

HISTOPATHOLOGICAL STUDY OF INTRACRANIAL SPACE-OCCUPYING LESIONS AT SMS MEDICAL COLLEGE AND ATTACHED HOSPITAL, JAIPUR (RAJASTHAN) 2021-2022

Pathology

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ABSTRACT

Background & objectives: The term intracranial space occupying lesion (ICSOL) is generally used to identify any lesion inside the cranial cavity, which increases the volume of intracranial contents and leads to a rise in the intracranial pressure. It includes any neoplasm, benign or malignant, primary or secondary, as well as any acute or chronic inflammatory lesion, a parasitic mass lying within the cranial cavity, any hematomas, different types of cysts and vascular malformations. Therefore, the purpose of this study to determine the diversity of ICSOL, highlight the incidence & histological spectrum of ICSOL so that it can be utilized to guide the patient management. **Methods:** Consists of ICSOL biopsy of 200 patients referred to Department of Pathology at SMS Medical College, Jaipur (Rajasthan) from 2021 to 2022. **Results:** In this study neoplastic lesions (80%) were more than non-neoplastic lesions (20%). Most common neoplastic lesions were Gliomas. Among neoplastic lesions, Astrocytoma was more common with 72 (36%) cases followed by Glioblastoma, Pituitary Adenoma, Meningioma and Medulloblastoma with 30 (15%), 18 (9%), 14 (7%) and 13 (6.5%) cases respectively. In non-neoplastic lesions, Brain Abscess were more common with 6 (3%) cases followed by Epidermoid cyst and Granulomatous lesions with 5 (2.5%) and 3 (1.5%) cases respectively. In this study most common lesions were Neoplastic WHO grade 4, (Neoplastic to Non-neoplastic lesions ratio (9:1) with most common age group affected 21-40 years and male preponderance (M: F 1.9:1), most of the patients presented with headache and involved site being frontal lobe. **Interpretation & conclusion:** From this study highlights the histological diversity of ICSOL in both adult and pediatric age groups. Although with the advent of modern imaging techniques, a provisional diagnosis could be given to these diseases, histological examination with further utilization of IHC remains the gold standard in diagnosis and grading of all ICSOL. This has further helped in management as well as the prognosis of these diseases.

KEYWORDS

Astrocytoma, Gliomas, immunohistochemistry.

INTRODUCTION

The term Intracranial space occupying lesions is generally used to identify any lesion inside the cranial cavity, which increases the volume of intracranial contents and leads to a rise in the intracranial pressure. It includes any neoplasm, benign or malignant, primary or secondary, as well as any acute or chronic inflammatory lesion, a parasitic mass lying within the cranial cavity, any hematomas, different types of cysts and vascular malformations.¹

The potentially life threatening behavior of ICSOL results from their occurrence in a confined space, as well as their proximity to vital structures. Therefore, it is of great importance to establish an accurate diagnosis for timely neurosurgical intervention. CT without contrast is appropriate as it is sensitive to blood products, such as contusion, hematomas and subarachnoid hemorrhage and to brain displacement due to mass lesion, cerebral edema or hydrocephalus. For specific indications, MRI is more useful.

Approximately 50% of all tumors occurring within the intracranial cavity are Gliomas. The incidence of primary brain tumors first rises among children less than 10 years old, then again climbs steadily after adolescence to peak during the sixth decade of life. Whereas hemispheric neoplasm is more prevalent among adults, cerebellar involvement is more common among children.³

Brain stem tumors are most common diagnosed in children, in whom they account for 10 to 20% of primary intracranial tumors. Histologically the majority of brain stem tumors are Astrocytoma, though other neoplasm, such as Ependymomas, Gangliogliomas and Hemangioblastomas may also be seen.⁴

The incidence of CNS metastasis increases with age. Most common after the age of 65 years. The general agreement that Bronchus or the respiratory tract is the preponderant site of origin, amounting to 50% of brain metastasis. Breast usually takes second rank i.e. 15%, skin and melanoma occupying the next position as primary sites amounting 10.5%.⁵

The pathologist plays a great role in differentiating between Neoplastic and Non-neoplastic mimickers since a varied number of Non-neoplastic conditions can mimic brain tumors, both clinically and radiologically. Gliomas are more common followed by Meningiomas, Abscesses, Pituitary tumors and Tuberculoma.

