

A Hospital Based Retrospective Assessment of the Clinicopathological Characteristics of Meningiomas at I.G.I.M.S., Patna.**Samrendra Kumar Singh¹, Niraj Kanaujia², Brajesh Kumar³**¹Associate Professor, Department of Neurosurgery, Indira Gandhi Institute of Medical Sciences, Patna, Bihar, India.²Assistant Professor, Department of Neurosurgery, Indira Gandhi Institute of Medical Sciences, Patna, Bihar, India.³Assistant Professor, Department of Neurosurgery, Indira Gandhi Institute of Medical Sciences, Patna, Bihar, India.

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Conflict of interest: Nil

Abstract**Aim:** The aim of the present study was to study the clinicopathological characteristics of intracranial meningiomas.**Methods:** This was a retrospective study conducted in the Departments of Neurosurgery at Indira Gandhi Institute of Medical Sciences, Patna, Bihar, India. The study period was of 4 years, between January 2019 to February 2023. All the patients diagnosed as intracranial meningiomas in our department were included in the study.**Results:** A total of 200 patients were included in the study. Meningothelial meningioma was most common histological type (40%, 80/200), followed by transitional (20%, 40/200) and psammomatous (10%). The WHO Grade I was seen in 180 (90%) patients, 10 (5%) had Grade II, and 10 (5%) had Grade III tumors. On analyzing cases of recurrence, we noticed a statistically significant relation with Simpson grade of excision. Of 200 patients, 140 (70%) were female and 60 (30%) were male. On the correlation of gender ratio with age, we found that females predominated males in the 4th, 5th, and 6th decade and this predominance is less pronounced in elderly and pediatric patients. Convexity meningioma was the most common subtype of meningioma, followed by parasagittal. We found that higher grade WHO Grade II and III meningiomas are more common in males as opposed to Grade I lesions which are more common in females, and the difference was statistically significant.**Conclusion:** Meningiomas are benign tumors which are more common in females. The supratentorial location is more common than infratentorial, pediatric meningiomas are aggressive, and recurrence of meningiomas depends on the histological grade and Simpson grade of excision.**Keywords:** Meningioma, recurrence, Simpson grade, WHO grading.

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Introduction

Intracranial meningiomas account for 25-30% of all primary intracranial tumors. They originate from the arachnoid cap cells and occur in middle-aged adults. Women are affected twice as often as men. Meningiomas are mostly well-differentiated, benign, and encapsulated lesions that indent the brain as they enlarge. Although most meningiomas are benign, they have a surprisingly broad spectrum of clinical characteristics, and histologically distinct subsets are associated with a high risk of recurrence, even after seemingly complete resection. In rare instances, meningiomas are malignant. Most meningiomas are iso-intense to the brain on T1- and T2-weighted images. [1]

Meningiomas usually grow slowly, with a long initial asymptomatic phase, and may remain silent until the patient's sudden death. [2] Only 3%–6% of clinically detected asymptomatic meningiomas later become symptomatic. [3] When symptomatic, intracranial meningiomas present a wide variety of symptoms arising from the compression of adjacent structures, direct invasion of or reactive changes in the adjacent brain tissue, and obstruction of cerebrospinal fluid pathways, cortical veins, or major venous sinuses. Symptoms and signs may include seizure disorders, raised intracranial pressure sign, classic early morning headaches, focal neurological deficits, such as motor and sensory disorders, ataxia, language dysfunction,

cranial neuropathies, psychomotor symptoms, and behavioral disturbances. [4]

The distribution of intracranial meningiomas is as following in most instances: cerebral convexity (35%) , parasagittal (20%), sphenoid wing (20%), infra-tentorial (13%), interventricular (5%), tuberculum sellae (3%) and other sites (4%).⁵ It has several subtypes including meningotheliomatous, fibrous, transitional, secretory, Chordoid, clear cell, papillary, rhabdoid, psammomatous, microcystic, lymphoplasmal cell rich and metaplastic types. [6] The correlation between clinical behavior and histologic grading of meningiomas has been of much interest in recent years. Several grading systems have been used for meningioma. One of the most objective systems was introduced by Mahmood who modified the initial WHO grading system accomplished by numeric scoring. [7] In the recently revised WHO grading system (2000) comparing to its initial version some criteria has been changed. [8] Many factors considered to have prognostic significance such as sheeting, hypercellularity, cytologic atypia, increased mitotic index, necrosis, small cell change, brain invasion and elevated proliferative index of MIB-1. [5]

