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Histopathological study of cases of supratentorial glioma in tertiary care hospital

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Abstract
Background: Gliomas account for the great majority of primary tumors that arise within the brain parenchyma. The term "glioma" refers to tumors that have histologic features similar to normal glial cells (i.e., astrocytes, oligodendrocytes and ependymal cells).
Aims & objectives: The present study aims towards histopathological study of various supratentorial gliomas. To evaluate the frequency, age, sex, site wise distribution and clinical presentation of the various gliomas.
Materials and Methods: The present histopathological study was undertaken in the department of pathology, B.J. Medical College, Civil Hospital Ahmedabad on surgical specimens received from department of neurosurgery Civil Hospital Ahmedabad from July 2022 to June 2024. Histopathological examination was correlated with detailed clinical findings and other relevant investigations.
Inclusion Criteria: All specimen having Supratentorial glioma lesions with adequate histology material received at Histopathology Department.
Exclusion Criteria: The superficial biopsy, biopsy with artefacts and inadequate material/history was excluded from the study.
Results: Out of 100 cases, maximum cases of Supratentorial gliomas were found in middle aged individuals, the most common age group affected was 41-50 years followed by 31-40 years of age group. Headache followed by convulsions were most common presenting symptoms. In present study most of the lesions were localized to frontal lobe (35%) followed by temporal lobe (32%), parietal lobe (23%) and 10% included other sites such as occipital cortex or insular lobe.
Conclusion: The present study highlights the histopathological study of various gliomas in both adult and pediatric age groups. Although with the advent of modern imaging techniques, a provisional diagnosis could be given, but histopathological examination with futher utilization of IHC remains the gold standard in diagnosis. The surgical pathologist plays an important role in accurate diagnosis of various gliomas which is of immense help for patient prognosis and treatment.

Keywords: Gliomas, pilocytic astrocytoma, oligodendroglioma, glioblastoma

Introduction

Brain and Central nervous system (CNS) tumors are most common tumors in people under 20 -40 years of age [1, 11]. Glial tumors constitute 60% of CNS tumors. Glial tumors also known as gliomas referred to as the tumors that arise from supportive tissue of the brain which is formed by glial cells (astrocytes, oligodendrocytes, ependymal cells) [2].

The incidence of central nervous system (CNS) tumors in India ranges from 5 to 10 per 100,000 population with an increasing trend and accounts for 2% of malignancies. Nearly two-thirds of all cases of supratentorial gliomas occur in the third to fifth decade. Classification is based on histologic and biological features and newer molecular analysis [3]. The 5th edition of the World Health Organization (WHO) classification of tumours of the CNS, published at the end of 2021 has introduced new taxonomy and nomenclature of a great number of tumours including gliomas. The exact histological diagnosis and location of CNS tumor is essential not only to predict the prognosis of the patients but also influence the treatment modality while investigating the risk factors. Glial tumors which are most common type of brain tumors include Astrocytoma, Oligodendroglioma, Glioblastoma and such others [4].

The prognostic outcome of the patients with certain given treatment is not only influenced by histological examination but also by the location of the tumor and the associated metastasis.

The objective of the present study is to assess the distribution of various supratentorial glioma according to age, sex, anatomical location and histological type.

Materials and Method

The present histopathological study was undertaken in the department of pathology, B.J. Medical College, Civil Hospital Ahmedabad on surgical specimens received from department of neurosurgery Civil Hospital Ahmedabad from july 2022 to june 2024.The materials were collected in the form of biopsy and resected specimens of central nervous system (CNS) along with the clinical profile of the patient with supportive investigation. The superficial biopsy, biopsy with artefacts, inadequate material and inadequate data were excluded from the study. This was correlated with gross and histopathological examination of respective surgical specimen.

For histopathological study, the specimens were received in 10% buffered formalin and processed under routine histopathology techniques. A thorough gross examination of the specimen was done. Then sampling of the specimen was done following standard protocol, and subsequently dehydration, clearing, embedding in paraffin wax was carried out. Blocks were made, sections of 5 um thickness were cut and stained with Harris Haematoxylin and eosin stain (H &E). Special staining like PAS, ZN etc were used wherever necessary. The slides were examined under microscope and histopathological findings were noted. The slides were examined for architecture and pattern of tumor cells, morphology of cells with nuclear and cytoplasmic characteristics. The clinical, radiological and therapeutic data from LIS records were correlated while reporting. Since the molecular testing and cytogenetic studies are not available in our institution the diagnosis is made on histopathological study only.

Results

The present study comprises histopathology of 100 cases of Supratentorial glioma studied in the Department of Pathology, Civil hospital, Ahmedabad, from July 2022 to june 2024.The patients age range 4 years to 70 years. The mean age was 37 years. Most of the cases belonged to 4th decade of life followed by 2nd decade. Out of the 100 cases, of various supratentorial glioma 60 cases were reported in males and 40 cases were reported in females. The study showed male preponderance for all Supratentorial glioma with male to female ratio 1.5:1. In the present study, most common presenting complaint was headache which was present in 36 cases out of 100. Other symptoms in our study includes convulsions, seizures, neurocognitive impairment, hemiparesis, aphasia, visual defects, unconsciousness and fatigue.

