



DIAGNOSTIC ACCURACY OF SQUASH CYTOLOGY IN GLIOMAS AND GLIONEURONAL TUMORS AND IDH1 IMMUNOEXPRESSION IN SELECTED CASES OF GLIOMA

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ABSTRACT **BACKGROUND:** The annual incidence of CNS tumors range from 10-17 per 1,00,000 persons for intracranial tumors. Gliomas are the most common primary intracranial tumors in adults and are of 3 types: Astrocytoma, ependymoma and oligodendroglioma. WHO grade 1 astrocytoma is pilocytic astrocytoma and grade 2 to 4 are infiltrating or diffuse astrocytomas. IDH1 mutation is present in about 80% of grade 2 to 4 gliomas and secondary glioblastomas. Gliomas with mutated IDH1 have improved prognosis compared with wild type/ IDH1 negative gliomas. **AIMS AND OBJECTIVES:** To study the diagnostic accuracy of squash preparation in correlation with histopathology of glial tumors and IDH1 immunopositivity in high grade gliomas to check their survival status. **METHODOLOGY:** A hospital based cross sectional study was carried out in 21 cases of radiologically diagnosed glial tumors. Squash preparation was done in OT itself and the diagnosis was confirmed by HPE, which is the gold standard. IDH1 immunostaining was done in the histopathologically diagnosed cases of grade 2,3 & 4 gliomas. **RESULTS:** Out of 17 histopathologically diagnosed cases of astrocytoma, 15 cases were diagnosed on squash cytology. Similarly, out of 3 histopathologically diagnosed ependymomas, 2 cases were diagnosed on squash cytology. And 1 case of ganglioglioma was diagnosed both on squash and on HPE. Hence the diagnostic accuracy of squash cytology was found to be 85.7%. IDH1 expression was seen in 11 cases of Grade 2-4 gliomas of which 10 cases showed good prognosis and prolonged survival. **CONCLUSION:** Squash cytology is an easy, rapid intraoperative method in diagnosing CNS tumors which is both sensitive and specific. IDH1 is the most important tumor marker having diagnostic and prognostic significance.

KEYWORDS : HPE, IDH1, glioma, squash cytology

Introduction

The incidence of CNS tumours in India ranges from 5 to 10 per 100,000 population with trend of rising and accounts for 2% of all malignancies(1,2). Gliomas, glioneuronal and neuronal tumours are the most common tumours affecting the parenchyma of CNS.

The 5th edition of the WHO classification of CNS tumours divides them into 6 different groups: (1) adult-type diffuse gliomas, (2) paediatric-type diffuse low-grade gliomas, (3) paediatric-type diffuse high grade gliomas, (4) circumscribed astrocytic gliomas, (5) glioneuronal and neuronal tumours and (6) ependymal tumours. Squash cytology together with the clinical picture and radio-imaging findings will help to reach an accurate and rapid diagnosis of intracranial lesions.

The cytological diagnostic accuracy depends on the consistency of the tissue.(3) The vast majority of low grade gliomas (grade 2-3) and secondary glioblastoma have IDH1 mutation.(4) Gliomas with mutated IDH1 have improved prognosis compared with wild-type IDH1.

Aims and Objective

- 1) To evaluate glial and glioneuronal tumours by squash cytology.
- 2) To correlate different different glial and glioneuronal tumours cytohistopathologically.
- 3) To study immunohistochemical expression of IDH1 in selected cases of gliomas.

Materials and methodology

STUDY DESIGN- Hospital based cross-sectional study.

INCLUSION CRITERIA:

1. All the glial and glioneuronal tumours which have been diagnosed clinically and radiologically.
2. Patients of all age groups and both sexes are included.

EXCLUSION CRITERIA:

1. Inadequate biopsy, Brain infarcts, CNS malformations, Cerebral hematomas.
2. Patients who have not given consent for the study.

SAMPLE SIZE- A total of 21 cases of glial and glioneuronal tumours who have been diagnosed clinically and radiologically in the

department of Neurosurgery, Gauhati Medical College and Hospital.

