Evaluation of Central Nervous System Tumors by Squash and Imprint Cytology with Histopathological Correlation

Dr. Namita Goyal¹, Dr. Sneha Gupta², Dr. Deepika Gupta³
¹ Associate Professor, ² Resident Doctor, ³ Resident Doctor
Department of Pathology, R.N.T Medical College, Udaipur.

Corresponding Author: Dr. Namita Goyal, Associate Professor, Department of Pathology, R.N.T Medical College, Udaipur.

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Abstract

Introduction: Intraoperative diagnosis of space occupying lesions of the central nervous system is of utmost importance in order to plan the early treatment of patients. The study was designed to find correlation of imprint cytology, squash cytology with histopathological diagnosis of CNS Tumors in southeast region of Rajasthan.

Material and methods: The present cross-sectional study was conducted in a course of 6 months (April 2017 - September 2017) after approval by ethical committee of RNT Medical college, Udaipur. Tissue samples from 50 patients of CNS lesions were studied by imprint and squash cytology and results were compared with histopathological biopsy.

Results: Male predominance was seen in CNS tumors. Most common age group for was 21-30 year. Astrocytoma and schwannoma were seen in almost each age group, only one case of medulloblastoma seen in older age group (61-70 year). meningiomas were present commonly in patients aged > 20 yrs. Overall sensitivity, specificity and Diagnostic accuracy was greater for squash Cytology. WHO Grade I included maximum number of cases.

Conclusion: Squash and imprint cytology aid in early intraoperative diagnosis and help surgeons to make prompt treatment plan. Both techniques are technically simple, have high diagnostic accuracy despite the small sample size, rapid, cost effective and do not require any special instrument and hence both techniques can be used as primary tools for diagnosing CNS tumors.

Keywords: imprint cytology, squash cytology, CNS tumors

Introduction

Intraoperative diagnosis of space occupying lesions of the central nervous system is of utmost importance in order to plan the early treatment of patients. Several previous studies regarding correlation of cytological diagnosis with histopathological diagnosis showed good results. Dudgeon and Patrick.¹ 1927 were the first to study smears prepared from cut surface of freshly removed surgical biopsies from various tissues including breast, thyroid, and lymph nodes. Due to lack of awareness, imprint cytology and squash cytology are not practiced currently at our institution southeast Rajasthan. Cytological
methods are ideal for speedy intraoperative diagnosis of stereotactic CNS biopsy samples because the tissue is minimally distorted, and none is wasted.2 The study is designed to find correlation of imprint cytology, squash cytology with histopathological diagnosis of CNS Tumors in southeast region of Rajasthan. Vikram Narang and Sunita Jacob et al reported diagnostic accuracy of squash smears 89.2% and that of imprint cytology 78.4%. the low accuracy of touch imprint was attributed to poor cellular yield.3 Both the techniques can be used as primary tool for diagnosis if correlation with histopathology is accurate.4

Material and methods
The present cross-sectional study was conducted in course of 6 months (April 2017 - September 2017) after approval by ethical committee of RNT Medical college, Udaipur. Tissue samples from 50 patients of CNS lesions were taken during intraoperative procedure in department of neurosurgery, Maharana Bhupal Singh Hospital, Udaipur, Rajasthan. Both positive and negative control were taken. Collected clinical data included Registration number, Age, sex, site and primary clinical diagnosis and radiological diagnosis. freshly resected samples were collected in normal saline and following method was used for cytosmear preparation. Touch imprint smears were prepared by gently pressing the slides on the sample and fixed in 95% ethanol. Squash smear smears were prepared by taking a small piece (<0.5 mm in diameter) on a slide, and subsequently smearing it with another slide. Smears were then fixed and stained with May Graunwald Geimsa stain. Histopathological sections were stained with H&E stain. Results of Imprint and Squash smears were then compared with Histopathological diagnosis. WHO grading was used for interpretation.

Observations
The present study was conducted on 50 patient of CNS lesions. All lesions were diagnosed by cytology and histopathology. Incidence of various CNS lesions and their variants were studied in reference to age, sex, site of occurrence, cytological and main histopathological features. Factors which were observed were as follows:
1. Sex ratio of CNS lesions.
2. Age and sex distribution of CNS lesions.
4. Localization of CNS lesions.
5. Incidence of individual CNS lesions
6. Correlation of cytology and histopathology diagnosis.
The cases where intraoperative cytological diagnosis was same as the histological diagnosis including the grade of tumor were considered complete correlation.
Out of 50 operated CNS lesions male patients were 29 and female 21 with M: F of 1.38.
Maximum cases were in supratentorial location 26, 15 were infratentorial and 6 in spinal region.
In astrocytoma, meningioma, choroid plexus papilloma, papillary adenoma, neurocytoma, oligodendrogliaoma female preponderance was observed. Rest of the tumors were more common in males.

