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CYTOPATHOLOGICAL PATTERN OF CNS LESIONS IN A TERTIARY CARE HOSPITAL

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Abstract:
Background: Squash cytology performed intra-operatively is considered as a necessary diagnostic tool. It holds an essential role, especially in the diagnosis of central nervous system tumours. This study was done to determine the role of squash cytology as an independent diagnostic test in our hospital setting in the absence of a frozen section facility.
Materials and Methods: Total number of patients who were included in the study was 62. These patients had presented with different intracranial lesions. Patients had undergone various radio-imaging and routine blood investigations. Post necessary investigations, these patients were operated upon in Neurosurgical department of Government medical college, Srinagar. First squash cytology diagnosis was performed intra-operatively, and then this was correlated with histological diagnosis as gold standard.
Results: Patients age group included in this study was 5–76 years. Meningioma was the most common benign tumour observed and astrocytoma was most common malignant lesion diagnosed in our patients. Diagnostic accuracy of intra-operative squash cytology irrespective of lesion & site was 86.33%. We were able to inform about the diagnosis to neurosurgeon in 15 minutes in all cases and within 12 minutes in >85% cases.
Conclusion: Squash smear cytology is reliable and rapid standalone diagnostic method and it can assist for intra-operative decision-making diagnosis of intracranial lesions in resource-limited settings where frozen section facility is not available.
Keywords: central nervous system Intra-operative diagnosis, Squash cytology

Introduction

Central nervous system (CNS) squash cytology (CSC) has now been established as a method of choice in the intraoperative diagnosis of CNS tumors. The soft consistency of neural tissue is best suited for squash cytology which in fact is a negative factor for frozen section. Moreover, ice crystal artifacts can make morphological assessment of frozen sectioned tissue difficult.[1,2]

CSC has been accepted by pathologists as technically easy, rapid, inexpensive and reliable intraoperative diagnostic tool. [3] It can help the neurosurgeon in optimizing the surgical approach and dealing with an unexpected lesion than that determined on clinical and imaging grounds. Thus intraoperative diagnosis by CSC is of crucial importance to neurosurgeons. The present study was undertaken to find out the utility of intraoperative squash cytology in neurosurgical practice. It is assumed that specialized neuroimaging techniques would obviate the need for any intraoperative consultation. However, in our experience intraoperative consultation continues to be relevant. Manipulation and planning of CNS surgeries can be done by the neurosurgeon when he has an intraoperative diagnosis available. This is why the intraoperative squash preparation is simple and accurate which can be of immense help to the surgeon. Role of CSC has increased with the advent of stereotactic biopsies which provide very tiny tissue that can be challenging for pathologists. Therefore, Pathologists should train themselves in cytomorphological interpretation of such scanty material. CNS squash smears can help pathologists in this matter

Material and methods

This was a prospective study conducted in the Department of Pathology in a tertiary care referral hospital from December 2018 to January 2020 with the collaboration of the Department of Neurosurgery. Total number of 62 consecutive cases (including benign and malignant lesion of the brain and spinal cord) were incorporated in the study. Intra-operative biopsy specimens of all intracranial lesions were collected. Before taking up each case various clinical and MRI findings were taken into consideration.

Intra-operative CSC was performed and smears were stained with Leishman and rapid Hematoxylin and Eosin (H and E) stain. The remaining tissue was processed routinely for paraffin sections. The CSC smears were studied with proper clinic-radiological backup. Neurosurgeons were informed about the diagnosis. A comparison was made between the diagnosis of intra-operative CSC with preoperative MRI diagnosis and routine histopathological diagnosis.

The CNS tumors were categorized based on clinical and therapeutic implications for deciding sensitivity, specificity, and positive and negative predictive value. In this manner, meningioma, schwannoma, hemangioblastoma, pilocytic astrocytoma, choroid plexus papilloma, and pleomorphic xanthoastrocytoma, which are treated with surgical removal and follow-up, were considered as tumors with benign behavior. Diffuse astrocytoma, glioblastoma, craniopharyngioma, medulloblastoma, central neurocytoma, and metastasis, which are treated with surgical removal combined with chemotherapy or radiotherapy, were considered as tumors with aggressive or malignant behavior. WHO grading was assigned wherever applicable.

Each case was followed up with the neurosurgeon to find out how useful the intra-operative diagnosis was on diagnostic and therapeutic grounds. Diagnostic accuracy, sensitivity, specificity and positive and negative predictive value of MRI and CSC were calculated by using statistical test for diagnostic accuracy test.

Results

Patients age group included in this study was 5–76 years. Eight tumors (13%) were present in children below 12 years of age. Rest of the tumors was seen in adults. There was a male preponderance with 38 males and 24 female patients. There were 8 intra-spinal, 40 supratentorial, and 14 infratentorial tumors.

