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Original Research Article

A study of squash smear cytology in the diagnosis of non-glial lesions in GMKMCH, Salem

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ABSTRACT

Background: Squash cytology is a rapid, inexpensive and accurate method of diagnosing intracranial lesions. Glial tumors are the most commonly encountered lesions whereas the Non-Glial lesions remain to be less explored. The distribution and detailed study of cyto-morphological features of Non-Glial lesions will lead to better diagnostic conclusions and effective managements.
Aims and Objectives: To analyze the distribution of Non-glial lesions using Squash cytology and to emphasize the potential of CNS smears in accurate diagnosis of Non-glial lesions.
Methods: This was a retrospective study conducted over a period of one year from November 2019 to November 2021 in 30 cases. Samples of Non-glial lesions obtained from the Department of Neurosurgery were studied using Squash cytology method and confirmed with histopathology.
Results: Out of the 30 cases studied, 2 cases were of non-neoplastic inflammatory lesions, 2 of them were cystic lesion, 19 cases were benign, 3 were malignant lesions and 4 cases were of metastatic origin. Meningioma was the most common benign tumor. Pediatric patients had more number of small blue round cell tumors.
Conclusion: Meningioma is the most common Non-glial tumor, followed by schwannoma. Metastasis is seen in elderly patients and pediatric cases presented with small round blue cell tumors. Squash cytology has a highly significant positive correlation with final histopathological diagnosis.

1. Introduction

The lesions of central nervous system are varied. The incidence of brain tumors in India is approximately 5 - 10 per 1,00,000 people.[1] Glial tumors are among the commonly encountered intra-cranial lesions which comprises about 40.3% of all brain tumors.[2] The non-glial lesions include a broad spectrum of conditions like meningioma, schwannoma, small round blue cell tumors and metastasis. Due to the infrequent incidence of these conditions, the knowledge of smear study in case of Non-glial lesions remains less explored. It is further difficult when the amount of biopsy material received is small.

Squash cytology is a rapid, inexpensive and effective method with an accuracy rate of 95%.[2] It requires only a minimal amount of tissue for diagnosis which is uplifts the paramount importance of squash cytology because resection of even a tiny tissue from functionally significant areas of brain is cumbersome.[3] Thus, it serves as a useful first line modality in directing the neurosurgeon towards appropriate management.[4–7] Also, it can be particularly useful in a resource limited setup wherein frozen sections cost more.[8] The method of making a smear is comparatively easier and can be stained by usual staining protocols. Kumaraguru et al considered squash cytology to be mirror

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image of histopathology.[9] However, detailed knowledge about smears of various CNS lesions is crucial in making a diagnosis.

This study aims to provide a detailed discussion about the squash cytology of various Non-Glial lesions encountered in our hospital and their distribution according to age and gender which will lead to better diagnostic conclusions and effective managements.

2. Aim and Objectives

1. To establish the efficacy of squash cytology in diagnosing non-glial tumors.
2. To analyze the distribution of various intracranial Non-Glial lesions in a tertiary care center, Salem.
3. To highlight the concordance of CNS smears with the gold standard histopathological diagnosis.

3. Materials and Methods

It is a retrospective study from November 2019 to November 2021, over a period of two years. A total of 30 cases were included in this study. Samples were obtained from Department of Neuro Surgery as fresh specimen. The labelled specimens were received and given an unique accession number. A tiny portion of the tissue was held between two clean glass slides and the tissue was crushed. The slides were moved in opposite directions to smear the tissue. The smears were immediately fixed in absolute alcohol solution. After 15 minutes, the slides were stained with Hematoxylin and Eosin staining method. The cytological features of the cases were studied and diagnosed. The remaining tissue was fixed with 10% neutral buffered formalin, processed and stained with Hematoxylin and Eosin stains. The cytological diagnosis was then confirmed with histopathological diagnosis.

3.1. Inclusion criteria

All intracranial neoplasms which were diagnosed as Non-glial lesions in histopathology were included.

3.2. Exclusion criteria

Extracranial neoplasms, osseous neoplasms and glial lesions were excluded from the study.

3.3. Sample size

30.

3.4. Age distribution

During a period of two years from November 2019 to November 2021, a total of 30 cases with Non-glial lesions were included in this study. Out of the 30 cases studied, the majority of the cases belonged to the age group of 51-60years. 3 pediatric cases were also included in the study. The Table 1 shows Age wise distribution of cases.

Table 1: Age wise distribution of cases

Age group	No. of cases
10-20 years	3
21-30 years	2
31-40 years	4
41-50 years	4
51-60 years	5
61-70 years	3
>70 years	1
Total	30

3.5. Sex distribution

There was a slight female preponderance with 17 cases, comprising 58% of the sample size. 13 cases were males occupying 42% of the sample size.

