Bulletin of Environment, Pharmacology and Life Sciences
Bull. Env. Pharmacol. Life Sci., Vol 11 [9] August 2022 : 153-158

Online ISSN 2277-1808
Journal's URL:http://www.bepls.com
CODEN: BEPLAD

ORIGINAL ARTICLE **OPEN ACCESS**

Central Nervous System Neoplasms Identified by Histopathology

V. SRI Lakshmi Priya, J.Priyadharisini
DEPARTMENT OF PATHOLOGY
Sri Lakshmi Narayana Institute of Medical Sciences Affiliated to Bharath Institute of Higher Education and Research, Chennai, Tamil Nadu, India.
***Corresponding author e-mail id:** priyadharsini158@gmail.com

ABSTRACT
The brain, spinal cord, and meninges make up the central nervous system. Neurons, a specialised network of cells, make up the human nervous system. The ability to receive, store, and transfer information is controlled by neurons. The most common cause of neurological morbidity is intracranial space-occupying lesions. To investigate the range of space-occupying lesions in the central nervous system. To classify the neoplasms according to the World Health Organization's recommendations (WHO). Because CNS tumours are well-known for their life-threatening nature, there are two sorts of malignant potential: anatomic and biologic. Anatomic lesions occur close to critical centres and are deeply seated, preventing surgeons from reaching them, and they progress until they are fatal. Special stains and Immunohistochemistry were used where needed to connect the diagnosis of these lesions with radiological findings in some malignancies.
Keywords*: Neuroglial cells,neurons,central nervous system,Glial cells.*

Received 26 .04.2022 Revised 23.06.2022 Accepted 11.07.2022

INTRODUCTION

The meninges that wrap the brain and spinal cord make up the central nervous system. Nerve cells, also known as neurons, contain many lengthy processes, and glial cells, which are nervous system supporting cells that occupy the space between neurons. Oligodendrocytes, Astrocytes, Microglial cells, and Ependymal cells are the four main types of neuroglial cells [1,2]. Biologic lesions are cancerous tumours that spread quickly, causing neurophil infiltration and destruction. Because CNS tumours rarely spread outside of their originating location, they do not fit under the standard criteria of malignancy [3].Brain tumours are still one of the top 10 causes of cancer-related death worldwide. The overall incidence was reported to be 21.97 per 100,000 people, according to the CBTRUS (Central Brain Tumor Registry of the United States). After leukaemia, brain tumours are the second most frequent solid tumour in children. Medulloblastoma is the most prevalent tumour in children under the age of 18. The variables that cause brain tumours are largely unknown. Radiation exposure, people who work in metal industries, people who work in rubber industries, and those who have a family history of brain cancer have all been linked to an increased chance of developing a brain tumor [4,7, 8].For detecting a brain tumour, increasingly advanced radiological studies are available, although these modalities are used to supplement the diagnosis rather than to confirm it. Only the probable diagnosis can be determined using these imaging techniques [5-10]. Histological analysis of the tissue biopsy is used to confirm the diagnosis. As a result, histopathology continues to be the gold standard for diagnosis. The tumours are rated using the revised WHO categorization criteria from 2007. For the management plan and treatment strategy, grading is critical [11-15]. In today's world, immunohistochemistry is a critical technique in clinical research. It aids in the confirmation of a diagnosis by revealing the cell of origin. Certain CNS cancers are difficult to diagnose, so immunohistochemistry is employed in these cases. It has been shown to be extremely helpful in determining the ultimate diagnosis.

MATERIALS AND METHODS

Biopsies in aggregate ranging in size from 0.5cc to 4cc were the most common specimens received. A complete history was taken, together with clinical symptoms and indicators. The location of the tumours was noted and compared to the imaging results.
In a 10% neutral formalin solution, all of the specimens were formalin-fixed. The sections were cut to a

thickness of 4 microns and stained as normal with haematoxylin and eosin. Astrocytomas were the most common CNS neoplasm, accounting for 52 percent of cases, followed by 19 instances of Meningiomas (20%), 12 cases (13%) of Nerve sheath tumours, 4 cases of Medulloblastoma, 4 cases of Pituitary adenoma (4%), and 3 cases of Ependymoma (2%). One case each of oligodendroglioma, raniopharyngioma, Primitive Neuro Ectodermal Tumor, and Lymphoma, accounting for 1% of all cases.

