



## DIAGNOSTIC ACCURACY OF SQUASH CYTOLOGY IN MENINGIOMA

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**ABSTRACT** **BACKGROUND :** Primary Central nervous system tumours occupies less than 2% of overall human cancers in adults. Among primary intracranial tumours, 20-30% are occupied by meningiomas. The accurate diagnosis of intracranial tumour is necessary for therapeutic and prognostic purpose. Intraoperative smear cytology provides a rapid diagnosis which helps the neurosurgeon for immediate decision regarding the extent of surgery.

**Objectives:** To determine the accuracy of squash preparation, by comparing it with histopathological sections and analysing the cytomorphological features of meningioma

**METHODS:** This was both retrospective and prospective study. We received twenty radiologically and clinically suspected meningiomas in saline with fixatives. Crush smear were made and stained with rapid Haematoxylin and Eosin. The corresponding biopsy materials were fixed in 10% neutral buffered formalin and submitted for tissue processing. Staining was done with routine Haematoxylin and Eosin stain. The cytomorphological features of these tumours were correlated with histopathological sections.

**Results.:** In our study, we received twenty case of meningiomas, tissue of all the tumours were soft and easy to smear except a case of fibrous meningioma which was relatively difficult to smear. Transitional meningioma was the most common histological type in our study, constituting 50% followed by meningothelial meningioma (40%). We got 100% correlation between squash cytology and histopathology.

**Conclusion:** Squash cytology is simple, rapid, accurate and cost effective diagnostic tool for meningioma.

**KEYWORDS :** Meningioma, squash cytology.

#### INTRODUCTION:

Primary central nervous system tumours constitutes less than 2% in adults but second most common tumours in children after leukemia. Meningioma occupies 24-30% of primary intracranial tumours.<sup>1,2</sup> Squash smear technique provides a rapid intraoperative diagnosis and guidance to the neurosurgeon during surgical resection and lesion targeting. High water content and inherent soft nature make frozen sections interpretations difficult. Squash cytology act as an alternative method to frozen section for intraoperative consultation. It is fairly accurate, relatively safe, rapid, simple, easily reproducible and cost effective technique.<sup>3</sup>

The role of squash cytology has increased with the development of CT and MRI guided stereotactic biopsies which yield a small quantity of tissue.

The present study is to determine the accuracy of squash cytology for rapid intraoperative diagnosis of meningioma and its correlation with histopathological diagnosis.

#### MATERIALS AND METHODS:

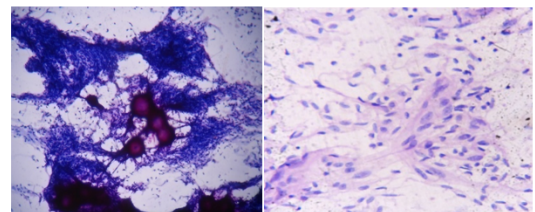
The study was carried out in the Department Of Pathology, Madurai Medical College, Madurai, for the period of two years. During this period, 20 specimens of radiologically and clinically suspected meningiomas were received in saline without any fixative. Squash smear were made and stained with rapid Haematoxylin and Eosin. The corresponding biopsy materials were fixed in 10% neutral buffered formalin and submitted for tissue processing. Staining was done with routine Haematoxylin and Eosin stain. The cases were classified based on WHO classification, 2007. The diagnostic accuracy of squash cytology of meningioma was compared with histopathological diagnosis. The observations were compared with other studies and inferences drawn.

#### OBSERVATIONS AND RESULTS:

In our study, we received twenty case of radiologically and clinically suspected meningioma, tissue of all the tumours were soft and easy to smear except a case of fibrous meningioma which was relatively difficult to smear. Transitional meningioma was the most common histological type in our study, constituting 50% followed by meningothelial meningioma (40%), fibrous meningioma and microcystic meningioma each constitutes 5%.

Squash cytology of meningioma was compared with histopathology and complete correlation were achieved in all the cases.

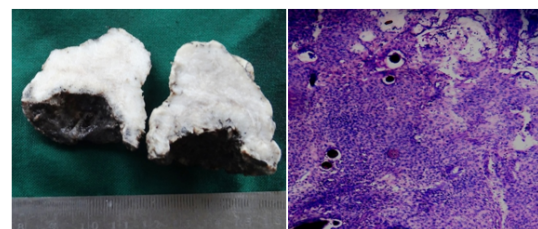
Meningioma type	Number of cases
Transitional meningioma	10
Meningothelial meningioma	8
Fibrous meningioma	1
Microcystic meningioma	1



A)

B)

Fig.1- Squash cytology Transitional meningioma. A) Tumor cells are arranged in sheets with irregular margins with psammoma bodies. (H&E, 100x). B) shows oval nuclei with diffuse chromatin and small nucleoli. (H&E, 400x).



A)

B)

Fig 2 – HPE: A) Macroscopic appearance of Transitional meningioma. Solid gray white lobulated mass, anchored to the dura mater. B) Lobular arrangement of meningothelial cells with indistinct cytoplasmic borders and psammoma bodies. (H&E, 100).

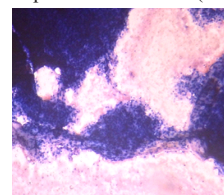


Fig.3 Squash cytology–Meningioma. Clusters of meningothelial cells are arranged in clusters and hyperplastic vessel.(H&Ex100).

