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# ORIGINAL ARTICLE

## TO EVALUATE RESECTABILITY AND OUTCOME OF INTRA CRANIAL MENINGIOMAS: A PROSPECTIVE STUDY (BETWEEN NOV 2006-NOV 2014)

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**ABSTRACT: AIMS & OBJECTIVES:** Prospective study of 84cases of intracranial meningioma as operated between Nov. 2006 to Nov. 2014, to study clinical characters, resectability and surgical outcome. **MATERIALS & METHODS:** Patients age ranging from 8-63years, of them 38 males and 46 females, Common location: Convexity (28) sphenoidwing (16), Parasagital (14), C-pangles (5), Torcuar (3). Orbit (2) Base of anterior cranial fossa (7), Tentorial (2) Lateralventricles (1). Clivus (1) Sellar & Parasellar (5) In these patients we evaluated the resectability the tumour mass clinical and radiological characteristics and surgical outcome **RESULTS:** Simpson's Grade–I resection done in-22, Grade–II in 47, Grade-III in 10, Grade-IV in 3 patients. **CONCLUSION:** All convexity, and parasagital meningiomas resected totally along with involved dura and bone (Gr.1). In case of torcular meningiomas and anaplastict tumors Gr-II to Gr-IV Guidelines were followed. With present microsurgical techniques these lesion scan be removed stagely and totally. Good longer outcome can be expected in almost all patients.

**KEYWORDS:** Intracranial meningiomas, resectability, surgical outcome.

**INTRODUCTION:** Meningiomas are histologically benign tumors of the intracranial and intraspinal compartments arising from meningothelial cells of arachnoid layers (Arachnoidal cap cells) surrounding central nervous system. Although meningiomas are benign and slow growing they cannot be completely resected in many instances, and are characterized by a high rate of recurrence, propensity for disturbing vital and anatomically complex structures within the nervous system, and poor response to traditional medical treatment regimens. Recurrence is often accompanied by a more aggressive profile of histopathology and biological activity. The more aggressive varieties, the so-called 'atypical' and malignant meningiomas, present their own specific problems for treatment. Meningiomas, therefore pose definitive therapeutic challenge to practicing neurosurgeons and oncologists.

Historical Background: Fleix paster first described the tumour in 1614. In 1887, W.W. Keen described first successful removal of meningioma.(1)

In the 18th & 19th centuries meningiomas were diagnosed during life only if they caused changes in overlying skull that could be appreciated by inspection or palpation. Only 13 operations performed between 1743 and 1896. Whose outcome was specified by Al-Rodhan and Laws. 9 ended in death.(2)

**REVIEW OF LITERATURE:** Incidence: 8.4% per 1,00,000 population in the elderly and 0.3% per 100,000 population in childhood 93). Cushing & Eisenhardt found that average at presentation was 42.9 years in men and 52 years in women. Meningiomas account for 13-40% of all intracranial

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neoplasms.[3] The male to female ratio being 1: 5. However in childhood meningiomas account for 1-4% of all brain tumors and there is no female predominate.

**LOCATION:** In adults 90% of intracranial meningiomas occur in the supra tentorial region. The three most common locations are parasagittal falx (25%), convexity (20%) and sphenoid wing (15 – 20%). The other less common locations being, olfactory groove, tuberculumsella middle cranial fossa and intraventricular. In children a review of several series found in the first two decades, 67% of were supratentorial, 14.4% infratentorial, 9.4% intraventricular, 5.4% orbital.

**ETIOLOGY:**

1. **Trauma:** No definitive etiological role found on several studies.[3,4,5]
2. **Viruses:** Most research concentrated on the papavo virus family, simion virus 40, BK viruses. Although these in suggestive that some role for DNA viruses in development of meningioma. An exact cause and effect relationship remains to be clearly defined.[6]
3. **Radiation:** A 1.6% incidence of meningioma induced by high dose of cranial irradiation has been reported in a single surgical series of mostly adults. A review of literature has received that the higher the dose and younger the patient when irradiated, the shorter the latency period for tumour development.[7,8]
4. **Genetics:**The most common condition associated with growth of meningiomas is neurofibromatosis type II, known to have loss of part of chromosome 22.[9]
5. **Hormone and growth factor receptors**: After clinical observation of tumors increasing during pregnancy and their association with breast cancer. Although early studies suggested that oestrogen and progesterone receptors present with any frequency or have any direct activity.[10]

**PATHOLOGY:** In 1922, Harvey Cushing coined the term meningioma to describe this frequently benign and globular tumors arising from the archnoid cap cells.

Two most widely used histopathological classification systems are:

Russell and Rubinstein and New World Health Organization classification. However neither system addresses pathological grade within each group or subtype of meningiomas. The grading system developed at the University of Helsinki, although not been widely adopted.[11,12,13,14,15]

**IMAGING:** Plain film radiography: Bone erosion, enlarged vascular channels, hyperostosis, tumor calcification expanded paranasal sinuses (sometimes seen with anterior basal tumors) are plain film findings of meningioma.

**CT SCAN:** NECT show 70 – 75% hyperdense well circumscribed uniform lesion which enlarges uniformly with CECT 10 – 15% shows cystic areas. The lesions are smooth lobulated masses that about dural surface extra axial usually at an obtuse angle. In 15 – 20% tumors calcification is seen.

Pasammomatous (Sand like) Sun burst or globular even rim like pattern occur. Hyperostasis can be strinking or absent. Bone destruction sometimes occurs. Peripheral oedema seen in 60% of cases.[16]

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**MRI:** Characteristic finding viz., gray, white interface buckling or displacement and a cleft or pseudo capsule of CSF and vessels that surround the mass, separating it from brain.

Typical meningiomas isointense (60 to 65%) or slightly hypointense (30-35%) relative to gray matter on Tl weighted images.[17] On proton density and T2 weighted images, approximately 50% isointense, 40% hyperintense, 10% hypointense.[18] Morethan 95% tumors enhance strongly on contrast administration. Post contrast studies can also delineate the precise extent of enplaque lesions. 60% of meningiomas have a collar of thickened, enhancing tissue that surrounds their attachment. So called dural tail sign which is highly suggestive but not specific for meningioma. Other lesions such as Schwannoma glioblastoma multiforme, and metastasis occasionally are associated with a dural tail.[19]

**MALIGNANT MENINGIOMA:** Imaging cannot predict with certainly the future behaviour of meningiomas, but certain imaging features may be associated with malignant histology aggressive clinical behaviour. These include moderate hyper density on NECT, gross bone destruction, absent or minimal calcification, irregular inward projections of tumor toward the brain central areas of low density, indistinct tumor margins at the brain surface and mush rooming.[20]

**ANGIOGRAPHY:** May occasionally be useful to serve a road map for surgery to facilitate pre-operative embolization, to establish patency of the major dural sinuses, and in patient with atypical cross sectional imaging features, to confirm the diagnosis. Classic findings include:

i. Modestly enlarged tortuous affected vessels usually from meningeal branches of the external carotid system.
ii. Abnormal arborisation of the efferent arteries, with the distal branches often larger than the parent arteries.
iii. Sun burst appearance of arteries at the hilus or attachment of the meningioma to the Dura matter which is the tumors site of origin.
iv. Tumor vascularity or corck screw appearance of the small arteries in the lesion.
v. Usually normal circulation time.
vi. Dense tumor capillary blush at late venous phase.[21]

**AIMS AND OBJECTIVES:**

1. To study clinical characteristics.
2. To study radiological characteristics.
3. To study surgical resectability.
4. To study surgical outcome.
5. To study histology of these tumors.

**CLINICAL METHODS & MATERIALS:**

**PATIENT POPULATION:** A prospective study of 84 (between NOV 2006 – NOV 2014) 84 cases of intra cranial meningioma were operated during this period. Total of 780 cranial tumors were operated during this period. This constitutes 10.96% of intracranial tumors.

Of 84 cases there were- 38 male: 46 females.

