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Histopathological Spectrum of Meningioma in a Tertiary Care Hospital

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Abstract: ***Background: Meningiomas are the commonest benign intracranial neoplasm with a diverse histological pattern. The aim of the study was to evaluate clinical and histopathological spectrum of meningiomas and grade them according to the 2016 WHO classification. Methods: The study included all cases of meningioma received between January 2017- August 2018. The clinico-radiological features were noted and histological examination of H&E stained sections was done. Results: 82 cases were included in the study, of these 82.9% were intracranial in location while 17.1% were spinal. Female predominance was seen and commonest age range was 41-50 years(n=24). Histologically the most frequent meningioma intracranially was meningothelial and psammomatous meningioma in the spine. Grade I meningiomas accounted for 92.7% cases, Grade II 6.1% and Grade III 1.2%. Conclusion: Meningioma is a slow growing benign neoplasm in majority of patients with a wide variation in histological appearance. They are predominantly low grade and amenable to complete surgical resection.***

Keywords: Meningioma, histopathology, WHO grade, location

1. Introduction

Meningiomas are common benign tumors, account for 34% of all brain tumors. Cushing in 1922 termed tumors arising from meninges as meningioma.[1] They are thought to arise from the arachnoidal cap cells embedded in the arachnoidal villi in the meninges covering both the brain and the spinal cord. There is a general increase in incidence of primary brain tumors and also of meningiomas in different countries. This being attributed to better diagnostic modalities and increasing aging population.[2] The age at presentation is usually 5th - 6th decade. The incidence rate is twice as great in females as compared to males.[3] According to the WHO classification 2016, meningioma are categorized into Grade I (Benign), Grade II (Atypical) and Grade III (Anaplastic). Grade II meningiomas also include Chordoid and Clear cell meningiomas while Grade III includes Papillary and Rhabdoid meningioma[4] The aim of the study was to determine the age, sex distribution, clinical features and histopathological spectrum of consecutively received meningiomas. Based on the histopathological features the meningiomas were assigned WHO grades.

2. Material and Methods

This is a retrospective descriptive study conducted in the Department of Pathology, King George Medical University, Lucknow from January 2017 to August 2018. 82 cases of meningioma received from the Department of Neurosurgery during the study period were included. The demographic and detailed clinical features at presentation before surgery were retrieved from the archives along with the radiology; contrast enhanced CT scan and Magnetic resonance imaging (MRI), depending on whichever was done in the individual patients. The Hematoxylin and eosin stained paraffin sections and immunohistochemical stains done for typing of the various types of meningioma were reviewed from the archives. Histological typing and grading of the meningiomas was done according to WHO 2016 classification.[4]

3. Results

82 cases of meningioma were diagnosed during the study period and graded based on their microscopic features which included 59 females and 23 males with a female:male ratio of 2.6:1. The median age at surgery was 44 years with maximum number of patients in the age range of 41 – 50 years (n=24). (Table1)

Table 1: Patient characteristics: Age and Sex (N=82)

Age Range (Years)	%(N)
1-10	3.6 (3)
11-20	0
21-30	15.8 (13)
31-40	26.8 (22)
41-50	29.3 (16)
51-60	19.5 (16)
61-70	2.5 (3)
71-80	1.2 (1)
SEX	
Male	28 (23)
Female	72 (59)

The clinical features found most commonly were headache, weakness / hemiparesis and vomiting. The other features noted were blurring of vision, loss of balance, seizures, tingling and numbness, occasional case with bladder and bowel involvement. Rarely amnesia was a presenting feature and one case had swelling over the scalp. The radiological findings were either contrast based CT scan or MRI with intracranial range of size of lesion from 1.5x0.8cms to 7.5x4.0cms while spinal lesions were small with average size of 1.2-2.0cms.