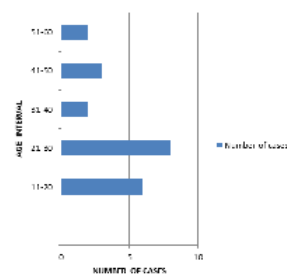
STUDY PERIOD- July 2021 to June 2022

Methodology

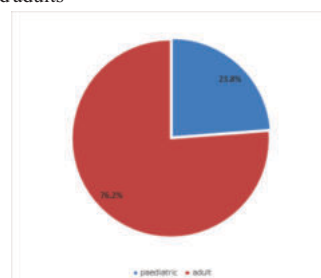
- Squash smears were made by using 0.5 to 1 mm² of tissue which is placed at one end of a clean labelled glass slide and compressing the tissue with the second slide.
- The smears were fixed rapidly and rapid Haematoxylin and eosin staining was performed.
- The diagnosis was confirmed by HPE, which is the gold standard.
- IDH1 immunostaining was done in the histopathologically diagnosed cases of grade 2,3 & 4 gliomas.

Results

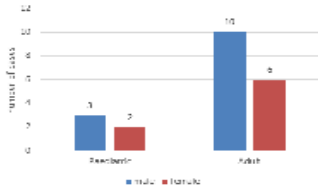
Distribution of glial & glioneuronal tumours by age



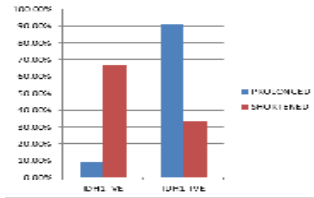
Distribution of glial & glioneuronal tumours among children & adolescent and adults



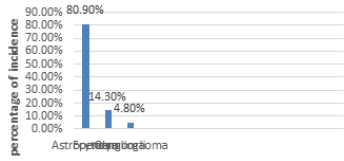
Sex specific distribution of adult and paediatric glial & glioneuronal tumours



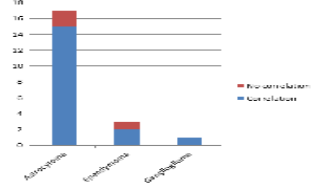
Distribution of survival status in relation to immunoexpression of IDH1



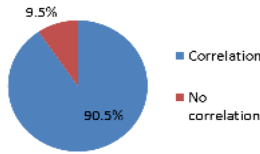
Distribution of glial & glioneuronal tumors by specific histology



Correlation of Squash Cytology with Histopathology



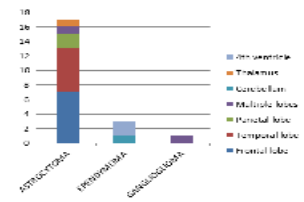
Correlation of radiological diagnosis with histopathology



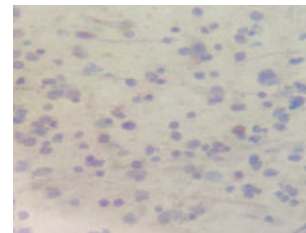
Diagnostic accuracy and P value of various glial & glioneuronal tumours

Glial & glioneuronal tumours	Diagnostic accuracy	P value
Astrocytoma	94.23%	< 0.001
Ependymoma	98.08%	< 0.0001
Ganglioglioma	100%	< 0.0001
Overall diagnostic accuracy	85.7%	

Histology specific location of CNS tumors

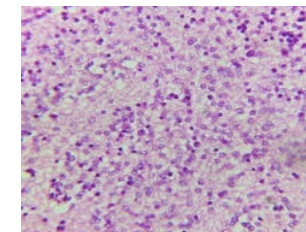
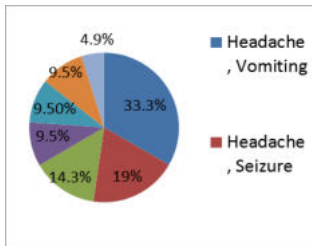


Case Photographs



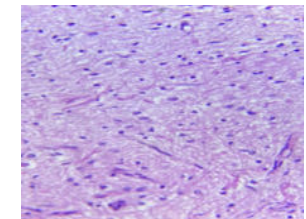
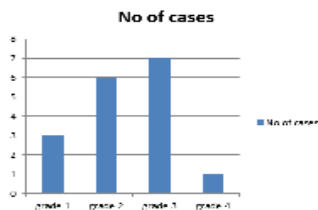
SQUASH SMEAR OF LOW GRADE ASTROCYTOMA