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This includes 3 paediatric age group patients. Age range being minimum of 8 yrs. to maximum being 63 yrs. with mean age of 38 yrs.

| Age in years | No. of patients |
|---|---|
| 1 – 10 years | 3 |
| 11 – 20 years | 6 |
| 21 – 30 years | 16 |
| 31 – 40 years | 20 |
| 41 – 50 years | 24 |
| 51 – 60 years | 12 |
| 61 – 70 years | 3 |

Table 1

**CLINICAL PRESENTATION:** Duration of symptomatology is 1 month to 8 years. The main clinical symptoms were headache (52 patients), convulsions either focal or generalized (39 patients), visual impairment (22 patients).

| Symptoms | Patients |
|---|---|
| Headache | 52 (61.90%) |
| Convulsions | 39 (45%) |
| Visual impairment | 22 (25%) |
| Limb paresis | 15 (19%) |
| Ataxia | 10 (11%) |
| Personality changes | 8 (9%) |
| Proptosis | 8 (9%) |
| Other | 12 (16%) |

Table 2

| Signs | Patients |
|---|---|
| Papilloedema | 33 (40%) |
| Normal examination | 13 (15%) |
| Limb paresis | 15 (17.85%) |
| Decreased visual acuity and field defect | 18 (21.4%) |
| Involvement of other cranial nerves | 13 (15%) |
| Memory disturbances, behavioural changes | 10 (12%) |
| Cerebellar signs | 8 (10%) |
| Optic atrophy | 4 (6.5%) |

Table 3

**RADIOLOGICAL FEATURES:** All the patients underwent apart from routine skull x-rays, CT scan brain plain & contrast studies. Only few patients underwent MRI brain. The CT scan results were

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analyzed for enhancement characteristics, calcification, hyperostosis, degree of hypo density, tumor size, and presence of midline shift. Angiography was not done for any patient.

| CT finding | No. of patients |
|---|---|
| Midline shift | 65 (80%) |
| Homogenous enhancement | 60 (71%) |
| Non homogenous enhancement | 20 (23%) |
| Surrounding oedema | 30 (36%) |
| Hyperostosis | 15 (18%) |
| Calcification | 20 (27%) |
| Mushrooming | 0 |

Table 4

**TUMOR LOCATION:** Commonest location in this study is cerebral convexity, 28 cases i.e., 33.35% followed by sphenoid ridge, 16 cases (23%).

| Location | No. of cases | | |
|---|---|---|---|
| | GGH KAKINADA | Cushing and Eisenhardt-1938 (%) | Naidich et al, 1996 (%) |
| Cerebral convexity | 28 (33.35%) | 18.3 | 17.6 |
| Sphenoid ridge | 16 (23%) | 18.0 | 12.5 |
| Parasagittal and Falx | 14 (22.95%) | 22.0 | 12.5 |
| Seller &Parasellar | 5 (5.95%) | 9.5 | 9.6 |
| Base of anterior cranial fossa | 7 (8.3%) | | |
| Orbit | 2 (2.3%) | 0.3 | --- |
| CP angle and Posterior fossa | 5 (5.95%) | 7.3 | 16.2 |
| Tentorial | 2 (2.3%) | | |
| Torcular | 3 (3.5%) | 4.7 | 0.7 |
| Lateral ventricle | 1 (1.19%) | | |
| Clivus | 1 (1.19%) | | |

Table 5

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**RIGHT PARASAGITAL MENINGIOMA**

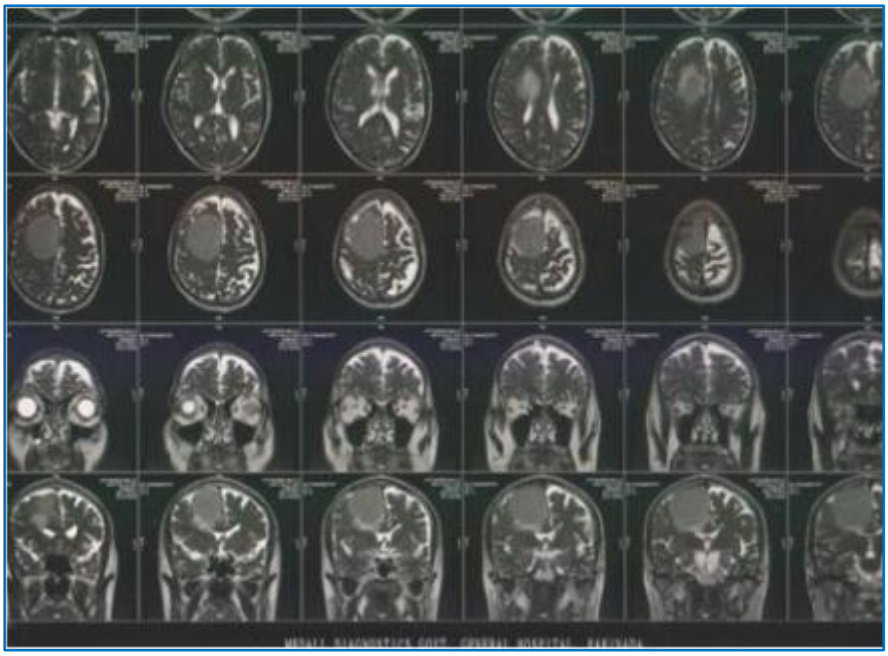

**Fig. 1**

**CLIVAL REGION MENINGIOMA**

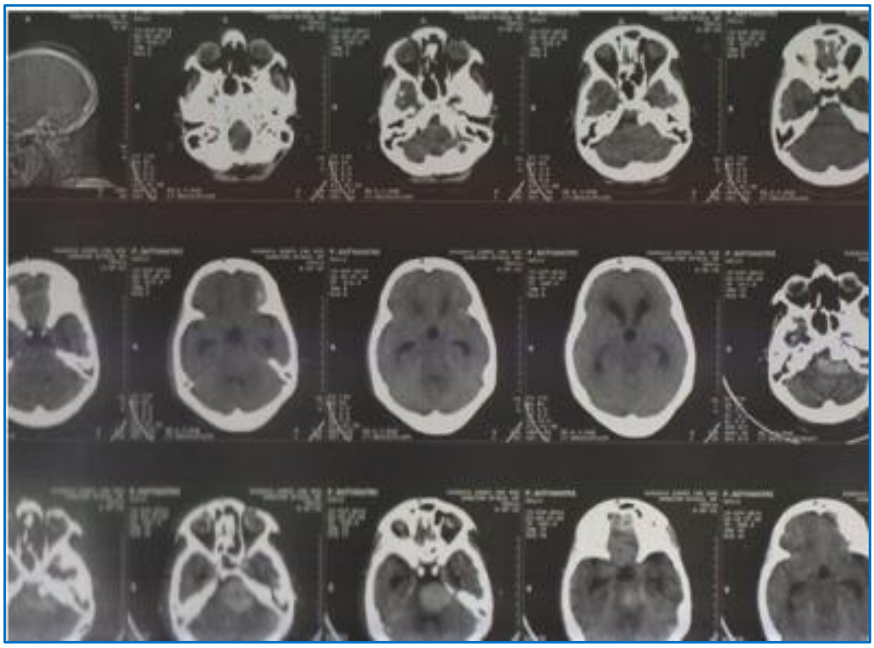

**Fig. 2**

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**LEFT TENTORIAL MENINGIOMA**

