HISTOPATHOLOGICAL SPECTRUM AND GRADING OF CNS TUMOURS IN TERTIARY CENTRE: CASE STUDY OF 83 CASES

Velayutham Sumathi[1], K. Balakrishnan[2], M. Sai Sridevi Krishna[3], K. Uma Maheswari[4]

[1]Assistant Professor, Department of Pathology, KAPV Government Medical College, Trichy, Tamilnadu, India.
[2]Professor, Department of Pathology, KAPV Government Medical College, Trichy, Tamilnadu, India.
[3]Assistant Professor, Department of Pathology, KAPV Government Medical College, Trichy, Tamilnadu, India.
[4]Assistant Professor, Department of Pathology, KAPV Government Medical College, Trichy, Tamilnadu, India.

ABSTRACT

BACKGROUND AND OBJECTIVES

Central nervous system is made up of the brain and the spinal cord. Cells within the CNS normally grow in an orderly and controlled way. If for some reason this order is disrupted the cells continue to divide and form a lump of tumour. Primary CNS tumours continue to be among the top ten causes of cancer related deaths in the world despite comparatively low incidence to other tumours. The objective of the study was to evaluate the incidence, histopathological features, grading according to WHO guidelines and immunohistochemistry analysis of difficult cases with glial differentiation.

MATERIALS AND METHODS

The retrospective study comprised of 83 cases of CNS neoplasms retrieved from the histopathology section. The study ranged from 5-70 years, mean age being 16 years. Clinical data was collected in most of the cases regarding the site of the tumour, presenting symptoms and radiological findings.

RESULTS

The study ranged from 5-70 years. Maximum number of cases were seen in the age group of 31-40 years. Overall, females (56%) showed a slight preponderance compared to males (44%). Paediatric neoplasms comprised 13.2 % of all cases in our institution. Commonest type of tumours were intracranial tumours (49.3%) and spinal tumours (8.4%).

CONCLUSION

Incidence of CNS neoplasms is rare in general population. The incidence of CNS neoplasms in our institution was 9.97% slightly higher compared to other studies. Females showed a slight predominance. Commonest intracranial neoplasm in adults was astrocytoma whereas it was medulloblastoma in the paediatric population. WHO grading revealed Grade II pattern as the most frequent one histopathologically. Immunohistochemistry plays a major role in diagnosis of CNS neoplasms.

KEYWORDS

CNS, tumour, incidence, grade.

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INTRODUCTION: Primary brain tumours continue to be among the top ten causes of cancer related deaths in the world, despite comparatively low incidence to other tumours. About half to three quarters are primary tumours, rest are metastatic. CNS tumours constitute 1-2% of all neoplasms. The most prevalent CNS tumours in the adult are the Astrocytic tumours (49%), followed by meningiomas (18%) and metastatic tumours (6.5%). In paediatric population, CNS tumours are second most common solid tumours (Jalali and Dutta 2008, Wrensh et al 2002).[1,2] In children, our study showed that commonly occurring tumours were medulloblastomas followed by craniopharyngiomas. Children are affected by metastatic tumours but to a much lesser extent than the adults (Arora et al 2009).[3] The commonest presenting symptoms are headache, vomiting, visual difficulties and seizures. Immunohistochemistry (IHC) has become an important tool in the diagnosis of brain tumours, although conventional haematoxylin-eosin staining is the main stay for pathologic diagnosis. Glial fibrillary acidic protein demonstration firmly establishes the tumour to be of astrocytic origin and differentiation. GFAP positivity has been seen in all low-grade astrocytomas, anaplastic astrocytomas and glioblastoma multiforme (Takei et al 2007).[4] A number of classifications have been proposed to classify tumours of the CNS. World Health Organisation (WHO) proposed a comprehensive classification in 1979 (Louis et al 2007),[5,6] which we have followed in our study.

