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Original Research Paper

Pathology

A PROSPECTIVE HISTOPATHOLOGICAL STUDY OF MENINGIOMAS IN A TERTIARY CARE CENTRE OF VIJAYAWADA

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ABSTRACT

Background: Meningiomas are neoplasms arising from the arachnoidal cap cells in the meningeal coverings of the spinal cord and brain. These are the most common benign intracranial tumours and account for about 13-26% of all primary brain neoplasms. These are generally benign neoplasms of adults most often seen in middle age, but about 10% are atypical or malignant. These neoplasms are graded by WHO as Grade I , II and III . Benign meningiomas can be cured by surgical resection where as higher grade meningiomas require radiotherapy after surgical resection as these higher grade meningiomas have greater recurrence and aggressive behavior.

Aims and Objectives: To study the variants and histopathological spectrum of meningioma and prognosis of variants.

Material & Methods: The present study is a prospective study conducted in the department of Pathology, Siddhartha medical college from June 2019-May 2020. During this study, 16 cases of meningiomas were diagnosed and reviewed.

Result: In our study of 16 cases females were 62.5%. The most common age group is 41-60 yrs (68.75%).

Most common variant was noted to be transitional meningioma followed by meningothelial meningioma. Out of the 16 cases, grade I were 81.25%.

Conclusion: Meningiomas account for 28-30% of primary central nervous system tumors and unveil a heterogeneous histopathology. The histological appearance of meningioma determines the grading for the management of the various subtypes and also associated with patient's prognosis. Hence a continuous revision of histopathological classification systems is required to improve the diagnostic accuracy. Benign meningiomas are the most common type. From our study, we conclude that transitional meningioma is the most common benign variant.

KEYWORDS : CNS tumors, Meningioma, WHO grading, Prognosis.

INTRODUCTION

Meningiomas are a group of slow growing primary intracranial neoplasms.[1] It was termed as Meningioma by Cushing in 1922.[2]

They are said to originate from the arachnoidal cap cell, a type of meningiothelial cell in the arachnoid membrane.[3] The arachnoid cells are most prevalent near the collections of arachnoid villi at the dural venous sinuses and their tributaries.[4] Meningiomas account for about 13-26% of the intracranial tumours.[5] A vast majority of them being histomorphologically benign. Although benign, they have a broad spectrum of clinical characteristics, and histologically distinct subsets that are associated with high risk of recurrence.[3] The present grading system is based on histological features found in many clinicopathological studies which aims to better predict these divergent characteristics of meningiomas with histological grading system, which is important for the treatment, prognosis and follow up of the patients.[3]

AIMS AND OBJECTIVES

1. To study the incidence of meningiomas.
2. To study the histomorphological variants of meningiomas and prognosis.

MATERIALS AND METHODS

The present study is a prospective study conducted in the department of Pathology, Siddhartha medical college from June 2019-May 2020. During this study, 16 cases of meningiomas were diagnosed and reviewed.

Sample collection & method

History was studied in detail in each case with respect to presenting symptoms, site, age and sex distribution. Specimen were fixed in 10% buffered formalin After that following procedures were performed in department of pathology; Proper labeling of the specimen was checked or done before further processing. Gross examination of the specimen was done which includes Site, Size, shape, color, appearance on surface, and consistency of specimen followed by routine paraffin processing. Staining was done with routine hematoxylin and eosin stain. Mounting was done with DPX(distyrene, plasticiser and xylene).Prepared slides were examined under microscope.Reporting and diagnosis with grading of meningiomas were done as per WHO 2016 criteria.

Inclusion criteria

Patients diagnosed as Meningioma during the study period in the Department of Pathology, Siddhartha Medical College, Vijayawada, irrespective of age and sex were included.

Exclusion criteria

Patients with inadequate biopsy specimen and the specimens with diagnosis other than Meningioma.

Statistical analysis

Data was analyzed in the form of tables and percentage.

RESULT

In our study, a total of 16 cases of meningiomas were studied histologically. 10 patients were female (62.5.53%) and 6 patients were male (37.5%) . Hence, female predominance was seen in meningioma. Age of the patients varied from 14 years to 73 years (Table 1). Most common age group for presentation of meningioma is 41–60 years, which consists of 11 cases (68.75%). In the study of histopathological variants, the most common variant was transitional meningioma, with 6 cases (37.5%), followed by meningothelial consisting of 3 cases (18.75%), psammomatous consisting of 2 cases (12.5%), angiomatous consisting of 1 case (6.25%), a fibrous meningioma consisting of 1 case (6.25%), 1 case of atypical (6.25%), 1 case of papillary (6.25%) and one case of

anaplastic (6.25%) Table 2.

According to the World Health Organization (WHO) grading, WHO grade 1 consists of 13 cases (81.25%) (Table 3).

