Original Article

Morphological Spectrum of Intracranial Space Occupying Lesions at Tertiary Care Hospital: A Clinicopathological Study

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Abstract

Background: An "Intracranial Space-Occupying Lesion" (ICSOL) is defined as a mass lesion in the cranial cavity with diverse etiology, such as benign or malignant neoplasm, inflammatory or parasitic lesion, hematoma, or arteriovenous malformation.

Materials and Methods: Biopsies of 202 cases of intracranial space-occupying lesions were received in the Department of Pathology, B.J. Medical College, Ahmedabad, during the period of December 2022 to May 2023. All specimens were preserved in 10% formalin and allowed to fix for 24 hours. Paraffin-embedded sections of 5 microns were cut, and the Hematoxylin and Eosin-stained sections of the CNS lesions were studied.

Results: Out of the total 202 cases, 176 were neoplastic lesions and 26 were non-neoplastic lesions. Among the 176 neoplastic intracranial tumors, 173 (98.3%) were primary, and 3 (1.7%) were metastatic. The most common type of intracranial tumor was Meningioma (33 cases, 18.6%), followed by Astrocytoma (31 cases, 17.5%). The most common age group affected by neoplastic lesions was 21-30 years, followed by the 31-50 years age group. The most common age group with non-neoplastic lesions was 31-40 years. Among the 26 cases of non-neoplastic intracranial lesions, 20 cases of cystic lesions and 6 cases of cerebral abscess were encountered.

Conclusion: The surgical pathologist plays an important role in the accurate diagnosis of various intracranial space-occupying lesions, which is of immense help for patient prognosis and treatment [3]. Histopathological study remains the gold standard for the diagnosis and grading of tumors, on which clinicians can decide the further line of management.

Keywords:

ICSOLs, Astrocytoma, Meningioma, Pineal parenchymal tumor.

Introduction

The annual incidence of CNS tumors ranges from 10 to 17 per 100,000 persons for intracranial tumors, with the majority of these being primary tumors [1]. Classification is based on histologic and biologic features and newer molecular analysis [2]. An "Intracranial Space Occupying Lesion" (ICSOL) is defined as a mass lesion in the cranial cavity with diverse etiologies, such as benign or malignant neoplasms, inflammatory or parasitic lesions, hematomas, or arteriovenous malformations [3]. Many non-neoplastic CNS lesions can clinically and radiologically simulate brain tumors. In such cases, histopathological examination (HPE) helps in differentiating between neoplastic and non-neoplastic etiologies [5]. CNS space-occupying lesions can cause life-

threatening outcomes irrespective of their nature. Hence, it is of great importance to establish an accurate diagnosis for proper and timely neurosurgical intervention [6]. The aims and objectives are: i) To study the histopathological pattern of the Intra Cranial Space Occupying Lesions. ii) To study the age- and sex-wise distribution of the Intra Cranial Space Occupying Lesions. iii) To study the frequency of ICSOLs according to WHO classification.

Materials and Methods

The present study was carried out in the Department of Pathology at a tertiary care teaching hospital in Ahmedabad over a period of six months, from December 2022 to May 2023. Cases of intracranial space-occupying lesions were received for histopathological examination. Information regarding age, clinical history, and clinical diagnosis was obtained. Informed consent was obtained from patients who underwent surgery. Ethical approval was secured from the college ethics committee. All specimens were processed by routine histopathological procedures, where they were preserved in 10% formalin and allowed to fix for 24 hours. Paraffin-embedded sections of 5 microns were cut. The Hematoxylin and Eosin-stained sections of the CNS lesions were studied, and the results were analyzed.

Inclusion Criteria: All intracranial space-occupying lesions.

Exclusion Criteria: Improperly preserved specimens, hematomas, traumatic lesions, bony lesions of the skull, and spinal cord lesions.

Results

Out of a total of 202 cases, 176 were neoplastic lesions and 26 were non-neoplastic. The most common age group affected by neoplastic lesions was 21–30 years, followed by the 31–50-year age group. The most common age group with non-neoplastic lesions was 31–40 years. The ratio of male patients (110/202) to female patients (92/202) was 1.20:1. Out of 110 biopsies from male patients, 90 were neoplastic and 20 were non-neoplastic. Of the 92 biopsies from female patients, 86 were neoplastic and 6 were non-neoplastic. The most common presenting clinical symptom was headache (47%), followed by loss of vision and vomiting. A total of 176 intracranial neoplastic tumors were diagnosed during the six-month study period. Of these, 173 (98.3%) were primary, and 3 (1.7%) were metastatic. Tumors of neuroepithelial tissue (which include diffuse astrocytoma, oligodendroglioma, glioblastoma, ependymoma, mixed glioma, medulloblastoma, pineal parenchymal tumor, embryonal tumor, and neurocytoma) constituted 76 cases (42.8%) [see Table 1]. The most common type of intracranial tumor among neoplastic intracranial lesions was meningioma (33 cases, 18.6%) [see Fig. 1], followed by astrocytoma (31 cases, 17.5%). Among the 33 cases of meningioma, 23 (69.6%) were Grade 1 meningioma, 8 cases (24.2%) were Grade 2 meningioma, 1 case was Grade 3 meningioma, and 1 case of atypical meningioma was also found. Among astrocytomas, Grade 1 astrocytoma was more common (54.8%). There were 3 cases of metastatic tumors, 2 of which were poorly differentiated metastatic carcinoma and 1 was metastatic adenocarcinoma. The majority of the neuroepithelial tumors were found in the third and fourth decades. Among the 26 cases of non-neoplastic intracranial lesions, the present study encountered 20 cases of cystic lesions, with the most common being epidermoid cysts (12 cases, 46.1%) and 6 cases of cerebral abscess.

