Research Article

Histopathological study of meningioma

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Received October 4, 2015. Accepted October 16, 2015

Abstract

Background: Meningioma, so named by Harvey Cushing in 1922, is a group of heterogeneous tumors that arise from meningothelial cells. Meningiomas are predominantly benign tumors usually attached to the dura mater that arise from the meningothelial cells of the arachnoids. Meningioma may be found along any of the external surface of the brain as well as within the ventricular system, where they arise from the stromal arachnoid cells of the choroid plexus.

Objective: To evaluate the incidence of various histopathological variant of meningioma, its frequency in various parts of the brain, and its age and sex distribution.

Materials and Methods: A total of 50 cases of meningioma (clinically diagnosed and histologically proved) admitted to neurosurgery units of a teaching hospital were studied. A detailed history was taken. Findings were recorded in the pro forma designated for the study.

Result: Most common variant is meningothelial meningioma, 32 (64%) cases. According to the World Health Organization (WHO) grading, the most common WHO grade is grade 1 consisting of 45 (90%) cases and the most common site in central nervous system is intracranial. Female predominance is seen in meningioma.

Conclusion: From our study, we can conclude that most common histopathological variants of meningioma are meningothelial meningioma followed by psammomatous meningioma, and least common is papillary meningioma. Most common WHO grade is grade 1. Benign meningiomas are most common meningioma. Intracranial location is the most common location for meningioma. Most common age group for presentation is middle-aged group of 31–50 years, and it is least common in children.

KEY WORDS: Meningioma; Brain; CT Scan; WHO

Introduction

Meningiomas are benign tumors of the central nervous system (CNS), which arise from leptomeninges. On gross examination, typical meningioma is lobulated or single, solid mass that is widely attached to the dura mater. On sectioning, meningioma is soft and grayish, sometimes show rubbery consistency due to colonization. Calcification is often present and yellow foci are seen because of the accumulation of lipid within tumor cells. Sometimes grayish black pigmentation is seen because of the colonization of the hyperplastic leptomeningeal melanocytes.[1] Meningiomas are notorious for the variety of their cytological and histological presentation.[2] Meningothelial meningiomas are characterized by lobular architecture, individual cell containing delicate round to oval nucleoli, light eosinophilic cytoplasm, and indistinct cytoplasmic border. Fibroblastic meningioma containing spindle-shaped tumor cell in storiform and fascicular pattern, and sometimes containing crystalline structure rich in tyrosine is noted.[3] Microcystic meningioma is named because of its microcystic appearance that occurs owing to the variable-sized intercellular vacuole.[4,5] These spaces are most of the time empty but in some instances contain lightly PAS-positive fluid derived from plasma due to transudation. Clear cell meningiomas are most commonly found in the spinal cord and they are more

Access this article online	
Website: http://www.ijmsph.com	Quick Response Code:
DOI: 10.5455/ijmsph.2016.04102015125	

commonly seen in young individuals.[6,7] They are most commonly extra-axial and dura based, but sometimes associated with spinal roots, cauda equinae, or cranial nerves. Sometimes a fourth ventricular presentation has also been described.[8]

Materials and Methods

A total of 50 cases of meningiomas (clinically diagnosed and histologically proved) in patients admitted in the neurosurgery units of a teaching hospital were studied. A detailed history was taken. Findings were recorded in the pro forma designated for the study.

Macroscopic examination of the entire biopsy specimen was done. The specimens were studied by paraffin sectioning and routine staining with hematoxylin and eosin stain and special stains such as reticulin stain and PAS stain were carried out as and when required. All the microscopic findings were carefully noted, and grading and histological typing of meningioma was made on the basis of established criteria as well as positivity for certain special stains.

Result

Total 50 cases of meningiomas were studied histologically, among them the most common variant is meningothelial meningioma, 32 cases (64%), followed by psammomatous consisting of 5 cases (10%), followed by angiomatous consisting of 4 cases (8%), followed by fibroblastic and atypical, each variant consisting of 3 cases (6%), followed by microcystic, clear cell, and papillary variant each consisting of 1 case (2%). So the most common variant is the meningothelial meningioma. According to the World Health Organization (WHO) grading, WHO grade 1 consists of 45 cases (90%), among them 32 cases were of meningothelial meningioma, 5 cases of psammomatous meningioma, 3 cases of fibroblastic meningioma, 4 cases of angiomatous meningioma, and 1 case of microcystic meningioma. WHO grade 2 consists of four cases (8%) of meningioma, among them three cases were of atypical meningioma, and one case (2%) of clear cell meningioma. WHO grade 3 consists of single case of papillary meningioma. Most meningioma is benign in WHO grade 1. Among five cases of psammomatous meningiomas, one case is intracranial and four cases are intraspinal. Among all other histological variants of meningiomas, all cases are intracranial. So the most common site of meningioma in CNS is intracranial. Among 32 cases of meningothelial meningioma, 8 patients are male and 24 patients are female. Among five cases of psammomatous meningioma, one patient is male and four patients are female. Among the three cases of fibroblastic meningioma, all patients are female. Among four cases of angiomatous meningioma, three patients are male and one patient is female. Among three cases of atypical meningioma, two patients are male and one patient is female. Thus, among total 50 cases, 34 patients are female and 16 patients are male. Hence, female predominance is seen in meningioma.

