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CORRELATION OF CLINICAL AND CYTO-HISTOPATHOLOGICAL DIAGNOSIS IN CNS TUMORS

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ABSTRACT

Background: Rapid and accurate intraoperative diagnosis of CNS tumors is essential for proper management. Though neuro-imaging technique is available but they are only supportive. Intraoperative crush smear cytology is rapid and simple alternative to histo-pathological evaluation of CNS tumors. **Material & methods:** During operation of CNS tumors, small amount of tissue was sent to Department of Pathology for squash smear cytology. Subsequently more tissue was sent at the end of operation, which then was processed for Histopathology evaluation. All findings of Cytology and Histology were recorded on proforma. Evaluation of squash smears for diagnosis of CNS lesions was done and the morphological details as observed in the smears were correlated with Histopathology findings. **Results:** Age, sex wise distribution shows Maximum number of cases (68 cases, 64.5%) was seen in males while the females comprised 37 cases (35.5%). Among males and females, again the highest number of cases was seen in the age group 41-50 years, 16 cases (15.2%) and 8 cases (7.6%) respectively. Distribution of CNS tumors shows The cerebral hemisphere including all regions had the largest number of cases (51 cases, 48.5%). Amongst lesions with more precise locations, the frontal lobe had the largest number of the cases (21 cases, 20%). Overall cytohistological correlation of 105 cases in present study was 71.4%. Where 18 cases in which cytological diagnosis was not given were taken out, the cytohistological correlation out of 87 cases was 86.2%. **Conclusion**: Study concludes that Intraoperative SQUASH smear cytology is a fairly rapid and reliable method of intra operative diagnosis for a wide spectrum of central nervous system tumors.

Key words: CNS tumors, Cytological, Histopathological evaluation.

INTRODUCTION:

Tumours of the central nervous system (CNS) constitute a remarkably diverse group of both neoplastic and non neoplastic conditions that can occur at virtually any site and in patients of any age. Therapeutic management of brain tumors is based on an accurate knowledge of their size, location and histologic type. Advances in neuroimaging techniques – computed tomography (CT) and magnetic resonance imaging (MRI), have led to the discovery of a

larger number of very small, slow growing and minimally symptomatic lesions. The availability of more therapeutic options, the better knowledge of the natural history of cerebral tumors and the increasingly frequent discovery of the tumors prior to the onset of intracranial pressure have made the accurate identification of such tumors more important, especially for choosing between surgery and alternative therapeutic strategies. The neurosurgeon requires rapid and accurate intraoperative histological diagnosis in order to plan operative management of the patients.(1) The major advantages of crush smear technique for intraoperative diagnosis are the speed of preparation, technical simplicity, need for minimal technical equipment, crisp cytological details, the low cost(2,3) Few problems of this technique are that some firm and tough biopsy materials like fibrous meningiomas, schwannomas and fibrillary astrocytoma, require more pressure for making crush smears which results in crushing artifacts. Also crush smears if not immediately fixed in alcohol reveal air-drying artifact resulting in swollen and distorted nuclei. (4, 5) In view of the above, this study was designed to study neoplastic and non –neoplastic lesions of CNS by cytology and histopathology in their diagnosis.

MATERIAL AND METHODS:

The present study was done in the department of pathology at tertiary level hospitals and medical college, which includes 105 patients who reported to neurosurgery department with CNS lesions and were operated at same Institute & Hospital during the period 2004-2006.

All the cases were recorded on the working proforma. The findings included age, sex, detailed clinical history, clinical examination findings, radiological findings and provisional clinical diagnosis. These findings were recorded one day prior to the operation. During operation, small amount of tissue was sent to Department of Pathology for squash smear cytology. The tissue was processed as described below and report was rendered within 30 minutes. Subsequently more tissue was sent at the end of operation, which then was processed for Histopathology evaluation. All findings of Cytology and Histology were recorded on proforma.

Evaluation of squash smears for diagnosis of CNS lesions was done and the morphological details as observed in the smears were correlated with Histopathology findings.

