Histomorphological Spectrum of Meningiomas in A Tertiary Care Hospital in Ahmedabad

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Abstract

Introduction: Meningiomas are predominantly benign tumors of adults; most often encountered in middle or later adult life. This tumor is mostly attached to inner aspect of dura and graded by WHO (World Health Organization) as Grade I, II, and III. The higher grade meningiomas have a greater likelihood of recurrence and aggressive behaviour. Meningiomas produce neurological signs and symptoms due to compression of adjacent structures. A few histological features and variants are associated with aggressive behavior and high risk of recurrence.

Material & Method: This is a prospective study comprised of 50 cases received in Department of Surgical Pathology, B.J. Medical College, Ahmedabad during period of November 2018 to October 2019 (1 year).

Results: Out of 50 cases, most common age group was 30-50 yrs. M:F ratio was 4:1. Most cases (94%) were intracranial. Most common chief presenting complain was headache (30% cases) followed by seizures (20% cases). Most common histomorphological pattern was Meningothelial meningioma(32%) followed by Psammomatous meningioma(22%). 90% cases belonged to WHO Grade I, 6% were Grade II and 4% Grade III.

Conclusion: Meningiomas display a wide diversity of histopathological appearances. The majority are benign and hence curable by surgical resection. Few high grade meningiomas require radiotherapy after surgical excision and hence histological diagnosis and grading is essential.

Key words: *Meningioma, Histopathology, WHO Grading.*

Introduction

Tumors of the meninges include those arising from meningothelial cells, mesenchymal non-meningothelial tumors, primary melanocytic tumors and tumors of unknown origin[1,2]. Those arising from the meningothelial cells, meningiomas, are the most prevalent of these.

Meningiomas are predominantly benign tumors of adults; most often encountered in middle or later adult life [3,4,5]. Females are afflicted more commonly than males (especially at spinal level) [6], and some studies suggest a particularly increased prevalence in woman with breast carcinoma [7]. Some Meningiomas show frequent expressions of progesterone, sometimes estrogen or androgen and the rapid enlargement of tumor during pregnancy or luteal phase indicate hormonal influence [8]. Amongst all primary central nervous system tumors, Meningiomas stand to about 25% the cell of origin is meningothelial cell also known as arachnoid cell.

This tumor is mostly attached to inner aspect of dura and graded by WHO (World Health Organization) as Grade I, II, and III. The higher grade meningiomas have a greater likelihood of recurrence and aggressive behavior. [5]. Many histological variants are also known of meningiomas. A few histological features and variants are associated with aggressive behavior and high risk of

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recurrence. Thus accurate histopathological diagnosis and grading of these tumors are essential [10].

WHO classification of 2016 and 2007 are similar as far as grading of meningioma is concerned.

WHO Grading of Meningiomas[9].-

Grade I- Pleomorphic, occasional mitosis, lacks features of anaplastic or atypical meningiomas.

Grade II- Containing four or more mitotic figures per 10 high-power microscopic fields **or**

Brain invasion, with tumor breaching beyond the pia **or**

Exhibiting at least three of the following features:

a. hypercellularity

b. patternless, sheet-like growth

c. macronucleoli

d. small cell components with high nuclear:cytoplasmic ratio

e. zones of spontaneous (i.e. noniatrogenic as seen after embolization) necrosis.

Grade III- Containing 20 or more mitoses per 10 high-power microscopic fields **or** exhibiting a loss of differentiated features resulting in carcinoma-, melanoma-, or sarcoma-like appearances [9].

The proper type, grading and histological features are very important for the management, treatment, prognosis, and follow up of the patients[10]. A few histological features and variants are associated with aggressive behavior and high risk of recurrence. Thus accurate histopathological diagnosis and grading of these tumors are essential.

Meningiomas produce neurological signs and symptoms due to compression of adjacent structures; the specific deficits depend on tumour location. Headache and seizures are common nonspecific presentations.[11]

The more common radiological findings were mass lesions with effect on adjacent structures and peritumoral edema [12].

Aims & Objectives

1. To study the histomorphological variants of meningiomas.

2. To study the incidence of age, gender, anatomical location and presenting symptoms of meningioma.

3. To grade of meningiomas according to WHO grading system.

Material and Method

- This is a prospective study conducted in Department of Surgical Pathology, B.J. Medical College, Ahmedabad during period of November 2018 to October 2019 (1 year).
- Study comprises of 50 cases.
- 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 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.

