

Histopathological Study and Categorisation of Brain Tumors

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ABSTRACT

World health organization (WHO) recently published its 4th edition of classification of tumors of central nervous system (2007). It is important to classify because each type has a specific outcome and the treatment differs. This study was aimed to have a brief overview regarding the different categories of brain tumors and their relative incidence. The study was inspired from the presence of a heavily loaded neurosurgery department at B.J.M.C and hence a good number of biopsies on daily basis. A Retrospective study of total 200 biopsies (routinely fixed in 10% neutral buffered formalin, processed and stained with hematoxylin and eosin) from August 2015 to June 2016 in Pathology department, B.J.M.C, Civil Hospital, Ahmedabad was done. Routine microscopy was done. It was found that that neuroepithelial tumors were the most common histological type followed by meningiomas and pituitary tumors. Majority of malignant intracranial tumors were WHO grade I and II.

Keywords: Brain, Cancer, Classification, Histopathology

Introduction

A brain tumor or intracranial neoplasm is an abnormal mass of tissue in the brain, the growth of which exceeds and is uncoordinated with that of the normal tissues and persists in the same excessive manner after cessation of stimuli which evoked the change¹. There are two main types of tumors: benign tumors and malignant tumors. Malignant tumors can be divided into primary tumors that start within the brain, and secondary tumors that have spread from somewhere else, known as brain metastasis. Classification of tumors is one of the arts of pathology, drawing on traditional recognition of histological and biological features combined with newer molecular analyses¹. Treatment protocols and experimental trials of glial tumors are usually based on WHO classification. WHO (World Health Organization) recently published its 4th edition of classification of tumors of central nervous system (2007), incorporating a substantial number of important changes to the previous version (2000)². The 4th edition introduces 10 newly codified entities, patterns and variants; changes in classification of existing brain tumors, grading as well as 1 new genetic syndrome. In the present study attempt has been made to classify the intracranial tumors according to WHO (2007) 4th edition². The WHO currently lists more than 100 types of CNS tumors and their variants³.



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There are a number of distinct types of brain cancers within the brain, and the treatments and their outcomes vary greatly based on pathological and

histological diagnosis. More recently, researchers are identifying new therapies based on increased knowledge of cellular and molecular biology⁴.

It is important to classify because each type has a specific set of outcome and its treatment differs. The WHO (2007) classified it as follows³:

A. Tumors of Neuroepithelial Tissue

- Astrocytic tumors
- Oligodendroglial tumors
- Ependymal tumors
- Mixed gliomas
- Neuroepithelial tumors of uncertain origin
- Tumors of the choroid plexus
- Neuronal and mixed neuronal-glial tumors
- Pineal Parenchymal Tumors
- Tumors with neuroblastic or glioblastic elements (embryonal tumors)

B. Tumours of Meninges

- Tumours of Meningothelial cells
- Mesenchymal tumours

C. Tumours of Cranial and Paraspinal Nerves

- Schwannoma
- Malignant Peripheral Nerve Sheath Tumor

D. Lymphomas and Haematopoietic Neoplasms

E. Germ Cell Tumours

F. Tumours of the Sellar Region

G. Metastatic Tumours

H. Tumours of Pituitary Gland

Aims and Objectives

This study was aimed to have a brief overview regarding the different categories of brain tumors and calculate their relative incidence by histopathological examination. Also their sex and age distribution was studied.

Materials and Methods

This study was done at B.J Medical College, Ahmedabad. Biopsies were obtained from 200 cases of intracranial tumors, over a period of 1 year from August 2015 to June 2016.

Complete clinical history and clinical diagnosis were noted down in all the cases. All the specimens were from biopsy of operated brain tumors received in 10% formalin. They were processed by the routine paraffin embedding technique. All the tissue bits that were received were embedded, wherever necessary in multiple paraffin blocks and sections from all these blocks were studied. Paraffin sections of 4 microns thickness were obtained from each block and stained with haematoxylin and eosin stain using standard procedures. Routine microscopy was done and data was interpreted as percentage of each tumor type out of total no. of cases.

Exclusions:

Spinal cord lesions were excluded from the study. Few tumors with ambiguous morphology raising suspicion of category were excluded.