RESULTS

In our study, the majority of patients (41%) had a headache, with 19 cases (20%) having seizures, 11 cases (12%) having hemiparesis, 11 cases (12%) having vomiting, 8 cases (8%) having vision loss, and 5 cases (5%) having loss of consciousness (Fig.4). The frontal lobe was the most prevalent place in our analysis, with 27 cases (29%) in the frontal lobe, 20 cases (21%) in the parietal lobe, and 9 (10%) in the temporal lobe.As shown in (Fig. 5), 8 cases (8%) were seen in the CP angle and 8 cases (8%) in the spine, 5 cases (5%) in the suprasellar region, 4 cases (4%) in the occipital lobe, 3 cases (3%) in the posterior fossa, and 2 cases (2%) in the sphenoid wing.

Radiologically on T1WI, low-grade glioma appears hypo intense; on T2WI, it appearshyperintense with mass effect and no enhancement. Necrosis, haemorrhage, and edoema with mass effect are all symptoms of a high-grade glioma. Glioblastoma has uneven borders, bleeding, and necrosis in the centre, which is surrounded by edoema 34.Three of the seven patients were radiologically classified as metastasis due to ring enhancement, however histopathology revealed GBM. In radiology, two cases were diagnosed as tuberculoma, but histology revealed that one was a high-grade glioma and the other was a low-grade glioma. Two cases were identified as Meningioma in radiology because it was linked to the dura, but histology revealed it to be Astrocytoma. As a result, radiography has been proven to be useful in preoperative diagnosis of CNS neoplasms, while histology has been determined to be the gold standard in CNS neoplasm diagnosis. Histopathological features of Astrocytomas seen in our study. Pilocytic astrocytoma was found in 4 cases (8%) of the 49 cases (52%) of astrocytomas. Pilocytic astrocytoma is classified as a low grade or Grade I astrocytoma. Rosenthal fibres and eosinophilic granular bodies were seen among a delicate network of hair-like cytoplasmic processes with tiny cysts on histopathology. There was no microvascular growth or necrosis (Fig .1). Totally 13 cases (26%) were reported as grade II tumors or Diffuse astrocytoma.

There were five cases of Gemistocytic astrocytoma, a kind of diffuse astrocytoma. There were five cases of Gemistocytic astrocytoma, a kind of diffuse astrocytoma. Under the microscope, tumour cells with eosinophilic cytoplasm and nuclei pushed to the periphery with visible nucleoli were detected amid a coarse fibrillary backdrop. Perivascular lymphocytic proliferation is seen (Fig. 2).

Grade III

Anaplastic astrocytoma: According to histological findings, we found 13 (26%) cases of grade III astrocytomas. Microscopy revealed an acellular tumour with hyperchromatic and pleomorphic nuclei organised in sheets in a fibrillary stroma backdrop. Capillary proliferation, mitotic figures, and microcystic degeneration can all be visible. There was no sign of necrosis.

In total, 19 cases of grade IV glioblastoma multiforme and 4 cases of Gliosarcoma, a type of GBM, were documented. Fragments of a cellular tumour with pleomorphic large cells, anaplastic cells, and epitheloid cells with hyperchromatic nuclei were seen under the microscope. Pseudo pallisading necrosis refers to necrosis that is surrounded by tumour cells. There is evidence of microvascular proliferation, tumour large cells, and abnormal mitotic figures. (Fig.4)

