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A Study of Meningiomas in Tertiary Care Center in South India.

Dr.Joel Dhanapandian S[1]., Dr.Johnsy Merla J [2].,
[1]*Associate Professor, Department of Neurosurgery, Tirunelveli medical college.*
[2]*Assistant Professor, Department of pathology, Tirunelveli medical college.*
The Tamilnadu Dr.M.G.R Medical University, India

Abstract:*Meningiomas are slow growing tumors arising from the meningothelial cells accounting for 25.25% of CNS neoplasms with a wide variety of histological patterns. Two of the most important factors that determine the prognosis in patients with meningiomas are the extent of the resection and the tumor's histological grade. Among 50 cases of central nervous system tumors, during the study period of 3 years, meningiomas constituted 36% of cases and these cases were analyzed for age, sex incidence, location and histopathological diagnosis. The tumor was more common in females - 55.55%. The most common age group affected was 31- 40 years. The most common location was intracranial - 88.88%. The convexities were commonly involved - 68.75%, in which frontal was commonest 45.45%. Intraspinal meningiomas were 11.11%. The most common clinical symptoms were headache, seizures and vomiting related to raised intracranial pressure. The common radiological findings were mass lesions with pressure effect on adjacent structures and peritumoral edema. The most common histologic types in our study were meningothelial type (38.89%) Although as a group they are considered to be benign, symptoms, variability in recurrence frequency, life expectancy, histological appearance and prognosis exists.*

Keywords*: CNS Tumors, Histopathology, Intracranial, Intraspinal.*

I. Introduction

Meningiomas constitute approximately a quarter of central nervous system (CNS) neoplasms. These are derived from arachnoidal cells of the leptomeninges, appear joined to the duramater, and located along the parasagittal sinus, over the cerebral convexity, sphenoid wing, around the pontocerebellar angle and along region of the spinal cord (1). Harvey Cushing in 1922 coined the name "MENINGIOMA", for the most common dural based tumor, accounting for 15-30% of all primary intracranial tumors (2). These tumors can occur in any age, but commonly present in middle age and has a female preponderance, with a female/male ratio of approximately 2:1 intracranial and 10:1 on the spine. Genetic factors also play a role in meningioma development and predisposition. Type 2 neurofibromatosis (*NF2*) is an autosomal dominant condition related to a mutation on chromosome 22q12 and is a common condition related to increased risk for developing meningiomas, among other neoplasms (3). Loss of heterozygosity at several points in the 22q locus has been found to be an early event in the development of benign meningiomas. Ninety percent of meningiomas are benign, 6% are atypical, and 2% are malignant tumors (4). Most patients with meningioma undergo resection to relieve neurological symptoms. Complete resection is often curative. For incompletely resected or recurrent tumors not previously irradiated, radiotherapy is administered. Two of the most important factors that determine the prognosis in patients with meningiomas are the extent of the resection and the tumor's histological grade (5). Although as a group they are considered to be benign, symptoms, variability in recurrence frequency, life expectancy, histological appearance and prognosis exist.

II. Materials And Methods

This study is a retrospective study conducted in the Department of Neurosurgery, Government Tirunelveli Medical College and Hospital, Tamilnadu, India, over a period of 3 years. Of all CNS tumors, only cases of meningiomas during the study period were included. Meningiomas in all age groups and both sexes were included in the study. Other CNS tumors were excluded. Among 50 cases of central nervous system tumors, during the study period, meningiomas constituted 18 cases and these cases were analyzed for age, sex incidence, location and histopathological diagnosis. Statistical analysis was done by calculating the numbers and percentage for computing the incidence in various age groups, in sexes, location and HPE diagnosis.

III. Results

Of 50 CNS tumors, Meningiomas constituted 18 cases (36%). Females 10 cases (55.55%) were more commonly affected compared to males 8 cases (44.44%) (Fig. 1). The most common age group affected was 31-40 years. In all age groups, the tumor was more common in females except in the older age group of 61- 70. There were no cases of meningioma in children, 11-20 age group and in 71-80 age group. (Table 1 & Fig. 2).

The most common location was intracranial 16 cases (88.88%) (Fig. 3). The convexities were commonly involved - 11 cases (68.75%), in which frontal was commonest- 5 cases (45.45%) (Table 2). Of the other sites within the intracranial location, 2 cases (11.11%) were seen in parasagittal location and in the cerebellopontine angle, and 1 case in falx. Intraspinal meningiomas were 2 cases (11.1%) with one case each in thoracic and cervical region. (Table 2& Fig. 4).