Discussion

In the present study, 202 cases of ICSOLs were observed and divided into categories according to WHO classification. Age and sex-wise distribution was also analyzed. There were a total of 176 cases (87.1%) of intracranial neoplastic lesions, and the

remaining 26 (12.9%) were non-neoplastic lesions. In the present study, the male-to-female ratio is 1.2:1, indicating a slight male predominance in overall ICSOLs. This trend is similar to that observed by Butt et al. (1.17:1) [4]. However, in the observations of Kothari et al. (1:1.17) and Hema et al. (1:1.14), a slight female predominance was mentioned.

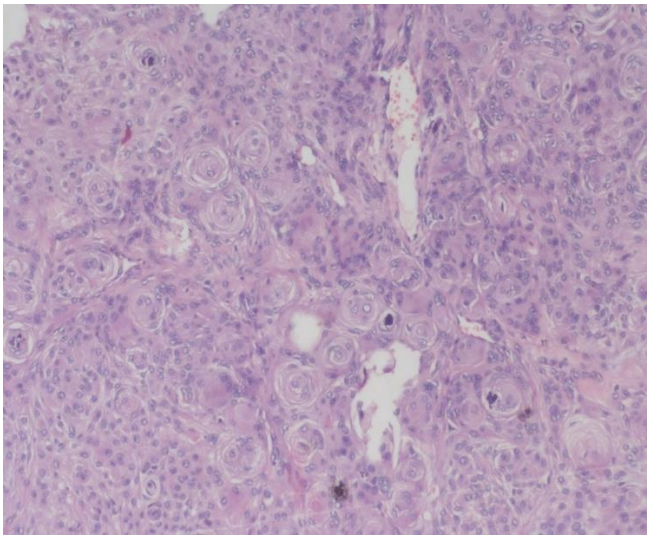

Figure 1: Haematoxylin and Eosin stain showing Meningioma psammomatous type WHO grade 1(40x)

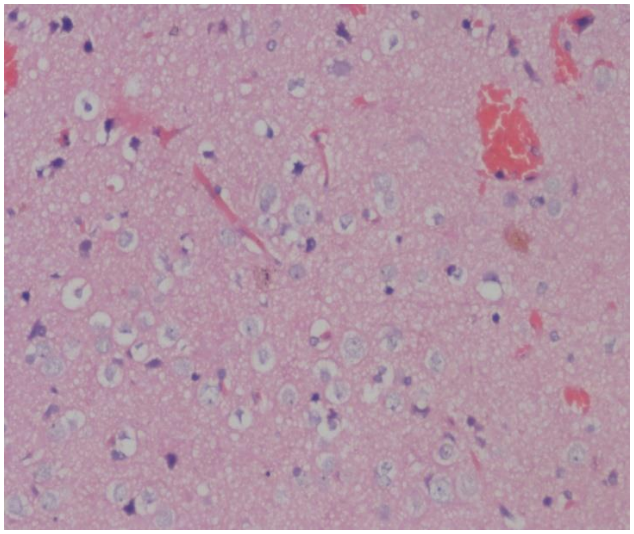

Figure 2: Haematoxylin and Eosin stain showing Oligodendroglioma WHO grade 2 (40x)

The percentage of brain lesions occurring below 20 years of age in the present study was 18%, which was similar to the observation of Rathod et al. (18%). However, it is comparatively lower than Hema et al. (32.2%) and Gunge et al. (21%), but higher than the observations of Butt et al. (16%) and Kothari et al. (11%) [3, 4, 7, 8, 10]. In the present study, ICSOLs occurred mostly during the third and fourth decades of life, which was consistent with Hema et al., Butt et al., and Shivraj et al. [3, 4, 11]. In the present study, regarding the age distribution of types of tumors, neuroepithelial tumors occurred significantly in the third and fourth decades of life. These findings were comparable to those of Shivraj et al., who also reported that the majority of neuroepithelial tumors were found in the third, fourth, and fifth decades [11].

