Original Article

Spectrum Of Histomorphololological Patterns Of Meningioma At A Tertiary Health Centre

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Abstract

Aim: To study various histomorphological patterns observed in meningiomas.

Material and methods: The present cohort study was conducted for a period of 4 years on40 meningioma specimens received in histopathology department from AVBRH hospital and Department of Pathology, Jawaharlal Nehru Medical College, DMIMS (DU), Sawangi, Wardha, Maharashtra. Cases were analyzed in detail about the complete clinical history, exact location, clinical and radiological diagnosis. All the specimens were thoroughly grossed, sectioned, and stained with H & E. Cases were reported taking into consideration all the clinicoradiological features in relation to age, sex, duration, site, symptoms in addition to the histomorphological features and WHO grading system.

Results: Females (65%) were comparatively more as compared to males (35%). Maximum subjects were from the age group of 41-50 years (42.5%) followed by 51-560 years (25%). Histology revealed meningothelial meningioma as the most common variant followed by psammomatous meningioma. WHO grade I, II and III was reported 36, 2 and 2 cases respectively. WHO grade II was revealed in atypical meningioma while grade III in anaplastic and papillary meningioma.

Conclusion: Meningioma is a slow growing benign neoplasm which presents with a wide range of clinical features and has a female predominance. Many histological variants occur with the meningothelial type being reported as the commonest. WHO Grade I tumors and those with complete surgical resection have good prognosis. Hence correct histological grading and typing are essential as few histological subtypes have higher risk of recurrence.

Keywords: health center, patterns, spectrum

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INTRODUCTION

Meningiomas are typically solitary, steadily growing tumours causing neurological signs and symptoms due to compression of surrounding structures; particular deficits depend upon the location of tumors. They show traditional dural attachment and account for 15 percent of intracranial tumors and about 25 percent of intraspinal tumors. Meningiomas constitute about 28 to 30 percent of primary Central Nervous System (CNS) tumours. While they are adult tumours, they are usually found in middle-aged and elderly people. (1-3) Meningiomas display positive vimentin, desmoplakin, and epithelial membrane antigen immunostain.(4)

According to WHO grading, WHO grade I- Benign Meningioma includes Meningothelial, Fibrous, Transitional, Psammomatous, Angiomatous, Microcystic, Secretory, Lymphoplasmacyte-rich, Metaplastic subtypes. WHO grade II- Atypical Meningioma includes Chordoid, Clear cell subtypes. WHO grade III- Malignant Meningioma includes Papillary, Rhabdoid, subtypes. Based on statistically relevant clinicopathological associations, the WHO classification aims to help predict the divergent clinical features of meningiomas with a histological grading method.(5,6) Grade II and Grade III meningiomas recur with greater frequency.

Histological grade of meningioma is important in deciding subsequent therapeutic intervention and management. Surgery is the treatment of choice for Grade I tumors where as Grade II and grade III tumors require both surgery and radiotherapy. Histological grade and extent of surgical resection are very important parameters to predict recurrence of tumors.(7)

Meningiomas exhibit a wide range of pattern variation in histomorphology which in fact reflects both epithelial and mesenchymal histologic potential of the arachnoid cells. Some of the patterns tend to show aggressive nature clinicopathologically and therefore are graded into I,II,III by the recent WHO system. This particular grading requires an accurate histopathological diagnosis for further management attributed to their prognostic significance.(8)

Thus, clinicopathological examination aims to distinguish the various meningiomas by obtaining knowledge about the type and pattern based on the origin, which is the key for diagnosis, prognosis and management. The aim and objectives of the study are as follows:

1. To study the incidence of meningioma at tertiary health center AVBRH during a time period of 4 year.
2. To study various histomorphological patterns observed in meningiomas.
3. To know the age, location and sex ratio.