Microscopy revealed open chromatin pleomorphic cells with conspicuous nucleoli organised around blood arteries, as well as foci of spongiform cells. There was an excessive growth of blood vessels as well as widespread necrosis (Fig.5,6).Only the glial components stain brown in GFAP immunostaining, whereas the non-glial components remain unstained. (See Figure 7). The mesenchymal component was demonstrated using reticulin labelling, which was visible around individual tumour cells. (Fig.8)

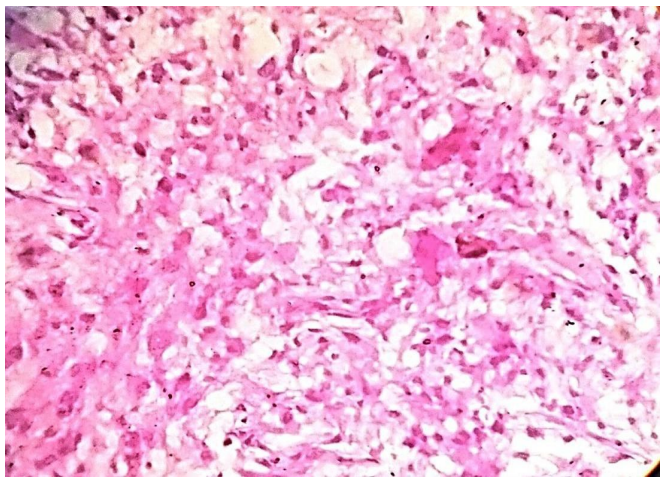

Fig 1: Numerous Rosenthal fibres reside among a delicate network of hair-like cytoplasmic processes in Pilocytic Astrocytoma. H&E.400X

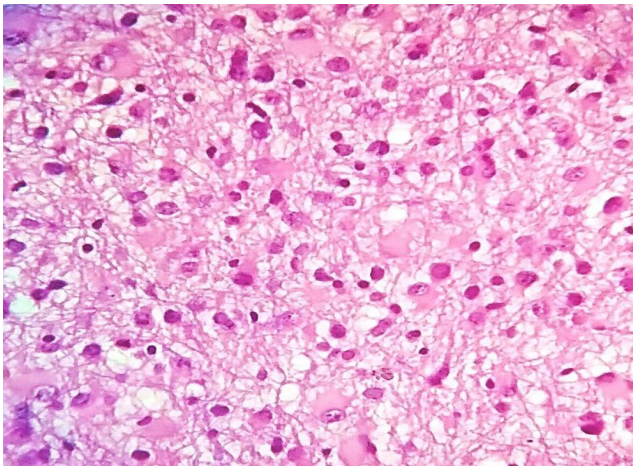

Fig 2.Grade II - Gemistocytes with eosinophilic cytoplasm and an eccentrically positioned nucleus are seen in a high-power image of a gemistocytic astrocytoma. 400X H&E.

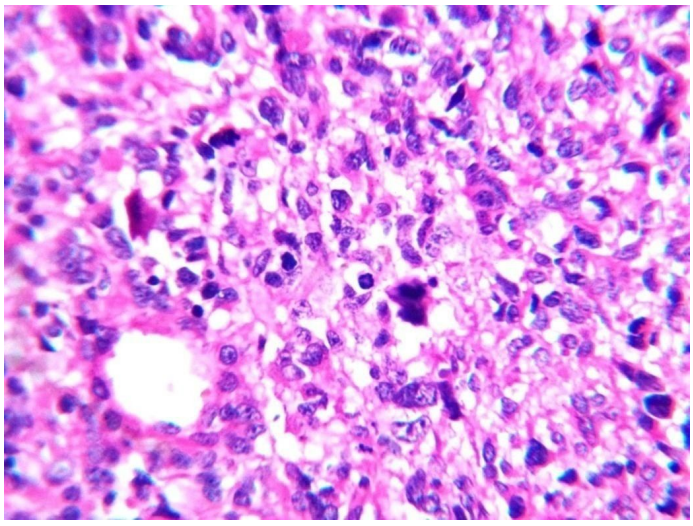

Fig.3 – Astrocytoma Grade III - a cellular tumour with pleomorphic nuclei and mitosis, seen at high magnification. H&E 400X.