Results

Table 1 : Percentage distribution of different tumors in present study

Histological type	Number	Percentage Cases
Neuroepithelial tumors	77	38.5
Cranial nerve tumors	37	18.5
Meningeal tumors	56	28
Tumors of sellar region	4	2
Lymphomas	2	1
Metastatic tumor	6	3
Pituitary Tumor	18	9
Total	200	100

Table 2 : Sex distribution of various tumors in present study

Histological Type	No. of Males	No. of Females	Male: Female Ratio
Neuroepithelial tumors	35	42	0.83:1
Cranial nerve tumors	18	17	1.05:1
Meningeal tumors	20	36	0.55:1 *
Tumors of sellar region	2	2	1:1
Lymphomas	2	0	2:0
Metastatic tumor	2	4	1:2
Pituitary Tumor	8	10	0.8:1

*study of meningeal tumors show that there is an increased female: male ratio in the present study. It is seen that females are more afflicted than males⁶.

Table 3: Age distribution of various tumors in present study

Histological Type	Subtype	0-10 years	11-30 years	31 -50 years	>50 years
Neuroepithelial tumors	Pilocytic Astrocytoma	-	1	-	-
	Low Grade Astrocytoma	-	13	10	-
	Anaplastic Astrocytoma	2	-	8	-
	Glioblastoma Multiforme	-	-	4	8
	Pleomorphic Xanthoastrocytoma	-	-	-	1
	Oligodendroglioma	-	2	10	-
	Ependymoma	4	1	-	-
	Ganglioglioma	-	1	-	-
	Pinealoblastoma	-	-	4	-
	Medulloblastoma	4	-	-	-
	Atypical Teratoid Rhabdoid Tumor	-	1	-	-
	Atypical Choroid Plexus Papilloma	-	-	1	-
Cranial nerve tumors		2	2	8	25
Meningeal tumors	Meningioma	-	-	27	26
	Hemangiopericytoma	-	1	-	-
	Hemangioblastoma	-	1	-	1
Tumors of sellar region	Craniopharyngioma	-	3	1	-
Lymphomas		-	1	1	-
Metastatic tumor		-	-	1	5
Pituitary Tumor		2	7	9	-

The above table-3 shows that all neuroepithelial tumors occur in middle aged persons except for embryonal tumors and ependymomas. Also meningiomas and cranial nerve tumors show a predilection for middle age and adulthood.

5. Discussion

On comparing the our study with other studies there was concordance between the results with neuroepithelial tumors being the most common of all brain tumors , followed by meningeal tumors, cranial nerve tumors and pituitary tumors.

- The present study brought into highlight various brain tumors, there incidence ,sex and age predisposition.
- There was concordance of site of maximum tumors like astrocytomas and oligodendrogliomas occurring in cerebral hemispheres, hemangioblastomas in cerebellum⁶.
- The sex distribution of tumors brought into light that meningeal tumors have a female predisposition.

- In children upto 10 years only few brain tumors were seen(7 %) - mainly medulloblastoma ,ependymoma followed by astrocytoma.
- One case of Craniopharyngioma was found in 45 year female, in agreement with the fact that craniopharyngioma have two peaks of occurrence one in first, second decade and other in the fifth decade⁶.
- A rare case of tumor of recently suggested WHO category – Atypical Choroid plexus Papilloma(Neuroepithelial Tumor) was also found in a 45 year male with a cerebellopontine angle SOL.
- One case of Atypical Teratoid Rhabdoid Tumor was also seen in a 15 year male. Unfortunately a follow-up could not be taken.