Table 1: Incidence of various histological type of meningioma

Histological type	Incidence	Percentages
Meningothelial	32	64
Psammomatous	5	10
Fibroblastic	3	6
Angiomatous	4	8
Microcystic	1	2
Atypical	3	6
Clear cell	1	2
Papillary	1	2
Total	50	100

Table 2: According to the WHO grade incidence of meningioma

WHO grading	Incidence	Percentage
WHO grade 1		
Meningothelial	32	64
Psammomatous	5	10
Fibroblastic	3	6
Angiomatous	4	8
Microcystic	1	2
Total	45	90
WHO grade 2		
Atypical	3	6
Clear cell	1	2
Total	4	8%
WHO grade 3		
Papillary	1	2
Total	1	2
Grand total	50	100

Table 3: Incidence of meningioma according to site

Histological type	Intracranial	Intraspinal	Total	Percentage
Meningothelial	30	2	32	64
Psammomatous	1	4	5	10
Fibroblastic	3	0	3	6
Angiomatous	4	0	4	8
Microcystic	1	0	1	2
Atypical	3	0	3	6
Clear cell	1	0	1	2
Papillary	1	0	1	2
Total	44	6	50	100

Most common age group for presentation of meningioma is 31–50 years, which consists of 28 cases. In the age group of 0–10 years, no case is present. Three cases of atypical meningioma were recorded, which show various atypical microscopic findings that are described in Table 6.

Table 4: Distribution of histopathological type according to sex

Histological type	Male	Female	Total
Meningothelial	8	24	32
Psammomatous	1	4	5
Fibroblastic	0	3	3
Angiomatous	3	1	4
Microcystic	1	0	1
Atypical	2	1	3
Clear cell	0	1	1
Papillary	1	0	1
Total	16	34	50

Table 5: Distribution of cases according to age group

Type	0–10 years	11–20 years	21–30 years	31–40 years	41–50 years	51–60 years	>61	Total
Meningothelial	0	1	2	9	9	7	4	32
Psammomatous	0	0	1	2	1	1	0	5
Fibroblastic	0	0	1	0	2	0	0	3
Angiomatous	0	0	0	1	1	1	1	4
Microcystic	0	0	0	0	0	1	0	1
Atypical	0	0	1	0	1	1	0	3
Clear cell	0	0	0	1	0	0	0	1
Papillary	0	0	0	1	0	0	0	1
Total	0	1	5	14	14	11	5	50

Table 6: Microscopic findings in three cases of atypical meningioma in present study

S. no.	Case no	Mitosis/10HPF	Hyper cellularity	Patternless growth	Macronucleoli	High N/C ratio	Necrosis
1	2	0–1	–	–	+	+	+
2	3	1–2	+	–	+	+	–
3	22	1–2	+	–	+	+	–

Table 7: Comparison of incidence of various histological types of meningioma in intracranial location with other study

Types of meningioma	Present study	Rohringer *et al.*[9] (193 cases)	Howng and Kwan[10] (83 cases)
Meningothelial	68.18%	71%	48.3%
Psammomatous	2.27%	4%	18.4%
Fibroblastic	6.81%	7%	–
Angiomatous	9.09%	2%	–
Malignant	2.27%	7%	–
Others	11.38%	9%	33.3%

Discussion

In comparison with other studies, our study shows 68.18% cases of meningothelial meningioma whereas studies by Rohringer *et al.*[9] and Howng and Kwan[10] show 71% and 48.3%, respectively. Our study shows 10% cases of psammomatous meningioma whereas studies by Rohringer *et al.* and Howng and Kwan show 4% and 18.4%, respectively. A total of 6.81% of fibroblastic meningioma is found in our study, whereas 7% in the study by Rohringer *et al*. Cases of angiomatous meningioma are 9.09% in our study and 2% in the study by Rohringer *et al*. Cases of malignant meningioma are 2.27% in our study and 7% in the study by Rohringer *et al*. Cases of other meningioma in our study are 11.38% and in the study by Rohringer *et al.* are 9%. Among three atypical cases of meningioma, mitosis, hypercellularity and patternless growth, macronucleoli, high N/C ratio, and necrosis in various amount are seen. Atypical cases of meningioma are

included in the higher grade of WHO grading and have worse prognosis. Among 32 cases of meningothelial meningioma, 30 cases were intracranial whereas 2 were intraspinal, so the intracranial site is the most common site of meningothelial meningioma.

Conclusion

From our study, we can conclude that most common histopathological variants of meningioma are meningothelial meningioma, followed by psammomatous meningioma, and the least common is papillary meningioma. Most common WHO grade is grade 1. Benign meningiomas are the most common meningioma. Intracranial location is the most common location for meningioma. The most common age group for presentation of meningioma is middle-aged group of 31–50 years, and it is least common in children.

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How to cite this article: Desai PB, Patel D. Histopathological study of meningioma. Int J Med Sci Public Health 2016;5: 327-330

Source of Support: Nil, **Conflict of Interest:** None declared.