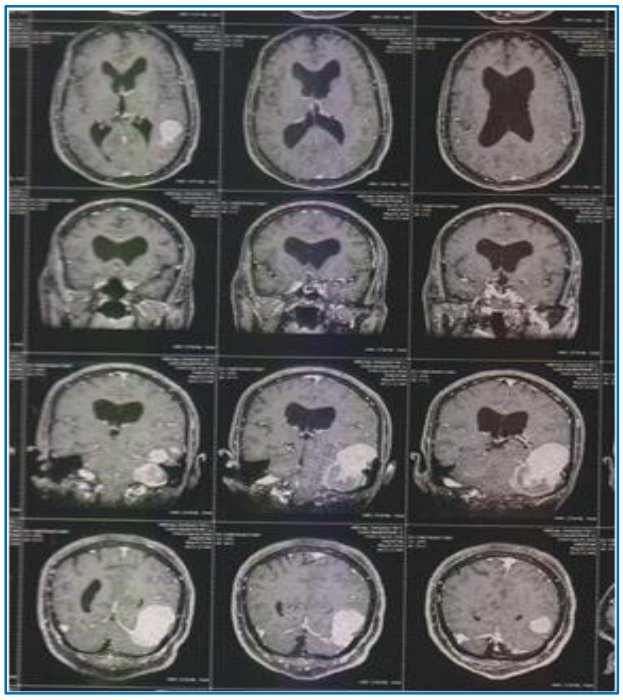

**Fig. 3**

**POSTERIOR PARASAGITTAL MENINGIOMA**

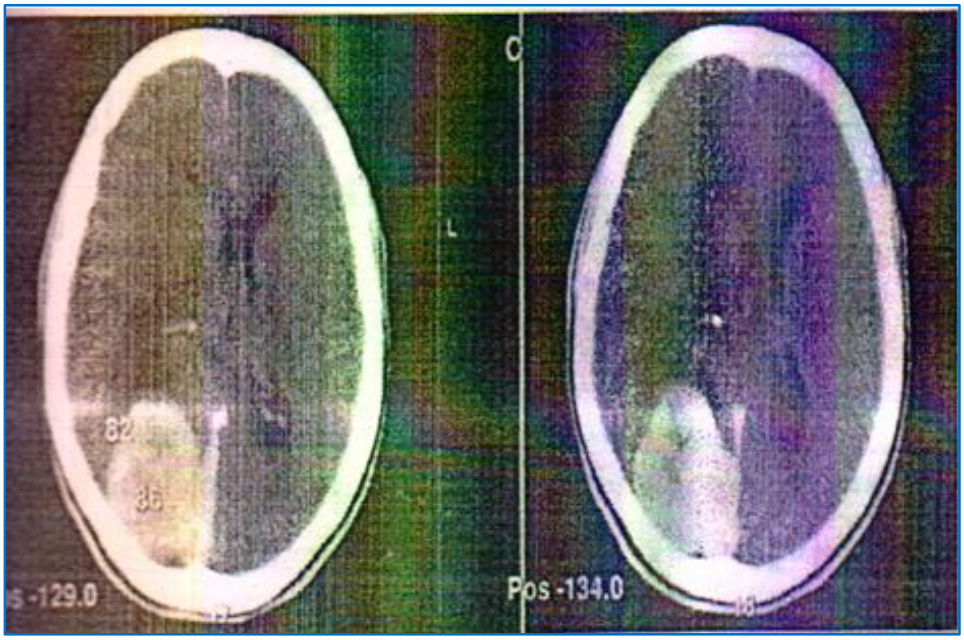


**Fig. 4**

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**TUMOR RESECTABILITY:** All 84 patients underwent surgery; the goal in every surgery is total removal of the tumour. But total removal could not be performed in all the cases.

**TUMOR RESECTION:**

| Simpson's Grade | No. of cases |
|---|---|
| Grade I | 22 (26%) |
| Grade II | 47 (56%) |
| Grade III | 10 (12%) |
| Grade IV | 3 (5%) |
| Grade V | 2 (3%) |

Table 6

Complete resection (Simpson's Grade I & II) : 69 (82.44%)
Incomplete resection : 15 (18%)

**RIGHT PARASAGITAL**

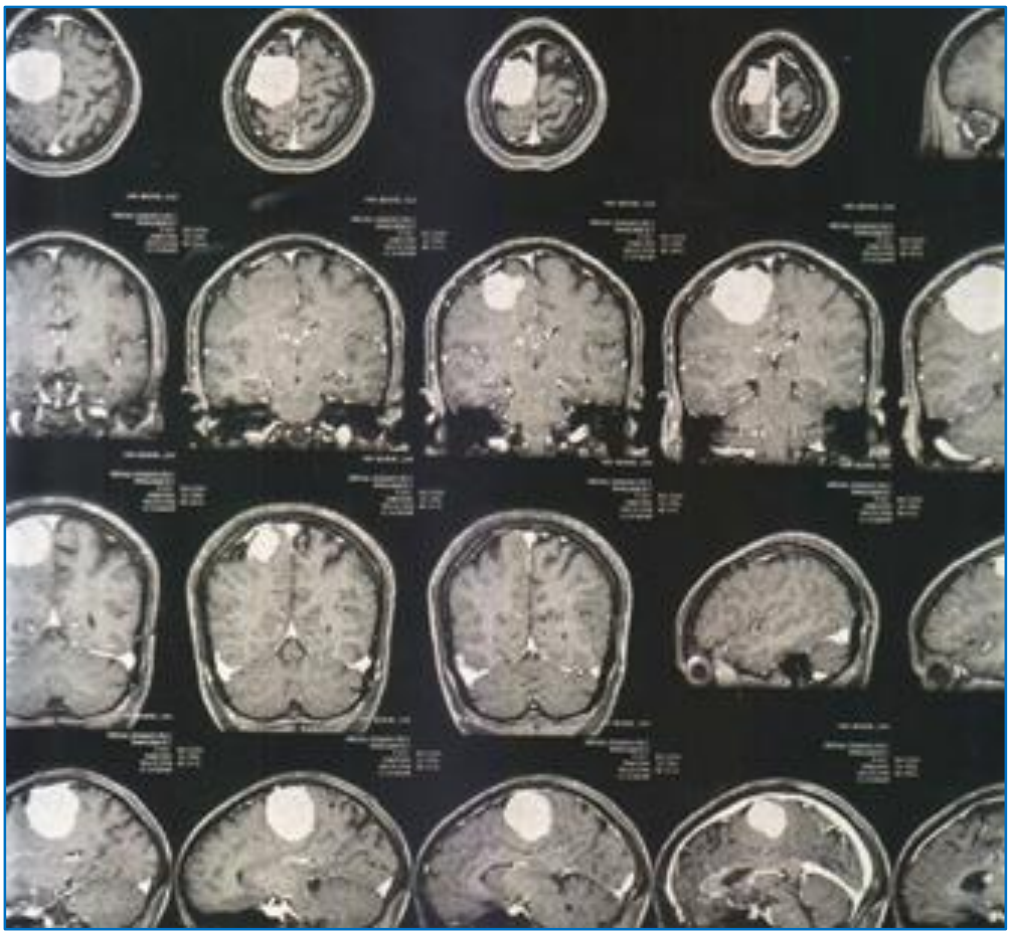

**Fig. 5: PRE-OP**

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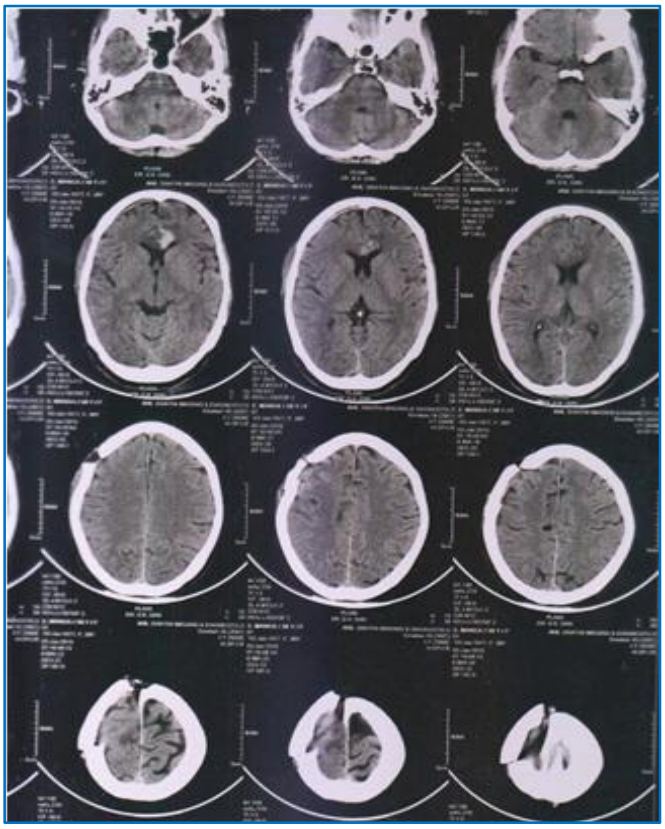