However, some tumors behave in a more aggressive fashion, and patients develop local recurrence or metastasis. Histopathologically, meningiomas currently are separated into three grades, i.e., benign (ordinary) meningioma, atypical meningioma, and anaplastic (malignant)

meningioma, that intend to reflect the clinical behavior of the tumors. [9]

The aim of the present study was to access the clinic-pathological characteristics of meningiomas.

Materials and Methods

This was a retrospective study conducted in the Departments of Neurosurgery at Indira Gandhi Institute of Medical Sciences, Patna, Bihar, India. The study period was of 4 years from January 2019 to February 2023. All the patients diagnosed as meningiomas in our department were included in the study. The parameters analyzed included age, gender, location of tumor on imaging, histopathological subtype, and grade of tumor according to the 2007 WHO classification. [9]

All the cases were reviewed histologically by a single neuropathologist. In doubtful and high-grade lesions, special stains such as reticulin, phosphotungstic acid hematoxylin, and immunohistochemistry were used. Patients were followed up on outpatient basis in the Department of Neurosurgery. As per the departmental protocol, serial contrast computed tomography (CT) scans were performed at 1, 2, 5, and 10 years of surgery. Other than this, patients who presented with raised intracranial pressure symptoms or new onset neurodeficits were also subjected to contrast CT.

Results

Table 1: Location of tumor

Gender	N	%	Total
Male	60	30	60
Female	140	70	140
			200
1. Anaplastic	6	0	6 (3)
2. Angioblastic	1	0	1 (0.50)
3. Angiomatous	7	1	8 (4)
4. Atypical	10	0	10 (5)
5. Clear cell	1	0	1 (0.50)
6. Chordoid	1	0	1 (0.50)
7. Fibroblastic	18	2	20 (10)
8. Lymphoplasmacytic	2	0	2 (1)
9. Meningothelial	60	20	80 (40)
10. Metaplastic	1	0	1 (0.50)
11. Papillary	3	0	3 (1.50)
12. Psammomatous	8	12	20 (10)
13. Rhabdoid	2	0	2 (1)
14. Secretory	1	0	1 (0.50)
15. Syncytial	3	1	4 (2)
16. Transitional	36	4	40 (20)

A total of 200 patients were included in the study. Meningothelial meningioma was most common histological type (40%, 80/200), followed by transitional (20%, 40/200) and psammomatous (10%).

Table 2: WHO grade of tumor

	Brain	Spine	Total
I	130	50	180 (90)
II	10	0	10 (5)
III	10	0	10 (5)
Relation of recurrence with Simpsons grade of tumor excision			
I	86	2	88 (44)
II	100	8	108 (54)
III	2	2	4 (2)

The WHO Grade I was seen in 180 (90%) patients, 10 (5%) had Grade II, and 10 (5%) had Grade III tumors. On analyzing cases of recurrence, we noticed a statistically significant relation with Simpson grade of excision.

Table 3: Location of tumors on imaging

Location	Gender		Total
	Female	Male	
Parasagittal	12	5	22
Intraventricular	1	0	1
Falcotentorial	1	0	1
Sellar/suprasellar	8	6	14
Convexity	50	32	114
Spinal	40	3	49
Falcine	8	4	18
Posterior fossa	6	1	9
ACF base	8	5	15
Sphenoid	2	1	3
CP angle	4	3	7
Primary intraosseous meningioma	0	1	1
Total	140	60	200

Of 200 patients, 140 (70%) were female and 60 (30%) were male. On the correlation of gender ratio with age, we found that females predominated males in the 4th, 5th, and 6th decade and this predominance is less pronounced in elderly and pediatric patients. Convexity meningioma was the most common subtype of meningioma, followed by parasagittal.

