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HISTOPATHOLOGICAL SPECTRUM OF TEMPORAL LOBE TUMORS; A 12 YEAR OBSERVATIONAL STUDY

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ABSTRACT

The Central Nervous System tumor comprises ~2% of all the tumors, an overall increase has been observed especially in less developed countries. This increase in the incidence may be due to exposure of population to various risk factors or improved diagnosis with advancement in the ancillary studies. Tumors of the temporal lobe show varied clinical behavior e.g., some low grade tumors with typical pathological features carry a favourable prognosis after total tumor excision.

AIMS AND OBJECTIVES; To study the histopathological spectrum of tumors of the temporal lobe.

MATERIAL AND METHODS: An observational study (analysis of temporal lobe tumors) in a tertiary care hospital using data from May 2005 through May 2017 RESULTS The total number of cases in our study was 206, which included the primary brain tumors of the temporal lobe diagnosed In our study, the maximum number of patients were in the age group of 21-40 years (40.8%) The male to female ratio was 2.03:1 in our study The most common clinical symptom was headache which was seen in 89.8% of cases followed by seizures (53.9%) GBM was the most common histopathological subtype in our study,followed by PXA and glioneuronal tumors.

SUMMARY AND CONCLUSION: In addition to gliomas which form the major subtype in temporal lobe,glioneuronal tumors have emerged as a significant group of tumors in the temporal lobe with a good prognosis as they mostly belong to a lower grade

KEYWORD

Temporal Lobe, Headache. Glioblastoma Multiforme

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INTRODUCTION;

Tumors of the central nervous system (CNS) constitute 1–2% of all malignancies.[1] They are the second most common form of cancer in children and sixth most common in adults. However, CNS malignancies arguably have the most varied manifestations among all cancer sites.Tumors of the brain can present with focal neurological signs , changes in personality etc. with successful treatments offered for only certain types. There are several anatomical subregions within the brain, and each of these has a predilection for a particular tumor subtype.[2] Further, each tumor can be subdivided into prognostic groups based on surgical resection extent, performance status, imaging findings, grade, age, and molecular characteristics.[3] Among CNS neoplasms, gliomas are the most common tumors.[1,2,3]

Imaging plays an important role in the diagnosis and management of brain tumors. For example conventional MR imaging is the mainstay of CNS glioma diagnosis but not always enough for differentiation of tumor subtypes and estimation of tumor grade.[4] Advanced MR imaging techniques are being applied to diagnose and grade tumors preoperatively, to plan and navigate surgery intraoperatively and to assess response to treatment.[5,6] However , inspite of all these recent imaging techniques, histopathology remains the the gold standard in the diagnosis and grading of brain tumors. The highly sophisticated CT or MRI guided stereotactic biopsies can take small but well targeted samples of tissue for pathological analysis. The effective use of pathology in the management of CNS tumors requires firm diagnostic criteria & classification which are essential for accurate communication between pathologist and clinicians.Tumors of the temporal lobe show varied clinical behavior e.g., some low grade tumors with typical pathological features carry a favourable prognosis after total tumor excision.

Since most pathologists have access to relevant clinical and imaging data from their patients, so there is a need for general awareness of the pathology of these tumors among all pathologists, radiologists & clinicians, if the management of

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the patients is to be effective and appropriate.

Present study is a humble attempt to study the histopathological spectrum of tumors of the temporal lobe.

MATERIALS AND METHODS

Design: An observational study (analysis of temporal lobe tumors) in a tertiary care hospital using data from May 2005 through May 2017 - A 12 year study [10 yrs retrospective and 2 yrs prospective].

Inclusion criteria: All cases of temporal lobe tumors suspected clinically & by imaging in all age groups

Exclusion criteria: Cases with a known primary malignancy elsewhere or established cases of brain metastasis .Cases of ischemic pathology involving temporal lobe.Cases with infective pathology of temporal lobe. In the retrospective part of our study, all cases which were histo-pathologically confirmed were included. Relevant details which included clinical, radiological and operative findings were collected from the hospital records. Relevant paraffin embedded blocks and their slides were taken out and 3 micron thick sections were cut from such blocks. New sections were cut if lost or when staining had faded. H&E staining was done In the prospective part of the study, all specimens received for histopathological examination were processed and included. The specimens were preserved in 10% formalin. While grossing, small biopsies were submitted entirely and representative sections were taken from the resected tumor specimens. The tissue was processed using conventional methods of processing. Tissue sections were cut using standard rotary microtome and stained with hematoxylin and eosin stain (H&E). Microscopic examination was carried out by two pathologists, individually to reduce observer bias.

Statistical Methods: The recorded data was compiled and entered in a spreadsheet (Microsoft Excel) and then exported to data editor of SPSS Version 20.0

RESULTS. A Total of 1080 cases of primary brain tumors were received during our study period. Of these 206(19.07%) were seen in the temporal lobe.

AGE DISTRIBUTION

In our study, the maximum number of patients were in the age group of 30-44 years (30.1%).(Table1)Age of the study population ranged between 4 to 75 years. Mean age of study population was 39.6±16.46.