Pediatric brain tumors are most commonly located in the Infratentorial region as compared to the Supratentorial region, whereas in the adult population the Supratentorial region is a commoner location.^{6,7,8}

In developing countries like India due to lack of complete registration of newly diagnosed cases with local cancer registries, the precise tumour burden of such diseases goes unnoticed and underestimated. Thus, hospital based prevalence databases are imperative for estimating the disease load.⁹

Therefore, the purpose of this study to determine the diversity of ICSOL, highlight the incidence & histological spectrum of ICSOL so that it can be utilized to guide the patient management.

MATERIAL AND METHODS:

Hospital based Cross sectional descriptive type of observational study was conducted after ethical clearance from institutional ethics committee and written informed consent was obtained from all patients. A total of 200 ICSOL biopsies received in Department of Pathology from Department of NeuroSurgery, SMS hospital, Jaipur. All formalin fixed, adequate size biopsies with clinical details received during study period were included and biopsies of patients with poorly preserved with incomplete history, biopsy of extracranial lesions means spinal and other site and patient who did not give consent were excluded.

The specimens were allowed to fix in 10% buffered formalin for 12-14 hours at room temperature and the gross features such as size, shape, colour, external surface, cut surface, consistency was noted.

Following adequate fixation, the tissues were routinely processed, following which the paraffin embedded serial sections of 3-4 µm

thickness were cut. The sections were examined after staining with Haematoxylin and eosin (H&E) stain for histopathological confirmation and grading of the lesions was done. Special stain and Immunohistochemistry (IHC) was performed with commercially available monoclonal antibody.

Data obtained were expressed in percentage, proportion, graphs, and tables and analysed by appropriate statistical test, association of histomorphological features with clinical profile. The cases were followed till the end of study.

RESULTS:

The study show that maximum number of cases of Intracranial SOL 109 (54.50%) had the occurrence in Males and 91 (45.50%) in Females with Male to Female ratio of 1.19:1 and according to age wise distribution maximum cases [77] are in 21 to 40 years of age group. [Fig:1]

Among 200 cases, 110 cases presented with Headache which were diagnosed as Astrocytoma followed by Glioblastoma and Pituitary Adenoma show in [Table:1]

Most common site for Intracranial space occupying lesions was Frontal lobe followed by sellar/suprasellar lesions. Frontal had 46 (23%) cases out of which maximum cases were of Astrocytoma followed by Glioblastoma, Oligodendroglioma and Meningioma which is show in [Fig:2]

Among 200 cases, most of the cases are neoplastic 180 [90%] while nonneoplastic were 20 [10%]. In Non-neoplastic lesion most common lesion was Brain Abscess 6 (3%), Epidermoid cyst 5 (2.50%), Granulomatous lesion, Hemorrhage 3 (1.5%) each, Arachnoid cyst, Dermoid cyst, and Rathke's cyst 1 (0.5%) each was observed in [Table:2]

Among neoplastic lesions, most common was Astrocytoma 72 (36%) followed by Glioblastoma 30 (15%), Pituitary Adenoma 18 (9%), Meningioma 14 (7%), Medulloblastoma 13 (6.5%), Craniopharyngioma 8 (4%), Schwannoma, Malignant round cell neoplasm 5 (2.5%) and 3 cases of Metastatic were observed in [Table:3]

