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Study of histopathological pattern of central nervous system tumours in a tertiary care hospital- A 3 year retrospective study.

Pathology

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ABSTRACT

Background : Tumours of Central nervous system(CNS) include tumours of brain and spinal cord where as the metastatic tumours are usually extradural. Globally there is an increase in the incidence of CNS tumours irrespective of age. This study aims to study histopathological pattern of CNS tumours in this region and to diagnose & classify CNS tumours according to WHO Classification 2016.

Material & Methods:

This is a retrosceptive study which was done in the PG Deptt of Pathology, Government Medical College, Jammu, over a period of three years, from 1st January 2014 to 31st December 2016. A total of 59 cases of CNS tumours were retrived from the archives of histopathology section in the Department of Pathology, GMC Jammu. The diagnosed CNS tumours were studied and classified according to the latest WHO classification(2016).

Results:

Out of the total 59 cases, tumours of neuroepithelium were the commonest(45.7%) followed by tumours of meningeal tissue(27.1%) and tumours of cranial and paraspinal nerves(18.6%). CNS tumours were seen in all age groups, but the maximum number of cases were seen in the age group of 40-60 years. The male to female ratio was 1.27:1.

KEYWORDS:

Astrocytoma, Central Nervous System tumours, Meningioma, WHO.

Introduction:

The brain originates from the midline of embryo as a primitive neural groove which forms the neural tube. This develops focal constriction to form four segments of brain i.e. forebrain, midbrain, hindbrain and spinal cord.[1] Brain tumors are intracranial lesions, which occur in brain parenchyma, also in blood vessels, cranial nerves, meninges, pituitary gland, pineal gland and spinal cord as well.[2] Tumours of the nervous system are histologically typed by WHO as tumours of neuroepithelial tissue, peripheral nerves, meninges, mesenchymal non-meningothelial tumours, lymphoma, germ cell tumours and metastatic tumours.[3]

Tumours of central nervous system (CNS) are not very common and account 2% of all malignancies, none the less are notorious for their fatality. The majority of the patients die within a year of diagnosing of a malignant lesion and less than 3% live beyond three years.[4] There is a substantial increase in the incidence of CNS tumours in past few decades, both in the developing and developed countries. This is attributed to improvement in diagnostic facilities like neuroimaging which pick up the lesion and histopathology with IHC which confirms the diagnosis. Still in a developing country like ours, exact tumour load is difficult to quantify in view of lack of local cancer registries and modern medical facilities like neuroimaging, especially the rural set up.

The aim of this article is to give a present overview CNS tumours in our hospital set up and to look for changing trends in distribution of brain tumours in this geographical area.

Material and Methods:

This is a retrosceptive study which was done in the PG Deptt of Pathology, Government Medical College, Jammu, over a period of three years, from 1st January 2014 to 31st December 2016. A total of 59 cases of CNS tumours were retrived from the archives of histopathology section in the Department of Pathology, GMC Jammu.

Inclusion criteria: We included all the brain biopsies, biopsies from spinal cord and meninges, of all sizes, ages and of either sex, which came for histopathological examination in the Histopathology section.

Exclusion criteria: We excluded all insufficient, autolysed tissue specimens and cases without relevant clinical details and neuroimaging investigations. Other CNS lesions like arteriovenous malformations, cysts, parasites were excluded from our study.

All the H&E stained sections were retrieved and studied. New sections were made, wherever required. All the sections were processed by fixation, dehydration and clearing followed by impregnation with wax. The wax blocks were cut in 5-6 μ and stained with Hematoxylin and eosin stain. Patients clinical details i.e. age, sex, chief complaints, imaging investigation, per operative findings and gross details were recorded. All cases were reviewed by the authors and brain tumours were diagnosed and classified according to the revised WHO classification of CNS tumours (2016)[3].

Aims and objective:

The aim of this study is to know about the histopathological pattern of CNS tumours in this region, their relative frequency and correlation with age and sex.

Results:

A total of 59 cases were obtained from the archives of Histopathology section of the Department of Pathology, GMC, Jammu, over a period of 3 years. In our three year study period, 59 cases of CNS tumours were studied. Among them, primary CNS tumours were 57(96.6%) and 02 (3.3%) were metastatic.

Amongst primary CNS tumours, tumours of neuroepithelium were the commonest(45.7%) of followed by tumours of meninges(27.1%). Relative frequencies of various CNS tumours is shown in Table No.-1

Table-1: Relative frequencies of various CNS tumours.

S.No	Histological types	Number(n)	(%)
1	Astrocytoma	18	30.5
2	Meningioma	16	27.1
3	Oligodendroglioma	6	10.2
4	Schwannoma	4	6.8
5	Neurofibroma	6	10.2
6	MPNST	1	1.7
7	Hemangioma	2	3.4
8	Ependymoma	2	3.4
9	PNET	1	1.7

10	Medulloblastoma	1	1.7
11	Metastatic tumours	2	3.4
	Total	59	100

There were 33 cases in males to 26 cases in females, the ratio of male to female being1.27:1. Astrocytoma, neurofibroma, oligodendroglioma and hemangioma showed a male preponderance and meningioma showed a female preponderance. Schwannoma, ependymoma and metastatic tumors were seen equally in both the sexes. Gender distribution is depicted in table No-2:

Table -2 Gender distribution in various CNS tumours.