Table 1: Showing age distribution of cases

Age (years)	Frequency	Percentage
< 15	11	5.3
15-29	46	22.3
30-44	62	30.1
45-59	53	25.7
≥ 60	34	16.5
Total	206	100
Mean±SD (Range) = 39.6±16.46 (4-75)		

GENDER DISTRIBUTION

In our study , there was male preponderance (67%) with a male to female ratio of 2.03:1

HPE Subtypes & Grading

A total of ten histopathological subtypes were seen. GBM was the most common (21.8%) followed by PXA (17.5%)(Figure1), Ganglioglioma (13%), DNET (12.1%), Gliosarcoma (11.7%) & Anaplastic oligodendroglioma (11.2%)(Table2). Most of the tumors were Grade IV (33.50%) followed by Grade I (26.69%). When grade of the tumor was compared to the age, it was seen that low grade tumors were more in the younger age group compared to high grade tumors which were more common after 4th decade of life. Using chi square test, the difference was statistically significant

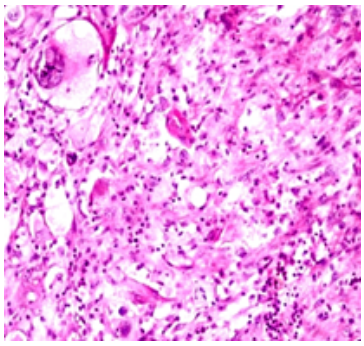

Table2;histopathological Typing Of Tumors

HPE	Frequency	Percent %
Anaplastic Ganglioglioma III	10	4.9
Anaplastic oligodendroglioma III	23	11.2
Angiocentric glioma I	2	1.0
DNET I	25	12.1
Ganglioglioma I	27	13.1
Ganglioneuroblastoma I	1	0.5
GBM IV	45	21.8
Gliosarcoma IV	24	11.7
Oligodendroglioma II	13	6.3
PXA II	36	17.5
Total	206	100.0

CLINICAL FINDINGS

The most common clinical symptom was headache which was seen in 90.2% of cases followed by seizures (53.9%) [including drug resistant refractory seizures]. The other common presentation was Nausea/ Vomiting (45.15%) followed by hemiparesis (13.1%).

MRI Findings

The tumors had varied radiological appearances. Most of the tumors were contrast enhancing with heterogenous enhancement seen in 54.85% cases. Most of the tumors were solid-cystic (41.74%) followed by cystic tumors (33.98%) and solid tumors (24.27%). Mass effect was seen in 23.78% cases. About 18.44% tumors appeared as an enhancing mural nodule and 23.78% were non-enhancing.

Table 3. Accuracy Of Mri Findings Vs Histopathology

HPE	MRI vs HPE		Total	Accuracy (%)
	Negative	Positive		
High grade glioma	3	28	31	90.3
Low grade glioma	2	5	7	71.43
DNET	1	24	25	96
GBM	1	44	45	97.8
Ganglioglioma	3	24	27	88.8
Gliosarcoma	1	23	24	95.8
Oligodendroglioma	3	10	13	76.9
PXA	1	33	34	97.0
TOTAL	16	190	206	92.23%

MRI Findings Vs Histopathology

In our study , overall diagnostic accuracy was 92.23%. The majority of histological subtypes correlated positively with the radiological findings. About 38 cases didn't fit into any specific histological subtype and were hence categorized as either high grade gliomas or low grade gliomas . Lowest accuracy was observed in low grade gliomas(71.43%).

DISCUSSION;

Temporal lobe which is one of the several anatomical subregions within the brain, has in addition to gliomas a predilection for some peculiar tumor subtypes[2] with good prognosis.There has been no extensive study done on primary temporal lobe brain tumors. Our study is a hospital based study carried out in the biggest tertiary care hospital of the state. A total of 1080 cases were diagnosed as primary brain tumors from the year 2005-2017 and out of these, 206 were primary brain tumors located in the temporal lobe.In our study, the maximum number of patients were in the age group of 30-44 yrs (30.1%). Age of the study population ranged between 4 to 75 years. Mean age of study population was 39.6±16.46. A similar retrospective study of 306 cases was conducted by **Nandita Ghosal et al** [7] in 2010 and found age range of 3 to 63 years. **Gianni C et al**[8] in the year 1999 conducted a study on 71 patients with PXA and found a mean age of 26±16 years.In our study , there was male preponderance (67%) with a male to female ratio of 2.03:1.Similar results were found in the study by **Nandita Ghosal et al**[7] **& Sarkar C et al**[9] . Among CNS neoplasms, gliomas are the most common tumors.[1,2,3] In our study, there were varied histological subtype of tumors with gliomas being the most common GBM was the most common tumor and also showed a male preponderance (32 cases). Similar observations were made by **Shrestha et al** [10]. found that gliomas of astrocytic, oligodendroglial and ependymal origin account for more than 70% of all brain tumors.. The next common high grade glioma was gliosarcoma a common tumor of cerebral hemispheres in general and temporal lobe in particular.. The clinical presentation was similar to that seen in GBM cases.This is supported by a study carried out by **Robert A et al** [11] where 8% of all cases of high grade gliomas were gliosarcomas and the presenting features were not very different from glioblastoma.We could not trace all patients of gliosarcomas hence couldn't study the clinical outcome. However the study by **Guobin Zhang et al** [12] in 2016 on clinical outcome of gliosarcoma (GSM) compared with glioblastoma multiforme (GBM) concluded that the clinical outcome is poor compared to GBM. In our study both GBM and gliosarcoma had male preponderance and the male:female ratio in GBM was 2.4:1. This is in concordance with a study done by **Manisha Khanna et al** [13] . Among different HPE subtypes, GBM was the most common and the mean age was 51.6 years.Most of the patients were above the age of 50 years. Only five patients were in their 2nd & 3rd decades of life. This is in concordance with the population based study done by Ohgaki H et al[14] in 2004.