Results

In our study, a total 50 cases of meningiomas were studied with ages ranging from 22 to 76 years, in which most meningiomas were in the age group between 30-50yrs. M:F ratio was 1:4.

Out of 50 cases, 3 cases were of spinal meningiomas while 47 were intracranial. Among intracranial meningiomas, Parietal region was the most common site (15 cases)(Table 1).

Table 1- Location wise distribution of cases of meningiomas

Location	No. of cases	Percentage
INTRACRANIAL	47	94%
Parital region	15	30%
Sphenoidal wing	5	10%
Parasagital	5	10%
Cerebral convexity	6	12%
Olfactory groove	3	6%
Foramen magnum	4	8%
Tentorium cerebelli	1	2%
Cerebellopontine angle	5	10%
Near the sella	3	6%
SPINAL	3	6%
TOTAL	50	100%

Among the chief presenting symptoms, Headache was the most common symptom (30% cases) followed by seizures (20% cases). Other symptoms were decreased vision(4%) and hearing (6% cases), weakness (16% cases) and tingling numbness of limbs (8% cases), altered sensorium (10% cases) and vomiting (6% cases).

On microscopical examination, predominant histological pattern (>50% of thee specimen) was noted in each case. Among the histomorphological subtypes, Meningothelial was the most common which is WHO Grade I(Table 2).

Table 2- Histomorphological pattern and grades of meningiomas.

Histomorphological Variants	WHO Grade	No of Cases	% of cases
Meningothelial Meningioma	WHO Grade I	16	32
Psammomatous Meningioma		11	22
Fibroblastic Meningioma		8	16
Transitional Meningioma		3	6
Angiomatous Meningioma		5	10
Metaplastic Meningioma		1	2
Microcystic Meningioma		1	2
Atypical Meningioma	WHO Grade II	3	6
Anaplastic Meningioma	WHO Grade III	1	2
Papillary Meningioma		1	2
Total		50	100%

Among these, majority cases (45 cases, 90%) were meningiomas of WHO Grade I.

Among these, 16 cases showed epitheloid tumor cells demarcated by thin collagenous septa forming lobules and were reported as meningothelial meningiomas WHO Grade I (Fig 1-A).

11 cases showed predominance of numerous psammoma bodies and were reported as Psamommatous meningiomas WHO Grade I (Fig 1-D).

8 cases showed predominantly spindled cells in storiform or parallel pattern or interlacing bundles and were reported as Fibroblastic meningiomas WHO Grade I (Fig 1-B).

5 cases showed predominantly small to medium sized vessels intermixed with meningothelial cells and were reported as Angiomatous meningiomas WHO Grade I (Fig 2-E).

3 cases showed meningothelial add well as fibrous pattern and lobular architecture along with transitional features and were reported as transitional meningiomas WHO Grade I (Fig 1-D).

1 case showed intercellular cysts of varying size, some of them containing eosinophilic fluid which was reported as microcystic meningioma WHO Grade I (Fig 2-F).

1 case showed spindled cells with areas of cartilaginous and myxoid differentiation and was reported as metaplastic meningioma WHO Grade I.

3 cases showed brain invasion at places along with increased cellularity, high mitotic count, sheet like growth pattern, these cases were reported as Atypical meningioma, WHO grade II (Fig 2-G,H).

One case showed perivascular papillary like arrangement of tumor cells with high mitotic count and few areas of necrosis, it was reported as Papillary Meningioma WHO Grade III (Fig 3-I).

One case showed markedly pleomorphic cells arranged in sheets with prominent nucleoli, high mitotic count and tongue shaped invasion into cerebral cortex at places and was reported ad Anaplastic Meningioma WHO Grade III (Fig 3-J).