The most common clinical symptoms were headache, seizures and vomiting related to raised intracranial pressure. The common radiological findings were mass lesions with pressure effect on adjacent structures and peritumoral edema.

The most common histologic types in our study were meningothelial type (38.89%), followed by atypical meningiomas (16.67%) . The other variants were fibroblastic (11.11%), transitional (11.11%), psammomatous variant, angiomatous, lymphoplasmacytic and fibrous (5.56%) each. Intraspinal cases were meningothelial and psammomatous meningioma. (Table 3& Fig. 5).

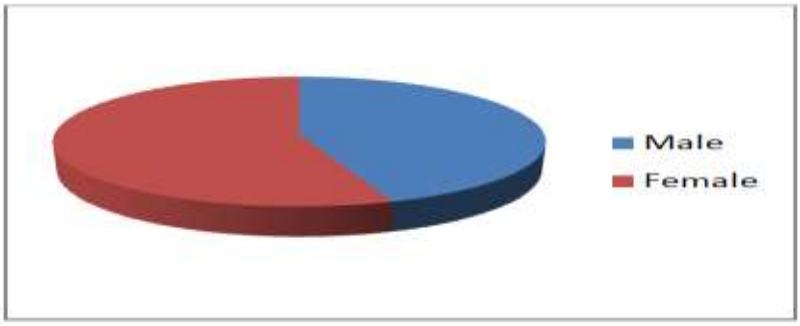

Figure 1: Incidence of meningiomas in male & female.

Table 1: Age wise incidence of meningioma.

Age in years	Male	Female	Total	Percentage
21-30	1	-	1	5.56%
31-40	3	4	7	38.88%
41-50	2	3	5	27.78%
51-60	1	1	2	11.11%
61-70	1	2	3	16.67%
TOTAL	**8**	**10**	**18**	**100%**

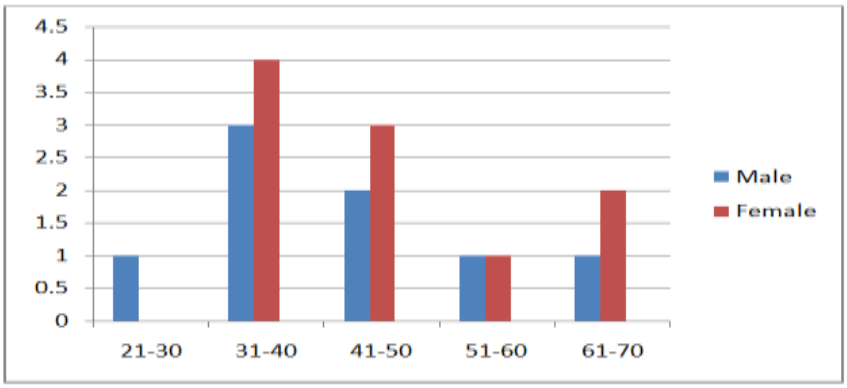

Figure 2: Age wise incidence of meningioma.

Figure 3: Location of meningiomas.

Table 2: Locations of meningiomas

Site	No.of Cases	Percentage
Intracranial		
Convexities	11	61.11%
Parasagittal	2	11.11%
Falx	1	5.56%
CP angle	2	11.11%
Intraspinal		
Cervical	1	5.56%
Thoracic	1	5.56%
Total	18	100%

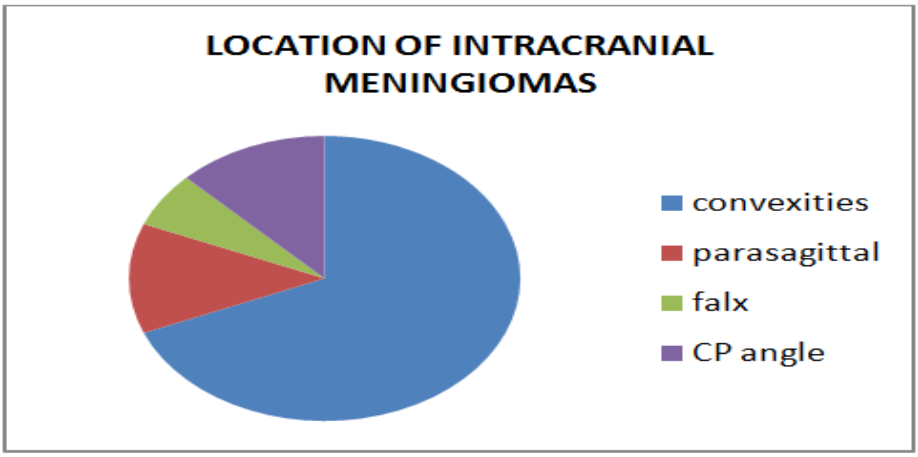

Figure 4: Location of intracranial meningiomas.