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Corresponding Author:
Dr. Velayutham Sumathi,
Assistant Professor, Department of Pathology,
KAPV Government Medical College, Trichy, Tamilnadu, India.
E-mail: kapvpath@gmail.com
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MATERIALS AND METHODS: The study was conducted in our institution for a period of one year where 83 cases of CNS neoplasms were reported. This was a retrospective study, hence histopathological reports maintained in the histopathology section were reviewed and H&E section of every case was re-examined. The clinical information was obtained from case records of patients retrieved from Department of Neurosurgery. Sections were stained with H&E. Histological characteristics and grading of tumours was done as per WHO guidelines. Immunohistochemistry was done for relevant cases. The results analysed and data prepared to calculate prevalence, incidence, types, age and sex distribution of CNS tumours in our area.

RESULTS AND DISCUSSION: Majority of the tumours in our study that is 95% presenting as SOL were malignant. Our study included 83 cases which were grouped according to the age at presentation i.e. (1-10 yrs., 11-20 yrs., 21-30 yrs., 31-40 yrs., 41-50 yrs., 51-60 yrs., 61-70 yrs.). (Table 1)

The tumours are grouped according to the age at presentation (i.e. 10-15 yrs., 11-20 yrs., 21-30 yrs., 31-40 yrs., 41-50 yrs., 51-60 yrs., 61-70 yrs.).

Age in years	Male	Female
1-10	4	6
11-20	2	6
21-30	3	4
31-40	11	16
41-50	10	8
51-60	5	6
61-70	2	1
Total	37	46

Table 1: Age & Sex wise Incidence of CNS Tumours

Table shows that CNS tumours occur more frequently in the age group of 31-40 years (27 cases -32.5%) followed by 41-50 years (18 cases -21.6%). Least number of cases is seen in the age of 61-70 years (3 cases – 3.6 %) followed by 11-20 years (8 cases- 9.6%).

This table also shows a slight preponderance in females 46 cases (55.4%) whereas males show an incidence of 37 cases (44.6 %).

Coming to the incidence of various CNS neoplasms, astrocytomas constituted the major portion of tumours (41 cases -49%), followed by meningiomas (15 cases -18.1%), neural tumours (7 cases -8.4 %) and metastatic tumours (5 cases -6.3%). In the paediatric population, medulloblastomas were the commonest tumours (4 cases - 4.8 %) (Fig. 1)

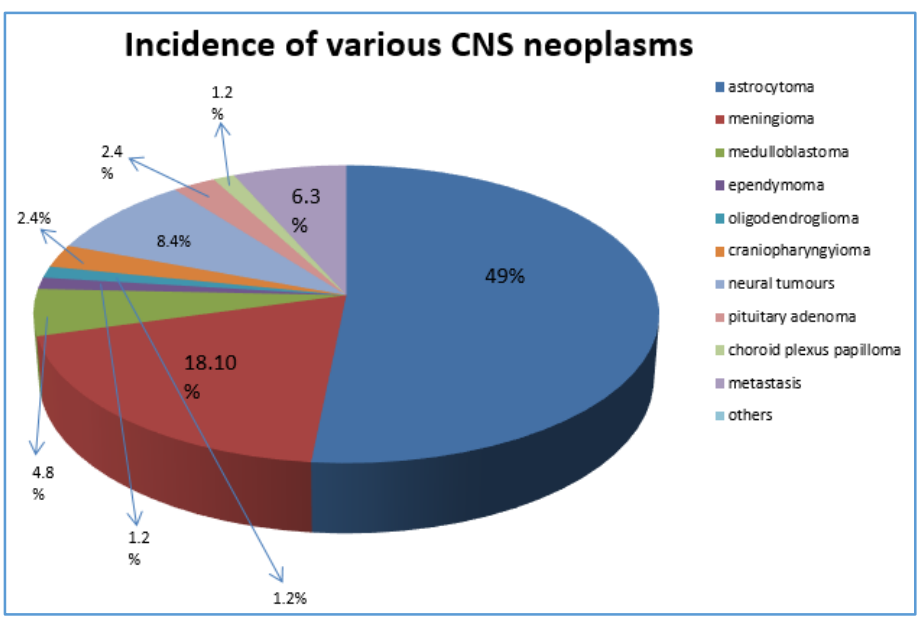

Fig. 1: Chart Exhibiting Incidence of Various CNS Neoplasms

Our study also classified the tumours on the basis of WHO grading. Out of the 75 cases, (Excluding metastatic tumours, lymphomas) Grade I tumours were the highest (28 cases – 37.2%), followed by Grade II (19 cases- 25.3%), Grade III (15 cases- 20%) and Grade IV (13 cases- 17.3 %). (Fig. 2)