S.No	Histological types	Male	Female	Total	M:F ratio
1	Astrocytma	10	8	18	1.25:1
2	Meningioma	6	10	16	0.6:1
3	Oligodendroglioma	4	2	6	2:1
4	Schwannoma	2	2	4	1:1
5	Neurofibroma	4	2	6	2:1
6	MPNST	1	0	1	1:0
7	Hemangioma	2	0	2	2:0
8	Ependymoma	1	1	2	1:1
9	PNET	1	0	1	1:0
10	Medulloblastoma	1	0	1	1:0
11	Metastatic tumours	1	1	2	1:1
	Total	33	26	59	1.27:1

The age of the patients ranged from 7 to 65 years with maximum number of the patients in 40-50 years age group (n=17) and followed by 50-60 years age group (n=16). Clubbing the two age groups, 55.9% cases fall in the age group of 40-60 years. Two patients were seen in the age group of 0-10 years, one diagnosed as astrocytoma and second as PNET. Two cases were seen in the age group of 10-20 years, one reported as case of astrocytoma and the other as a case of medulloblastoma. Patients over the age of 60 years showed a total of six cases, out of which two were astrocytoma and one case each of meningioma, neurofibroma, Malignant peripheral nerve sheath tumour (MPNST) and one metastatic tumour. Table No.3 depicts the age distribution in various CNS tumours.

Table -3 Age distribution in various CNS tumors:

S. No	Histological types	0-10yrs	10-20yrs	20-30yrs	30-40 Yrs	40-50 Yrs	50-60 Yrs	60 and above	Total
1	Astrocytoma	1	1	1	3	5	5	2	18
2	Meningioma	0	0	0	2	7	6	1	16
3	Oligodendroglioma	0	0	0	2	2	2	0	6
4	Schwannoma	0	0	1	2	1	0	0	4
5	Neurofibroma	0	0	2	1	1	1	1	6
6	MPNST	0	0	0	0	0	0	1	1
7	Hemangioma	0	0	0	2	0	0	0	2
8	Ependymoma	0	0	0	0	1	1	0	2
9	PNET	1	0	0	0	0	0	0	1
10	Medulloblastoma	0	1	0	0	0	0	0	1
11	Metastatic tumours	0	0	0	0	0	1	1	2
	Total	2	2	4	12	17	16	6	59

Primary CNS tumours were further divided on the basis of cell of origin. Tumours of neuroepithelium were commonest followed by tumours of meninges and cranial & peripheral nerve sheath tumours. Astrocytic tumours were the commonest among, neuroepithelial tumours(66.6%), with glioblastoma forming the largest subtype of neuroepithelial tumours(29.62%).Two metastatic tumours were reported, one in a male and second in a female in the age group of 50 and above years. The primaries were seen in the lung and breast respectively.

Distribution of CNS tumours according to WHO classification(2016), grading and relative frequencies are depicted in TableNo-4,5,6, 7.

Table -4:Distribution of CNS tumours according to the cell of origin.

S.No	Tumour type	Frequency	Percentage %
1	Neuroepithelial tumors	27	45.8%
2	Meningiomas	16	27.1%
3	Mesenchymal,non meningiothelial tumours	3	5.1%
4	Tumours of cranial and paraspinal nerve	11	18.6%
5	Metastatic tumours	2	3.4%
	Total	59	100%

Table No-5 Histological subtypes with WHO grading:

Tumour type	WHO Grading	N	(%)
Tumours of Neuroepithelial tissue			
Astrocytic tumours			
• Pilocytic astrocytoma	Grade I	4	6.8%
• Diffuse astrocytoma	Grade II	2	3.4%
• Anaplastic astrocytoma	Grade III	2	3.4%
• Glioblastoma multiforme	Grade IV	8	13.5%
Oligodedroglial tumours			
• Oligodendroglioma	GradeII	3	5.1%
• Anaplastic oligodendroglima	Grade III	3	5.1%
Ependymal tumours			
• Ependymoma	Grade II	2	3.4%
Embroynal tumours			
• Medulloblastoma	Grade IV	1	1.7%
Meningioma			
• Meningioma	Grade I	14	23.7%
• Atypical Meningioma	Grade II	2	3.4%
Mesenchymal, non meningiothelial tumours			
• Hemangioma	Grade I	1	1.7%
• PNET	Grade IV	1	1.7%
Tumours of Cranial and Paraspinal nerves			
• Schwanoma	Grade I	4	6.8%
• Neurofibroma	Grade I	6	10.2%
• MPNST	Grade IV	1	1.7%
Metastatic tumours		2	3.3%

Table -6 CNS tumours grading according to WHO classification:

S. No	Histological types	Grade I	Grade II	Grade III	Grade IV	Total
1	Astrocytoma	4	2	2	8	18
2	Meningioma	14	2	0	0	16
3	Oligodendroglioma	0	3	3	0	6
4	Schwannoma	4	0	0	0	4
5	Neurofibroma	6	0	0	0	6
6	MPNST	0	0	0	1	1
7	Ependymoma	0	2	0	0	2
8	PNET	0	0	0	1	1
9	Medulloblastoma	0	0	0	1	1
	Total	28	9	5	11	55

Table No-7 Distribution of CNS tumours according to their grade.