Materials and method

The present cohort study was conducted for a period of 4 years on patients admitted in Department of Neurosurgery for brain lesions (carried out in Histopathology) and Department of Pathology, Jawaharlal Nehru Medical College, DMIMS (DU), Sawangi, Wardha, Maharashtra. Cases were analyzed in detail about the complete clinical history, exact location, clinical and radiological diagnosis.

Source Of Data

40 meningioma specimens received in histopathology department from AVBRH hospital.

Sample size

Calculation: Sample size formula with desired error of margin:

$n = (Za/2)2x\ p\ x\ (1-p)/\ d2$

where, Za/2 is the level of significance at 5% i.e. 95 % confidence interval

p= prevalence of neonatal sepsis.

d= desired error of margin

n=sample size

Material

1. Brain biopsies
2. Tissue processor
3. H and E stain
4. Microscope
5. Microslides

Inclusion Criteria

1. Meningioma specimens received in histopathology department from patients operated and treated in AVBRH hospital.

Exclusion Criteria

1. Patients with primary malignant lesions at any site other than brain.

Procedure

All the specimens were thoroughly grossed, sectioned, and stained with H & E. Cases were reported taking into consideration all the clinicoradiological features in relation to age, sex, duration, site, symptoms in addition to the histomorphological features and WHO grading system.

Mitotic count was assessed in areas with high mitotic activity, both by summing the highest number of mitotic figures in ten consecutive non-overlapping HPFs and by calculating the mitotic index (MI) determined by the number of mitosis amid other cells in an ocular grid reticule and expressed as a percentage. Brain infiltration, defined as irregular, tonguelike protrusions of tumour cells infiltrating underlying brain parenchyma without an intervening layer of leptomeninges, was registered as either present, absent, or inaccessible when no brain parenchyma was observed.

Data was collected and subjected to statistical analysis.

Statistical analysis

It was done using SPSS software version 24.

Results

In this study, females (65%) were comparatively more as compared to males (35%). Maximum subjects were from the age group of 41-50 years (42.5%) followed by 51-560 years (25%). Minimum subjects were found w.r.t 1-20 year age followed by 21-30 year (table 1).

Table 1: Gender and age distribution among the study subjects

Variables	N=40	%
Gender		
Male	14	35
Female	26	65
Age Group (in years)		
1-10	1	2.5

11-20	0	0
21-30	3	7.5%
31-40	5	12.5%
41-50	17	42.5%
51-60	10	25%
61-70	4	10%
71-80	0	0

Intracranial and intra spinal tumors were reported among 72.5% and 27.5% of the subjects respectively. Most common intracranial tumour was para sagittal followed by sphenoid ridge while most common intra spinal tumor was lumbar followed by thoracic (table 2).

Table 2: Distribution of the study subjects according to the location

Location	**N**	**%**
Intracranial	29	72.5
Para sagittal	12	30
Sphenoid ridge	8	20
Cerebral convexities	7	17.5
Parasellar	2	5
Olfactory grooves	0	0
Intraspinal	11	27.5
Cervical	0	0
Thoracic	2	5
Lumbar	9	22.5

Table 3 shows the clinical features among the study subjects. Most common clinical feature was headache (65%) followed by vomiting (22.5%). Least common clinical feature among the study subject was decreased hearing as well as numbness of the limbs (2.5% each).

Table 3: Clinical features among the study subjects

Clinical Features	**N**	**%**
Headache	26	65%
Vomiting	9	22.5%
Seizures	5	12.5%
Loss of consciousness	3	7.5%
Decreased vision	3	7.5%
Weakness	2	5%
Decreased hearing	1	2.5%
Numbness of the limbs	1	2.5%

Histology revealed meningothelial meningioma as the most common variant followed by psammomatous meningioma. Atypical, anaplastic and papillary meningioma was found in 2, 1 and 1 case respectively. WHO grade I, II and III was reported 36, 2 and 2 cases respectively. WHO grade II was revealed in atypical meningioma while grade III in anaplastic and papillary meningioma (table 4).