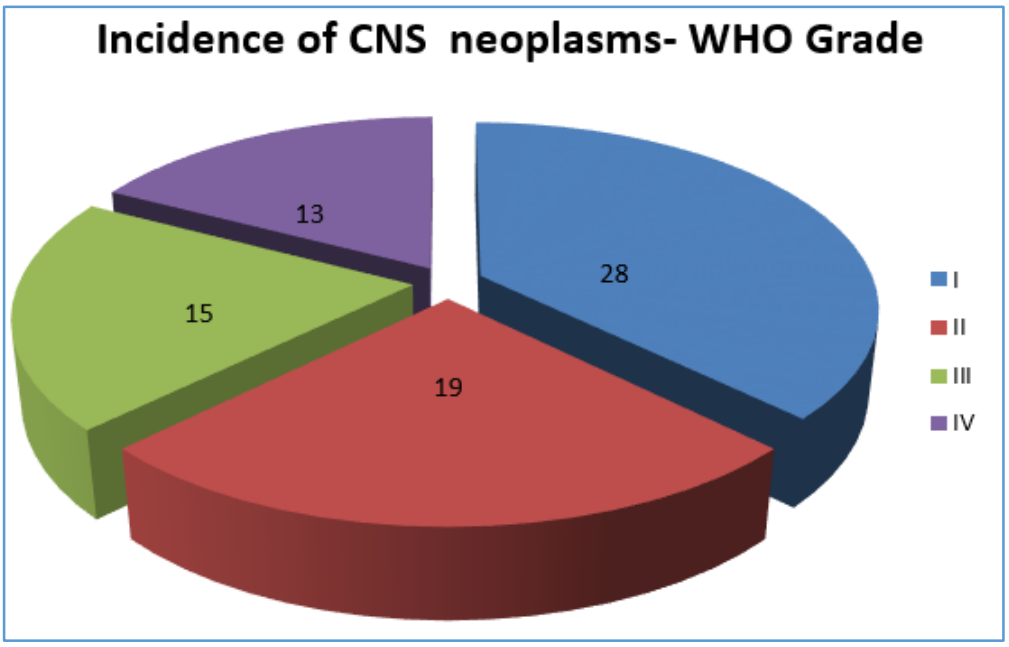

Fig. 2: Chart Showing Grading of Various CNS Neoplasms

Our study showed the sex wise incidence of WHO grading of CNS neoplasms. Females outnumbered males in Grade I (18 cases-64%), whereas Grade III neoplasms were predominated by males (11 cases-73%). (Table 2).

Grade	Male	Percentage	Female	Percentage
I	10	35%	18	64%
II	8	42%	11	57%
III	11	73%	4	26%
IV	4	30%	9	59%
Total	**33**	**44%**	**42**	**56%**

Table 2: Grading and Sex wise Incidence of CNS Neoplasms

Astrocytomas comprised the major chunk of glial neoplasms in our study (41 out of 83 cases).

WHO grading was done as per the norms and our study showed that Grade II Astrocytomas were commonest (16 cases – 39.02%). Fig. 3 Immunohistochemistry was done for few cases where there was doubtful glial differentiation. (Fig. 4)

Grade	No. of Cases	Percentage
I	3	7.3%
II	16	39.02%
III	14	34.1%
IV	8	19.5%

Table 3: Incidence of Grades of Astrocytoma (41/83)

DISCUSSION: Primary tumour of CNS are rare neoplasms in adults constituting about 1-2% of all malignancies. Brain tumour incidence tends to be higher in countries with more developed medical care. Although there is no population that is not at risk for developing glioma, there is some correlation between incidence and characteristics such as age, gender, ethnicity and geography according to Nicholas A. Butowski and Suran M, Chand et al.[7]

The commonest site of CNS neoplasm in this study occurred in the parietal lobe 27 cases (32.5%) followed by frontal lobe 25 cases (30.1%) Astrocytic tumour comprised the most common group followed by meningiomas in adults. Incidence of paediatric neoplasms was found to be 13.2% compared to studies done by Russell DS Rubinstein et al.[8] Medulloblastomas being the commonest tumour (4.8%).