Table 4: Relation of gender with WHO grade of tumor

Grading	Gender		Total
	Female	Male	
WHO-I	130	50	180 (90)
WHO-II	5	5	10 (5)
WHO-III	5	5	10 (5)
Total	140	60	200

We found that higher grade WHO Grade II and III meningiomas are more common in males as opposed to Grade I lesions which are more common in females, and the difference was statistically significant.

Discussion

Meningiomas are the most frequently encountered primary non-glial tumors of the central nervous system and constitute about 20% of all primary brain tumors. [10,11] The distribution of intracranial meningiomas is as following in most instances: cerebral convexity (35%), parasagittal (20%), sphenoid wing (20%), infra-tentorial (13%), interventricular (5%), tuberculum sella (3%) and other sites (4%). [9] Meningiomas as brain tumors have been recognized for nearly 200 years. [12] Initially all of them were considered benign.

Recognition of their recurrent and malignant potential has encouraged some authors to classify them according to their histology. Despite introduction of new subtypes in WHO grading system such as clear cell and Chordoid (assumed as atypical) and rhabdoid (assumed as malignant); disagreement with Mahmood's system was observed only in 3 cases that had mild nuclear pleomorphism taking them to "atypical" group of Mahmood's system while according to WHO system which considers only prominent nucleoli as important, these tumors were classified as "benign". [13]

A total of 200 patients were included in the study. Meningothelial meningioma was most common histological type (40%, 80/200), followed by transitional (20%, 40/200) and psammomatous (10%). There is a 2:1 female to male ratio in

intracranial meningiomas. [14-17] A female preponderance for meningioma correlates with an endogenous hormone level and exogenous hormone replacement in postmenopausal women (in whom an increased incidence of meningioma is seen) as compared with postmenopausal women who have not taken exogenous hormone replacement therapy. [18,19]

The WHO Grade I was seen in 180 (90%) patients, 10 (5%) had Grade II, and 10 (5%) had Grade III tumors. On analyzing cases of recurrence, we noticed a statistically significant relation with Simpson grade of excision. Of 200 patients, 140 (70%) were female and 60 (30%) were male. On the correlation of gender ratio with age, we found that females predominated males in the 4th, 5th, and 6th decade and this predominance is less pronounced in elderly and pediatric patients. Convexity meningioma was the most common subtype of meningioma, followed by parasagittal. We found that higher grade WHO Grade II and III meningiomas are more common in males as opposed to Grade I lesions which are more common in females, and the difference was statistically significant. Meningiomas can arise anywhere from the dura, most commonly within the skull and at sites of dural reflection (falx cerebri, tentorium cerebelli, venous sinuses). [20] Other less common sites include the optic nerve sheath and choroid plexus; approximately 10 percent arise in the spine. Very rarely, meningiomas can arise at extradural sites. [21] Symptoms from a meningioma are determined by the location of the mass and by the time course over which the tumor develops. Meningiomas frequently are extremely slow growing and often are asymptomatic. Many meningiomas are asymptomatic or minimally symptomatic, and are discovered incidentally on a neuroimaging study or at autopsy. [22-24] Follow-up studies on patients with asymptomatic meningiomas suggest that most such tumors either remain the same size or grow slowly over prolonged periods. [23,24] On MRI, the typical meningioma is a well-defined extra-axial mass that displaces the normal brain. They are smooth in contour, adjacent to dural structures, and sometimes calcified or multilobulated. Iso-intensity with a normal surrounding brain may make diagnosis difficult on a non-contrasted scan, but intravenous contrast administration results in uniformly bright enhancement. Secondary involvement of adjacent bone (reactive sclerosis, invasion, erosion) is uncommon with convexity meningiomas, but occurs in up to one-half of skull base tumors. [25]

Conclusion

Meningiomas are benign tumors which are more common in females. The supratentorial location is more common than infratentorial, pediatric

meningiomas are aggressive, and recurrence of meningiomas depends on the histological grade and Simpson grade of excision.

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