Table 1: The relative frequency and sexwise distribution of neoplastic intracranial space occupying lesions

Sr No.	Neoplastic lesions ICSOL	Male	Female	Total	Percentage of total cases
1	**Meningioma**	7	26	33	18.6
2*	**Diffuse astrocytoma and oligodendroglioma**	19	12	31	17.5
3	**Schwannoma**	9	12	21	11.9
4	**Pituitary adenoma**	16	5	21	11.9
5*	**Glioblastoma**	12	6	18	10.1
6*	**Ependymoma**	5	8	13	7.3
7*	**Medulloblastoma**	4	1	5	2.8
8*	**Mixed glioma**	2	1	3	1.7
9	**Craniopharyngioma**	4	2	6	3.3
10*	**Embryonal tumor**	0	1	1	0.6
11*	**Pineal parenchymal tumor**	1	1	2	1.1
12	**Mature teratoma**	1	0	1	0.6
13	**Squamous cell carcinoma**	1	0	1	0.6
14	**Hemangioblastoma**	1	1	2	1.1
15	**AV malformation**	1	2	3	1.7
16*	**Neurocytoma**	1	2	3	1.7
17	**Hemangiopericytoma**	1	0	1	0.6
18	**Langerhans cell histiocytosis**	1	1	2	1.1
19	**Non Hodgkin's lymphoma**	0	3	3	1.7
20	**Reactive gliosis**	1	0	1	0.6
21	**Hemangioma**	0	1	1	0.6
22	**Atypical Ewing sarcoma**	1	0	1	0.6
23	**Metastatic carcinoma**	2	1	3	1.7
24	**Hemangioendothelioma**	1	0	1	0.6
	TOTAL	90	86	176	100%
***asterisk symbol represents neuroepithelial tumors**					

Table 2: The relative frequency and sexwise distribution of Non neoplastic intracranial space occupying lesions

Sr No.	Non Neoplastic lesions ICSOL	Male	Female	Total	Percentage
1	**Epidermoid cyst**	9	3	12	46.2
2	**Abscess**	5	0	05	19.2
3	**Arachnoid cyst**	2	2	04	15.5
4	**Colloid cyst**	2	1	03	11.5
5	**Dermoid cyst**	1	0	01	3.8
6	**Reactive gliosis**	1	0	01	3.8
	TOTAL	20	6	26	100%

Among the 26 cases of non-neoplastic intracranial lesions, the present study encountered 20 cases of cystic lesions, the most common being epidermoid cysts (12 cases). Many reports have suggested that the incidence and pattern of intracranial space-occupying lesions are subject to considerable geographic and racial variation. Molecular aspects of tumors identified are not discussed, as procedures for molecular genetics are not available at the institute.

Limitations: There can be potential bias in sample collection and diagnostic discrepancies. The molecular aspects of tumors identified are not discussed, as the procedure for molecular genetics is not available at the institute. The paper lacks details of follow-up data or post-diagnostic patient outcomes due to the short duration of the study.

Table 3: Comparison of various studies of histologic types of intracranial tumors

SR NO.	ICSOLs	Present study	Butt et al.	Hema et al.	Shivraj et al.	Gunge et al.
1	**Neuroepithelial tumors**	76(42.8%)	41(41%)	27(56.5%)	13(34.1%)	20(52%)
2	**Meningioma**	33(18.6%)	23(23%)	6(12.5%)	15(39.4%)	7(18%)
3	**Schwannoma**	21(11.9%)	11(11%)		7(18.42%)	3(8%)
4	**Pituitary adenoma**	21(11.9%)	2(2%)	1(1%)	1(2.63%)	1(3%)
5	**Craniopharyngioma**	6(3.3%)	-	-	-	-
6	**Histiocytic tumors**	2(1.1%)	-	2(4.2%)	-	-
7	**Vascular tumors**	8(4.5%)	2(2%)	2(4.2%)	-	1(3%)
8	**Lymphoma (NHL)**	3(1.7%)	1(1.3%)	-	-	-
9	**Germ cell tumors**	1(0.6%)	1(1.3%)	-	-	-
10	**Squamous cell carcinoma**	1(0.6%)	-	-	-	-
11	**Atypical Ewing sarcoma**	1(0.6%)	-	-	-	-
12	**Metastatic tumor**	3(1.7%)	6(6%)	-	2(5.27%)	2(5%)
	TOTAL	176	87	38	38	34

Conclusion

The surgical pathologist plays an important role in the accurate diagnosis of various intracranial space-occupying lesions, which is of immense help for patient prognosis and treatment. This study provides the spectrum of various neoplastic and non-neoplastic intracranial space-occupying lesions and the relative frequency of various intracranial lesions in a tertiary care hospital. Histopathological study remains the gold standard for the diagnosis and grading of tumors, on which the clinician can decide the further line of management. It was observed that neoplastic lesions were more common in ICSOLs than non-neoplastic entities, and most of the former occurred in the third and fourth decades of life. The overall ratio of male to female patients was 1.2:1, suggesting a slight male preponderance. The present study attempts to provide histomorphological diagnoses that help facilitate better therapeutic results.

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Conflicts of Interest: The authors declare that they have no conflicts of interest.

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