Table 1: Age Distribution

Age distribution	No. of cases	percentage
1-10yr	0	0%
11-20yr	1	6.25%
21-30yr	0	0%
31-40yr	1	6.25%
41-50yr	6	37.5%
51-60yr	5	31.25%
61-70yr	2	12.5%
>70yr	1	6.25%

Table 2: Histopathological Variants

Histomorphology	No.of cases	Percentage
Meningothelail	3	18.75%
Transitional	6	37.5%
Psammomatous	2	12.5%
Angiomatous	1	6.25%
Fibrous	1	6.25%
Atypical	1	6.25%
Papillary	1	6.25%
Anaplastic	1	6.25%

DISCUSSION

Meningiomas are the most common primary tumors of the CNS and were well described in the centuries before Harvey Cushing coined the term in 1922.[6] Meningiomas are predominantly benign tumors of adults; most often encountered in middle or later adult life.[7,8,9] Females are affected more commonly than males.[10] Similar findings were also reported by Perry et al[9], Shah et al [11] and Commins et al[12]. some studies suggest a particularly increased prevalence in woman with breast carcinoma.[13]

Some Meningiomas show frequent expressions of progesterone sometime estrogen or androgen and the rapid enlargement of tumor during pregnancy or luteal phase which indicates that there is hormonal influence.[14]

The age at presentation in our study group ranged from 14-73 years. Although no cases were found in the second decade, maximum number of cases occurred between 41–60 years. Similar findings were reported in Reddy R et al[15] and Shah SR et al[16]. As meningiomas have heterogenous histological picture these are divided into three grades according to WHO classification of tumours of the central nervous system. This grading system is of prognostic importance. Most of the meningiomas are benign, but few have atypical and malignant features. Higher grade of meningiomas are associated with increased chances of recurrence and have biologically aggressive behavior. Histology is an important tool for categorizing meningiomas into various subtypes and WHO grading. In our study 13 of 16 cases are grade I.

The morphological changes for grading a tumor could be focal or diffuse and their grading is as;. Grade I lesion may have pleomorphic feature with occasional mitotic figures[17]. Grade II lesion i.e atypical meningiomas has more than 4 mitotic figure/10HPF and exhibit 3 features out of Hypercellularity, Patternless, sheet like growth, Macronucleoli, Small cell component with high nuclear :cytoplasmic ratio , and Zones of necrosis. chordoid and clear cell morphology also included in grade II[17].

Grade III i.e. anaplastic meningioma contain ≥ 20 mitotic figures /10 HPF (High Power Field) and exhibit a lot of differentiated features resulting in carcinoma, melanoma, or sarcoma like appearances[18].

Normal meningothelial cells and cells of meningiomas have ability to differentiate into epithelial and mesenchymal cells Meningiomas may show more than one histomorphological spectrum due to the variation in histological pattern of tumor[19].

Table 3 : Comparison of WHO Grading with other Studies

WHO Grade	Malik V et al[10]	Desai P. B. et al[11]	Shah SR et al[12]	Gadgil NM et al[15]	No.of cases our study	Our study
I	85.7%	90%	92%	85.6%	13	81.25%
II	11.9%	-	-	-	1	6.25%
III	2.4%	-	-	-	2	12.5%

Grossly most meningiomas are gray-tan and soft, rubbery or firm, well-demarcated, sometimes lobulated, rounded masses that feature broad dural attachment.[20,21] On cut surface ,whorled or trabeculated appearance is seen (resembling that of the leiomyoma).[20,21] In Most meningiomas Calcification is apparent and yellow discoloration is seen due to infiltration with foamy macropahes.[20,21] Grossly apparent regions of grey–black pigmentation characterized a unique example of meningioma colonized by hyperplastic leptomeningeal melanocytes.[20,21] Invasion of dura or dural sinuses is fairly common. Occasional meningiomas invade into the adjacent skull with characteristic hyperostosis, which is highly indicative of bone invasion.[20,21]

Histologically the commonest subtype of meningioma was transitional meningioma accounting for 37.5% of cases, next were the meningothelial meningioma (18.75%). Similar to our study, Malik V et al[19] also showed Transitional meningioma was the most common variant (53.2%) followed by atypical type (11.1%) and meningothelial type (9.5%). Gadgil NM et al[20] study also showed the commonest histopathological type of meningioma was transitional (24.2%) followed by meningotheliomatous (22.8%).

Transitional meningioma is the common variant of meningiomas that contains meningothelial and fibrous patterns as well as transitional features. In transitional meningioma, lobular and fascicular foci appear side by side with conspicuous tight whorls and psammoma bodies.[10,11] (Fig: 1,A).