There is general difference in the age incidence of different tumour types. Astrocytoma can be found from childhood to over 70 years. However, majority of CNS tumours occurred from 3rd – 4th decade. Grading is done for all CNS neoplasms according to the world health organisation. Grading follows the same guide line with the Dumas-Duport grading system as quoted by Roger. E. McLendon et al.[9] In this system, one point is accorded to the presence of each of nuclear pleomorphism, mitotic activity, vascular proliferation and necrosis. While cellular density is not considered in grading, cellular density is a consideration in establishing a diagnosis of neoplasia in the sense that the formation of a tumour is derived solely on the uncontrolled replication of cells. According to study of Peter et al, [10] the incidence of various CNS neoplasms according to age show Grade II neoplasms in 3rd to 4th decade & Grade III – 5th decade & Grade IV – 6th decade.

Our study showed that Grade I neoplasms were in accordance with the above study whereas grade II & Grade IV neoplasms in contrast were seen in 3rd& 5th decades respectively. Our study also showed that astrocytomas constituted the major chunk of gliomas consistent with studied conducted by other institutions.

IHC plays an important role in the confirmation of diagnosis of glial neoplasms GFAP is currently being employed to assist in the diagnosis of CNS neoplasm. GFAP

occurs to be sensitive and specific marker for glial differentiation. We have also employed IHC for some astrocytic tumours for confirmation of diagnosis. (Fig: 3 & 4)

CONCLUSION: The incidence of CNS neoplasms is rare compared to other tumours. High incidence of CNS neoplasms is seen in the 3rd and 4th decade with slight female predominance. The incidence of CNS neoplasms in our study is 9.97%. Paediatric neoplasms constitute 13.2% of all CNS neoplasms. Primary CNS tumours are seen supratentorially in adults and in children it occurs infratentorially. Astrocytomas constitute the most common CNS tumour, WHO norms reveal Grade II pattern as the commonest. In doubtful cases, IHC markers provide a valuable tool in arriving at a final diagnosis.

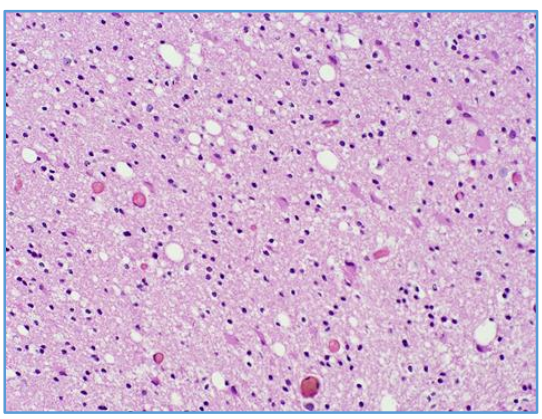

Fig. 3: H & E Section Showing Grade II Astrocytoma with Increased Cellularity and Nuclear Atypia

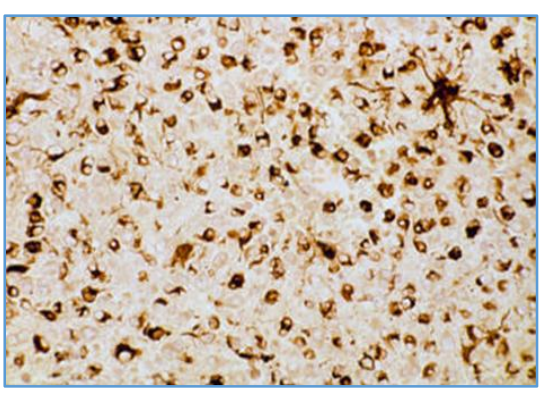

Fig. 4: Immunohistochemical Staining with Glial Fibrillary Acidic Protein (GFAP) Showing High Positivity

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