In children, there were 4 infratentorial tumors with 2 cases each of medulloblastoma and pilocytic astrocytoma. The supratentorial tumors in children consisted of pleomorphic xanthoastrocytoma and craniopharyngioma. In adults, supratentorial tumors included 14 glioblastoma multiformi (GBM) 24 meningiomas, 7 diffuse astrocytomas,

1 craniopharyngiomas, and 1 case each of choroid plexus papilloma, and central neurocytoma. Infratentorial tumors in adults consisted of 9 schwannomas and 1 case each of meningioma and hemangioblastoma. Three schwannomas, 1 case each of meningioma, diffuse astrocytoma, and metastasis located in the spine.

Astrocytic tumors, medulloblastomas and choroid plexus papilloma were easy to squash whereas those difficult to squash included meningiomas, schwannomas, craniopharyngiomas, and hemangioblastoma.

Sensitivity, specificity, positive predictive, value and negative predictive value of preoperative MRI was 91.47%, 83.70%, 78.16%, and 93.20% respectively. These values of utility parameters for intra-operative CSC were 100% for each.

On discussion with the neurosurgeon, intra-operative CSC helped the neurosurgeon in optimizing surgical procedure in majority of the cases.. Intraoperative cytology also helped in the diagnosis and management of many unexpected lesions, which were missed on MRI. We also attempted grading of tumors wherever possible.

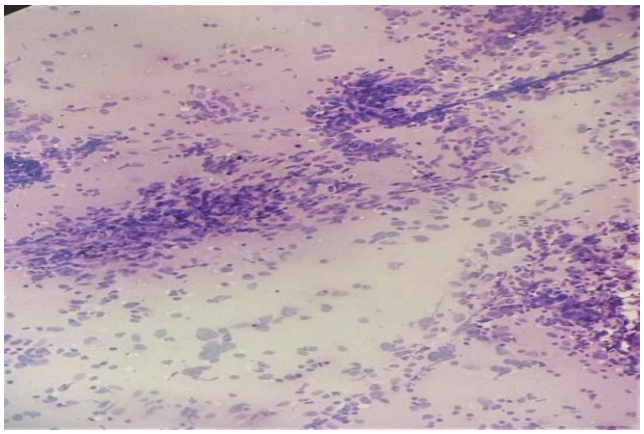

Figure 1a: Cellular smears composed of mainly neoplastic astrocytes showing hyperchromasia and increased N/C ratio.

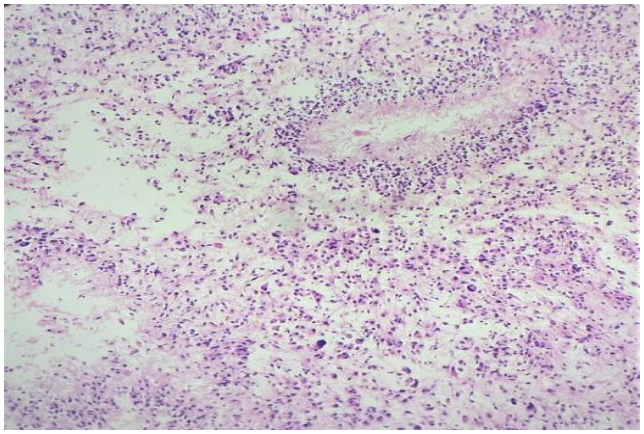

Figure 1b: Dense cellularity with pleomorphic astrocytes and zones of coagulative necrosis with palisading astrocytes.

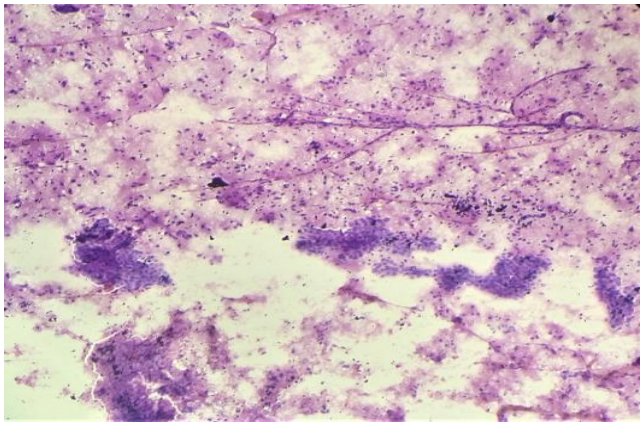

Figure 2a: Cohesive groups of hyper chromatic and pleomorphic malignant epithelial cells with background neural tissue.

