deficit | 1 | 3.13 |
| Death | 1 | 3.13 |

In present study good recovery was observed in 22 (66.5%) patients while other functional outcome were mild disability (with cranial nerve deficit) (16.5%), moderate disability (with cranial nerve deficit) (6.4%) & severe disability (with cranial nerve deficit) (6.4%).

**Table 6: Functional outcome & tumor excision**

| Extent of excision | Good recovery | Mild disability (with cranial nerve deficit) | Moderate disability (with cranial nerve deficit) | Severe disability (with cranial nerve deficit) | Death |
|---|---|---|---|---|---|
| Gross total (n=23) | 19 | 2 | 2 | - | - |
| Subtotal (n=7) | 3 | 3 | - | 1 | - |
| Partial (n=2) | - | | - | 1 | 1 |
| Total | 22(66.5%) | 5(16.5%) | 2(6.4%) | 2(6.4%) | 1 (3.2%) |

Good recovery was observed in tumor locations as CP angle meningioma (90%), Cerebellar convexity (84%) & foramen magnum (75%).

**Table 7: Functional outcome & tumor location**

| Tumor location | Good recovery | Mild disability | Moderate disability | Severe disability | Death |
|---|---|---|---|---|---|
| CP angle meningioma | 9 (90%) | - | 1 | - | - |
| Petroclival | 2 (50%) | 1 | 1 | - | - |
| lateral Tentorial | 2 (50%) | 1 | - | - | 1 |
| Cerebellar convexity | 5 (84%) | 1 | - | - | - |
| Jugular foramen | 1 (50%) | | | 1 | - |
| foramen magnum | 3 (75%) | 1 | - | - | - |
| Unclassified | | 1 | - | 1 | - |

Common Histopathological variants were Fibrous (31.25 %), Transitional (21.88 %) & Meningothelial (18.75 %).

**Table 8: Histopathological types**

| Histopathological variants | No. of subjects | Percentage |
|---|---|---|
| Fibrous | 10 | 31.25 |
| Transitional | 7 | 21.88 |
| Meningothelial | 6 | 18.75 |
| Angiomatous | 3 | 9.38 |
| Psammomatous | 3 | 9.38 |
| Atypical | 2 | 6.25 |
| Anaplastic | 1 | 3.13 |

On follow up of average 2 years, 5 (15%) patients had recurrence, patients were managed by re-excision (2 patients), radiotherapy (1 patient) & observation (2 patients).

**Table 9: Recurrence**

| Tumor location | Re-excision | Radiotherapy | Observation |
|---|---|---|---|
| C P angle meningioma | 1 | - | - |
| Petroclival | - | 1 | - |
| Lateral Tentorial | 1 | | 1 |
| Cerebellar convexity | - | - | - |
| Jugular foramen | - | - | 1 |
| foramen magnum | - | - | - |
| Unclassified (entire clivus, other types) | - | - | - |

## DISCUSSION

In routine clinical practice, headaches are the most common symptom of brain tumors presenting to the ER.8 Other features of raised intracranial pressure (ICP) include recurrent vomiting, blurring of vision, altered sensorium, third nerve palsy, or limb weakness due to herniation. Stroke-like presentation, intraventricular bleeding, and hydrocephalus have also been reported with meningiomas.[9]

The WHO 2021 brain tumor classification of is the most common used tool for grading tumor types. WHO classification consists 15 variations of meningiomas according to microscopic cell type. These histopathological subtypes are organized into three grades as WHO grade I-benign, grade II-atypical, grade III-malignant.[10,11]

Treatment options are Observation/ Surgical excision/ Radiotherapy/Radiosurgery. Surgical Approach Depends on: Location, dural attachment and extensions of the tumor. Retromastoid Suboccipital Craniectomy/Craniotomy is surgical management for CP angle meningiomas/ Lateral tentorial meningiomas/ Convexity meningiomas. The primary treatment for big intracranial meningiomas is surgical excision. To achieve a safe and efficient maximum tumor excision, the surgical strategy for each tumor is tailored based on its size and location.[12,13]

The primary objective of surgical treatment is gross complete resection. In present study, majority tumors were excised grossly (71.88 %) while others were excised subtotally (21.88 %) & partially (9.38 %). Due to adhesion and encasement of significant neurovascular structures like the optic nerve, carotid artery, or superior sagittal sinus, it is not usually possible for huge meningiomas.[14,15]

In study by Hüseyin Berk BENEK.,16 59 were women (70%) and 25 were men (30%). Female/male ratio was 2.36/1. The average age was 55.58 years (range: 28-79 years). The most common locations of surgical intracranial meningiomas were convexity, and parasagittal/falcine. Fifty-four (64.3%) patients with Simpson grade I and II, 26 (30.9%) with grade III, and 4 (4.8%) patients with grade IV resection were carried out. The most common histopathological results were transitional meningioma 28 (33.3%) patients, atypical 22 (26.2%) patients, meningothelial meningioma 21 (25.0%) patients. Sixty (71.4%) patients had WHO grade I tumor, 22 (26.2%) patients grade II tumor, and 2 (2.4%) patients grade III tumor.

Yaşar S et al,[17] noted that surgical treatment of giant intracranial meningiomas became satisfactory and safer with the use of advanced imaging techniques and intraoperative technologies, such as neuronavigational, 3-dimensional ultrasound, radiofrequency thermocoagulation, intraoperative angiography, and electrophysiological monitoring. A neuronavigational system provides the shortest way to reach the tumor and optimum craniotomy for safe resection. This also increases the resection level of the tumor and survival of the patient.

Vijayakumar J et al,[18] retrospectively reviewed 64 posterior cranial fossa meningiomas. Mean age was 56 years with a female preponderance (67.2%). Headache was the most common symptom. Retrosigmoid approach was the commonest surgical procedure (23.4%). The incidence of cranial nerve related complications was 28%. Postoperatively facial nerve weakness was observed in 11%. The incidence of cerebrospinal fluid leak was 4.6%. Gross total resection was achieved in 37 patients (58%). Sixteen patients (25%) with residual tumors underwent Gamma knife radiosurgery. Recurrence or tumor progression was observed in 12 patients (18.7%). Operative mortality was 3.1%. At their last follow-up, 93% of the cases achieved Glasgow Outcome Scale scores 4 or 5.

Total excision is the ideal goal which can be achieved with meningiomas located in certain location, such as lateral convexity, but for other posterior fossa meningiomas the close proximity of critical structures is a major obstacle in achieving this goal. In practicality, a balance between good functional outcome and extent of resection is important for posterior cranial fossa meningiomas in proximity to critical structures.

## CONCLUSION

Posterior fossa meningiomas are difficult tumors to excise due to their precarious anatomical locations. The technique of intracapsular decompression followed by meticulous capsular resection is the ideal surgical method. CUSA is helpful in excising fibrous tumors. Although post-op morbidity is high, safe radical excision decreases the recurrence rate and improves over all outcome.

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