**Fig. 6: POST-OP**

**RIGHT PARASAGITAL MENINGIOMA**

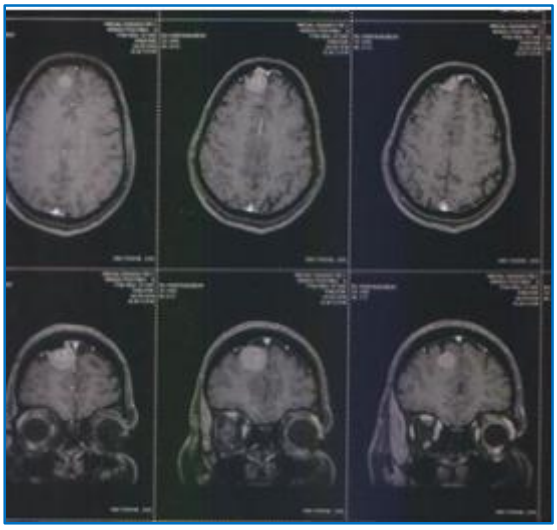

**Fig. 7: PRE-OP**

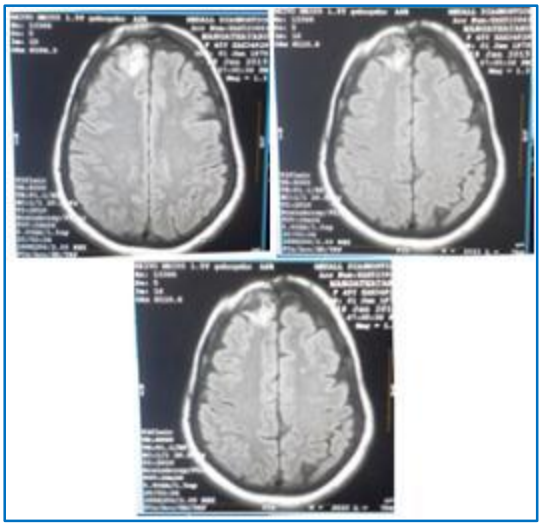

**Fig. 8: POST-OP**

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**LEFT SPHENOIDRIDGE MENINGIOMA**

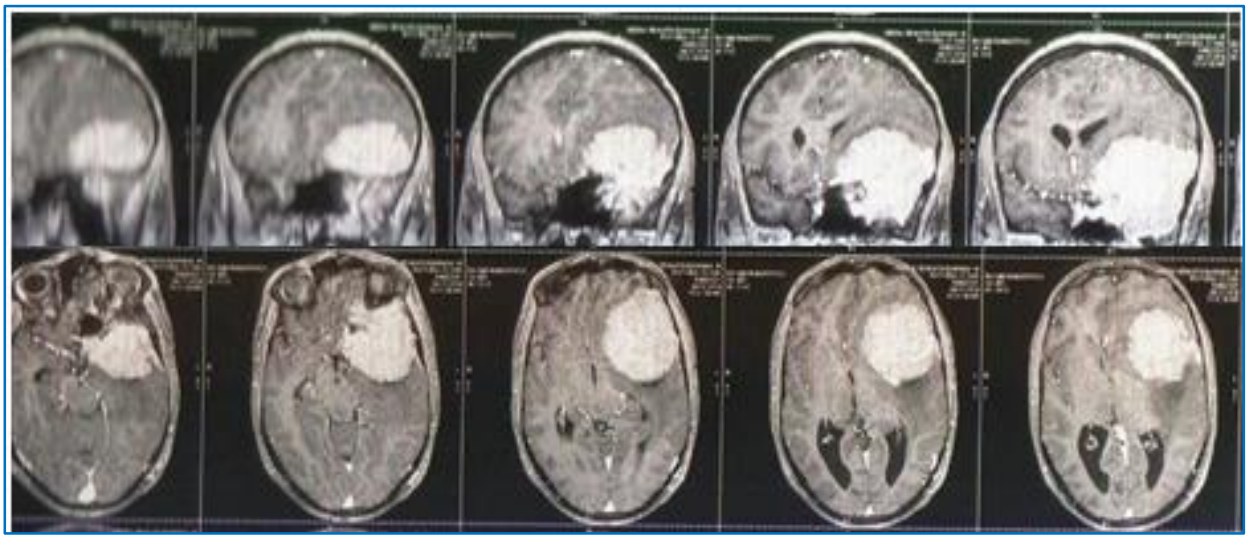

**Fig. 9: PRE-OP**

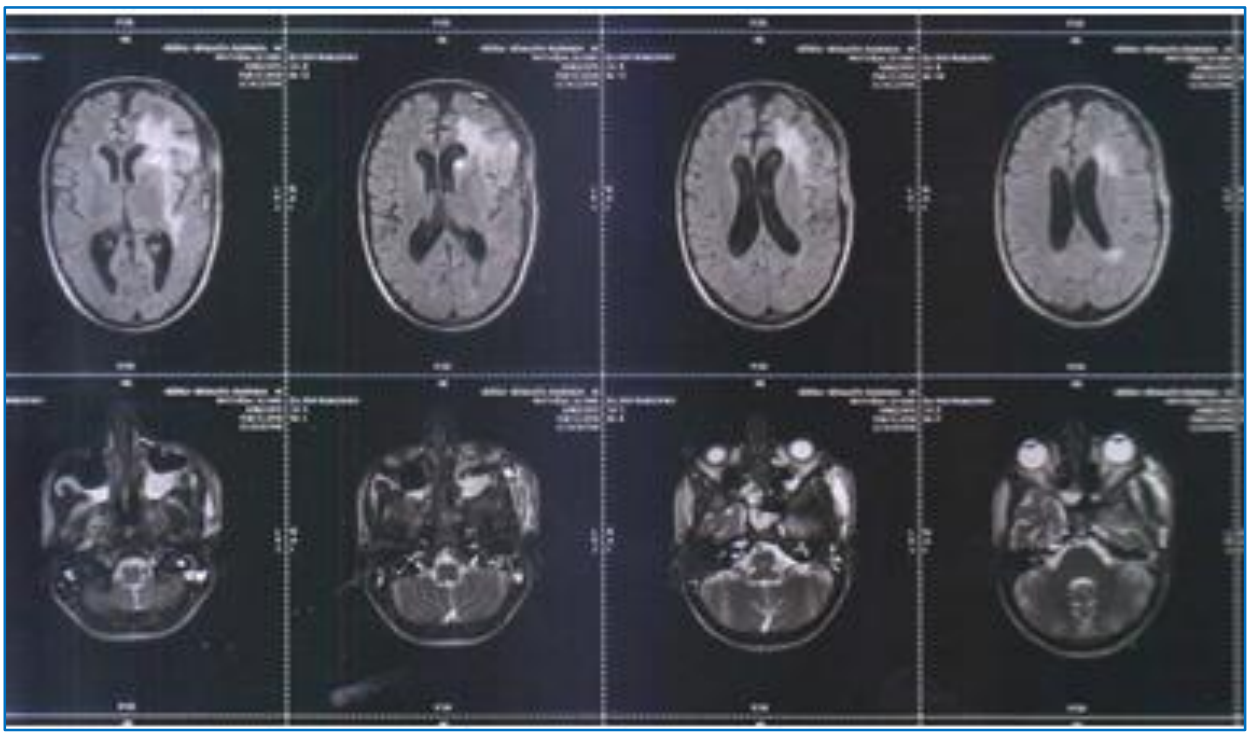

**Fig. 10: POST-OP**

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**ANTERIOR SKULL BASE MENINGIOMA**