In present study most of the lesions were localized to frontal lobe (35%) followed by temporal lobe (32%), parietal lobe (23%) and 10% included other sites such as perislyvian region (sylvian fissure), occipital cortex or insular lobe. Other study also comprised of frontal lobe as predominant site of presentation.

Amongst 100 cases of Supratentorial glioma, Histopathologically the most common diagnosis was Diffuse Astrocytoma and Oligodendroglioma (35%) followed by Glioblastoma which was second most common Histopathological diagnosis (27%). Pilocytic astrocytoma comprises of (15%) of cases. Pleomorphic xanthoastrocytoma comprises of (13%) of cases and others (Subependymal Giant Cell Astrocytoma, Chordoid glioma) comprised of (10%) of cases.

Discussion

Glial tumors comprise 60% of the brain tumor. In the present study, the most common diagnosis was Diffuse Astrocytoma and Oligodendroglioma (35%). While Glioblastoma was second most common Histopathological diagnosis (27%). Pilocytic astrocytoma comprises of (15%) of cases. Jaiswal J *et al*. study had 15.5% of Glioblastoma and 25.1% of Diffuse Astrocytoma and Oligodendroglioma cases [7]. However the Glioblastoma cases are comparatively lower in Krishnatreya M *et al*. and Jazayeri SB *et al*. In the present study, Pleomorphic xanthoastrocytoma cases were (13%) where as in Krishnatreya M *et al*. and Jazayeri SB *et al*. had 37% and 1% of cases and Jaiswal J *et al*. study had 7% of cases [11, 12]. Mean age at diagnosis in present study was 37 years. Damir *et al*. had 35.4 years as mean age at diagnosis in their study [5]. The median age of Pilocytic astrocytoma and Glioblastoma were 15 years and 45 years respectively in present study compared to 12 years and 55 years respectively in CBTRUS [6, 7]. Many studies showed that the incidence of Supratentorial glioma was more in the male population than the female. In our study to 60% of the cases were males and 40%were females (1.5:1) which was quite similar to Jaiswal J *et al*. study [7]. However, it is comparatively higher in Krishnatreya M *et al*. (2.3:1).

The most common site of tumors in present study was frontal lobe followed by temporal lobe similar to CBTRUS study [6]. Temporal lobe followed by frontal lobe was common site of Supratentorial glioma in Damir *et al*. study [5].

WHO CNS5 2021 has taken a new approach to classify the Gliomas, Glioneuronal Tumors, and Neuronal Tumors, Gliomas are a diverse family of tumors with varying prognosis depending on grade and age. Fourteen newly recognized types have been added to the classification of Gliomas, Glioneuronal Tumors, and Neuronal Tumor. — Importantly, WHO CNS5 recognizes the clinical and molecular distinctions between those diffuse gliomas that primarily occur in adults (termed “adult-type”) and those that occur primarily in children (termed “pediatric-type”) [8]. Note the use of the word “primarily” in the last sentence, since pediatric-type tumors may sometimes occur in adults, particularly young adults, and adult-type tumors may more rarely occur in children. The management of a patient with glioma begins with careful evaluation of the history and clinical findings. The physician needs to have a clear understanding of the symptoms and how they are affecting the patient's life. The potential impact of other medical problems is also assessed. These survival data suggest that both low-grade and high-grade Supratentorial gliomas have outcomes which are highly dependent upon histologic type [9]. Therapeutic strategies may need to be individualized based upon tumor grade and histologic type.

Traditionally, CNS WHO tumor grades were written as Roman numerals. However, the fifth-edition WHO Blue Books have emphasized more uniform approaches to tumor classification and grading and have favored the use of Arabic numerals for grading, as is currently done for all the other organ systems. Furthermore, a danger of using Roman numerals in a within-tumor grading system is that a “II” and a “III” or a “III” and a “IV” can be mistaken for one another and an uncaught typographical error could have clinical consequences [10]. This was less likely when each tumor type

had a different name, eg, "anaplastic" was present in addition to grade "III." Given these considerations, WHO CNS5 has changed all CNS WHO tumor grades to Arabic numerals.

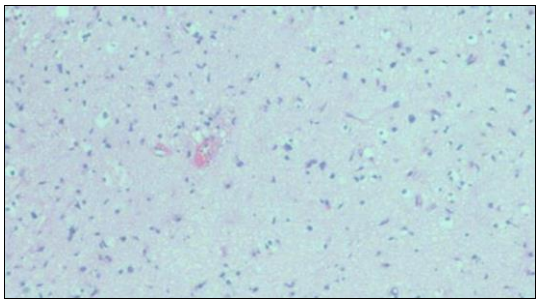

Fig 1: Diffuse Astrocytoma: Neoplastic fibrillary astrocytic cells in a background of a loosely structured matrix (Haematoxylin –Eosin stain, 40x)