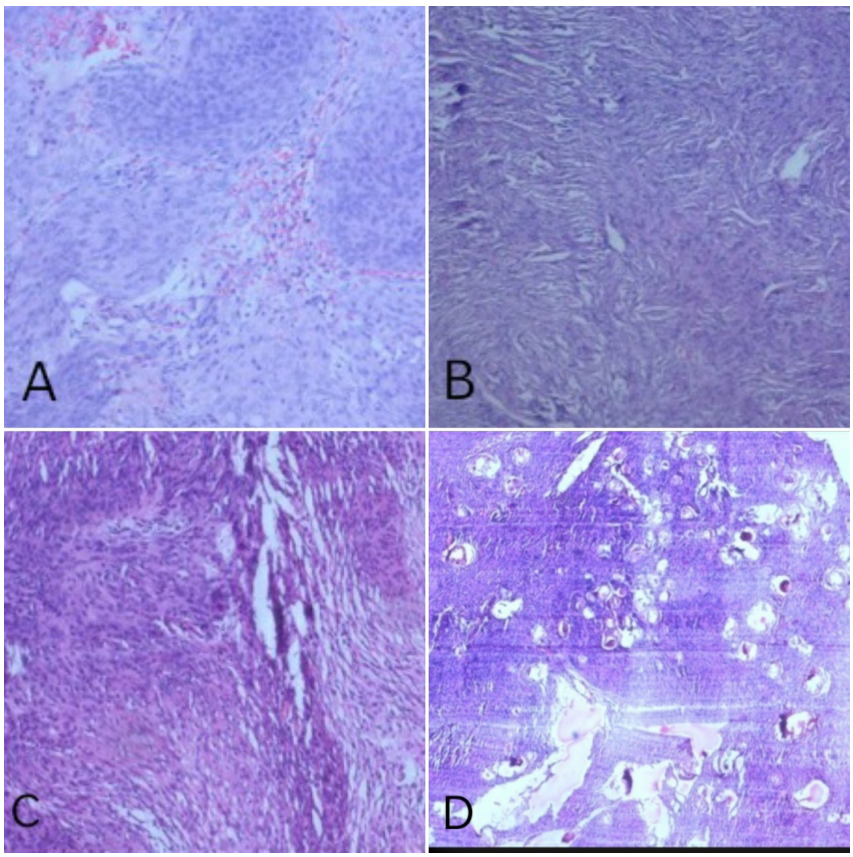

Fig 1: A) Meningothelial Meningioma (H&E stain, 10x).

B) Fibroblastic Meningioma (H&E stain, 10x)

C) Transitional Meningioma (H&E stain, 10x)

D) Psammomatous Meningioma (H&E stain, 10x)

