

Diagnostic accuracy and limitations of intraoperative cytology in diagnosis of gliomas-A two year study in a tertiary care hospital in South India

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Abstract-Intraoperative diagnoses of a lesion achieved by cytologic methods helps a surgeon plan his surgery and alternative treatments. This is a Retrospective study conducted in Department of Neuropathology, Institute of Neurosurgery, Madras Medical College & RGGGH, Chennai to correlate squash smears with histopathology of gliomas and find out diagnostic accuracy and limitations of squash cytology. Retrospectively we analysed 254 cases of histopathologically proven gliomas. We found that the most frequent glioma in our study is glioblastoma and the diagnostic accuracy of squash smears and specificity of lesions compared with Review of literature

Keywords-squash smear ,histopathology, glioblastoma, astrocytoma

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I. Introduction-

Squash smear cytology is a universally accepted technique in diagnosing a variety of Central Nervous System (CNS) lesions and is presently in vogue for both therapeutic and prognostic purposes. (5). Pre-surgical diagnoses of a lesion achieved by cytologic methods or by tissue biopsy helps a surgeon plan his surgery and alternative treatments. (7) This technique is simple, rapid, inexpensive, fairly accurate, and dependable intraoperative diagnostic tool. This study was conducted with an aim to correlate squash smears with histopathology of gliomas and find out diagnostic accuracy and limitations of squash cytology and compare with statistical data available (5)

II. Materials And Methods

This is a Retrospective study conducted in **Department of Neuropathology, Institute of Neurosurgery, Madras Medical College & RGGGH, Chennai**, for a period of 2 years, from September 2015 to September 2017. A Total of **1301** Neurosurgical specimens were received during that period of which only cases with histopathological diagnosis of gliomas were included in our study. Retrospectively we analysed 254 histopathologically proven glioma cases, of which squash smear was done in 213 cases. Details of patient's age, sex, clinical findings, radiology findings were recorded and squash findings were correlated with histopathology as gold standard.

III. Results-

Out of 213 patients 131 (61.50%) were males and 82 (38.50%) were females. The commonest age group ranged between third to fifth decade (table-1). The youngest patient was 11 month old baby and the oldest was 88 years. The most common location was anterior cranial fossa accounting for 72.3% (154/213) followed by posterior cranial fossa 23% (49/213) and spinal gliomas were 4.7% (10/213). (Table)

The most frequent glioma in our study is glioblastoma 24.88% (53/213 cases) with diffuse astrocytoma 19.25% (41/213), oligodendroglioma 14.55% (31/213) forming the next common gliomas. **Table 2** lists the frequency of occurrence of gliomas in our study.

The histopathological diagnosis and the number of positive and negative correlation on cytology are presented in Table 3. Out of 213 squash smears studied 186 cases showed complete correlation with histopathological diagnosis, 23 cases are discordant on squash. The details of the discordant cases in squash smears are given in (Table 4). 04 cases were inadequate sample in cytology. Thus, the overall diagnostic accuracy of squash cytology in the evaluation of gliomas was 87.3%.

TABLE-1

AGE GROUP(YEARS)	MALES	FEMALES	TOTAL NOS	PERCENTAGE
LESS THAN 1	-	01	1	0.47
01- 10	14	11	25	11.73
11-20	15	08	23	10.8
21-30	15	09	24	11.26
31-40	26	16	42	19.72
41-50	24	18	42	19.72
51-60	20	15	35	16.43
61-70	15	2	17	7.98
71-80	02	01	03	1.41
>81	-	01	01	0.47
TOTAL	131	82	213	100