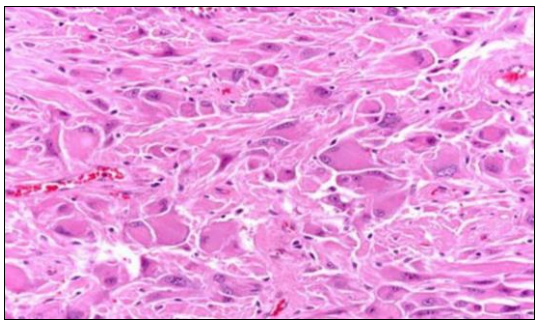

Fig 2: Subependymal Giant Cell Astrocytoma: Large ganglion cell like nuclei with prominent nucleoli with pink glassy astrocyte like cytoplasm (Haematoxylin –Eosin stain, 40x)

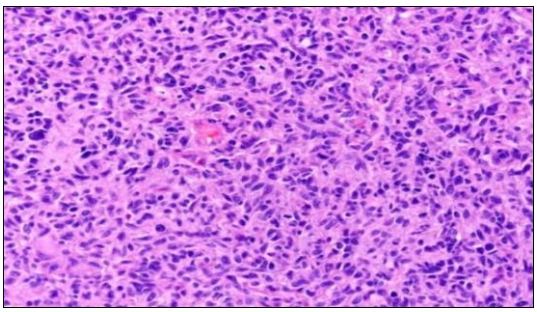

Fig 3: Glioblastoma: Cellular pleomorphism poorly differentiated pleomorphic tumor cells with nuclear atypia and nuclear hyperchromasia (Haematoxylin –Eosin stain, 40x)

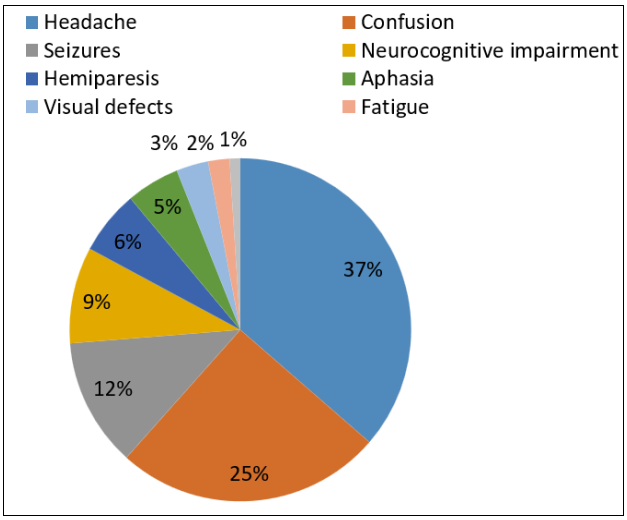

Fig 4: Distribution of symptoms in Supratentorial glioma

Table 1: Age Incidence (Age of Presentation)

	Our Study	Damir *et al.*	CBTRUS
Median Age	36	35.4	55

Table 2: Sex Incidence

	Present study	Jaiswal J *et al.*	Krishnatreya M *et al.*
M: F ratio	1.5: 1	1.3: 1	2.3: 1

Table 3: Location of Tumour

	Present study	Jaiswal J *et al.*	Krishnatreya M *et al.*	Damir *et al.*	CBTRUS
Most common site	Frontal	NA	Frontal	Temporal	Frontal

Table 4: Histology of Tumour comparison with others studies

Histology of Tumour	Our Study (N=100)	Jaiswal J *et al.*	Krishnatreya M *et al.*	Jazayeri SB *et al.*
Diffuse astrocytoma and oligodendroglioma	(35%)	(25.1%)	(37.2%)	(15.2%)
Glioblastoma	(27%)	(15.5%)	(21.2%)	(13.8%)
Pilocytic astrocytoma	(15%)	(7%)	(37%)	(5%)
Pleomorphic xanthoastrocytoma	(13%)	(7%)	(37%)	(1%)
Others (Subependymal Giant Cell Astrocytoma, Ganglioglioma)	(10%)	-	(15.5%)	-

Table 5: The relative frequency and sex wise distribution of Supratentorial glioma

Sr. No.	Types of lesions	Male	Female	Total	Percentage of total cases (%)
1	Diffuse astrocytoma and oligodendroglioma	20	15	35	35
2	Glioblastoma	16	11	27	27
3	Pilocytic astrocytoma	10	5	15	15
4	Pleomorphic xanthoastrocytoma	4	9	13	13
5	Others (Subependymal Giant Cell Astrocytoma, Chordoid glioma)	6	4	10	10

Conclusion

The present study highlights the histopathological diversity of various Supratentorial gliomas in both adults and the pediatric age groups. Although with the advent of modern imaging techniques, a provisional diagnosis could be given, histopathological examination with futher utilization of IHC remains the gold standard in diagnosis.The present study provides histopathological aspects of various gliomas. Combining histopathological and molecular features helps in definitive diagnosis and management of Supratentorial tumors thus providing better quality of life to the patient. Molecular aspects of tumors identified are not discussed as procedure for molecular genetics and cytogenetics is not available at our institute.

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Conflicts of Interests: The authors declare that they have no conflict of interest.

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