3.6. Distribution of cases according to location

The maximum number of tumors occurred in the frontal lobe. It was followed by cerebellopontine angle tumours. Nearly all of the tumours arising from the cerebellopontine angle were schwannomas. The distribution of cases according to their intracranial location are enlisted as in Table 2.

Table 2: Distribution of lesions according to location

S. No.	Location	No of cases
1	Cerebello Pontine Angle	6
2	Frontal	10
3	Fronto- Parietal	3
4	Parietal	3
5	Temporal	1
6	Occipital	1
7	Cerebellum	2
8	Suprasellar	2
Total		30

3.7. Distribution of cases

In our study, meningioma was the most commonly occurring Non-Glial lesions, followed by schwannomas. The total number of meningiomas studied was 12 which is double the number of schwannomas. The accuracy rate of diagnosing the lesions by squash cytology is 93.3%.

4. Discussion

The present study was conducted from November 2019 to November 2021 over a period of 2 years. Though various studies have been made in this subject, Jindal et al. suggested that it is necessary to know the essential clinical

Table 3: Distribution of non-glial lesions

Type of lesion	No. of cases correctly diagnosed by squash cytology	No of discordant cases	Accuracy rate
Non-Neoplastic Lesions			
Epidermoid cyst	2	0	100%
Infectious etiology	2	1	50%
Benign Tumors			
Meningioma	12	1	96.67%
Schwannoma	6	0	100%
Pituitary adenoma	2	0	100%
Malignant Tumors			
Medulloblastoma	2	0	100%
Lymphoma	1	0	100%
Metastasis			
Squamous Cell Carcinoma	1	0	100%
Malignant Melanoma	1	0	100%
Adenocarcinoma	1	0	100%
Total	30	2	93.3%

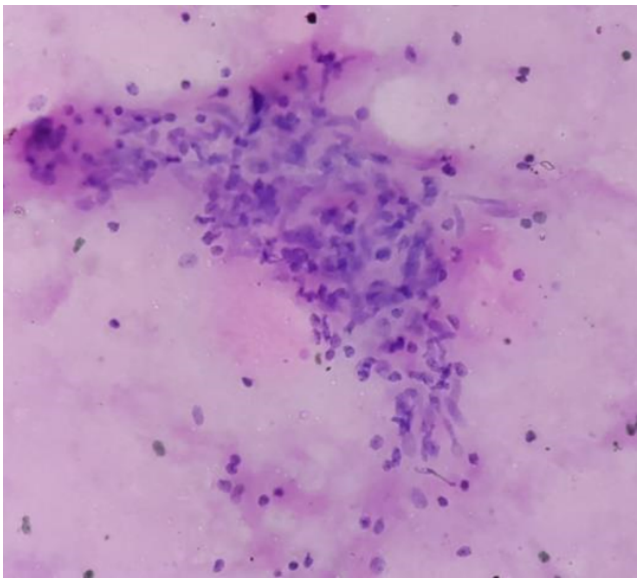

Figure 1: Showing epitheloid cell clusters in a fibrillary background- Tuberculous abscess (40x view)

history and radiological imaging before smear evaluation.[10] Squash cytology of Non-Glial lesions of a total of 30 cases was studied. The commonly affected age group was 51-60 years. This was similar to a study conducted by Seema Acharya et al,[11,12] and Kaki et al.[13] Also, the majority of the patients were adults rather than elderly patients and children. Dogar et al,[14] Deshpande et al[15] and Goyani et al[16] showed that majority of the cases were observed in fourth decade.

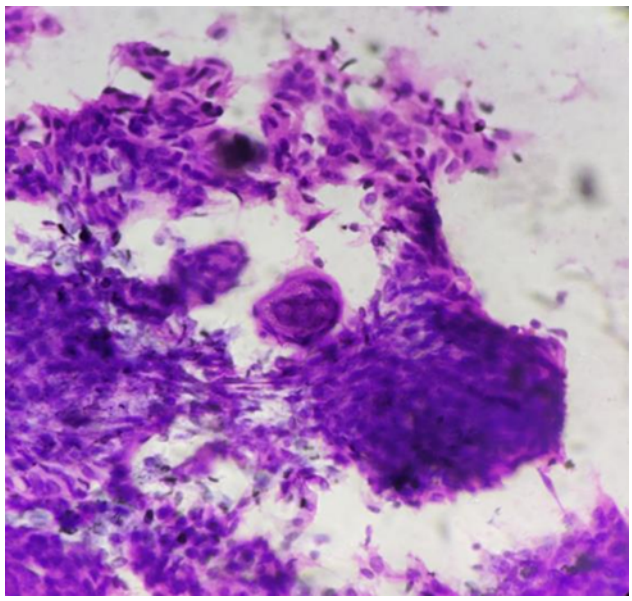

Figure 2: Showing whorls of meningothelial cells with focus of psammamatous calcification – Meningioma (40x view)