TABLE 2 DISTRIBUTION OF GLIAL TUMOURS

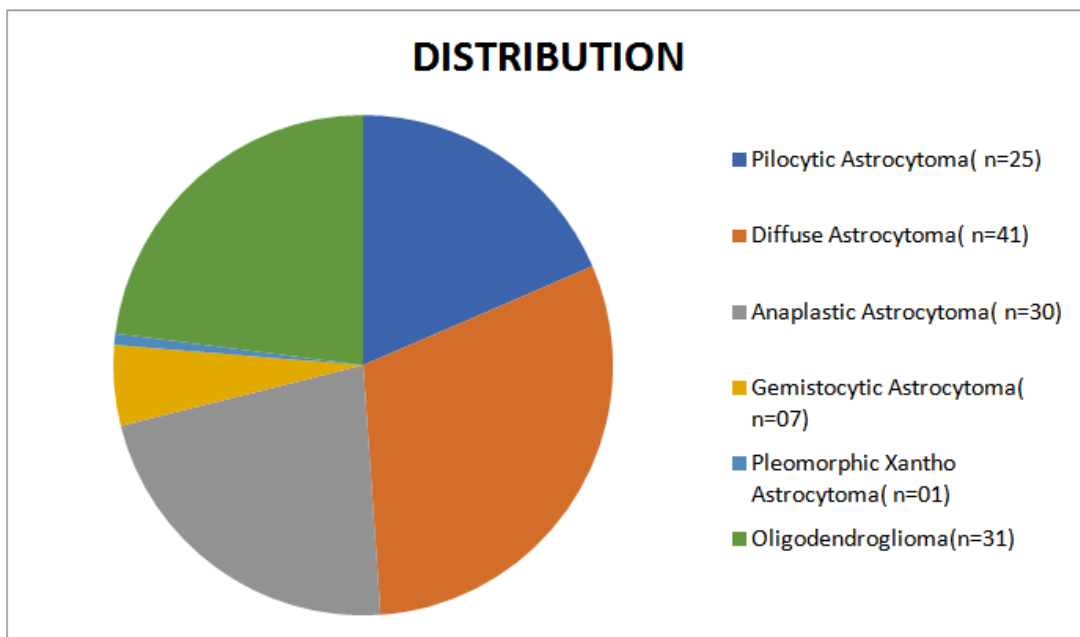


TABLE-3

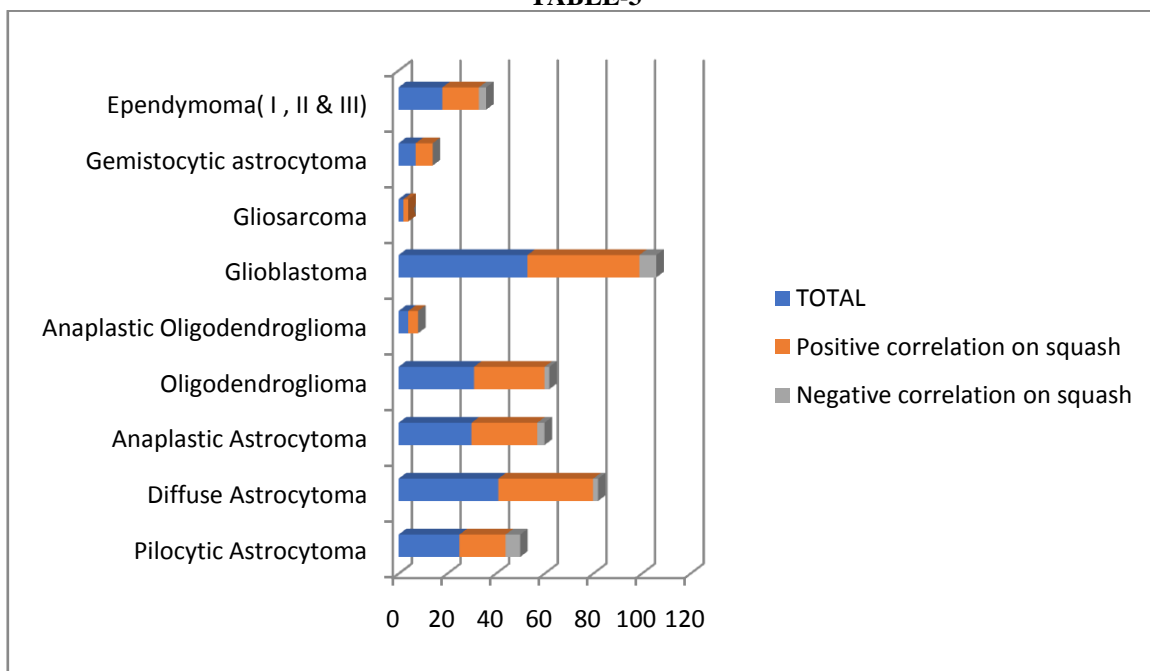


TABLE -4

HPE DIAGNOSIS	DISCORDANT CYTOLOGY DIAGNOSIS	NOS & PERCENTAGE
PILOCYTIC ASTROCYTOMA	MEDULLOBLASTOMA(2) HIGH GRADE GLIOMA(3) SRCT(1)	06(24%)
DIFFUSE ASTROCYTOMA	HIGH GARDE GLIOMA	02(4.87%)
OLIGODENDRGLIOMA	HIGH GRADE GLIOMA	02 (6.45%)
ANAPLASTIC ASTROCYTOMA	DIFFUSE ASTROCYTOMA GRANULOMALYMPHOMA	03 (10%)
EPENDYMOMA	SRCT MEDULLOBLASTOMA	2 (11.11%)
ANAPLASTIC EPENDYMOMA	PXA	1 (5.56%)
GLIOBLASTOMA	GRANULOMA(1) MENINGIOMA(2) METASTASIS(4)	07(13.21%)