Table 3: Histopathological Types of Meningioma.

Histological Types	Male	Female	Total	Percentage
Meningothelial	4	3	7	38.89%
Atypical	1	2	3	16.67%
Fibroblastic	1	1	2	11.11%
Transitional	0	2	2	11.11%
Angiomatous	1	0	1	5.56%
Psammomatous	0	1	1	5.56%
Lymphoplasmacyte rich	1	0	1	5.56%
Fibrous	0	1	1	5.56%
Total	**8**	**10**	**18**	**100%**

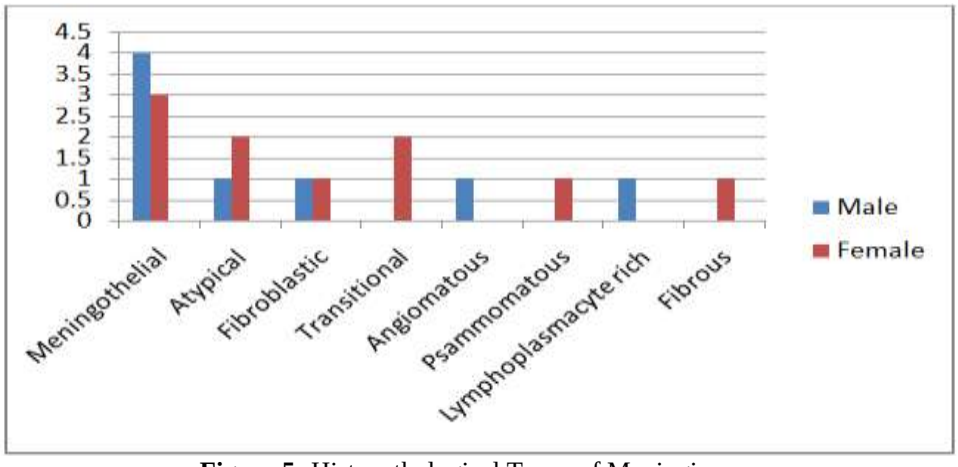

Figure 5: Histopathological Types of Meningiomas

IV. Discussion

Meningiomas constitute 25 - 30% of all CNS tumors and are the most common tumors arising from the meninges (6). Of 50 cases of CNS tumors, Meningiomas constituted 18 (36%), similar to studies by AB, Shah et al (7), Ruberti R F (8), Intisar SH Patty et al (9), Shrilakshmi 25.25% and Ejaz Butt et al (10). Women are more likely to develop a meningioma, with a female/male ratio of 2:1 intracranial and 10:1 in the spine (5).

In our study, females were more commonly affected -10 cases (55.55%) compared to males 8 (44.44%). The present study revealed that the incidence of meningioma was common in the age group 31-40. In the studies done by A B Shah et al (7), Shrilakshmi (2), the most common age group involved was 40- 50years.

Meningiomas in children are less common (11), and in our study, there were no cases of meningiomas in children and in the 11-20 age group and 71-80 age group. Most meningiomas are intracranial - 90%. The present study also revealed the intracranial location to be 88.88% and the convexities were commonly involved 68.75%, in which frontal was more common, 45.45%, followed by the parasagittal area, CP angle and falx, similar to the various studies. In a study by shrilakshmi et al, 61.11% of tumors were located in convexity, which is similar to our studies. In a study by Shrilakshmi (2), the most common location in the posterior cranial fossa was the CP angle, and we had 11.11% of meningiomas in CP angle. Spinal meningiomas are less common than intracranial meningiomas comprising 7.5% - 12.7% of all meningiomas (2). In our study intraspinal meningiomas constitute 11.12% of all meningiomas, similar to studies done by Oren Gottfried et al and Shrilakshmi.