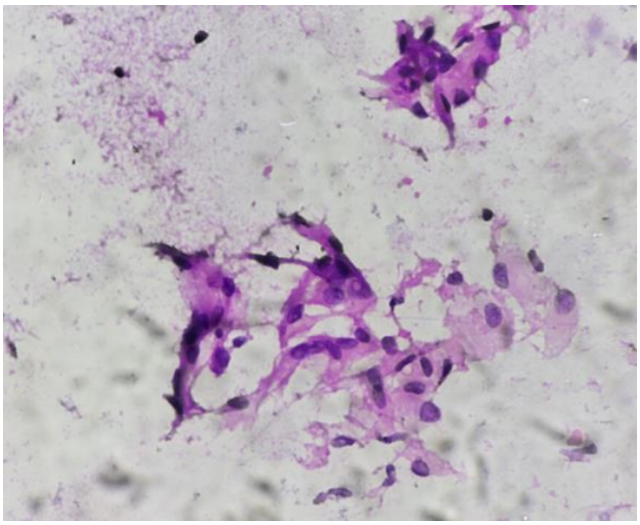

Figure 3: Showing intranuclear inclusions in meningothelial cells – Meningioma (40x view)

Among the 30 cases studied, there was a slight female preponderance in the distribution of cases. Although a study conducted by Deorah et al[17] suggests that males are at higher risk in procuring brain tumours than females due to the difference in susceptibility of X and Y chromosomes to the tumour stimuli, the recent WHO classification states that most of the Non-Glial lesions like meningiomas and schwannomas occur commonly in females rather than males.[18]

The distribution of lesions in our study showed frontal lobe as the common location of majority of tumours. It

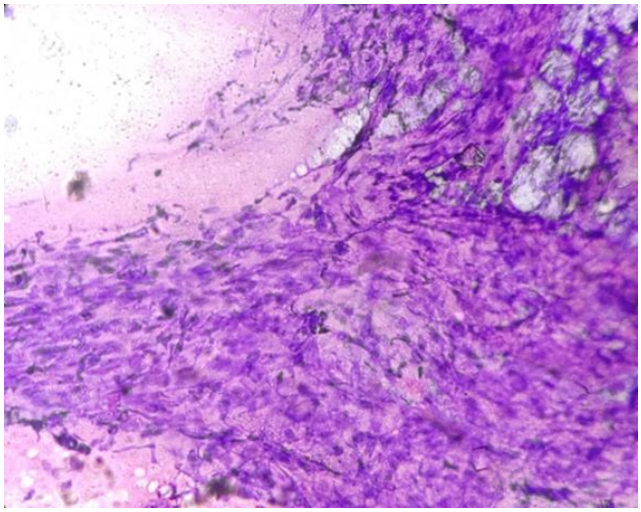

Figure 4: Showing cohesive sheets of spindle cells – Schwannoma (10x view)

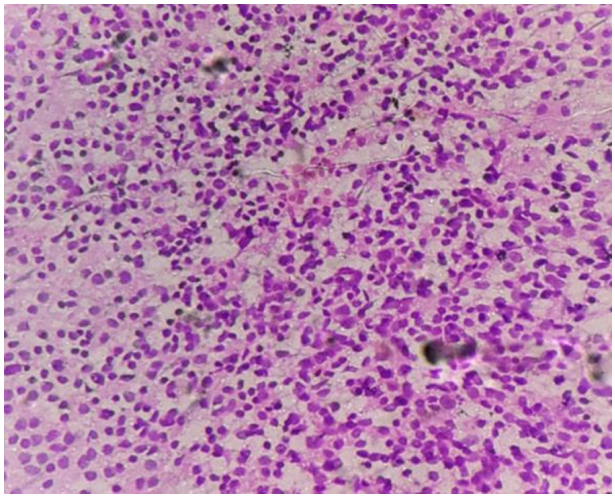

Figure 5: Showing cells with scant cytoplasm and hyperchromatic nuclei- (Medulloblastoma- 40x view)