TABLE -5 DIAGNOSTIC ACCURACY OF GLIAL TUMOURS

LESIONS	Roessler K Etal (1)	Shukla K Etal (17)	Nigam S K Etal (18)	Kini J R Etal (15)	Present study
Astrocytoma	96.7%	96.42%	84%	100%	95.8%
Oligodendrogloma	80.9%	90%	33.3%	22.2%	94.2%
Glioblastoma	95.7%	-	84.6%	64.7%	87.3%
Ependymoma(I, II & III)	77.6%	83.33%	50%	22.2%	83.3%

IV. Discussion-

Intraoperative squash cytology plays a crucial role in the intraoperative diagnosis of central nervous system tumor. The main advantage of CNS squash smears in intraoperative diagnosis is the ease with which soft CNS tumors can be crushed to get a cellular smear (8,13) . Rapid intraoperative diagnosis of the nature of the tumor helps the surgeon to plan the extent of surgery and modify it accordingly. The knowledge of location, clinical presentation, and neuroimaging findings, as well as its correlation with squash smear and histopathological findings is of utmost importance to pathologists, which provides reasonably accurate cytological diagnosis in CNS tumors. Moreover, this methodology allows reasonable and realistic differential diagnosis (8)

The diagnostic accuracy of squash smears in our study 87.3% with a sensitivity of 87.3% and specificity of 79.41%. The main pitfalls noted in smear study was in diagnoses of glioblastoma (24.88%) Misinterpretation of Glioblastoma as metastatic tumor was due to presence of bizarre dark staining cells ,lack of fibrillary background and lack of architecture. Similar error was encountered in the other studies too.

Misinterpreted as granuloma due to only epitheloid looking cells in smear without necrosis and vascular proliferation , it may be due to the fact that necrosis cannot be recognized because it sticks poorly to the slides.[8] The necrosis can also be missed on smears, as reported by Mitra *et al.*, (8.16) and also misdiagnosis due to probably be due to sampling error. Misinterpretation as meningioma due to preoperative radiological imaging is shared by authors such as Mitra *et al.* (8)

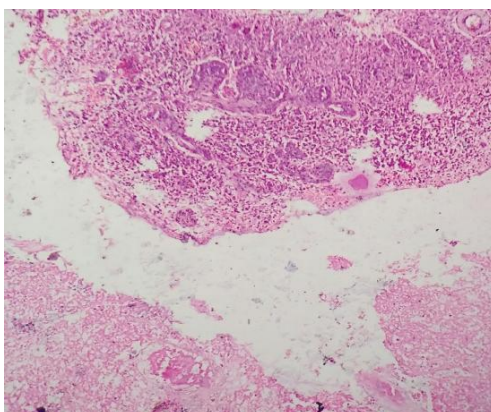
Difficulty in grading of astrocytic tumors on smears due to intratumoral variability of grade, variation in cellularity, pleomorphism and mitosis . Hence some authors conclude that it is not advisable to grade malignancies in small biopsy or cytology. 6 cases of pilocytic astrocytoma were misinterpreted , all the cases were located in cerebellum in which 50 % of the cases on squash due to sampling error ,were misinterpreted as SRCT and medulloblastoma as the variably sized cells in granular layer cells misled us. 50 % misinterpretation due to predominant hyperchromatic pleomorphic cells with scarce low grade areas .