Table 1: Sex Incidence Of Various Lesions
Figure 2: Age And Sex Incidence Of CNS Tumors
Table 2: Age Incidence Of Various CNS Lesions
Maximum male patients were observed in 2nd decade followed by 3rd decade. Maximum female patients were observed in 3rd decade.

Table 3: Correlation Between Squash And Histopathological Diagnosis
Meningioma (12) and astrocytic tumors (10) formed main proportion of lesions in our study. One case of hemorrhagic blastoma was diagnosed as vascular lesion and one case of tuberculoma was diagnosed as chronic granulomatous lesion on imprint smears. One case of choroid plexus carcinoma was misdiagnosed as ependymoblastoma. One case of reactive gliosis was misdiagnosed as astrocytoma on imprint but was correctly diagnosed on squash smears.

Table 4: Correlation Between Squash And Histopathological Diagnosis
One case of tuberculoma and one case of chronic granulomatous lesion was diagnosed as chronic inflammatory lesion on squash smears. And one case of hemangioblastoma was diagnosed as vascular lesion on squash smears.

Out of 12 cases 11 show same results on histopathology, squash smears and imprint smears. One case of transitional meningioma was incorrectly diagnosed as meningothelial meningioma on imprint and squash smears.

Table 6: Who Grading Of CNS Tumors
Maximum cases were WHO grade I (23) followed by WHO grade II (10). The sensitivity and specificity of imprint smears was 97.8% and 66.7% respectively. And sensitivity and specificity of squash smears was 97.9% and 100% respectively. NPV of imprint smear was 66.7% and of squash smear was 100%. PPV of imprint smears was 97.8% and of squash smears was 97.9%.

Table 7: Comparison of Both Techniques

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Table 8: Various Studies: Imprint Cytology And Squash Cytology

Nishant et al (2012) reported a sensitivity 92.9%, specificity 90.6%, diagnostic accuracy 92% on imprint smears and sensitivity 90.6%, specificity 87.5% and diagnostic accuracy 89.3% on squash smears.

Table 9: COMPARISON OF RESULTS OF OUR STUDY WITH OTHER STUDY

Conclusion

The study was able to bring up cytological techniques as accurate diagnostic tool for early intraoperative diagnoses. This procedure is safe, very rapid, simple, easily reproducible and low-cost effective tool to diagnose brain lesion where frozen sections are not available. Thus, in future all neurosurgery operation theatre should be equipped with a cytology facility.
References


14. Iqbal et al (2007) studied 151 cases with intraoperative crush smear cytology and observed a diagnostic accuracy of 95.36% when histology was


![Figure 1: Imprint smear of Oligodendroglioma showing discohesive, relatively small tumor cells with scanty cytoplasm, uniform dark nuclei, no cell process (MGG 1000X). Squash smear of Oligodendroglioma showing chicken wire network of vessels. (MGG 100 X).](image1)

![Figure 2: Imprint Smear of Fibrous Meningioma showing plump spindle cells (MGG,400 X View). Squash smear of Fibrous Meningioma showing Plump spindle nuclei in sheets. (MGG,400 X View)](image2)

![Figure 3: Imprint of Medulloblastoma showing poorly differentiated cells arranged in rosettes with high N/C ratio and densely staining nuclei (MGG ,400 X View) and Squash smear of Medulloblastoma (MGG,400 X View) high cellularity with poorly formed rosettes.](image3)

![Figure 4: squash smear of Haemangioblastoma (MGG ,400 X view), Imprint smear (MGG, 400 X view)](image4)
Figure 5: Imprint smear of Tuberculoma showing epithelioid cells, lymphocytes. (MGG 1000 X). Histopathological section of Tuberculoma (H & E, 400 X).

Figure 6: Imprint smear of pilocytic astrocytoma showing presence of uniform nuclei with delicate chromatin surrounded by hair like elongated glial cell processes. (MGG, 400 X). Squash smear of pilocytic astrocytoma showing clustering of tumor cells around blood vessels. (MGG 400 X)