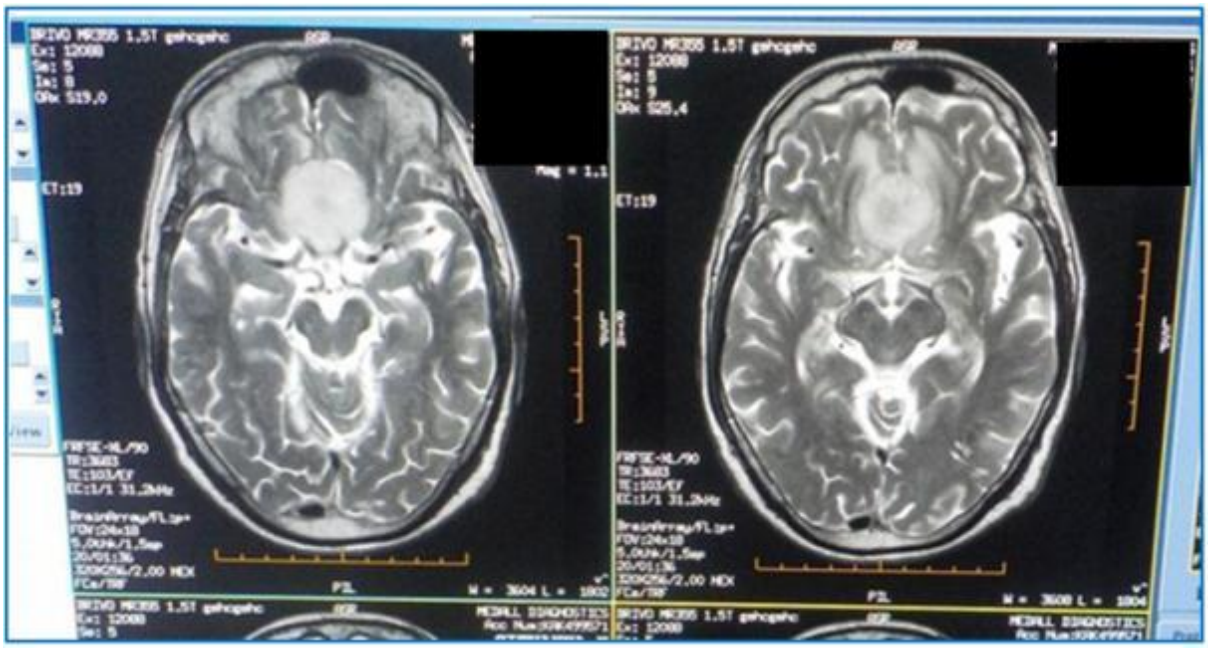

**Fig. 11: PRE-OP**

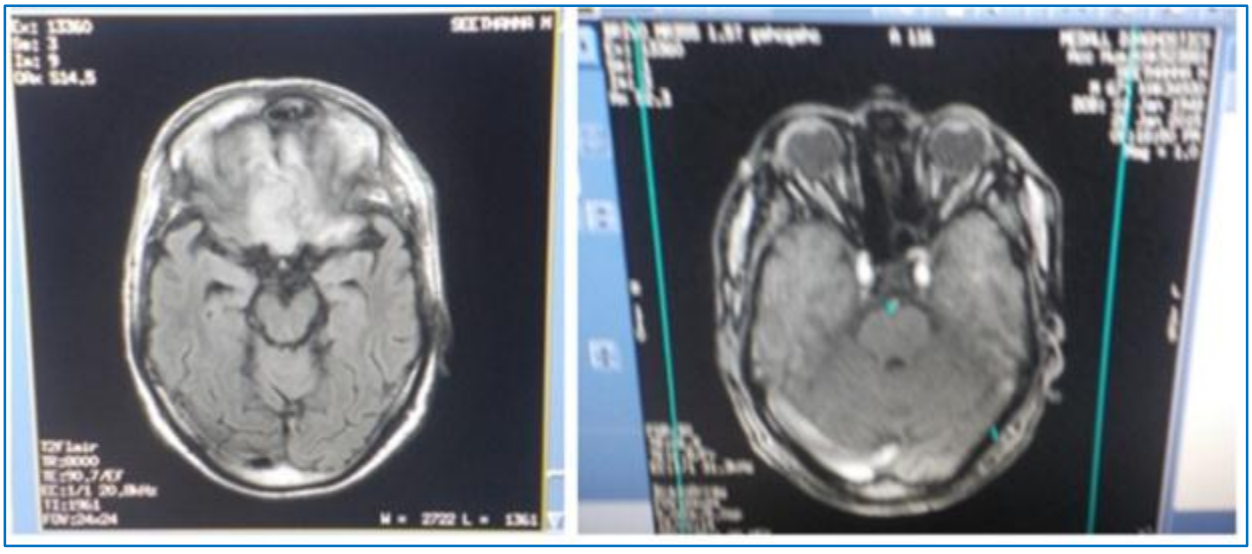

**Fig. 12: POST-OP**

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**ANTERIOR SKULL BASE MENINGIOMA**

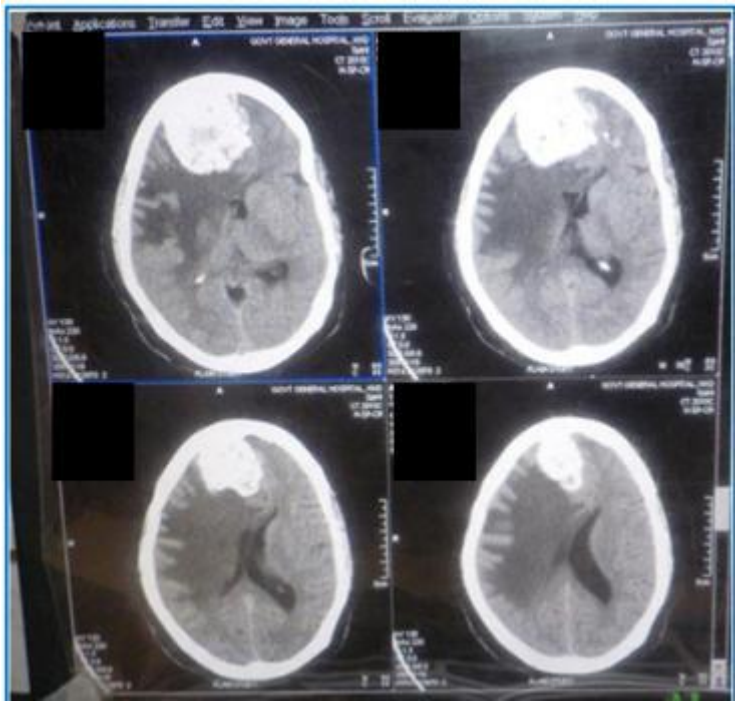

**Fig. 13: PRE-OP**

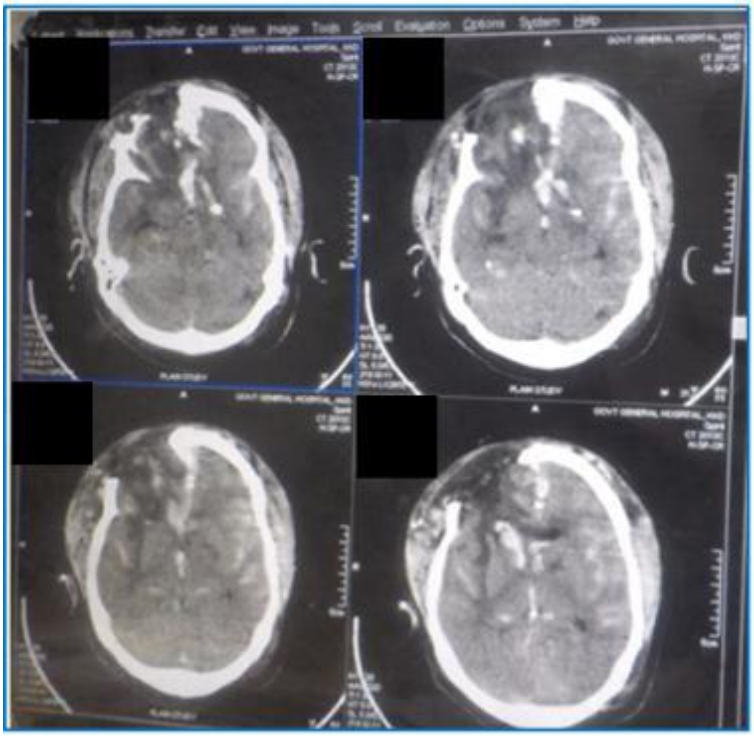

**Fig. 14: POST-OP**

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**OLFACTORYGROOVE MENINGIOMA**

