Study of 38 Cases of Meningioma Anatomical Locations with their Histopathological Gradings

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Abstract:

Objective: *This study was done to determine the clinical, histological patterns,the socio-demographic characteristics and clinical presentationsof meningioma. This study also aims to correlate the clinical patterns of intracranial meningioma with their anatomical locations and WHO histological grading.*

Materials and Methods: *We have studied 38 cases of meningioma. Meningioma was diagnosed primarily by contrast enhanced Computed Tomography (CT) Scan and/or Magnetic Resonence Imaging (MRI) of brain. This was confirmed by the histopathological examination of the tumor specimen. Histopatholgical results were tabulated according to the age and sex distribution, anatomical location of tumor, histological type and WHO grading of the tumor. Correlation of clinical features and radiological findings were made with thehistopathological results.*

Results and conclusion: *Most of the cases were male 22 (57.9%). The commonest age group was 40-59 years. The commonest site of tumor was convexity meningioma, which was present in19 cases (50%). The 57.9% of the meningioma was WHO GradeI tumor.*

Key words: *Meningioma, WHO grading of meningioma, Histological types,anatomical location of meningioma.*

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Introduction:

Meningiomas originate from the arachanoidal cap cell, a meningothelial cell in the arachnoid membrane. They generally arise where arachnoidal villi are frequent[2]. The arachnoid cap cells are most prevalent near the collections of arachnoid villi at the dural venous sinuses and their large tributaries. Meningiomas may arise anywhere the arachnoid cap cells are present[2]. Meningiomas account for 15% of all intracranial tumors. They commonly occur in the fourth to sixth decades of life, with a mean age of 45 years at diagnosis. Females have meningiomas more often than males; ratio is 2:1 for intracranial and 4:1 for spinal meningiomas[3]. The etiology of meningioma is unknown. Cases exist in which the tumor has arisen under a fracture, from an area of scarred dura mater or around a retained foreign body. Low and high dose radiation has been implicated in meningioma formation especially during childhood. Neurofibromatosis type 1 and 2 genetic diseases inherited in autosomal dominant fashion may be associated with meningioma[4]. 90% of meningiomas are located intracranialy and of these 90% are supratentorial in location.

According to site, meningiomas are located at parasaggital/falcine, convexity, sphenoid ridge, suprasellar, posterior fossa, olfactory groove, middle fossa, tentorial, peri-torcular, lateral ventricle, foramen magnum, spinal, orbit or optic nerve sheathand few located at ectopic site[5]. At spinal level, meningioma clearly favors the thoracic region. Cervical spinal region

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involvement by meningioma is uncommon and lumbar spinal region is rare. It can also be foundin epidural, calvarial and intra-petrous areas as well as the variants located entirely outside the craniospinal confines[6].

Meningiomas are classified as benign, atypical, or malignant. Benign meningiomas are not encapsulated; they grow invaginating, but well demarcated from the brain. They grow with finger-like projections, and penetrate the surrounding mesenchymal tissue, including the bone. They may produce both an osteoblastic and a lytic reaction2. Meningiomas show positive immunostain with vimentin, desmoplakin, and epithelial membrane antigen. They have a WHO grade I biological behavior. Meningiomas grow in 3 primary histological patterns: (1) meningothelial, (2) fibroblastic, or (3) transitional, a combination of both meningothelial and fibrous features. Meningothelialmeningiomas consist of lobules of cells with oval pale nuclei, with chromatin marginated around the nucleus. Benign meningiomas of WHO grade I can invade the dura, dural sinuses, skull, and even extra-cranial compartments, such as orbit, soft tissue, and skin. Although these types of invasion make it more dificult to resect the tumour, they are not considered as atypical or malignant. By contrast, brain invasion is associated with recurrence and mortality rates similar to atypical meningiomas in general, even if the tumour seems completely benign otherwise7-8. WHO grade II meningiomas include atypical, chordoid, and clear cell meningiomas9. Both WHO grade II and III classifications of meningiomas require brain invasion as a criterion10. WHO grade II meningiomas make up 5% to 7% of all meningiomas[11,12,13].

WHO grade III meningiomas make up 1.0% to 2.8% of all meningiomas. These include anaplastic, rhabdoid, and papillary types[9]. Malignant meningiomas have further increase in mitoses and cellularity with conspicuous necrosis[15]. Anaplastic or malignant meningiomas by definition must have equal to or greater than 20 mitoses per 10 highpower field under microscope[10,14,15,16,17,18].

Methods and Materials:

This was a descriptive study. This study was carried out at the Departments of Neurosurgery and Pathology, Bangabandu Sheikh Mujib Medical University, Dhaka from November 2012 to Jaunary2016 (over 3 years period). We have studied 38 cases of meningioma. Histological subtypes and WHO grading for all meningioma were carried out. The parameters like patient's age, gender, location of tumor, microscopic appearance of tumor were studied.