Table 4: Histomorphological pattern and grades of meningiomas

Histomorphological Variants	WHO Grade	N	%
Meningothelial Meningioma		14	35
Psammomatous Meningioma		9	22.5
Fibroblastic Meningioma (Figure 1)	WHO Grade I=36	6	15
Transitional Meningioma		2	5
Angiomatous Meningioma		3	7.5
Metaplastic Meningioma		1	2.5
Microcystic Meningioma		1	2.5
Atypical Meningioma	WHO Grade II=2	2	5
Anaplastic Meningioma	WHO Grade III=2	1	2.5
Papillary Meningioma		1	2.5
Total		40	100%

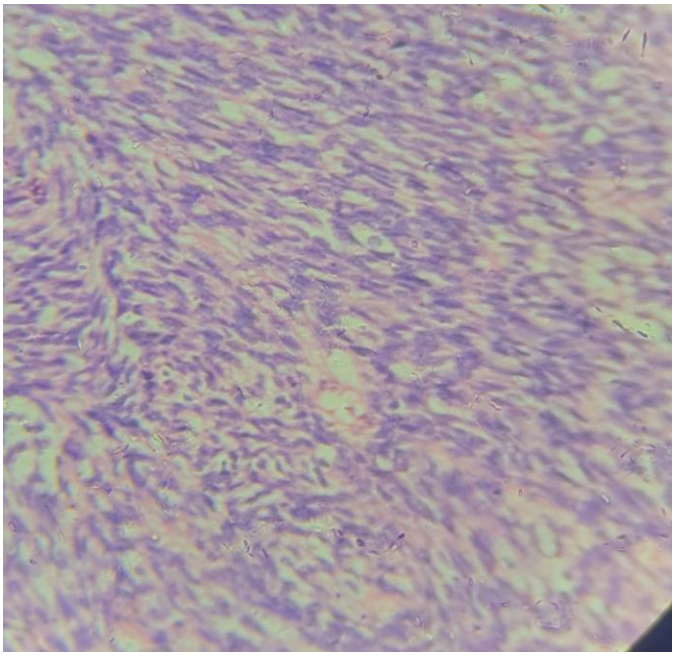

Figure 1: Fibroblastic Meningioma

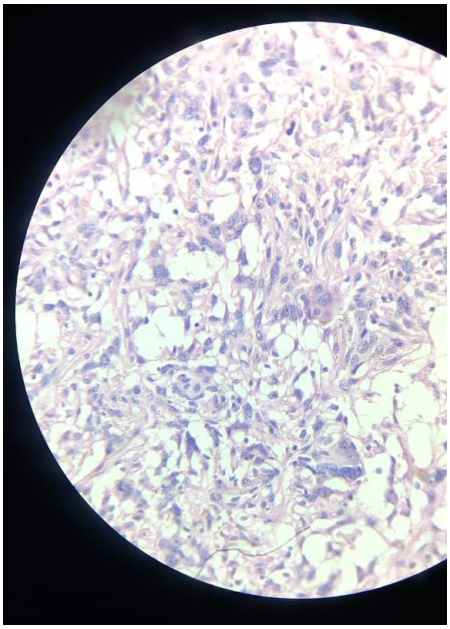

Figure 2: Anplastic Meningioma

Discussion

Meningiomas are the most common primary, non-glial tumours of the brain and spine. They are usually sporadic and solitary in occurrence; however several associations do occur, as with Neurofibromatosis type1 and 2. The incidence rates of cerebral meningiomas usually range from 1.28 to 7.8/100000 (sex and age standardized) for cerebral meningiomas while the spinal meningiomas are uncommon and the incidence rate is estimated to be 0.32/100000 in the US registry.9,10 In Shalini Bhalla et al11 study, the intracranial meningiomas were 82.9% (68/82) and spinal cases were 17.1% (14/82). Similarly in our study, intracranial meningiomas were more as compared to intra spinal.