Frequencies of clinical features



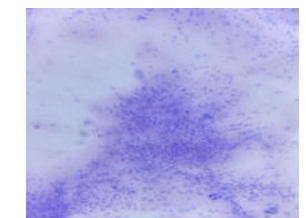
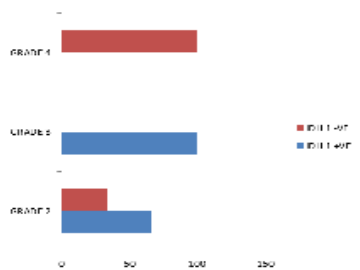
HPE OF CNS WHO GRADE 2 ASTROCYTOMA

Distribution of astrocytoma by its grading

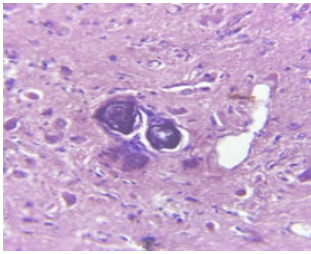


HPE OF PILOCYTIC ASTROCYTOMA SHOWING ROSENTHAL FIBRES

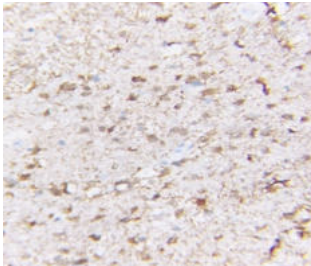
Immunohistochemical expression of IDH1 in selected cases of glioma (grade 2, 3 and 4)



SQUASH SMEAR SHOWING BIPHASIC CELL POPULATION



HPE OF GANGLIOGLIOMAWITH DYSTROPHIC CALCIFICATION



POSITIVE EXPRESSION OF IDH1 IN GRADE 3 ASTROCYTOMA

Discussion:

In the present study, incidence of astrocytoma was found to be 80.9% among the glial and glioneuronal tumours. Studies conducted by Emanuele Crocetti et al(5), Vincent K.Y.Ho et al(6) and Kailash et al(7) revealed 86%, 66.7% and 52.5% respectively. The age distribution of low grade glioma was in between 21 to 30 years of age and high grade glioma was 41 to 50 years of age in the current study. This is concordant with other study done by M Kapoor et al(8). We have found male to female ratio of 1.6:1, other studies done by Jain et al(9), Ghosal et al(10) also found male preponderance. In our study, fronto-temporal location was the most frequent site of involvement.

The diagnostic accuracy of squash cytology in the present study was 85.7%. Studies done by different authors also found the same.

COMPARISON OF DIAGNOSTIC ACCURACY OF SQUASH CYTOLOGY

STUDY	DIAGNOSTIC ACCURACY
Asha T et al(11)	87%
A B Shah et al(12)	89.7%
Mitra et al(3)	88.5%
Jaiswal et al(13)	83.7%
Khonglah et al(14)	84%
Present study	85.7%

In our study, out of 14 cases of glioma, 4 cases (66.7%) of grade 2 glioma and 7 cases (100%) of grade 3 glioma show IDH1 positivity by immunohistochemistry. Studies done by Zuzana Sporikova et al(15) observed 80% of samples of grade II to III gliomas showing IDH1 immunoeexpression, M Preusser et al(16) found approximately 60 - 90% of grade 2 & grade 3 gliomas, Jinqun Cai et al(17) found IDH1 immunoeexpression 57.81%-81.63% cases of grade 2 gliomas. In the present study, Majority of cases with IDH1 immunoeexpression showed prolonged survival status and it was concordant with other studies.

COMPARATIVE ANALYSIS OF IDH1 EXPRESSION WITH SURVIVALSTATUS

STUDY GROUP	IDH1 EXPRESSION	SURVIVAL STATUS
Shingo Takano et al(18)	Positive	Prolonged
Nancy M Joseph et al(19)	Positive	Prolonged
Susmita Sarma et al(20)	Positive	Prolonged
Present study	Positive	Prolonged

Conclusion: Squash cytology is a sensitive and specific modality for diagnosing tumours of the Central Nervous System. However, it

cannot be used for grading of the tumours. IDH1 is one of the most important tumour marker for diagnosis as well as prognosis.

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