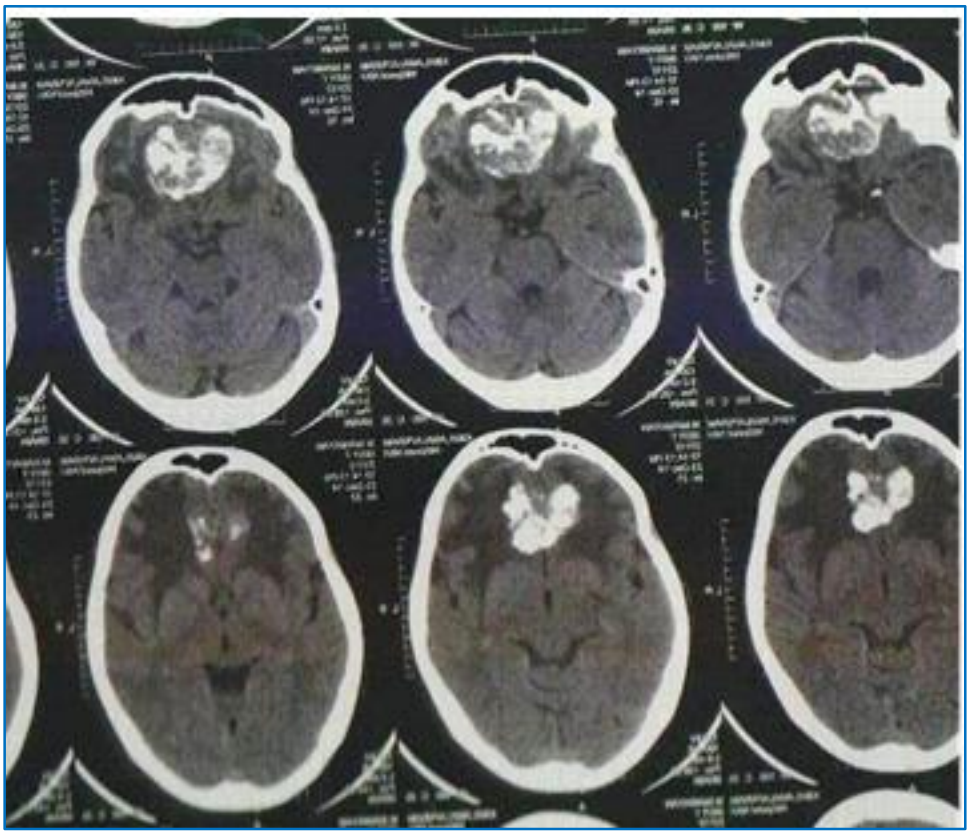

**Fig. 15: PRE-OP**

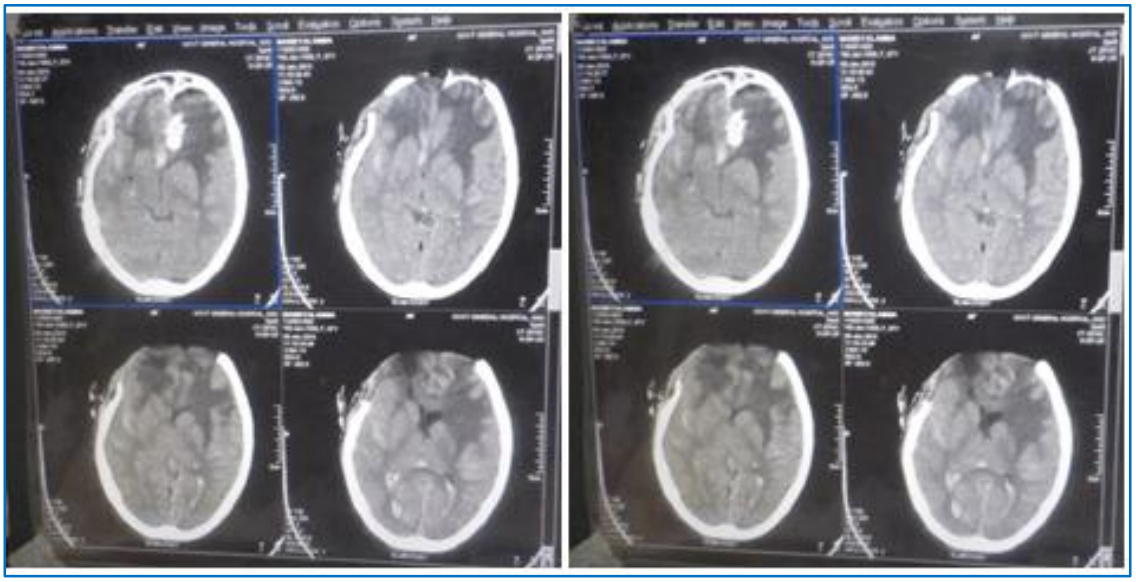

**Fig. 16: POST-OP**

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**RIGHT SPHENOID WING MENINGIOMA**

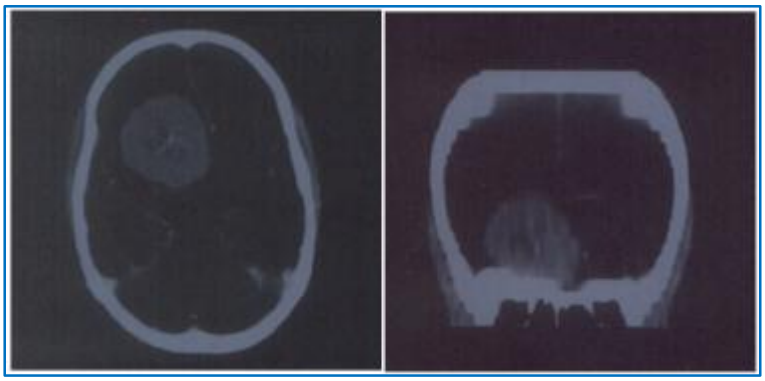

**Fig. 17: PRE-OP**

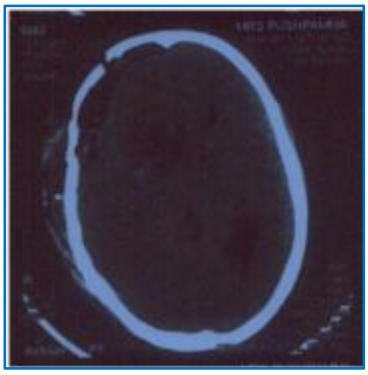

**Fig. 18: POST-OP**

**TORCULAR MENINGIOMA**

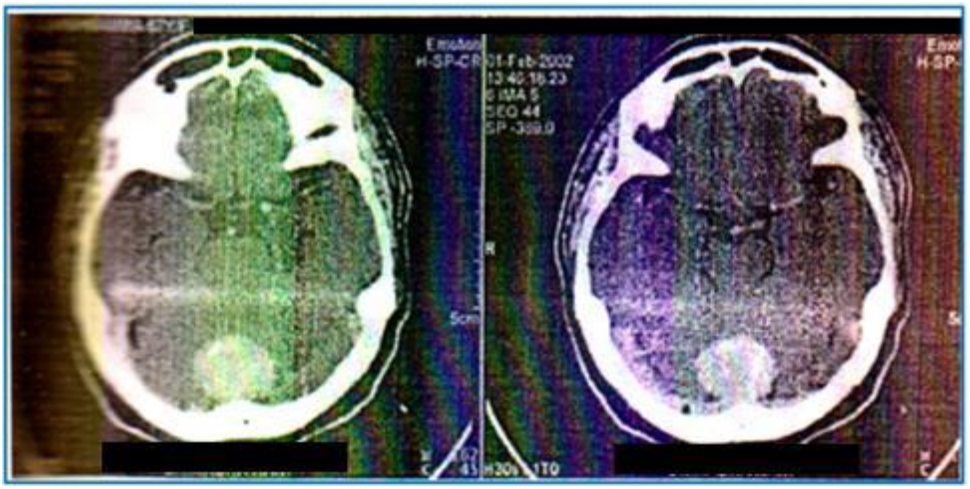

**Fig. 19: PRE-OP**

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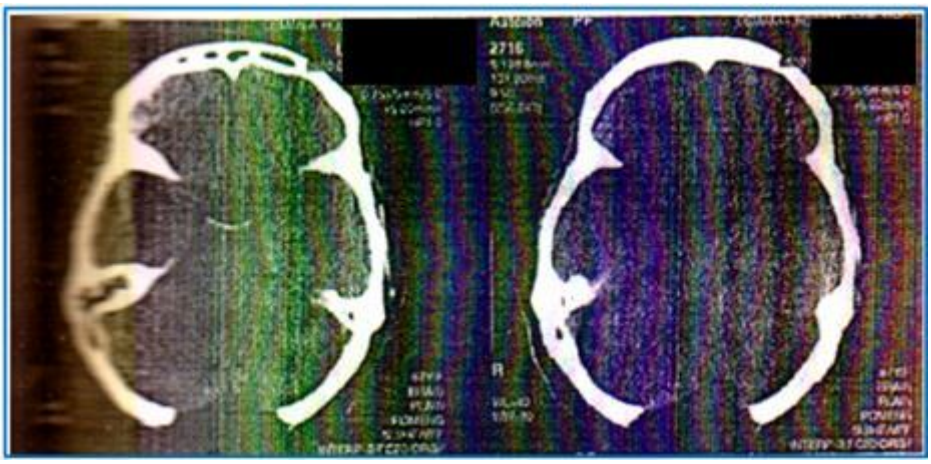

**Fig. 20: POST-OP**

Surgical out Come: Post-operative convulsions being commonest complication, occurred in 26 patients (22%) followed by wound infection in 14 patients (16%), CSF leak in 11(13%),meningitis in 8 patients (10%), Post-operative limb paresis in 5 patients, cranial nerve palsies in 3 patients, post-operative hydrocephalus in two patients, later needed VP shunt subsequently.