These lesions can occur at any age but usually occur in the middle age. Maximum subjects were from the age group of 41-50 years (42.5%) followed by 51-560 years (25%) in this study. According to Shalini Bhalla et al11 study, no cases were found in the second decade and maximum number of cases occurred between 41-50 years. Similar findings were also reported

by Perry et al12, Shah et al13 and Commins et al14. Meningiomas are relatively uncommon in childhood and adolescence, representing only 0.4% to 4.1% of tumours in paediatric patients and 1.5% to 1.8% of all intracranial meningiomas15.

In this study, there was female dominance. Few studies by like ones by Raza AKMM et al16 and Shah et al4 showed female predominance. Another study by Iyengar S et al17 showed almost equal incidence in males and females1.

In this study, the most common intracranial tumour was para sagittal followed by sphenoid ridge while most common intra spinal tumor was lumbar followed by thoracic. Similarly in past literature (Buetow MP et al18, Chamberlain MC et al19 and Lang FF et al20), it was showed that the most common intracranial location is the convexity of brain, followed by parasaggital and sphenoid regions. Other intracranial sites are suprasellar, posterior fossa, olfactory groove, middle fossa, tentorial, orbit or optic nerve sheath. Intracranially the supratentorial meningiomas are more common in location as compared to infratentorial lesions. The rarer sites are interventricular meningiomas and those at the foramen magnum. Epidural, calvarial and petrous are other sites which have been identified. In the spine most common site is in the thoracic region.

In the present study, most common clinical feature was headache (65%) followed by vomiting (22.5%). Least common clinical feature among the study subject was decreased hearing as well as numbness of the limbs (2.5% each). This was in concordance with Shruti Sabnis et al21, Shah et al4 and Raza AKMM et al16.

Histologically the commonest subtype of meningioma was meningothelial meningioma accounting for 35% of cases, next were the psammomatous followed by fibroblastic meningioma. While most studies have found meningothelial meningiomas as the commonest subtype however others have found transitional subtype and fibroblastic the commonest subtype.22 Psammomatous meningioma was the commonest among the spine. Roser et al found higher percentage of psammomatous meningiomas among older patients. Higher percentage of calcified psammomatous meningiomas have been suggested as a reason for lower

disease recurrence rates in patients with meningiomas.23

WHO grade I meningiomas have a relatively low risk of recurrence or aggressive growth. Various histologic patterns are observed including meningothelial, fibroblastic, transitional, psammomatous. Xanthomatous degeneration, metaplasia, and moderate nuclear pleomorphism are common in WHO grade I meningiomas. WHO grade II meningiomas are lesions with a higher rate of recurrence and more aggressive local growth. They are distinguished from lower grade meningiomas by having four or more mitoses per 10 high power fields or at least three atypical features (increased cellularity, small cells with a high nucleo-cytoplasmic ratio, prominent nucleoli, patternless growth, or necrosis). WHO grade III (Anaplastic/ Malignant) meningioma is a highly aggressive tumor. Mitotic rates are often high (>20 mitoses per 10 high power fields)11. In the present study; WHO grade I, II and III was reported 36, 2 and 2 cases respectively. WHO grade II was revealed in atypical meningioma while grade III in anaplastic and papillary meningioma. Similarly in a study by Maruf Raza A.K.M. et al16, 94.1% of the cases were WHO Grade I tumor, 1.9% were WHO Grade II tumor, 3.9% were WHO Grade III.

Conclusion

Meningioma is a slow growing benign neoplasm which presents with a wide range of clinical features and has a female predominance. They occur more commonly intracranially than in the spine. Many histological variants occur with the meningothelial type being reported as the commonest. WHO Grade I tumors and those with complete surgical resection have good prognosis. Hence correct histological grading and typing are essential as few histological subtypes have higher risk of recurrence.

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