Table 1 : Distribution According To Clinical Feature

Clinical feature	No. of Cases	Percentage
Altered Sensation/ Fever/ Weakness	18	9.00%
Headache	41	20.50%
Headache, Vomiting	42	21.00%
Loss of Vision	36	18.00%
Speech Deficit	5	2.50%
Headache, Seizure	23	11.50%
Imbalance Walking	9	4.50%
Headache, Decrease Hearing	4	2.00%
Other (Nausea, Unconsciousness, Numbness, Facial Palsy and Vertigo)	22	11.00%
Total	200	100%

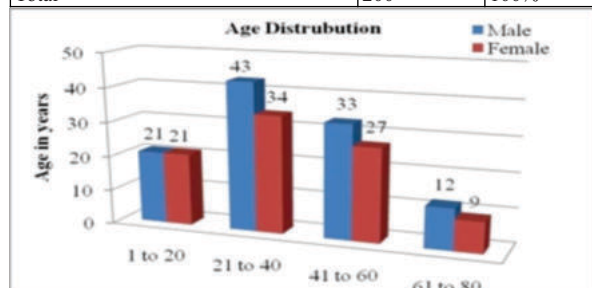


Fig 1 : Distribution According To Clinical Feature

Table 2: Histomorphological Distribution Of Non Neoplastic Lesions

Type of CNS Lesions	No. of Cases	Percentage	Male	Female
Brain Abscess	6	3.00%	4	2
Granulomatous Lesion	3	1.50%	1	2
Hemorrhage	3	1.50%	0	3
Arachnoid Cyst	1	0.50%	0	1

Epidermoid Cyst	5	2.50%	2	3
Dermoid Cyst	1	0.50%	0	1
Rathke's Cyst	1	0.50%	1	0

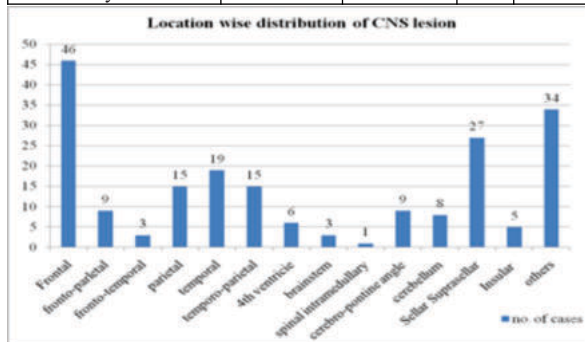


Fig 2 Location Wise Distribution Of Cns Lesions

Table 3 : Histomorphological Distribution Of Neoplastic Lesions

Type of CNS Lesions	No. of Cases	Percentage	Male	Female
Meningioma	14	7.00%	6	8
Pituitary Adenoma	18	9.00%	12	6
Craniopharyngioma	8	4.00%	5	3
Schwannoma	5	2.50%	1	4
Neuroepithelial Tumor	3	1.50%	2	1
Hemangioblastoma	1	0.50%	0	1
Astrocytoma	72	36.00%	44	28
Glioblastoma	30	15.00%	20	10
Ependymoma	3	1.50%	1	2
Medulloblastoma	13	6.50%	4	9
Gliosarcoma	2	1.00%	2	0
Malignant Round Cell Neoplasm	5	2.50%	0	5
Embryonal Tumor	1	0.50%	1	0
Solitary Fibrous Tumour	2	1.00%	0	2
Metastatic Tumour	3	1.50%	3	0

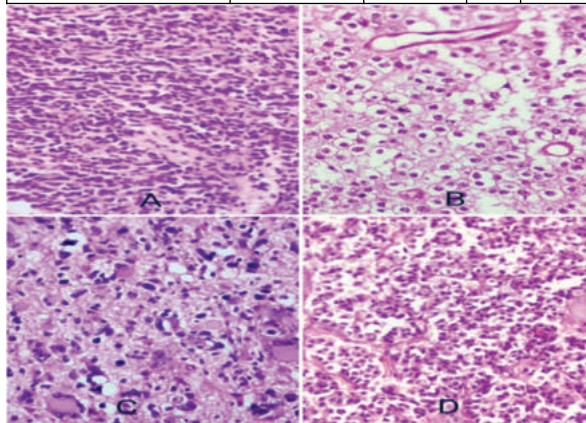


Fig:4 (A) H & E stained Astrocytoma Grade 4 [40x] (B) H & E stained Oligodendroglioma [40x] (C) H&E stained Glioblastoma [40x] (D) H&E stained Ependymoma [40x]