The clinical presentation of meningiomas, depends on tumor location (12). The symptoms at presentation are rarely precipitous, but often insidious. Onset of slowly evolving headache is common and usually not associated with other symptoms suggestive of raised intracranial pressure, reflecting the slow growth of these tumors. A history of partial seizures is common for convexity meningiomas and an insidious personality change that is confused with dementia or depression is common in patients with large inferior frontal meningiomas (4). In our study, the most common clinical symptoms were headache, seizures and vomiting. The common radiological findings were mass lesions with pressure effect on adjacent structures and peritumoral edema.

Meningiomas have a wide variety of histological patterns. Our present study revealed that the most common histologic type was meningothelial (38.89%), similar to studies by Nasrin Samadi et al (13) Sangamithra et al (14), Thomas Backer et al (15), followed by atypical meningiomas (16.67%). The other variants were fibroblastic (11.11%), transitional (11.11%), psammomatous variant, angiomatous, lymphoplasmacytic and fibrous (5.56%) each. According to WHO (5) atypical meningiomas have more than three of the following features – increased cellularity, smaller cells with high N/C ratio, greater than 4 mitotic figures/ 10HPF, prominent nucleoli and geographic necrosis. In our study (16.67%) of atypical meningiomas were reported. Singh Avninder et al (16) reported that papillary meningiomas and anaplastic meningiomas are rare and constitute 1 – 2.5% of all meningiomas. In the studies done by S Hoon et al (17) and Gottfried et al. (18) Psammomatous variant was the most common variant in the spinal region. In Our study, among the two cases reported in spinal region, one was psammomatous meningioma.

Histological analysis reveals that 80–90% of meningiomas are benign [World Health Organization (WHO) Grade I], 5–15% are atypical (WHO Grade II) and associated with a marked increase in recurrence. Only 1–3% of the cases become anaplasic or malignant (WHOGrade III), developing a high tendency to invade brain structures, metastasize, and recur. In our study, 16.67% of atypical meningioma was observed. Though meningiomas are considered to be benign tumors, recurrence is frequently observed (19). Benign meningiomas can recur following incomplete resection, if large and associated with monosomy14 and del (1p36). The extent of surgical resection depends on the size of the tumor, site, and its relation to vital structures. The best accepted system for prediction of recurrence is the Simpson grading system for completeness of resection (20), which evaluates the invasion of the venous sinuses, tumor nodules in adjacent dura, and infiltration of unresected bone by meningothelial cells. The recurrence rates that Simpson refers to were 9% for grade I, 16% for grade II, 29% for grade III, 39% for grade IV, and 100% for grade V, respectively.

Simpson's scale of grading divides the extent of resection into 5 grades:

Grade I: Complete removal

Grade II: Complete removal with coagulation of dural attachment

Grade III: Complete removal, without coagulation of dural attachment or resection of involved sinus or hyperostotic bone

Grade IV: Subtotal resection

Grade V: Decompression biopsy.

For patients with resection grades IV and V, endpoint for recurrence was enlargement of the remaining tumor, shown on MRI or CT. In addition, histological characteristics of malignancy such as peritumoral brain edema, cellular pleomorphism, nuclear atypia, presence of macronuclei, atypical mitoses, increase of neovascularization, brain invasion and necrosis, favor recurrence rate of meningiomas (20).

The treatment in grade I meningioma is total resection. In grade II and grade III meningiomas (2), surgery and adjuvant radiotherapy are the treatment of choice. Extent of surgical resection is one of the most important factors in predicting recurrence along with histological grading.

V. Conclusion

Meningiomas are slow growing tumors arising from the meningothelial cells accounting for 25.25% of CNS neoplasms with a wide variety of histological patterns. These tumors are common in women and Grade I tumors are predominant. Though meningiomas are considered to be benign tumors, recurrence is frequently observed. Two of the most important factors that determine the prognosis in patients with meningiomas are the extent of the resection and the tumor's histological grade. Although as a group they are considered to be benign, symptoms, variability in recurrence frequency, life expectancy, histological appearance and prognosis exist. There is a need to develop new chemotherapeutic, biological and genetic options for recurrent meningiomas that have exhausted surgical and radiation treatment options.