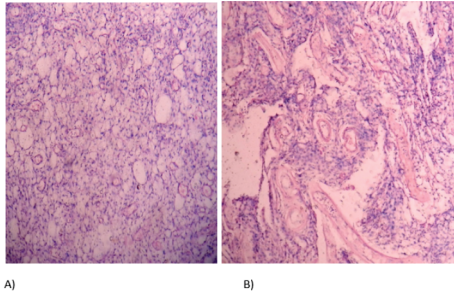


Fig.4A)HPE: Microcystic meningioma. Tumor has a loose, lace-like pattern.(H&Ex100).B) Microcystic meningioma. Hyalinised stromal vessel. (H&Ex100)

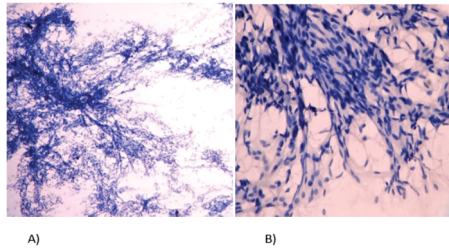


Fig.5 A)Squash cytology – Fibroblastic meningioma. Tumor cells are arranged in fascicles which interweave and overlie one another.(H&Ex100). B)shows spindle shaped cells with elongated nuclei.(H&Ex400).

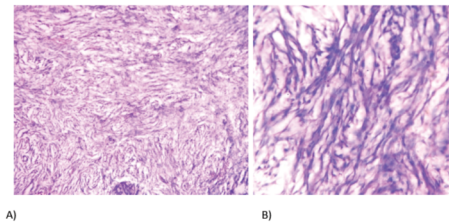
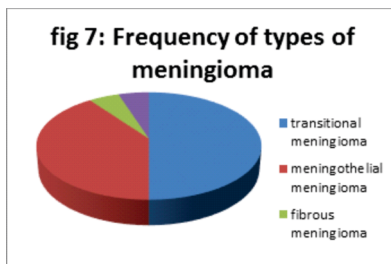


Fig.6HPE: A) – Fibroblastic meningioma. Fibroblast like spindle cell tumors are arranged in storiform growth pattern. (H&Ex100). B)shows spindle cells with elongated nuclei. (H&E x400)



**DISCUSSION:**

In early '30s, squash technique was introduced as intraoperative neurosurgical diagnosis and the advent of stereotactic neurosurgical technique produces very small specimen which are difficult to get a section on cryostat and increased the popularity of squash cytology in rapid diagnosis.

This present study was done to evaluate the diagnostic accuracy of squash cytology of meningioma and their level of correlation with histopathological diagnosis. Complete correlation was obtained. It demonstrated 100% diagnostic accuracy on squash smears of meningioma.

Most meningioma are benign and falls under the grade I in WHO. But some meningioma are classified as WHO grade 2 (atypical) and 3 (anaplastic). These tumors are more prone for recurrence and aggressive clinical behavior. Meningiomas commonly occur in middle age to elderly adults and peak incidence in sixth to seventh decades of life.<sup>4,5</sup> and sex predilection to female,<sup>2,6</sup> due to the expression of estrogen receptors.<sup>6</sup> It may also seen in children.

Smears can be made easily from meningioma, as it is a soft tumor. Tumors with variable cellularity and are seen as clumps with varying size and irregular margins which are unrelated to the blood vessels. Each tumour cells have round to oval nuclei with diffuse delicate chromatin and inconspicuous nucleoli, pale cytoplasm and have ill-defined cell borders.

Meningothelial meningioma are highly cellular tumor. It is composed of epithelioid meningothelial cells arranged in the form of cellular whorls or syncytial pattern.

Fibroblastic meningioma are difficult to make a smear and are composed of elongated cells which are arranged in storiform or intersecting fascicles pattern.

Transitional meningioma composed of mixture of islands of meningothelial cells and the fibrous types of spindle shaped cell in interlacing bundles. Numerous whorls and sometimes psammoma bodies are seen.

Microcystic meningioma are composed of tumour cells with elongated processes surrounding a clear space which contain pale eosinophilic mucin. Hyalinized thick walled small blood vessels and pleomorphic cell and nuclei are frequently encountered.

In our study, we received a tissue of all tumours were soft and easy to make smears except a case of fibrous meningiomas which relatively difficult to make a smear.<sup>5,7</sup> Transitional meningioma was the most common histological type in our study, constituting 50% followed by meningothelial meningioma (40%). All these tumours were easy to smear and showed highly cellular with meningothelial cells were arranged in whorls, clusters and sheets with irregular margin.

Individual cells were ill defined cell border, moderate eosinophilic cytoplasm and oval vesicular nucleus, some of them shows pseudonuclear inclusion. Occasional cells showed mild pleomorphic nucleus. Numerous psammoma bodies were seen in the background. Smears from fibrous meningioma were highly cellular and the tumor cells are arranged in ill-defined fascicles which interweave and overlie to one another. The individual tumor cells were spindle shaped cells with scant to moderate eosinophilic cytoplasm and elongated nuclei. Smear of microcystic meningioma showed hyperplastic vessel. All of these tumours were confirmed by their corresponding histopathology. In our study, the diagnostic accuracy was 100% which was similar to the study of Kumar SN et al. and Kini JR et al.<sup>18</sup> 97.9% in similar study of Roessler K et al<sup>5</sup> and 95% in Shukla K et al study.<sup>9</sup>

**Table 1: comparison with other study**

Name of the similar study	Accuracy in percentage
Kumar SN et al	100
Kini JR et al	100
Roessler K et al	97.9
Shukla K et al	95
Current study	100

**SUMMARY AND CONCLUSION:**

We had observed a complete correlation between squash cytology and its histopathology in meningioma. So Intraoperative squash cytology are rapid and reliable diagnostic tool for meningioma.

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