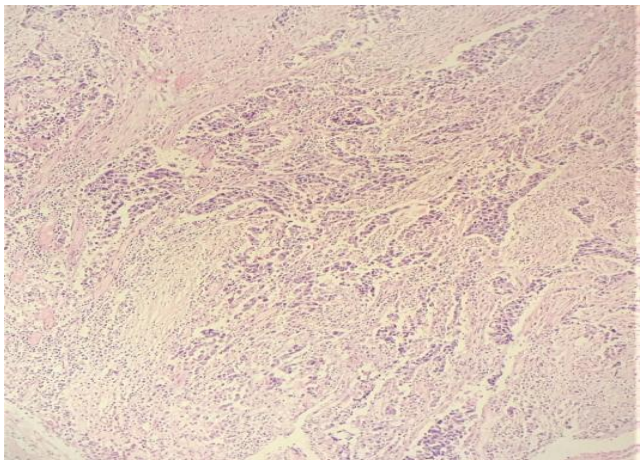

Figure 2b: Malignant epithelial cell islands percolating through recognizable neuropil.

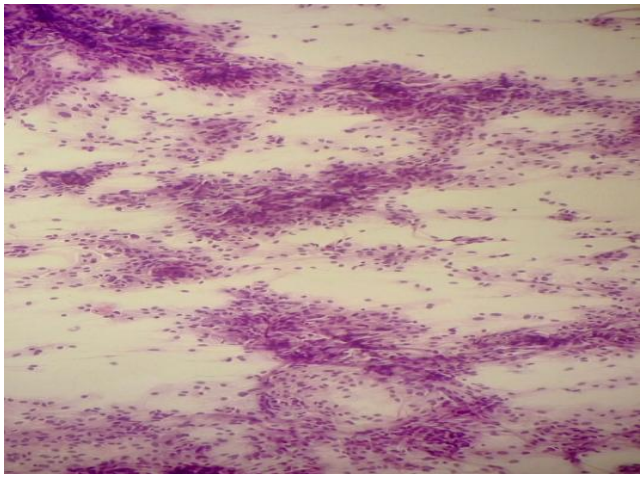

Figure 3a: Cellular smears populated by cells having round to ovoid nuclei inconspicuous nucleoli, lightly eosinophilic cytoplasm whorling vague papillary formation seen.

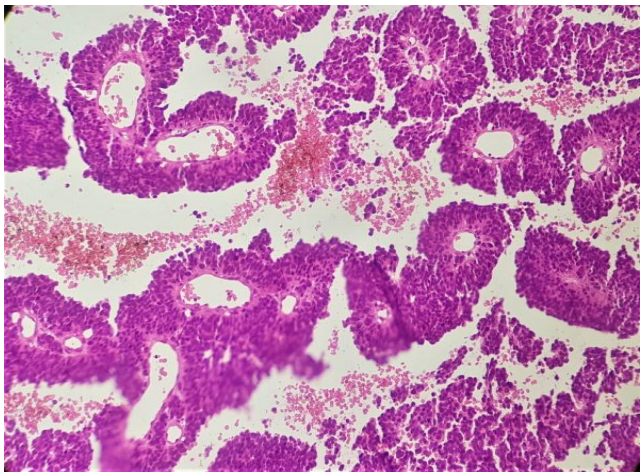

Figure 3b: Papillary configuration with ependymoma like perivascular structuring of constituent cells. Areas with conventional meningothelial appearance were identified elsewhere.

Discussion

The inaccessibility to the cranial cavity contents makes diagnosis of CNS tumors difficult than that of other visceral tumors. The advances in neuroradiology have revolutionized the management of CNS tumors. The topography, clinical presentation, and imaging as well as its correlation with cytological and histopathological findings are of utmost importance to pathologists. With the advent of stereotactic biopsy or endoscopic approach it is now possible to approach inaccessible lesions that have increased the responsibility of pathologist who has to play an important role in its evaluation, diagnosis, and management. [4, 5]. The cytological diagnosis heavily depends on the consistency of a tissue. The soft and friable tissues are easy to smear and yield good cellular details. This is true for CNS tumors such as gliomas, pituitary adenomas, medulloblastomas, and metastatic carcinomas [6]. Another advantage of CNS squash cytology is that it can be done on a tiny tissue, and is of immense value when the tissue obtained is scant and one does not want to lose it to frozen section but preserve it for paraffin sections. The CSC not only economizes on tissue but also on time. The intraoperative diagnosis with it can be obtained in as early as 10 min [7],[8]. The rapid H and E and Leishman stains used in the present study took 10 min for staining and another few minutes for interpretation.

Squash smear cytology provides optimum cellular details. As seen in the present study, the architecture and details of tumor cells are well-maintained in the cases of Glioblastoma [Figure 1a] and [Figure 1b]. Similarly, metastatic infiltration [Figure 2a] and [Figure 2b] are also well-appreciated in squash smear cytology and subsequent histopathology. In the present study, papillae were better appreciated with H and E and Leishman stains in a case of papillary meningioma [Figure 3a] and [Figure 3b].