V. Conclusion-

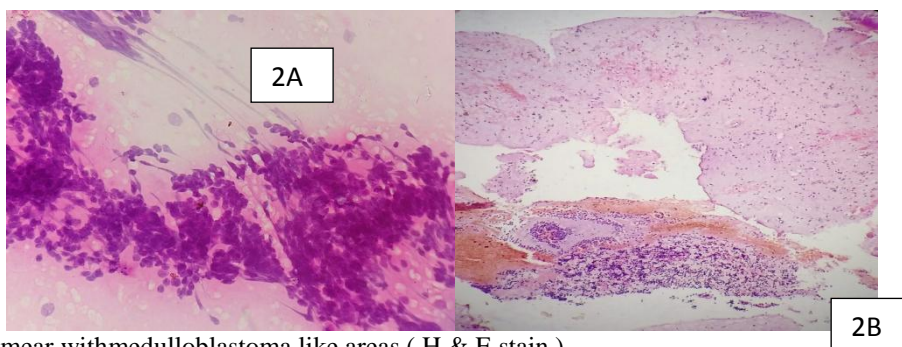
Intraoperative squash smears permit rapid and reliable diagnosis of CNS gliomas, which helps the surgeon to monitor and modify the approach of surgery. Sampling of representative site of a lesion will yield the good cellular arrangements and its architectural patterns are characteristic of specific diagnosis of varied gliomas in correlation with radiology . Almost all studies reviewed for the present work have reported a high accuracy rate of intraoperative squash smear diagnosis of intracranial and spinal cord tumors as more than 80% (1,4,7,15,16,17,18). However proper techniques, correlation with clinical and imaging findings while reporting and awareness about the diagnostic pitfalls help in achieving reasonable accuracy

References

- [1]. Roessler K, Dietrich W, Kitz K. High diagnostic accuracy of cytologic smears of central nervous tumours. A 15- year experience based on 4,172 patients. *ActaCytol* 2002;46(4):667-674
- [2]. Sharma S, Deb P. Intraoperative neurocytology of primary central nervous system neoplasia: a simplified and practical diagnostic approach. *J Cytol* 2011;28(4):147-158
- [3]. Jha B, Patel V, Patel K, et al. Role of squash smear technique in intraoperative diagnosis of CNS tumours. *Int J Med Sci Public Health* 2013;2(4):889-892.
- [4]. Firlik KS, Martinez AJ, Lunsford LD. Use of cytological preparations for the intraoperative diagnosis of stereotactically obtained brain biopsies: a 19-year experience and survey of neuropathologists. *J Neurosurg* 1999;91:454-8.
- [5]. Bajaj NK, Somalwar SB, Nagamuthu EA, et al. Study of intraoperative squash cytology of intracranial and spinal cord lesions with histopathological and IHC study. *J. Evid. Based Med. Healthc.* 2016; 3(55), 2820-2825. DOI:10.18410/jebmh/2016/616
- [6]. Jindal A, Kaur K, Mathur K, Kumari V, Diwan H. Intraoperative squash smear cytology in CNS lesions: A study of 150 pediatric cases. *J Cytol* 2017;34:217-20
- [7]. .Bhardwaj K, Kriplani D, Bhake A, Bhardwaj K. Study of intraoperative squash cytology of intracranial and spinal cord tumors. *Int J Res Med Sci* 2015;3:3101-8
- [8]. Patil SS, Kudrimoti JK, Agarwal RD, Jadhav MV, Chuge A. Utility of squash smear cytology in intraoperative diagnosis of central nervous system tumors. *J Cytol* 2016;33:205-9
- [9]. NPawar, K Deshpande, S Surase, G D'costa, S Balgi, A Goel. Evaluation of the Squash Smear Technique in the Rapid Diagnosis of Central Nervous System Tumors: A Cytomorphological Study. *The Internet Journal of Pathology.*2009 Volume 11 Number 1.
- [10]. Govindaraman PK, Arumugam N, Ramasamy C, Prakasam G. Role of squash smear in intraoperative consultation of central nervous system tumors. *J Sci Soc* 2017;44:7- 14
- [11]. Din NU, Memon A, Idress R, Ahmad Z, Hasan S. CNS lesions:Correlation of intraoperative and final diagnosis, a six years experience at a referral centre in a developing country,Pakistan. *Asian Pac J Cancer Prev* 2011; 12: 1435-1437
- [12]. Lacruz C R, Santamaría J S D, Bardales R H. Central nervous system intraoperative cytopathology. *Springer Science & Business Media*; 2013: 238-239.
- [13]. Jaiswal S, Vij M, Jaiswal AK, Behari S. Intraoperative squash cytology of central nervous system lesions: A single center study of 326 cases. *DiagnCytopathol* 2012;40:104-12.
- [14]. Asha T, Shankar SK, Rao TV, Das S. Role of squash smear technique for rapid diagnosis of neurosurgical biopsies- a cytomorphological evaluation. *Indian J PatholMicrobiol* 1989; 32(3): 152-60
- [15]. Kini JR, Jeyraj V, Jayaprakash CS, Indira S, Naik CN. Intraoperative consultation and smear cytology in the diagnosis of brain tumours. *Kathmandu Univ Med J* 2008;6(24):453-7
- [16]. Mitra S, Kumar M, Sharma V, Mukhopadhyay D. Squash preparation: A reliable diagnostic tool in the intraoperative diagnosis of central nervous system tumors. *J Cytol* 2010;27(3):82-5.
- [17]. Shukla K. Parikh B, Shukla J, Trivedi P, Shah B. Accuracy of cytologic diagnosis of CNS tumours in crush preparation. *Indian J PatholMicrobiol.*2006; 49: 483-486.
- [18]. Nigam SK, Nigam N, Mishra A,Nigam N, Narang A. Diagnostic accuracy of squash smear technique in brain tumours. *JARMS.*2012; 1: 538- 545.