Table 4 : Comparison of data of present study with previous studies

Histological Type	Present Study	Suchitra et al⁵, mangalore	Banerjee et al Chandigarh	Pal AK & Chopra et al, Lucknow	Dastur And Lalitha et al, Bombay	Verma et al, Pune	Kastur a et al, Japan	Fan et al, USA
Neuroepithelial tumors	38.5 *	31.6	55.4	64.7	50.25	61.8	31.68	65.79
Cranial nerve tumors	18.5	10.5	6.8	5.0	9.77	4.95	11.85	2.83
Meningeal tumors	28 *	30.0	20.30	15.1	13.67	14.83	15.71	13.84
Tumors of sellar region	2	2.6	1.7	4.2	0.60	3.18	9.44	-
Lymphomas	1	2.6	-	-	0.60	0.71	-	-
Metastatic tumor	3	7.9	1.7	-	7.6	3.89	4.28	-
Pituitary Tumor	9	15.8	3.4	7.6	6.95	7.6	10.84	9.69
Total No. of cases	200	38	177	100	1844	283	3367	16311

*indicates the highlights of the study.

In the present study neuroepithelial tumors hold the maximum percentage of cases followed by meningeal tumors.

Image 1 : Gemistocytic Astrocytoma

[10x]

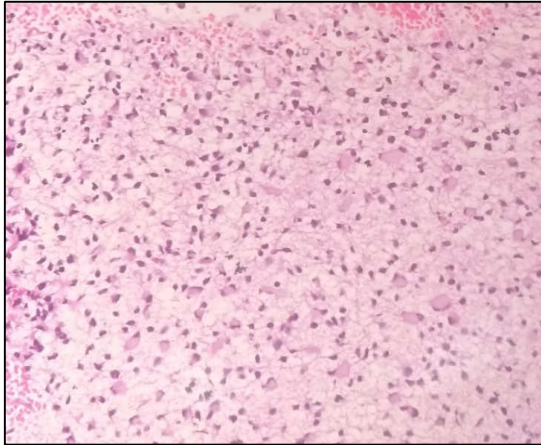


Image 2: Pleomorphic Xanthoastrocytoma

[10x]

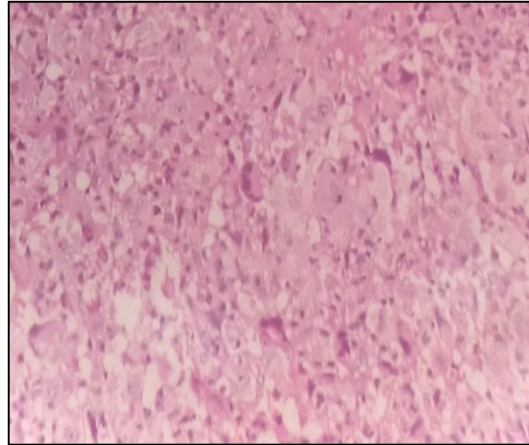


Image 3: Glioblastoma Multiforme

[10x]

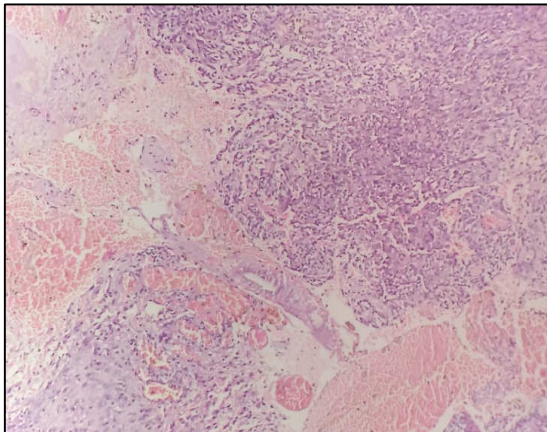


Image 4: Atypical Teratoid Rhabdoid Tumor

[10x]

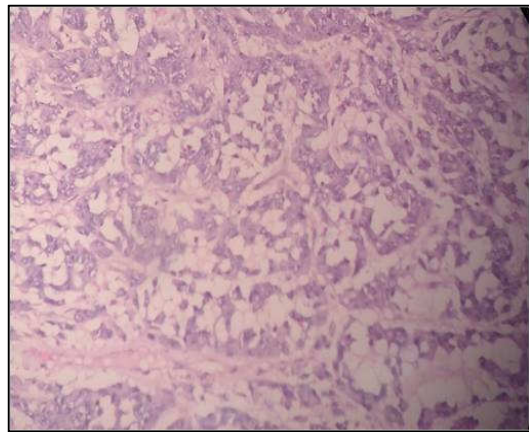


Image 5: Meningioma

[10x]