Although CNS squash smears provide good cytological details a there are many diagnostic difficulties in the cytohistological interpretation.[9] This is exemplified in under diagnosing two cases of GBM as anaplastic astrocytoma. This could be attributed to sampling error as a result of exclusion of characteristic necrosis which is important for diagnosis of GBM. We missed a case of central neurocytoma by misdiagnosing it as oligodendroglioma as both these tumors share similar cytomorphological features. Perinuclear halo characteristic of oligodendroglioma on histological preparation is a fixation artifact not seen in cytological preparation. One may sometimes detect calcification which facilitates the diagnosis of oligodendroglioma. Presence of mini-gemistocytes, sparse glial fibers, and perineuronal satellitosis also favor its diagnosis. On the other hand, foci or background of finely fibrillary neuropil is a feature characteristic of neurocytoma [10].This experience

emphasizes the fact that intraoperative diagnosis is of utmost importance which needs to be dealt with extreme care and patience and in correlation with clinical and radio imaging findings.

In the present study, the overall diagnostic accuracy for the cytologic preparation was 86.33%, whereas, according to Govindaraman et al.,Nanarng et al., Jindal et al., it was 90.67%, 82.35%, 94.67%respectively.

In our study, sensitivity and specificity in detecting neoplastic lesions on cytology were 94.4%, and 85.7%, respectively, and supported by Govindaraman et al.(98.7% and 93.2%), Bhardwaj et al. (97.2% and 100%) and Sanjeev et al. (94.79% and 95.67%)[11,14,15].

The limited number of patients in our study precludes us for evaluation of the true value of squash cytology as standalone intra-operative diagnostic procedure. Our study, however, reaffirms the reliability of squash cytology and further multicentre studies may help to decide its use in neuroclinical practice.

Conclusion:

Our study provides the insight for the feasibility of using intraoperative squash cytology as standalone diagnostic technique for better management of patients in settings with economic limitations and where frozen section facility is not available. Also, in stereotactic biopsies, which provide scant tissue, diagnosis is fairly reached upon with CSC. We believe the squash cytology findings if interpreted in an algorithm together with the clinical and radio-imaging findings will help to reach an inexpensive, accurate and rapid diagnosis of central nervous system lesions especially in developing settings with many and varied limitations

References:

1. Ud Din N, Memon A, Idress R, Ahmad Z, Hasan S. Central nervous system lesions: Correlation of intra operative and final diagnoses, six year experience at a referral centre in a Developing Country, Pakistan. Asian Pac J Cancer Prev. 2011;12:1435–7.
2. Jha B, Patel V, Patel K, Agarwal A. Role of squash smear technique in intra operative diagnosis of CNS tumors. Int J Med Sci Public Health. 2013;2:889–92.
3. Mitra S, Kumar M, Sharma V, Mukhopadhyay D. Squash preparation: A reliable diagnostic tool in the intra operative diagnosis of central nervous system tumors. J Cytol. 2010;27:81–5.
4. Powell SZ. Intraoperative consultation, cytologic preparations, and frozen section in the central nervous system. Arch Pathol Lab Med 2005; 129:1635-52.
5. Goel D, Sundaram C, Paul TR, Uppin SG, Prayaga AK, Panigrahi MK, *et al*. Intraoperative cytology(squash smear) in neurosurgical practice- pitfalls in diagnosis experience based on 3057 samples from a single institution. Cytopathology 2007; 18:300-8.
6. Mitra S, Kumar M, Sharma V, Mukhopadhyay D. Squash preparation: A reliable diagnostic tool in the intra operative diagnosis of central nervous system tumors. J Cytol 2010; 27:81-5
7. Jaiswal S, Vij M, Jaiswal AK, Behari S. Intraoperative squash cytology of central nervous system lesions: A single center study of 326 cases. Diagn Cytopathol 2012; 40:104-12..
8. Nigam K, Nigam N, Mishra A, Nigam N, Narang A. Diagnostic accuracy of squash smear technique in brain tumors. JARBS. 2013;5:186-90.
9. Sharma S, Deb P. Intraoperative neurocytology of primary central nervous system neoplasia: A simplified and practical diagnostic approach. J Cytol 2011; 28:147-58.
10. Deb P, Kinra P, Bhatoe HS. Intraoperative cytology of central neurocytoma mimicking oligodendroglioma. J Cytol. 2011;28(4):219–222.
11. 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
12. Nanarng V, Jacob S, Mahapatra D, Mathew JE. Intraoperative diagnosis of central nervous system lesions: Comparison of squash smear, touch imprint, and frozen section. J Cytol 2015; 32:153-8.
13. 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.
14. 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.
15. Sanjeev K, Aparna B, Anuradha K, Brijesh T, Sanjay K, Neetika S. Intraoperative squash cytology of central nervous system and spinal cord lesions with histological correlation. Ann Pathol Lab Med 2016; 3:61-72