RESULT:

Age, sex wise distribution shows Maximum number of cases (68 cases, 64.5%) was seen in males while the females comprised 37 cases (35.5%). Among males and females, again the highest number of cases was seen in the age group 41-50 years, 16 cases (15.2%) and 8 cases (7.6%) respectively. Distribution of CNS tumors shows the cerebral hemisphere including all regions had the largest number of cases (51 cases, 48.5%). Amongst lesions with more precise locations, the frontal lobe had the largest number of the cases (21 cases, 20%) (Table 1, 2)

The cases in which 100% correlation was seen includes pituitary adenoma (5 cases),metastasis (5 cases), craniopharyngioma (2 cases), choroid plexus tumor (1 case), tuberculoma (1 cases).Correlation of 65% and above was seen in meningiomas (12 cases, 83.3), schwannoma (3 cases, 66.6%) and vascular lesions (4 cases, 75%). The glial tumors taken together showed cytohistological correlation of 91.6%. Further analyzing separate entities showed the cytohistological correlation to be 58.8% (11

cases) in Astrocytomas, 66.6% (15 cases) in Glioblastoma and 42.8% (7 cases) in Ependymomas. In 1 case of Seizure related surgery, where no definite opinion could be given on cytology, the case was diagnosed as Microdysgenesis on histopathology. The groups of round cell tumors showed 66.6% (2 cases) cytohistologial correlation. The group of spindle cell tumors (8 cases) on cytology showed low cellularity and fibrous tissue hence the diagnosis was given as 'Suggestive of Schwannoma and Neurofibroma' which was confirmed on histology thereby showing 100% cytohistological correlation. There were 18 cases in which no opinion could be given on cytology due fibrous tissue resisting smearing, low cellularity, poor quality of smears and poor preservation of cells and seven cases showed morphology obscuring inflammation. Overall cytohistological correlation of 105 cases in present study was 71.4%. Where 18 cases in which cytological diagnosis was not given were taken out, the cytohistological correlation out of 87 cases was 86.2%.

The observations of the present study showed 2 major categories of tumors, namely Glial tumors and Meningial tumors. These tumors after confirmation of diagnosis by histopathology immunohistory were studied and analysed.

The Glial tumors comprising Astrocytomas, Glioblastoma multiforme, Ganglioglioma, Ependymoma and Oligodendroglioma formed a large group (44 cases, 41.9%). (Table 3)

DISCUSSION:

This study was carried out in the department of pathology in association with department of neurosurgery. The study included 105 consecutive cases who had clinically and radiologically diagnosed central nervous system lesions, during the period of three years. Median age of lesions was seen to be 45 years. Similar findings have been shown by Cappabianca et al (6) and Nguyen et al (7) who have reported cases from ages 10-80 years with median age group of about 40-45 years.

The biopsies that were submitted by the neurosurgeon included cases from all parts of the brain but the maximum cases were from cerebrum (51 cases, 48.5%) followed by Spinal cord (26 cases, 24.7%) and ventricles (9 cases, 8.5%). A study by Cahill et al (8) has also reported that maximum number of cases was seen from cerebrum.

The cytohistopathological correlation for glioma / astrocytoma was 91.6%. There were 10 cases which turned out to be oligodendroglioma (4 cases, 12.1%), Ependymoma (4 cases, 12.1%) and ganglioglioma (2 cases, 6.0%).

This was due to the fact that the smears of oligodendroglioma showed large nuclei and clustering around blood vessels which gave a false impression of high grade astrocytoma. Similar findings were reported by Roessler et al (9) who found that oligodendroglioma were most often misdiagnosed as astrocytoma (9.0 % of cases) due to lack of uniform appearing nuclei and simulation of cytoplasmic processes.

In our study two cases of Ependymoma were misdiagnosed as high grade astrocytoma due to absence of true rosettes. Similar opinion has been expressed by Roessler et al (9) who reported that absence of rosettes or rosettoid appearance on cytology can lead to erroneous diagnosis. On immunostaining in our study, a strong positive reaction was observed with elongated and bipolar cells. Small round cell component showed very little or no staining. The areas of necrosis and macrophages remained

unstained. Similar features have been described by Eng LF and Rubistin LJ (10) who reported that in the more differentiated astrocytic elements of glioblastomas, and malignant astrocytomas, the GFAP stain possessing the advantage of leaving the more primitive or more anaplastic tumor cells unstained

This study had 12 cases (11.4%) that were diagnosed as meningiomas of all types based on cytological features. This was the second largest group of all the CNS lesions. The nuclei were round to elongated with thick nuclear margins and coarse chromatin (11). Whorled appearance was also seen in cellular areas. The cases diagnosed as fibrous meningioma showed elongated cells with some areas showing fascicular or storiform pattern in disaggregated fragments. Abundance of psammoma bodies in cytological smears merited a diagnosis of psammomatous meningioma. Similar features have been reported by Kobayashi (11) and Roessler et al (9).