There were 6 deaths (7.14%) in this study.

**HISTOPATHOLOGY:** Based on 1979 WHO classification of tumors of meninges, most common histopathological tumor is Meningothelial meningioma, 40 cases, followed by fibroblastic in 19 cases. Anaplastic variety seen in three patients. Angioblastic histological type in three patients.

| Histology | No. of cases |
|---|---|
| Meningothelial meningioma | 40 |
| Fibroblastic | 19 |
| Transitional | 8 |
| Psammomatous | 6 |
| Mixed variety | 5 |
| Anaplastic | 3 |
| Angioblastic | 3 |

Table 7

**Follow Up:** The follow up period is 1 month to 4 ½ years. During this period patient was evaluated clinically and in some cases repeat CT scan brain, to know recurrence or residual tumor.

However follow up period is short, to discuss about recurrence of tumor.

**RESULTS:**

1. This is a prospective study of 84 cases (between NOV 2006 – NOV 2014) were included in this study. Total 84 cases of meningiomas were operated, a total of 780 intracranial tumors were operated during this period in which meningiomas comprises 10.76%.
2. The male: female ratio is 1: 1.21.

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3. Peak age of presentation is 63 years, with mean age of 38 years.
4. The duration of symptomatology ranges from 1 month to 3 years.
5. Commonest presenting symptoms being headache in 52 (62%) and convulsions in 39 patients (45%).
6. Papillodema was the commonest clinical sign seen in 33 patients (40%).
7. Normal clinical examination noted in 14 patients (16%), these patients was investigated for their long symptomatology which revealed the disease.
8. CT scan of the brain is the main stay in diagnosis in all the patients; however it didn't help in preoperative assessment of histological type and vascularity of lesion.
9. Commonest location of meningiomas in this study were cerebral convexity 28 patients (34%) followed by sphenoid ridge 16 patients (23%).
10. On surgical resection, total resection (Simpson's grade I & II) done for 69 cases (82%). Incomplete resection (Simpson's grade III,IV,V) done for 15 cases (18%).
11. The reasons of incomplete resection being deliberate incomplete resection of tumors which are close to important major neurovascular structures, technical difficulties, non-availability of adequate blood, anaesthesia and patients related complications.
12. Commonest post-operative, convulsions 19 patients (22.6%) which were subsequently controlled, another common complication being infection 14 patients (16%) is the main cause of morbidity and mortality in our series. Post-operative CSF leek noted in 8 patients (9.5%), meaningitis in 6 patients (10%).
13. There were 6 deaths (7.14%) in this series. In various other series death rate range from 4% to 14%.
14. In this study reasons were intraoperative anaesthetic and patient related complications in two cases fulminant meningitis in two cases, MCA territory infarction in one case, post-operative myocardial infarction in one case.
15. Our total follow-up period of maximum being 4 ½ years. There is 1 recurrence, parasagittal malignant meningioma for which grade IV resection was done.

**Comparison of results with Literature:**

| | **Kallio et al** | **Martin et al** | **GGH-KAKINADA** |
|---|---|---|---|
| Period of study | 1953-1980 | 1980-87 | 2006 - 2014 |
| Total No. of cases | 935 | 193 | 84 |
| Male: Female | 1:2 | 1:2 | 1:1.2 |

Table 8

| **Clinical Features** | **Kallio et al** | **Martin et al** | **GGH-KAKINADA** |
|---|---|---|---|
| Headache | 385(41%) | 70 (36%) | 52 (61.2%) |
| Preoperative epilepsy | 421 (45%) | 65 (34%) | 39 (45%) |
| Papilloedema | 290(31%) | 15 (8%) | 33 (40%) |

Table 9

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| Location of tumor | Kallio et al | Martin et al | GGH-KAKINADA |
|---|---|---|---|
| Cerebral convexity | 209 (22%) | 60 (34%) | 28 (35.3%) |
| Parasagittal &falx | 255 (27%) | 39 (22%) | 14 (22.5%) |
| Olfactory groove 7 suprasellar region | 169 (18%) | 13 (6%) | 4 (4.5%) |
| Sphenoid ridge | 211 (23%) | 30 (17%) | 16 (23%) |
| Posterior fossa | 92 (10%) | 16 (9%) | 5 (5.75%) |

Table 10

| Histological type | Kallio et al | Martin et al | GGH-KAKINADA |
|---|---|---|---|
| Benign | 882 (94%) | 179 (93%) | 80 (95%) |
| Malignant | 53 (6%) | 14 (7%) | 4 (4.7%) |

Table 11

| Extent of Tumor Removal | Kallio et al | GGH-KAKINADA | Madras Medical College, Chennai |
|---|---|---|---|
| Complete resection | 762 (69%) | 69 (82%) | 76 |
| Incomplete resection | 168 (15%) | 15 (18%) | 24 |

Table 12

| Complications | Kallio et al | GGH-KAKINADA |
|---|---|---|
| Post operative hematoma | 56 (6%) | 1 (1.1%) |
| Meningitis | 33 (4%) | 8 (10%) |
| Removal of bone flap | 31 (3%) | 2 (3.4%) |

Table 13

**MORTALITY:**

| | | |
|---|---|---|
| Kalio et al | 1953 – 1965 | 16% |
| | 1965 – 1983 | 7% |
| Balazin & Temirov ES | 1946 – 1966 | 17.8% |
| | 1970 – 1980 | 15.5% |
| | 1986 - 1996 | 5.2% |
| GGH | 2006 – 2014 | 7.14% |

Table 14

**DISCUSSION:** This is a prospective study of 84 cases between NOV 2006 – NOV 2014. Total 84 cases of meningioma as were operated, a total of 780 intracranial tumors were operated during this period in which meningioma as comprises 10.76% of total primary intracranial neoplasms. This reflects same as described by various authors, the incidence of meningioma being 13% - 20% of all primary intracranial neoplasms.[22] The male: female ratio in the study in 1: 1.2. A study of Sri Chitra Tirunal Institute of Medical Sciences has M: F of 2: 3 which is comparable with our series. But the various other series (Kallio et al, Martin et al)[23] described the incidence being 1: 2. The lower percentage of

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female population in our series' most likely due to cultural phenomenon like illiteracy lack of independency, poverty, neglect of health related problems etc.

The incidence of meningioma as increases with age. Same is observed in this study. A dip after sixth decade noted. Possibly be explained by several factors such as neglect or failure to attend elderly problems, less aggressive surgical approach in elderly etc. There are 3 paediatric age group patients in this study, which correlated uncommon presence of meningioma as in this age group as described in literature.

The commonest initial presenting symptom is headache, noted in 61% of cases. This is in comparision with other studies showed as commonest initial presentation in about 35 – 50% of total cases. The high percentage of headache as initial complaint may be due to long duration of symptoms, initially considered as nonspecific. Epilepsy as presenting symptom noted in 40% of patients, which is comparable to various other series.

Commonest clinical sign on examination is papilloedema in this series, noted in 39% of cases. Other series like Kallio et al, showed 31%, in another series the incidence is as low as 8%. Normal clinical examination noted in 16% of patients. These patients were investigated for their long standing nonspecific symptomatology and on investigation showed the disease.

The most important diagnostic modality in our series is CT scan brain. All the patients underwent both plain and contrast enhanced CT scan brain. 8 patients in our study underwent MRI scan of brain. CT plays a major role in a establishing the diagnosis and location of meningioma. CT will permit an earlier diagnosis and very cost effective. But MRI has multiplanar imaging capability with better anatomical details, especially useful to plan surgery in complicated anatomical regions like, sellar region and tentorial region. In our study, CT scan of brain is the diagnostic modality. The reasons being, CT scan gives almost all the information needed for planning surgery. CT scan is more economical investigation compared to MRI, where most of our patients cannot afford. In our study, CT scan is neither helpful in preoperative prediction of histological type nor the tumor vascularity. 3 of our patients underwent angiography. Angiography is considered useful to serve as road map for surgery, to facilitate preoperative embolization, to establish patency of involving dural venous sinuses, and in patients with atypical cross-sectional imaging features, to confirm the diagnosis.

In our study there are 3 anaplastic tumors, among them 2 are para sagittal & 1 cp angle in location. The CT scan findings being calcification of absent in all the 3 and 2 para sagitalmeningiom as were showing perilesional oedema and tumor necrosis and CP angle meningiomas was showing lytic changes in the mastoid bone.