DISCUSSION:

In this study, Overall 200 cases of ICSOL encountered which was male 109 and female 91. A Male preponderance with a Male to Female ratio was 1.19: 1. For ICSOL which was similar to studies done by Butt et al. (2005), Chalwa et al. (2014), and Ghanghoria et al. (2014) showed the ratio of Male to Female was 1.7:1, 1.3:1, and 1:0.86, respectively^{2,10,11}. All of these study revealed that the Male gender was more affected than the Female regardless of minor variances in ratios. The age range of brain lesion starts from the 1st year of life to 80 years. Studies done by Butt et al. (2005) and Ghanghoria et al. (2014). Showed 1-85 years and 1-69 years, respectively^{2,11}.

Most of the lesions 77 (37.50%) presents from 21 to 40 years which was similar to the studies done by Hema et al (2016), Khonglah et al (2020) and Shihora et al (2020) ranging from the 31 to 40 years (23.68%, 23.41% and 20.33% respectively)^{12,13,14}.

Numerous symptoms were found in the majority of the cases the most frequent presenting symptom was a Headache 110 (55%), which was similar to the studies done by Hema et al. (2016), Khonglah et al. (2020), Rathod et al. (2009).^{6,12,13}

Frontal lobe was the commonest site 58 (29.00%) of the involvement of Intracranial lesions as for Astrocytoma. As studies done by Masoodi et al (2012) and Shashidhar et al (2017) showed 20.7% and 23% of ICSOLs were located in Frontal lobe respectively.^{15,16}

Neoplastic lesion were 180 (90%) and Non neoplastic lesions were 20 (10%) among the 200 CNS lesions. Y. Khonglah et al (2020). Dogar et al (2015), and Nibhoria et al (2015) conducted other study in India that revealed a distribution of Neoplastic against Non neoplastic pathological lesions of 86.13% versus 13.86%, 89% versus 11%, and 89% versus 11% respectively.^{9,13,17}

Among 200 cases, 20 cases (10%) were Non neoplastic lesion out of which, most common lesion was Brain Abscess 6 (3%) followed by Epidermoid cyst 5 (2.5%) observed which was quite similar to studies done by Jamjoom et al (1989), Hema et al (2016), Joshi et al (2019) and Shihora et al (2020) 6.6%, 6.5% and 3.07% of Brain Abscesses respectively.^{12,18,19}

The most of the cases 107 (53.5%) were Astrocytic tumours according to the age distribution 21 to 40 years which was similar to the studies done by Butt et al (2005) and Y Khonglah et al (2020) with Astrocytic tumour preponderance in young age.^{2,13}

The incidence of Metastasis was 1.50 %, which was lower than the incidence reported by Nibhoria et al (2015) and Y Khonglah et al (2020) of 5.6% and 2.4 % respectively.^{9,13}

INTERPRETATION AND CONCLUSION:

The study has brought attention to the relative prevalence of various ICSOL at a tertiary care facility. The study highlights the histological diversity in CNS lesions in both adults and the paediatric age groups. Although with the advent of modern imaging techniques, the provisional diagnosis could be given to these diseases, histological examination with further utilization of IHC remains the gold standard in diagnosis and grading of all ICSOL. This has further helped in management as well as the prognosis of these diseases. Central nervous system tumours are among the most feared malignancies. By producing paralysis, seizures, cognitive decline, and personality changes, it changes the patient's sense of self. It is the second most common neurological condition after stroke. To determine the prognosis and course of treatment for Central Nervous system abnormalities, a precise histological diagnosis is required.

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