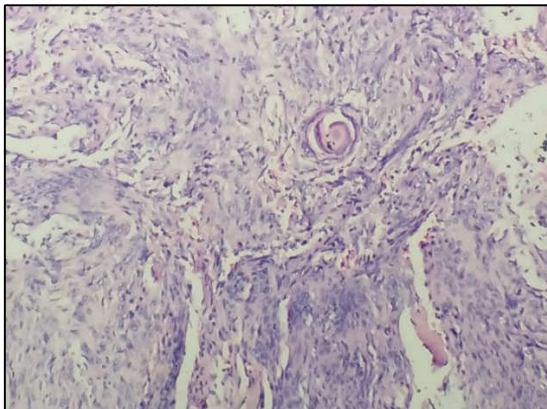


Image 6: Schwannoma

[10x]

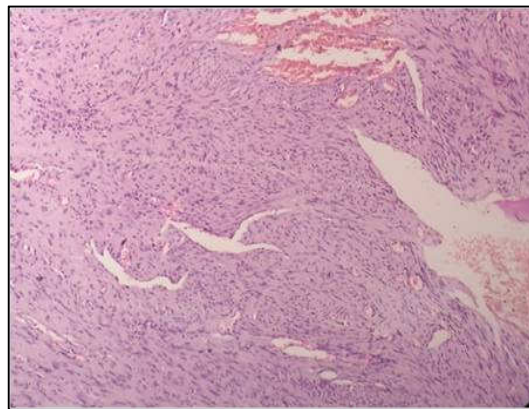
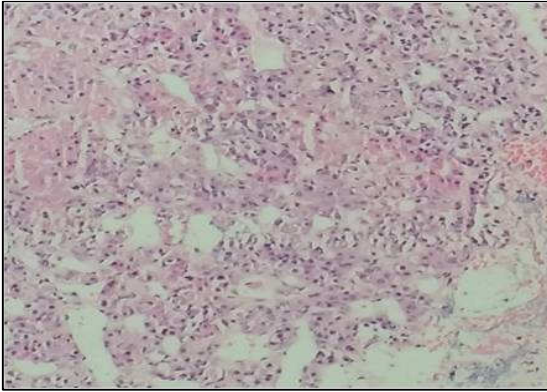
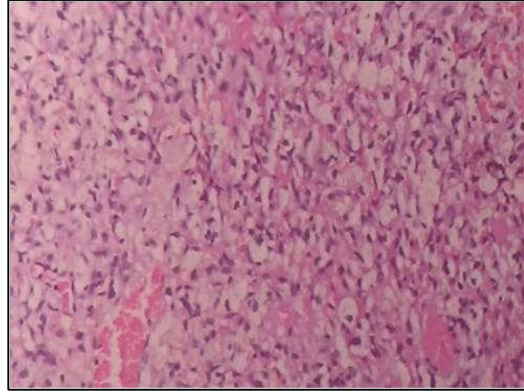
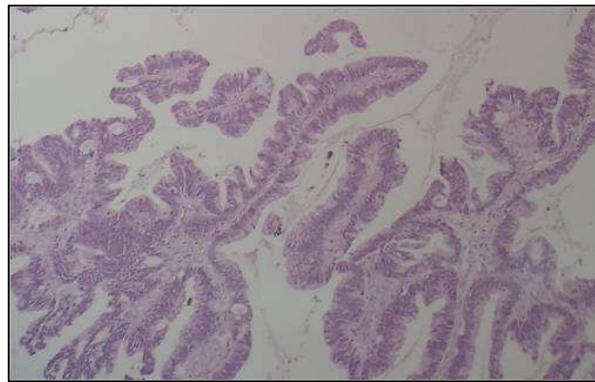


Image 7: Pituitary Adenoma [10x]**Image 8: Pituitary Adenoma [40x]****Image 9: Metastatic Papillary carcinoma [10x]**

Conclusion

Neuroepithelial tumors are the most common histological type followed by meningiomas and pituitary tumours. Craniopharyngiomas can also occur in older age group. Most meningiomas are of grade I, but most astrocytomas are of higher grade. Germ cell tumors are rare, in the present study their incidence was nil.

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