Tumour Grade	Frequency	Percentage
Grade I	28	47.4%
Grade II	9	15.2%
Grade III	5	8.5%
Grade IV	11	18.6%

Discussion:

It has been observed that substantial differences exsist between different countries, geographical areas and ethnic groups in the incidence of CNS tumours, however, the incidence of CNS tumours is increasing world wide. Moreover because of its high fatality, it forms a challenging problem to the neurooncologists.

In the present study, 59 cases from a tertiary care hospital, have been categorized according to the recent WHO classification of tumours of Central Nervous System(2016)[3]. In our study the most common CNS tumours were the tumours of neuroepithelum (45.7%), followed by tumours of meninges(27.1%), tumours of cranial and paraspinal nerves(18.6%), mesencymal (non meningiothelial tumours)(5.1%) and metastatic tumours(3.4%). This was in concordance with the

nationwide database in France which revealed the proportion of tumors of neuroepithelial tissue and meninges were 53.9% and 28.8%, respectively, from 2004to 2008[5]. Nibhoria et al(2015)[6] reported that tumours of neuroepithelium comprise 57.1%, tumours of meninges comprise 34.8% and metastatic tumours comprise 5.6 % in their study of 100 cases of CNS tumours. Ahsan et al(2015)[7] also reported similar findings.

This study showed age range of 7-65 years, with maximum number of cases in the age group of 40-50 years, followed by 50-60 years of age. Ahsan et al(2015) reported most cases in the 5th decade followed by the 3rd and 4th decade. Chawla et al(2014)[8] reported highest incidence of CNS tumours in the age group of 36-50 years. Ghanghoria et al(2014)[9] reported maximum number of cases in the age group of 31-50 years. There is general agreement on the age differences in the incidences of different CNS tumours. But all studies show lesser incidence of CNS tumours in the extremes of age.

In the current study the male to female ratio was 1.27:1. Almost the same male dominant ratio of 1.55:1, 1.6:1, 1.17:1 and 1.086:1 was shown by Sajjad et al(2016)[10], Ahsan et al(2015)[7], Butt et al(2005)[11], Ghanghoria et al (2014)[9] where as Aryal et al (2011)[12] showed equal male to female ratio.

In our study Astrocytoma was the commonest CNS tumour with 18 cases (30.5%). Out of the 18 cases, 4 were reported as pilocytic astrocytoma, 2 as diffuse astrocytoma, 2 as anaplastic astrocytoma and 8 as glioblastoma. This was followed by meningiomas with 16 cases (27.1%). Out of the 16, 2 meningiomas were reported as atypical meningiomas. There were 11 cases(18.6%) of cranial and paraspinal nerves followed by 6 cases(10.2%) of oligodendroglioma, 2 cases(3.4%) each of ependymoma, hemangioma & metastatic tumour and 1 case(1.7%) each of medulloblastoma, PNET.

Sajjad et al (2016)[10] reported astrocytoma (46.22%), meningioma (20.75%) followed by oligodendroglioma and medulloblastoma with each 5.66% cases. Ahsan et al (2015)[7] reported astrocytoma as 56% followed by meningioma 23%, pituitary adenoma 2.6% and germ cell tumour 0.1%. lakhshmi et al (2015)[13]reported most common tumour as astrocytoma followed by meningioma and schwanomma. Chawla et al (2014)[8] also reported astrocytoma as the most common CNS tumour followed by metastatic tumours and meningiomas.

In our study Astrocytoma was more common in males than females. The male to female ratio was 1.25:1. This is comparable to Ghanghria et al (2014)[9], who reported that in their study, male to female ratio was 1:0.86. In present study meningiomas were more common in females with the male to female ratio of 0.6:1. Kanthikar et al (2017)[15] also reported a female predominance in meningiomas.

In present study we divided the CNS tumours according to WHO grading system(2016)(wherever applicable). The grading system helps the neurosurgeon in deciding the treatment modality (chemo or radiotherapy). Grade I were the most common followed by Grade IV, Grade II and Grade III. This is in concordance with Jat et al (2016)[14].

Conclusion:

The present study highlights the trends of CNS tumours in a single center. In the present study, neuroepithelial tumours were the most common neoplasm and astrocytoma was the most common glioma reported. Meningioma was the next common CNS tumour. CNS tumours are challenging because of their increasing incidences in all ages and high mortality. Neuro-oncologist, pathologist and radiologist should work as a team for accurate and early diagnosis & treatment of CNS tumours.

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