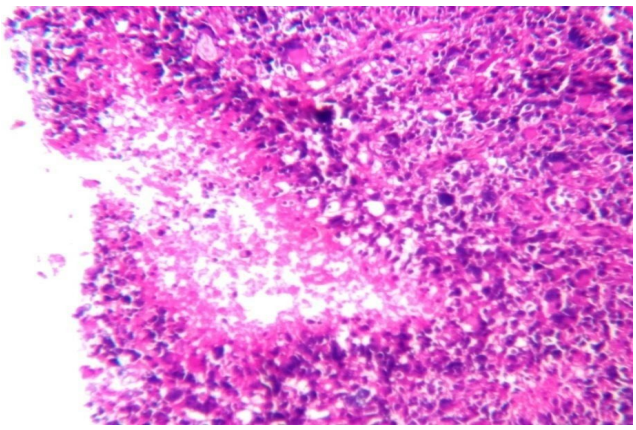

Fig.4 – Glioblastoma multiforme (astrocytoma grade IV) — high power view shows central area of necrosis surrounded by tumour cells (pseudopalisading necrosis) H&E.100x

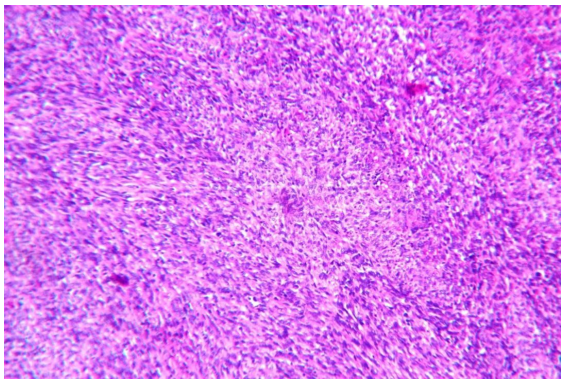

Fig 5 .Low power image of gliosarcoma reveals both spindle cell and glial components. 100X H&E

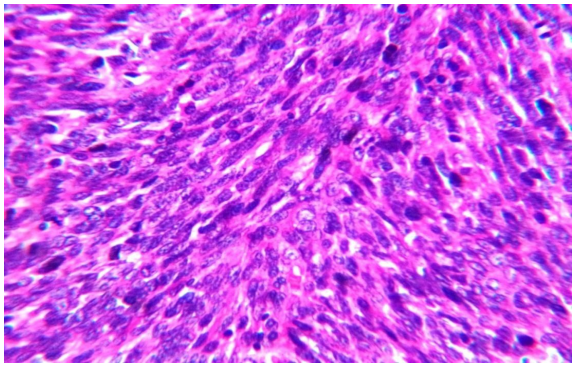

Fig6: Pleomorphic spindle cells with hyperchromatic nuclei are seen in a high-power view of the same. There are mitotic figures visible. H&E-400 X, H&E-400 X, H&E-400 X

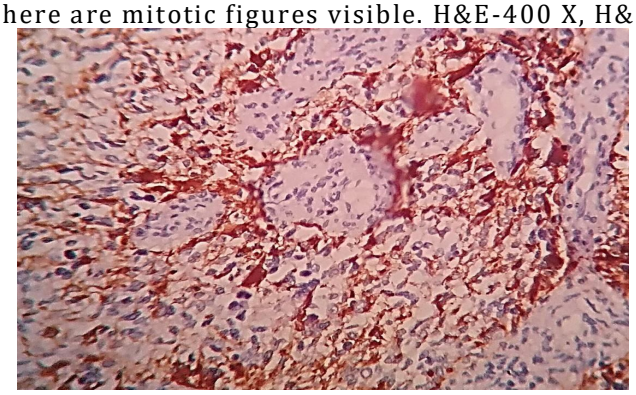

Fig 7 .GFAP immunostaining in gliosarcoma demonstrates cytoplasmic positivity in glial cells and negative in nonglial regions. (400X).