In this study there was 1 case (0.95%) that was diagnosed as tuberculoma on cytology. The smears showed mainly caseous necrotic background, fibrous tissue, few clusters of epithelioid cells, langherhan's multinucleate giant cells and amorphous calcified debris. The cytological findings are consistent with those reported by Burger et al (12).

CONCLUSION:

This study shows a very high degree of cytohistological correlation. With better and precise radio imaging and stereotactic biopsies, the percentage of cytohistological correlation can improve and increase. Some cases will always require histopathological study and / or Immunohistochemical marker studies for definite diagnosis.

Conflict of interest: Nil

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Table I. **Age & Sex distribution of patients with CNS tumors (n=105)**

Age (yrs)	Total Cases		Males		Females	
	No.	%	No.	%	No.	%
0-10	11	10.4	08	7.6	03	2.8
11-20	16	15.2	13	12.3	03	2.8
21-30	14	13.3	08	7.6	06	5.7
31-40	18	17.1	10	9.5	08	7.6
41-50	24	22.8	16	15.2	08	7.6
51-60	16	15.2	09	8.5	07	6.6
61-70	04	3.8	04	3.8	00	00
71-80	01	0.95	00		01	0.95
81-90	01	0.95	00		01	0.95
Total	**105**	**100**	**68**	**64.5**	**37**	**35.5**

Table 2 **Site wise distribution of CNS tumors (n=105)**

S.No.	Site	No. of Tumors	Percentage (%)(n=51)	Percentage (%) (n=105)
1	**Cerebral Hemisphere**	**51**		**48.5**
	-Frontal	21	41.1	20
	-Parietal	03	5.8	2.8
	-Temporal	06	11.7	5.7
	-Overlapping lesions	21	41.1	20
2.	Cerebellum	01		0.95
3.	Pineal region	01		0.95
4.	Ventricles	09		8.5
5.	Suprasellar region	06		5.7
6.	Cerebellopontine angle	06		5.7
7.	Posterior fossa	04		3.8
8.	Spinal cord	26		24.7
9.	Non-Specific	01		0.95
	Total	**105**		**100**

Table 3 **Cyto-histological correlation of CNS tumors (n=105)**

S. No	Cytological Diagnosis	No. of Cases	Histological Diagnosis	No. of Cases	Diagnostic Accuracy Percentage
1	Glioma	33+2+1	Astrocytoma	10	30.3
	Necrotic		Glioblastoma	16	48. 4
			Oligodendroglioma	04	12.1
	Inflammation		Ependymoma	04	12.1
			Ganglioglioma	02	6.06
3	Oligodendroglioma	01	Astrocytoma	01	-
4.	Ependymoma	07	Ependymoma	03	42.8
			Astrocytoma	02	-
			Medulloblastoma	01	-
			Multiple myeloma	01	-
9	Pituitary Adenoma	05	Pituitary Adenoma	04	100
			Sample not received	01	-
10	Craniopharyngioma	02	Craniopharyngioma	02	100
11	Meningioma	12	Meningioma	10	83.3
			Hemangiopericytoma	01	-
			Mod diff SCC	01	-
12	Schwannoma	03	Schwannoma	02	66.6
			Meningioma	01	-
14	Metastatic	05	Metastatic	05	100
					-
16	Dermoid	01	Epidermoid	01	-
18	Vascular lesion	04	Vascular lesion	03	75
			Tubercular	01	-
19	Choroid tumor	01	Choroid plexus carcinoma	01	100
20	Tuberculoma	01	Tuberculoma	01	100

22	Round cell tumor	03			
			-Medulloblastoma	02	66.6
			-Oligodendroglioma	01	-
23	Spindle cell lesion	08	Schwannoma	06	75
			Neurofibroma	02	25
24	Inflammatory pathology	07	Tuberculoma	03	-
			Cysticercosis	01	-
			Adenocarcinoma	01	-
			Astrocytoma	01	-
			Oligodendroglioma	01	-
25	No diagnosis possible	05	Metastatic carcinoma	02	
			Meningioma	01	
			Schwannoma	01	-
			Meningomyelocele	01	
26	Fibrous lesion	03	Meningioma	02	00
			Tuberculoma	01	
	Necrotic	02	No opinion	02	
	Total	**105**		**105**	