Results:

Table-I

Distribution of the patient by age (n=38)

Age Years	Number	Percentage	Mean±SD
<20	5	13.2	41.28±17.55
20-39	9	23.7	
40-59	18	47.4	
≥60	6	15.8	
Total	38	100.0	

Table-II

Distribution of the patient by sex (n=38)

Sex	Number	Percentage
Male	22	57.9
Female	16	42.1

Table-III

Distribution of patient by location of the tumor (n=38)

Site	Number	Percentage
Convexity Meningioma	19	50.0
Sphenoid wing meningioma	5	13.1
TubeculumSella Meningioma	2	5.3
Orbital Meningioma	2	5.3
Petroclival meningioma	2	5.3
Parasaggital Meningioma	2	5.3
Tentorial Meningioma	2	5.3
Clinoidal Meningioma	1	2.6
Falcine meningioma	1	2.6
Olfactory groove meningioma	1	2.6
Thoracic spinal meningioma	1	2.6

Table-IV

Distribution of patient by surgery performed (n=38)

Site	Number	Percentage
Left parietal craniotomy and tumor removal	5	13.2
Bi-frontal craniotomy and tumor removal	2	5.3
RightFronto- temporal craniotomy and Simpson Grade IV resection	12	31.6
LeftFronto-parietal craniotomy and excision of tumor	4	10.5
Orbitofrontal craniotomy and excision of tumor	1	2.6
Left Fronto-temporal craniotomy and excision of tumor	3	7.9
Thoracic spinal Laminectomy and excision of tumor	1	2.6
Right Mastoid, pre sigmoid suboccipital craniotomy and excision of tumor	1	2.6
Rt. Parietal craniotomy and excision of tumor	4	10.5
Subtemporal occipital craniectomy and posterior petrosectomy and tumor removal	1	2.6
RightOrbitozygomatic craniotomy and Simpson Grade IV resection	1	2.6
RightTemporo- parietal craniotomy and removal of tumor	2	5.3
Lateral supra orbital craniotomy and excision of tumor	1	2.6

Table-V

Distribution of patient by Histological grade of tumor (n=38)

Histological grade	Number	Percentage
WHO Grade I	22	57.9
WHO Grade II	12	31.6
WHO Grade III	4	10.5
Total	38	100

Discussion:

The present study was conducted in the Departments of Neurosurgery and Pathology, Bangabandhu Sheikh Mujib Medical University, Dhaka.

In the present study,meningiomas were most common in the age group of 40-59 years 47.4%. Among the 38 patients, in our study 22 (57.9%) were male and 16 (42.1%) were female, with male to female ratio being 1.4:1. Akyildiz EU et al. 2010[19]studied 245 cases of meningioma, 74 (30.2%) were male and 171(69.8%) were female, with male to female ratio being 1:2.3. WanjeriJ et al. 2011[20]conducted a study of 78 cases of meningioma, females whose prevalence was 69.2% were more affected than males 30.2% with male to female ratio being 1:2.3. In all of these studies meningiomas were most common in female; however in our study, the male showed predominance with male to female ratio of 1.4:1. This may be due to the fact that male seek more medical attention compared to female in our country due to socio-cultural norms. A small sample size may also be responsible for the male predominance in our study.

Among the 38 patients, in our study the most common location of tumor was convexity meningioma 19 cases(50%), followed bysphenoid wing meningioma5 cases (13.1%). Akyildiz EU et al 2010 study[19], intracranial location of tumor was found in 96% of cases.

In our study, WHO Grade I tumour were 57.9%, WHO Grade II tumour were 31.6% and WHO Grade III tumour were 10.5%. Wanjeri J et al 2011[20] study found that according to WHO classification, the benign form (grade I) was the commonest at 94.7%. Grade II (atypical) and grade III (malignant) represented 4% and 1.3% respectively. Akyildiz EU et al 2010 study[19], WHO Grade I tumour were 82%, WHO Grade II tumour were 6%.

Our result is consistent with the abovementioned studies in that the most common grading of meningioma was WHO Grade I. But we had higher frequency of WHO Grade II and III tumor compared to abovementioned studies.This discrepancy may be in part due to a small sample size. We are a tertiary referral center for neurosurgical patients and hence increased chances of inhomogeneity of patients afflicted with meningioma being admitted here. There is also tendency of more aggressive meningioma cases clinically and radiologically being referred to our center, which when operated reveals higher WHO grading on histo-pathological evaluation.

In our study, we found 12 cases of WHO Grade II tumour. 10 cases had atypical meningioma with 1-2 mitotic figures per high power field with combination

of increased cellularity or focal nerosis or presence of giant cells. We found 2 cases of clear cell meningioma. Both were in age group less than 20years and one is located in spinal region and other at CP angle, which are common locations for clear cell meningioma.

In the remaining 4 WHO Grade III meningioma, 3 wereanaplastic types as all of them showed increased mitotic activity (e"4 mitoses per high power field) and 1 was diagnosed as papillary meningioma.

Conclusion:

Meningiomas occurred more frequently in males compared to female (1.4:1 ratio) in our study as compared to the existing literature pointing toward female predominance of meningioma. Adults were more affected than their elderly counterparts. The mean age at presentation was 42.6 years. Majority of the patients presented with the complaints of chronic headache and vomiting. All meningiomas except for one (thoracic spinal meningioma) were at intracranial locations. Most intracranial meningiomas occurred in the supratentorial compartment. Majority of the meningioma were histologically benign with WHO Grade I being most common (57.9%) and hence curable by surgical resection.

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