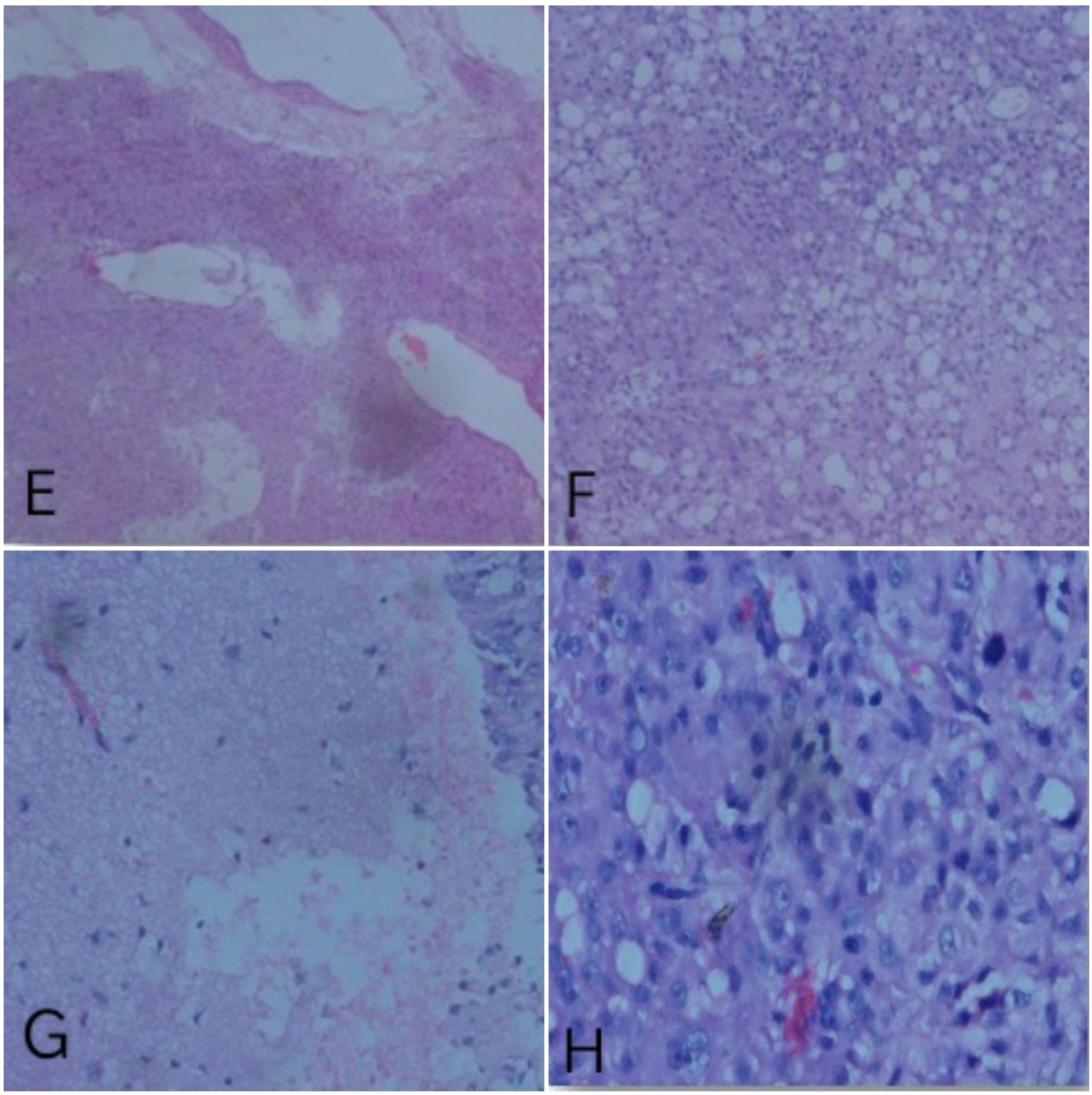

Fig 2: E) Angiomatous meningioma (H&E stain, 10x)

F) Microcystic Meningioma (H&E stain, 10x)

G) Atypical meningioma (H&E stain, 10x) showing focus of brain invasion ( ).

H) Atypical meningioma (H&E stain, 10x) showing sheet like arrangement of cells.