In cases of gliosarcoma, mean age was 56.2 years with a male preponderance. This is in concordance with the study done by **Sarkar C et al**[9] in 1997. Another study by **Huo Z et al**[15] in 2014 on clinicopathologic features of gliosarcoma found mean age of the patients to be 54 years and the male-to-female ratio was 1.5:1.

In our study, the mean age of gangliogliomas was 27 years with male preponderance.The male to female ratio was 1.7:1 . The youngest case of ganglioglioma in our study was 13 years and the oldest was a 40 year old patient. **Hirose T et al**[16]**, Prayson RA et al**[17] **, Wolf HK et al**[18] found similar results in their respective studies.

In our study, patients presented with a wide range of symptoms & signs. The most common clinical symptom was headache which was seen in 89.8% of cases followed by seizures (53.9%) [including drug resistant refractory seizures]. The other common presentation was Nausea/ Vomiting (45.15%) followed by hemiparesis (13.4%). Less common presentations included aphasia, altered sensorium, depression and amnesia. . Headache is usually the first symptom of brain tumor due to increased intracranial pressure.[9,11]

In our study, 55 patients had pharmacoresistant refractory seizuresand most of these cases were histologically low grade tumors with ganglioglioma being the most frequent (27 cases) followed by DNET (25 cases).Most patients had more than one year history of epilepsy.This is in concordance with a study done by **Karl H et al in 1993**[19] on 247 patients with pharmacoresistant seizures of which 126 were neoplasms of the temporal lobe. These results again indicate that a high proportion of pharmaco-therapy-resistant complex-partial seizures are caused by neoplasms of the temporal lobe.

RADIOLOGICAL FINDINGS (MRI)

In our study , the tumors had varied radiological appearances. MRI was the main imaging modality used since the sensitivity and specificity has been found to be more than computed tomography.Most of the tumors were contrast enhancing with heterogenous enhancement seen in 54.85% cases. Most of the tumors were solid-cystic (41.74%) followed by cystic tumors (33.98%) and solid tumors (24.27%). Mass effect was seen in 23.78% cases. About 18.44% tumors appeared as an enhancing mural nodule and 23.78% cases were non-enhancing. The least common radiological finding was homogenous enhancement Hence the tumors were predominantly solid-cystic in appearance.MRI is very sensitive for detecting intracranial tumors and also provides an excellent diagnostic accuracy when compared with the final HPE diagnosis. The majority of histological subtypes correlated positively with the radiological findings In our study, high grade gliomas and glioneuronal tumors on MRI had highest diagnostic accuracy (91.56%) when compared with the final HPE diagnosis.Out of 64 glioneuronal tumors,27 cases were gangliogliomas followed by DNET. This is again in concordance with a study done by **Ishita Pant et al**[20]in 2015; a retrospective analysis of CNS tumors to formulate location-wise radiologic (MRI) diagnostic algorithms and assess their concordance with the final histopathological diagnosis.Koeller KK **et al**[21] also studied superficial gliomas and correlated radiological findings with histopathology.. About 38 cases didn't fit into any specific histological subtype and hence were categorized as either high grade gliomas(31) or low grade gliomas(7). Lowest accuracy was observed in low grade gliomas(71.43%).Glioneuronal tumors like ganglioglioma , DNET, have very strong predilection for temporal lobe and are associated with temporal lobe epilepsy in young patients. Amongst these gangliogliomas are the most common. In our study , overall diagnostic accuracy was 92.23%. This is in concordance with the study done by **R ÅBronen et al** [22]on 117 patients of refractory epilepsy.**Ji Hoon Shin et al**[23] studied radiological findings in neuronal tumors of temporal lobe with pathologic correlation and got results similar to our study.

CONCLUSION.

Hence we deduce that Temporal lobe which is one of the several anatomical subregions within the brain, has in addition to gliomas a predilection for some peculiar tumor subtypes with good prognosis.In addition to gliomas which form the major subtype,glioneuronal tumors have emerged as a significant group of tumors in the temporal lobe with a good prognosis as they mostly belong to a lower grade.There have been a lot of studies done on individual histological subtypes of primary brain tumors and few on primary brain tumors in general. In particular there is no extensive study done on primary temporal lobe brain tumors.Our study is a little effort towards this major goal of analyzing temporal lobe tumors in particular and hopes are high that it will act as a guiding light in this yet to be discovered area.

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