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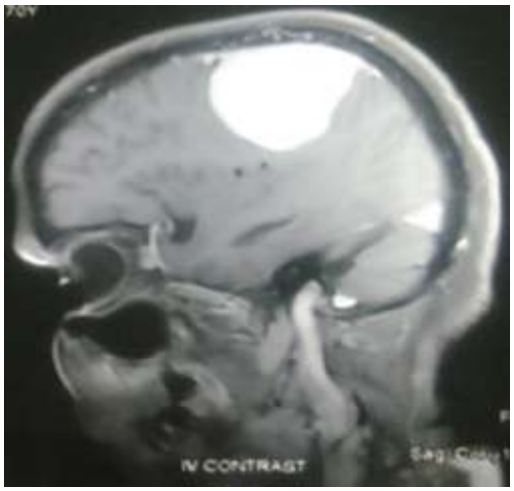

Figure 6a: MRI contrast – Sagittal section showing contrast enhancing Tumor- Parietal Convexity meningioma.

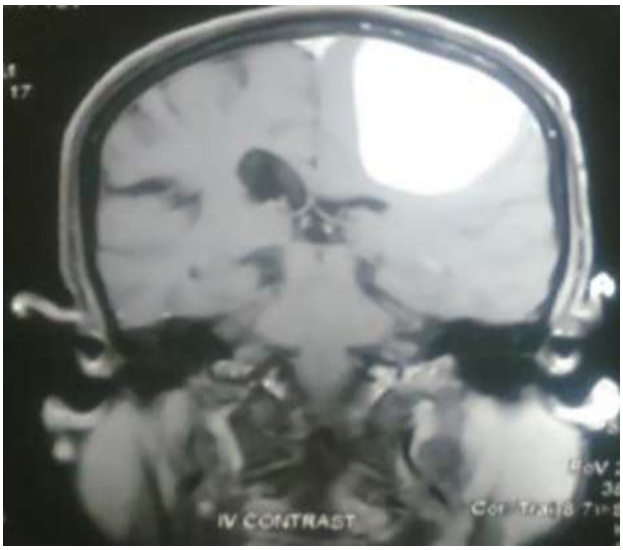

Figure 6 b: MRI contrast – Coronal section showing contrast enhancing Tumor- Parietal Convexity meningioma.

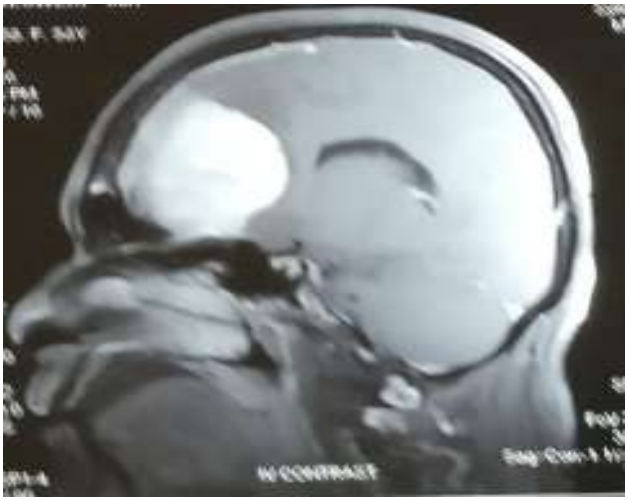

Figure 7a: MRI contrast - Sagittal section showing contrast enhancing Tumor- Frontal meningioma.

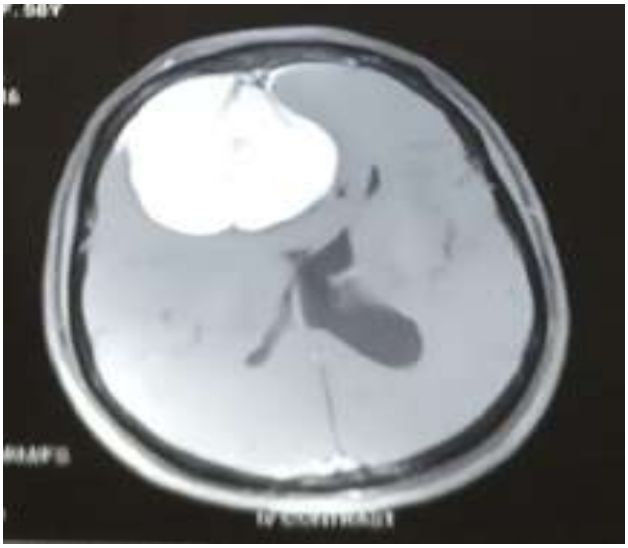

Figure 7b: MRI contrast – Axial section showing contrast enhancing Tumor- Frontal meningioma.