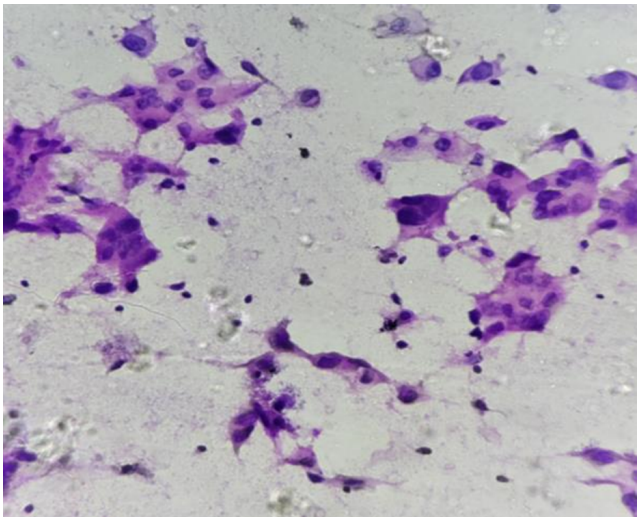

Figure 6: Showing clusters and singly scattered polygonal cells with moderate cytoplasm with pleomorphic vesicular nuclei and coarse chromatin- Metastatic squamous cell carcinoma deposits (40x view)

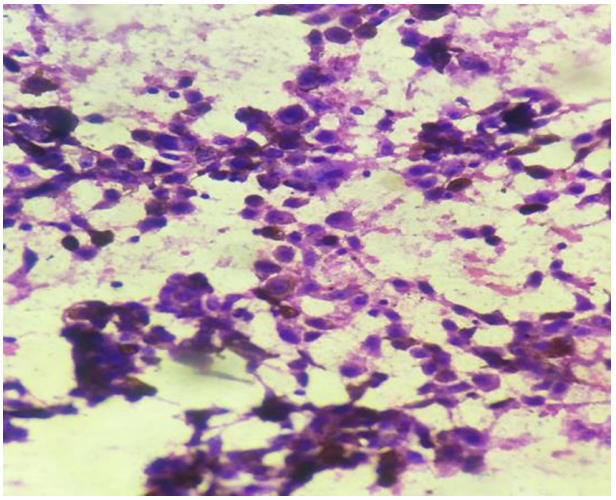

Figure 7: Showing melanin pigments in malignant cells- Metastatic melanoma (40x view)

was followed by cerebellopontine angle where nearly all of the tumours encountered were Schwannomas. One case of temporal abscess was seen which turned out to be a case of Aspergillosis. Both the cases seen in cerebellum turned out to be Medulloblastomas. Fronto-temporal was reported to be the common site by a study conducted by Nanarng et al[19] whereas parietal region was the commonest in studies done by Kaki et al,[13] Goyani et al[16] and Dogar et al.[14]

The accuracy rate of Squash cytology with comparison to the final histopathology was 93.5%. The sensitivity and specificity were 96.5% and 98.7% respectively. This proves the utility of squash smear cytology in diagnosing CNS lesions. Chart 4 compares the number of cases diagnosed by squash cytology and their corresponding histopathological analysis.

In our study, one case of meningioma was misdiagnosed as metastatic adenocarcinomatous deposits. This is because of the absence of whorls and psammoma bodies which are the characteristic features of meningiomas. However, it is a commonly encountered pitfall which could be overcome by correct smearing techniques and the identification of broad fibers connecting meningothelial cells.[20] Studies done by de Souza Balsimelli et al[21] and Mitra et al[22] encountered similar diagnostic pitfalls and have suggested solutions to avoid them.

Fungal infections of CNS can occur in immunocompromised individuals, masquerading as mass lesions in radiology. Clinical history and MRI findings

are crucial before attempting to diagnose a case of CNS infection. The presence of plasma cell rich infiltrates along with ill-defined granulomas and fungal hyphae helped in the diagnosis of two cases in a report published by Parth A. Desai et al.[12] In our study, definitive fungal hyphal elements were not seen and hence the case was reported as inflammatory smears. The sensitivity, specificity and accuracy of squash cytology in diagnosing specific lesions in our study were as follows:

The results of our study were similar to that of a study done by Seema Acharya et al.[11] The accuracy rates of the study in diagnosing meningiomas, schwannomas, pituitary adenomas, epidermoid cysts and metastasis were 95.1%, 100%, 100%, 100% and 81.8% respectively.

5. Conclusion

Squash cytology proves to an effective and rapid technique for the typing of Non-glial lesions. Meningioma is the most common tumor followed by schwannoma. Males are more commonly affected than females. The common age group affected was middle-aged adults. Squash cytology proves to be an effective alternative for histopathology. In our study, the diagnostic accuracy of CNS smears in comparison to histopathology is 93.75%.

6. Source of Funding

None.

7. Conflict of Interest

None.

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