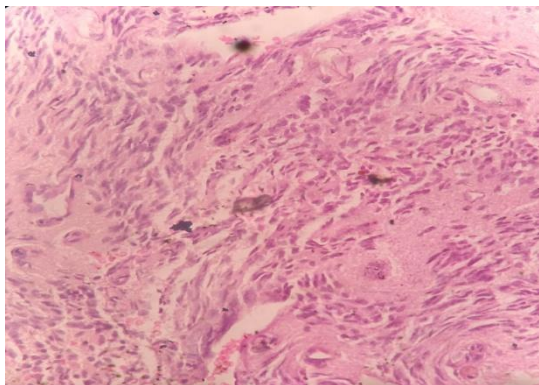
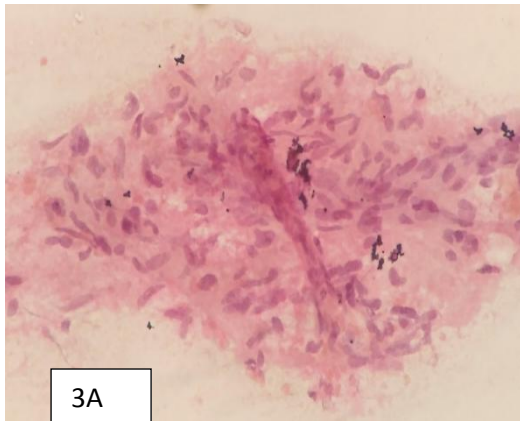


pic-1- anaplastic astrocytoma with a low grade component (H & E stain)

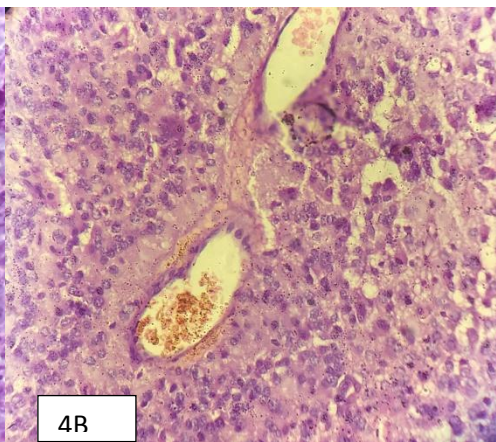
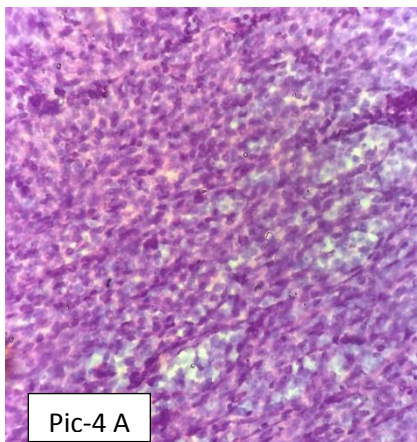


(2A)cytology smear with medulloblastoma like areas (H & E stain)

(2B) HPE of the same - normal cerebellum with pilocytic astrocytoma(H& E stain)



3A.looks granuloma in cytology smear (H& E stain)
3B.glioblastoma in HPE(H& E stain)



Pic 4A-cytology smear shows small round cells in sheets
4B- H& E section of the same shows ependymoma features

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