Meningothelial meningioma is classic and common variant of meningiomas, with medium-sized epithelioid tumour cells forming lobules, some of which are partly demarcated by thin collagenous septae. Meningothelial meningioma cells are largely uniform, with oval nuclei with delicate chromatin and variable nuclear holes (i.e. empty-looking clear spaces) and nuclear pseudo inclusions, lightly eosinophilic cytoplasm, and indistinct cytoplasmic borders (thus their alternate designation of "syncytial" meningiomas).[10,11](Fig: 1,B)

Psammomatous meningioma containing a predominance of psammoma bodies over tumour cells (Fig: 2A). Tumors of this type characteristically occur in middle-aged to elderly women and exhibit a particular predilection for the intraspinal compartment.[10,11]

Fibrous meningiomas consisting of spindled tumor cells in fascicular or storiform array interlacing bundles in a collagen-rich matrix.[10,11] (Fig-2,B).

Angiomatous meningioma is a variant of meningioma that features numerous blood vessels, which often constitute a greater proportion of the tumour mass than do the intermixed meningioma cells. Angiomatous meningioma is also known as vascular meningioma. The vascular channels are small to medium-sized, thin-or thick-walled, and variably hyalinized. There may be degenerative nuclear atypia present.[10,11] (Fig-3,A).

Atypical meningioma is the one meningioma of intermediate grade between benign and malignant forms, with increased mitotic activity, brain invasion on histology, or at least three of the following features: increased cellularity, small cells with a high nuclear-to-cytoplasmic ratio, prominent nucleoli, sheeting (i.e. uninterrupted patternless or sheet-like growth) and foci of spontaneous (i.e. not iatrogenically induced) necrosis. Atypical meningiomas have been associated with high recurrence rates, even after gross total resection.[10,11] (Fig-3,B)

Papillary meningioma is a rare variant of meningioma defined by the presence of a perivascular pseudopapillary pattern constituting most of the tumour. This pseudopapillary architecture is characterized by loss of cohesion, with clinging of tumour cells to blood vessels and a perivascular nucleus-free zone resembling the pseudorosettes of ependymoma. An invasive tendency, including brain invasion, has been noted in 75% of cases, recurrence in 55%, metastasis (mostly to lung) in 20%, and death of disease in about half [10,11] .

Anaplastic meningioma exhibits overtly malignant cytology and/or markedly elevated mitotic activity. In one study, markedly elevated mitotic activity was defined as > 20 mitoses per 10 high-power (0.16 mm2) fields also show extensive necrosis and a Ki-67 proliferation index > 20%.[10,11]

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 also size, location, accessibility, relation to vital structures and incomplete surgical resection.[24] The reported recurrence rates of Grade I–III meningiomas is 7-25%, 29- 52% and 50-94%, respectively.[25,26,27]

CONCLUSION

Meningiomas are slow growing tumors originating from meningeal layer of the brain and spinal cord, more common in females. Middle aged individuals are most commonly affected than elderly. Many histological variants occur, of which transitional being the most common with than the other variants of meningiomas. 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 and higher WHO Grades have higher risk of recurrence and poor prognosis.

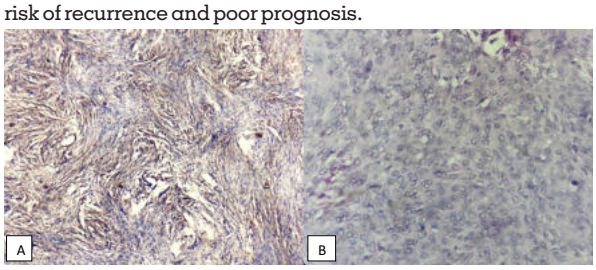

Figure 1: A) Transitional meningioma with cells arranged in fascicles and lobules and tight whorls with psammoma bodies. (H & E X40). B) Meningothelial meningioma with tumor cells arranged in lobules which are separated by collagenous septae (H&E X40)

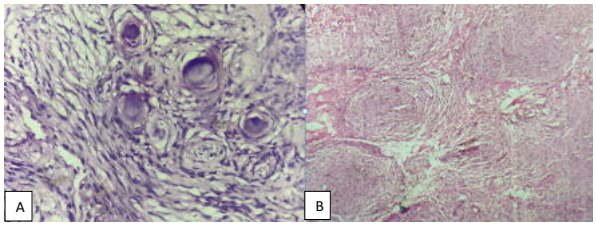

Figure2:- A)Psammomatous meningioma showing psammoma bodies(H&E X40), B)Fibrous meningioma showing tumor cells arranged in fascicles and bundles (H&E X40)

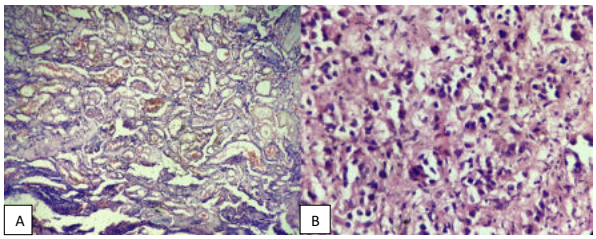

Figure-3:-A) Angiomatous meningioma with many vascular channels(H&E X40), B) Atypical meningioma- sheet-like growth, spontaneous necrosis, increased cellularity, prominent nucleoli, and small cells with high nuclear to cytoplasmic ratio.

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