In our study cerebral convexity being commonest location of meningiomas, noted in 33% of patients followed by sphenoid ridge in 23%. Kallio et al, of their 935 cases of meningiomas.[8] Parasagittal and falx being commonest location noted in 27% of patients, while convexity lesions noted in 22%. In another series of Martin et al of his 193 cases of meningiomas cerebral convexity noted in 34% of cases.

In our series of 84 cases of meningiomas, even though the goal in every surgery is total removal of tumor, but we could not perform total removal in all the cases. As per Simpson's grades of tumor resection, a complete resection (Simpson's grade I & II) performed in 62% of cases, imcomplete resection (Simpson's grade III, IV & V) done for 18% of cases. This is comparable to various other studies:

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i. Deliberate incomplete resection for tumors located close to major neurovascular structures (Tumors located at sellar, parasellar region, medial sphenoid wing tumors and tumors involving posteior parasagittal region).
ii. Technical difficulty of total removal in cases of tentorialmeningiomas, clival tumors and posterior parasagittal meningiomas involving sagittal sinus.
iii. Non-availability of adequate blood.
iv. Anaesthesia and patient related complications like intraoperative haemodynamic instability, intraoperative brain swelling and intra operative cardiac rhythm irregularities.
v. 2 stage operations were performed in 2 cases that were angimatous and bled profusely in first operation.

Complete resection done for all tumors involving cerebral convexity, olfactory groove meningiomas, anterior third Para sagittal meningiomas and lateral sphenoid wing tumors.

**Comparison of extent of removal with other Studies:**

| Extent of Tumor Removal | Kallio et al | GGH- KAKINADA | Madras Medical College, Chennai |
|---|---|---|---|
| Complete resection | 762 (69%) | 69 (82%) | 76 |
| Incomplete resection | 168 (15%) | 15 (18%) | 24 |

Table 15

Bone flap removal was done for 2 cases due to intraoperative brain swelling.

Major post-operative complications in our study were convulsions 22% wound infection 16%, CSF leak in 13%, meningitis in 10% of cases. All the patients before surgery were adequately treated with anticonvulsive therapy. Postoperatively 15% of cases developed convulsions within 48 hrs after surgery. They were controlled with increase in the dose of antiepileptics or addition of another antiepileptic drug. The major morbidity in our series was post-operative infection, in the form of wound infection, CSF leak, and meningitis was due to improper functioning of central sterilization equipment, at certain times, which was investigated and brought to the notice of hospital administration by us.

There are 6 deaths i.e., 7.14% of cases in our series. The literature shows mortality rate as high as 16% (Pertuiset et al 7%, Jan et al 14.3%, Jaaskelain et al 7% mortality rate). The reasons in their series being poor preoperative neurological status, advanced age, pulmonary embolism and post-operative intracranial hematoma. In our series, reasons for mortality were, two cases related to intraoperative anaesthetic and patients related complications, two cases because of fulminant meningitis.

One case due to post-operative MCA territory infarct, and one case due to myocardial infarction. Patient related and infections (meningitis) are major causes of mortality in our series. Thorough workup, better anaesthetic monitoring facilities, uncompromised aseptic operative and post-operative conditions, and availability of higher antibiotics whenever indicated may reduce the mortality and morbidity to significant degree.

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**Mortality Comparison with others Studies:**

| | | |
|---|---|---|
| Kalio et al | 1953 – 1965<br>1965 – 1983 | 16%<br>7% |
| Balazin&TemirovES | 1946–1966<br>1970–1980<br>1986-1996 | 17.8%<br>15.5%<br>5.2% |
| GGH-KAKINADA | 2000–2005 | 7.14% |

Table 16

On histopathological examination based on WHO classification (1979) 95% of our patients showed benign histopathology. Various other series Kallio et al and Martin et al described 94% of their study showed Benign tumours.

In Simpson's series Grade-I to grade IV tumors had recurrencerate of 9%, 19%, 29% and 40% respectively at 10years. Jaaskelian et al analysis of 657patients showed an overall recurrence rates of 19% over 20years period.

In our series the total follow up period is 4½ years during which the patients were followed up and assessed clinically and in some patients with CT scan brain. There is one recurrence in our study which was a parasagital malignant meningioma which required stage IV decompression. This follow up period is not enough to comment about recurrence rate.

Radiotherapy was given for 3 patients; all the 3were anaplastic tumors.

**CONCLUSION:** The management of meningiomas remains a major challenge to neurosurgeons. With the advance of better imaging technique, tumors are identified earlier. Surgical technique using operative microscope, intraoperative monitoring facilities and improved understanding of anatomy will allow tumors to be resected totally with better results.

**BIBLIOGRAPHY:**

1. AI-Mefty O- Meningiomas Newyork, Raven 1991.
2. Al -Rodhan NRF, Laws ER Jr. Meningioma: A Historical study of tumour and its surgical meningiomas neuro. Surg. 26: 832- 847: 1990.
3. Rachlin JR, Rosenblum Mc.,: Etiology and biology of meningiomas in Al-mefty O (ed): Meningomas, New york, Raven; 22- 37,1991.
4. Annergers JF, Laws FR Jr. Kurland LT, Grabow JD. Head trauma and subsequent brain tumors. Neurosurgery 4: 203- 206, 1979.
5. Choi NW, Schwman LN, Gullen WH, Epidemiology of primary central nervous system neoplasms II, Case control study, Am. J. Epidemiol.91: 467- 485,1970.
6. Ibelgrafts H, Jones Maitland, N. Shew JF, Adenovirus related RNA, Sequences in human neurogenic tumors, Acta Neurological 56, 113 -117, 1982.
7. Glic M, TT 0. Brien M. Meacheem L, et al Childhood intracranial meningiomas after high dose irradiation, cancer 71: 1993.
8. Modan, B. Bardat Z D, Mart H Steiniz R. Levin SG, Radiation induced head and neck tumors Lancet J: 1: 277- 279,1974.
9. Collins VP, Morden SK J old M. Du Monski JP, The molecular genetics of meningiomas. Brain pathology 1: 1990.

DOI: 10.14260/jemds/2015/339



10. Adems EF Schrell U.M. W. Fehlbusch, R. et al Hormonal dependency of cerebral meningoma. J. Neurosurgery 73,750 -755,1990.
11. Zulch KJ, Histologic typing of tumors of central nervous system. International histological classification of tumors No.21: Geneva World Health organization 1979.
12. Kepes 11, Review of WHO's new proposed classification of brain tumors, proceedings of XI international congress of neuropathology, Tokyo, Japan, 87 -97, 1990.
13. Rohringer M, Sutther land oR, Louw DF, Simo AA, Incidence and clinicpatho-logical features of meningioma, J.Neurosurg.71: 665- 672,1989.
14. Asim Mohmmed, Dariou Cecum, Frank J, Tomeck, Ghansi A typical and malignant meningiomas, A clinicopathological Review. Neurosurg. Vol.33, 955- 963, 1993.
15. Jaaskelainen J, Haltia M. Lassonen E et al: The growth rate of intracranial meningiomas and its relation to histology, An analysis of 43 patients, surg. Neurology 24: 165 -172, 1985.
16. Jaaskelainen H. Haltia M, Servo, A: Atypical and anaplastic meningiomas, Radiology, Surgery, Radiotherapy and outcome. Surg. Neurol. 25: 223-242, 1986.
17. Osborn AG. Handbook of Neuro Radiology St. Louis Mosby Year book: 1991.
18. Spangnoli MY, Goldberg HI, Gross Man RI et al Intracranial meningiomas high filed MR imaging, Radiology 1986; 161.
19. Goldsher D, Litt A W, Pinto RS et al Dural tail, associated with meningiomas on Gd. DPT A enhanced MR images: Characteristics, differential diagnostic value, and possible implication of treatment, Radiology 1990; 176.
20. New PF1, Hessselink JR, Carrollcl, Kleinmen oM, Malignant meningiomas, Am.J. Neurology: 3: 267 -276, 1982.
21. Taveras JM, Wood EH, Diagnostic Neuroradiology.
22. Peter MCL., Black P MCL Meningiomas Neuro. surgery, 32: 643 -657, 1993.
23. Kallio M, Sankila R, Hakulinen T, J aaskelainen J. Factor affecting operative and excess long tenn mortality in 935 patents with inracranial meningiomas. Neuro Surgery 31: 2-12, 1992.

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