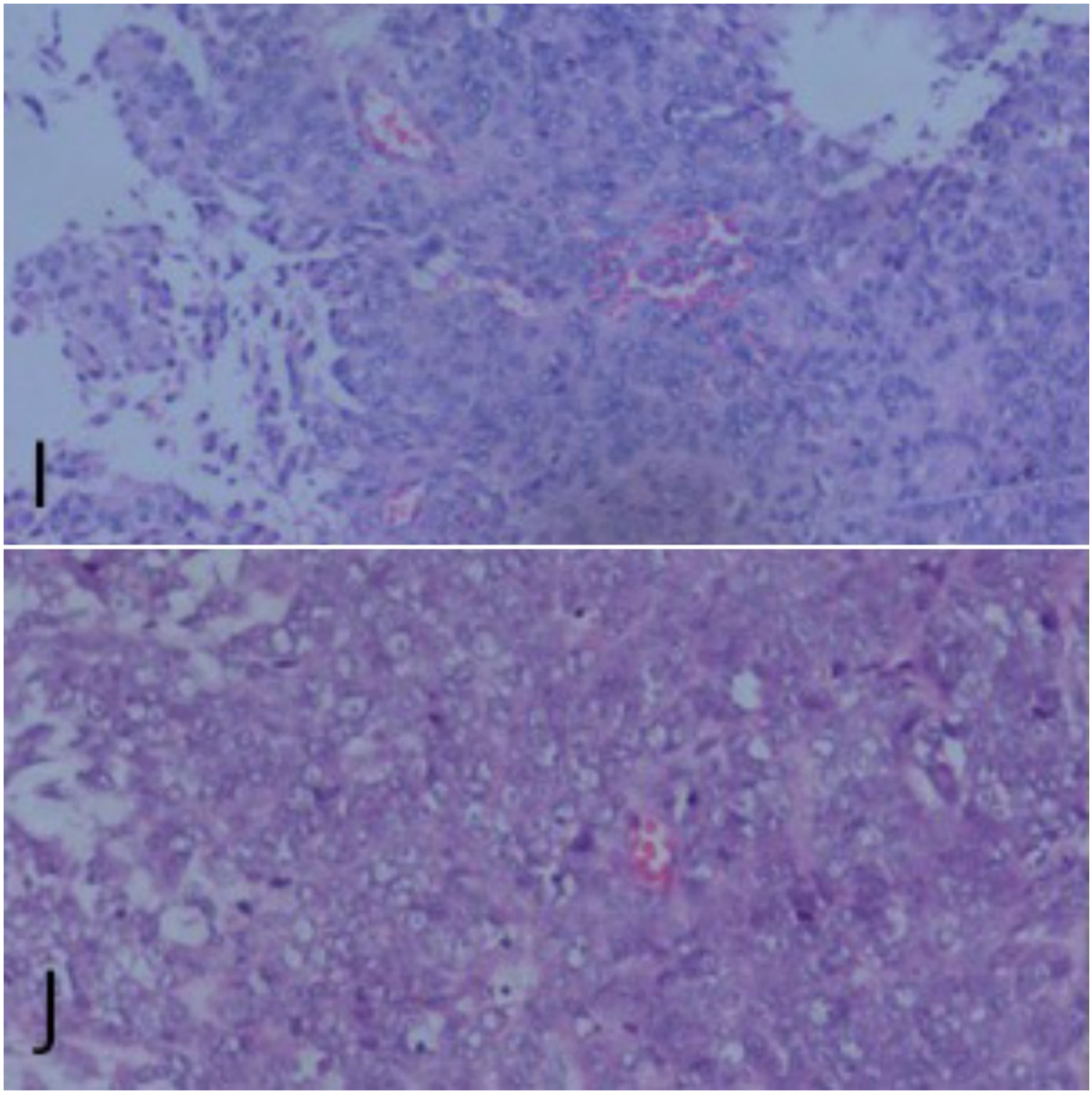

Fig 3- I) Papillary Meningioma (H&E stain, 10x)

J) Anaplastic Meningioma (H&E stain, 10x)

Discussion

Meningiomas are the single largest group of tumors arising from the meninges. Benign (WHO grade I) meningiomas constitute the majority of these tumors, followed by atypical (WHO grade II) and anaplastic (WHO grade III) meningiomas according to both Western and Indian literature[1,2,13,14.]

The distribution of the meningioma variants in this study also supports this view.

The majority of patients in our study belonged in the 31 – 50 years age group which was younger compared to studies by Raza AKMM et al[(10)], Iyengar S. et al[(15)] and Shah et al[(16)].

Few studies by like ones by Raza AKMM et al[(10)] et al and Shah et al[(16)] showed female predominance. Another study by Iyengar S. et al[(15)]showed almost equal incidence in males and females. Present study showed female predominance but M:F was 4:1 which was much

more than other studies.

The most common clinical feature was headache (30%), followed by vomiting (20%) This was in concordance with Shah et al[16] and Raza AKMM et al[10].

Present study showed incidence of intracranial meningiomas to be much more than spinal meningiomas. Similar results were noted in studies by Raza AKMM et al[10] and Niranjan J et al[17].

Table 3- Comparison of incidence of histomorphological patterns and grades of Meningiomas.

Types of meningiomas		Lakshmi S. et al(12)	Iyengar S. et al(15)	Niranjan J et al(17)	Raza AKMM et al(10)	Present study
	Total cases	128	117	57	103	
	WHO Grade	Percentage of cases				
Meningothelial	WHO Grade I	23.44	62.42	33.3	61.1	32
Psammomatous		21.88	12.82	8.77	4.9	22
Fibroblastic		23.44	7.69	8.77	4.9	16
Transitional		15.63	5.98	28.07	15.5	6
Angiomatous		2.34	10.53	10.53	4.9	10
Microcystic		0.78	0.78	3.51	-	2
Secretory		2.34	-	-	-	-
Lymphoplasmacyte rich		-	-	-	0.9	-
Metaplastic		0.78	-	-	0.9	2
Clear cell	WHO Grade II	2.34	-	-	0.9	-
Atypical		4.69	1.70	-	4.9	6
Papillary	WHO Grade III	0.78	3.41	-	-	2
Rhabdoid		0.78	-	1.75	-	-
Anaplastic		1.75	-	1.75	-	2

As we see in table3, incidence of meningothelial meningiomas is highest in all the studies. But the percentage is comparable with some studies[12,17] while other studies[10,15] show extremely high percentage. Grade II and Grade III variants of meningiomas constitute of very few cases in all the studies[10,12,15,17]

Conclusion

Outcome of present study is that meningiomas are common tumor of central nervous system, and its most common histological variant is meningothelial meningioma. Grade I meningioma has good prognosis whereas grade II and grade III meningiomas has low frequency but comes with poor prognosis. It is most commonly prevalent in middle aged person with female predominance. Histopathological and WHO grading is important for the treatment and prognosis of the patients.

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