DISCUSSION

The current analysis comprised 95 CNS neoplasms that were reported between April 2015 and September 2016. CNS tumours are most common in the age group 41-50 years (27%) in our study, followed by 31-40 years (19%) and 31-50 years (19%). (19 percent). In the first decade, there were the fewest cases. Astrocytomas were found to be more common in males in our study, with 32 instances (65%) compared to 17 cases (35%) in females, which is comparable to the findings of Das et al [4] and Intisar et al [4], who also observed a higher frequency in males.

In India, meningiomas are a common tumour among the elderly. Meningiomas were the second most common neoplasms in our study, ranking in second to astrocytomas in 19 cases (20%), which is similar to Ejas et al 26's findings. Sameh et al74 and Sasidhar et al [8] found that grade I tumours are the most common, accounting for 18 cases (95%). Females were found to have an excessively high occurrence in our analysis, with 14 cases (74%), which is consistent with other investigations.

With 12 occurrences, the nerve sheath tumour is second only to meningiomas in our study (13 percent). Schwannomas were found to be more common than Neurofibroma, with 9 cases (75%) compared to 3 instances (25%) in a study conducted by Intisar et al40. There is a male preponderance in our analysis, which is similar to many other studies [40]. Pituitary adenomas account for 10-20% of all CNS neoplasms [11]. Pituitary adenomas were found in four people, one in the first decade, one in the second decade, and two in the third and seventh decades, respectively. The male-to-female ratio was determined to be equal in our study.

Three cases of Ependymoma were discovered during our examination, one in the juvenile age group, one in the third decade, and the other in the fifth decade. In a 35-year-old male, we reported a single incidence of MyxopapillaryEpendymoma at the L1-L2 level. One incidence of lymphoma in the frontal lobe was found in a 35-year-old woman during our investigation. Brain tumours in children are the second most common solid tumour in children. Every year, 4350 children are diagnosed with a brain tumour, according to the CBTRUS study14. The aetiology was unknown, however ionising radiation has been linked to both benign and malignant gliomas, as well as primitive neuro-ectodermal tumours in rare cases (PNET).

Most malignancies, according to Ron Modan et al, are multifactorial, with genes and the environment both playing important roles. In our analysis, there were 13 cases of paediatric brain tumours (14 percent). According to the CBTRUS study, children account for around 7% of all brain tumors [14]. The prevalence of childhood brain tumours is compared to the findings of previous studies.

CONCLUSION

The cornerstone of the management plan and treatment for brain tumours is histopathological diagnosis and grading. Despite significant progress in ancillary studies, histopathology remains an important tool for evaluating and diagnosing brain tumours. Astrocytomas were the most common CNS neoplasm, accounting for 52% of cases, followed by 19 instances of Meningiomas (20%), 12 cases (13%) of Nerve sheath tumours, 4 cases of Medulloblastoma, 4 cases of Pituitary adenoma (4%), and 3 cases of Ependymoma (2%). One instance each of Oligodendroglioma, Craniopharyngioma, Primitive Neuro Ectodermal Tumor, and Lymphoma, accounting for 1% of all cases. Radiological features, particular stains, and Immunohistochemistry were found to be highly helpful in establishing an accurate diagnosis during a Histopathology inquiry.

Funding: No funding sources

ETHICAL APPROVAL: The study was approved by the Institutional Ethics Committee

CONFLICT OF INTEREST

The authors declare no conflict of interest.

ACKNOWLEDGMENTS

The encouragement and support from Bharath University, Chennai is gratefully acknowledged. For provided the laboratory facilities to carry out the research work.

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CITATION OF THIS ARTICLE

V. SRI Lakshmi Priya, J.Priyadharisini. Central Nervous System Neoplasms Identified by Histopathology. Bull. Env. Pharmacol. Life Sci., Vol 11[10] August 2022 : 153-158