Most meningiomas were intracranial 82.9%(68/82) while 14.9% (14/82) of cases were spinal in location. All the spinal meningiomas involved the thoracic spine. Of the intracranial meningiomas the most common location was the convexity of the brain. Only two cases were intraventricular in location.(Table:2)

Table 2: Intracranial Tumor Location (N=68)

Location	% (N)
Cerebral convexity	45.6(31)
Parasagittal / falx	11.8(8)
Posterior fossa	8.8(6)
Petrous ridge	7.4(5)
Sphenoid	5.9(4)
Infraorbital	5.9(4)
Tentorium	4.4(3)
Suprasellar	2.9(2)
Interventricular	2.9(2)
CP angle	2.9(2)
Foramen magnum	1.5(1)

The commonest histological type of intracranial meningiomas were meningothelial meningiomas accounting for 47.6% (n=39) and the other types are shown in Table 3. WHO grade I meningiomas were in 92.7% (n=76), Grade II were 6.1% (n=5) and Grade III was 1.2% (n=1). Psammomatous variant was the commonest in the spinal lesions

Table 3: Histological subtypes of meningiomas (N=82)

WHO Grade	Histological Subtype	%(n)
I	Meningothelial	47.6 (39)
I	Fibroblastic	9.8 (8)
I	Transitional	23.2 (19)
I	Psammomatous	9.7 (8)
I	Angiomatous	2.4 (2)
II	Chordoid	1.2 (1)
II	Atypical	4.9(4)
III	Anaplastic	1.2(1)

4. 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.[5,6] In this study the intracranial meningiomas were 82.9% (68/82) and spinal cases were 17.1% (14/82). These lesions can occur at any age but usually occur in the middle age. The age at presentation in our study group ranged from 3 – 71years although 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 al[4,] Shah et al[7] and Commins et al[8] Female predominance is seen meningiomas with intracranial female to male ratio of 2:1 and intraspinal the ratio is 10:1; however this predominance is not seen in pediatric age group and aggressive meningiomas.[9,10] In our study three cases presented in the first decade of life and the female to male ratio was 2:1. 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 meningiomas.[11]

Meningiomas can arise from meningothelial cells in intracranial, spinal or ectopic sites. 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.[12-15] In our study the commonest site was convexity of the brain (45.6%) for the intracranial meningiomas and thoracic spine for all spinal lesions.

Histologically the commonest subtype of meningioma was meningothelial meningioma accounting for 47.8% of cases, next were the transitional followed by the transitional type. While most studies have found meningothelial meningiomas as the commonest subtype however others have found transitional subtype and fibroblastic the commonest subtype.[16] 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.[17]

WHO grade I was the commonest with 92.7%, grade II 6.1 % and Grade III 1.2%. Grade I meningiomas predominantly comprised of meningothelial meningiomas and only three cases were of angiomatous meningioma. Angiomatous meningiomas are a rare histological variant and account for 1.2% of all meningiomas with a higher M:F ratio as compared to meningiomas in general.[18] In our study the male to female ratio was 2:1. Grade II meningiomas comprised of five cases, four were atypical meningioma while one was chordoid meningioma. Chordoid meningiomas are a rare subset with likelihood of recurrence and account for 0.5% of meningiomas.[19] Atypical meningiomas are tumours with increased mitotic activity with 4 mitoses or more per 10 high power fields (HPFs), brain invasion and /or have at least three of the following characteristics: sheet-like growth, spontaneous necrosis, increased cellularity, prominent nucleoli, and small cells with high nuclear to cytoplasmic ratio.[4]

Treatment of meningiomas is complete surgical excision of tumor in all subtypes. Radiotherapy as standard adjuvant is still controversial. Grade II and III meningiomas are more likely to recur, however recurrence depends not only on grade but size, location, accessibility, relation to vital structures and incomplete surgical resection.[14] Younger age at presentation, male sex, petroclivial and parasagittal location and higher grade according to histologic type are associated with higher rate of recurrence. The reported recurrence rates of Grade I –III meningiomas is 7-25%, 29-52% and 50-94%, respectively.[20-22]

5. 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.

6. Declaration

Conflict of Interest: NONE
Disclosure of grants or funding: NIL

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