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DIAGNOSTIC ACCURACY OF FROZEN SECTION IN DETECTING MALIGNANT BRAIN TUMORS TAKING HISTOPATHOLOGY AS GOLD STANDARD.

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ABSTRACT… Objectives: To evaluate the diagnostic accuracy of frozen section in detecting malignant gliomas, taking histopathology as gold standard. **Study Design:** Cross-Sectional study. **Setting:** Neurosurgery Department, Aga Khan University Hospital, Karachi. **Period:** From March 2018 to Jan 2019. **Material & Methods:** Through consecutive sampling technique, total 100 specimens from patients suspected of malignant gliomas on MRI brain with contrast, who were admitted in the neurosurgery department for elective tumor surgery were included. Intraoperatively, the specimen from the lesion identified on imaging through neuro-navigation was taken and sent to histopathology department for frozen section analysis. The histopathology consultant was pre-informed about the case and probable time of receiving the specimen. The specimen for frozen section was sent in a dried container without formalin. Once received in pathology department, the tissue is rapidly cooled through a cryostat which converts tissue water into the ice and makes the tissue rigid for cutting into slices and viewing under the microscope for identifying the neoplastic tissue. The consultant histopathologist was request to provide frozen section report immediately and to keep the remaining specimen for definitive histopathology reporting as well. Data of malignancy on both Frozen Section and formal histopathology report was noted and comparison was done. **Results:** Mean age of the patients was 36.7±8.76 years. There were 64 (64%) male patients and 36 (36%) female patients. Diagnostic accuracy of frozen section taking histopathology as a gold standard shows that sensitivity was found to be 83.3%, specificity 84.4%, Positive predictive value (PPV) 71.4% and negative predictive value (NPV) 91.5% & Overall diagnosis accuracy was found 96.6%. **Conclusion:** The Diagnostic accuracy of frozen section (FS) in detection of brain malignant gliomas was found to be satisfactory. It has a diagnostic accuracy of 96.9%, sensitivity 83.3%, specificity 84.4%, Positive predictive value (PPV) 71.4% and negative predictive value (NPV) 91.5%.

Key words: Diagnostic Accuracy, Frozen Section, Histopathology, Malignant Lesions.

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INTRODUCTION

Despite appreciating advancements in neuro-radiology techniques, proper planning in neurology procedures is still dependent on histopathology reporting.[1] The pathologist role is very important during neurology procedures; it helps to guide neuro-surgeons for on-going neurosurgery especially involving the tumors. Pathologists help in differentiating the inflammatory masses from tumors and high grade tumors with cystic components.[2,3] Frozen section (FS) have a very vital role for decision making of patients with neoplastic versus non-neoplastic neurological lesions. Since FS introduction, this technique has got widespread and rapid acceptance.[4] FS provides easy and quick pathological information to the operating surgeons while the patient is still on operating table. The specimen for frozen section is sent in a dried container without formalin. Once received in pathology department, the tissue is rapidly cooled through a cryostat which converts tissue water into the ice and makes the tissue rigid for cutting into slices and viewing under the microscope for identifying the neoplastic tissue. The tissue structure is well preserved by dried cooling, thus providing better

visualization of stroma and tumors.[5]

The ultimate purpose of FS is to provide accurate information in a shorter time to the surgeons to make immediate decision regarding nature of lesion, the extent and adequacy of resection thereby preventing the need of reoperations.[6,7]

The neuro-surgeon main confidence on FS is its diagnostic accuracy. So FS are routinely compared to the permanent sections to evaluate their diagnostic accuracy. This helps to evaluate discrepancies and deficiencies in FS reporting that may occur due to sampling errors, or interpretation errors.[8] Correction of these errors helps to improve of diagnostic accuracy of FS. Therefore it is recommended to do periodic review of accuracy in histopathology departments.[9]
In present study we aimed to evaluate the diagnostic accuracy of frozen section in detecting malignant brain tumors taking histopathology as gold standard.

MATERIAL & METHODS

In this cross-sectional study a total number of 100 specimens of patients who were suspected of brain tumor on MRI brain with contrast and were admitted in the neurosurgery department for elective tumor surgery, were included. Diagnosed cases of brain tumor who came with recurrence, patients with already reported tumor on histopathology, and patients with metastasis, arterio-venous malformations, abscesses, chronic granulomatous inflammation, lipomas, and tumours of the scalp were also excluded from the study. The study duration was from March-2018 to Jan-2019.

Intraoperatively, the specimen were sent to histopathology department. The consultant histopathologist was request to provide frozen section report immediately and to keep the remaining specimen for histopathology reporting as well. Data of malignancy on both FS and histopathology report was noted and compared.

Data regarding patient's age, gender, as well as FS and histopathology reporting was collected and entered in SPSS v23. Software for further analysis. 2×2 contingency table was tabulated for calculation of diagnostic accuracy of FS against histopathology reporting.

RESULTS

Mean age of the patients was 36.7±8.76 years. There were 64 (64%) male patients and 36 (36%) female patients. Frozen section findings showed that Malignant Glioma was found in 56 (37%) patients. While histopathology findings revealed Malignant Glioma in 48 (31.7%) patients. Diagnostic accuracy of Frozen Section taking histopathology as a gold standard shows that sensitivity was found to be 81.25%, specificity 83.82%, PPV 70.27% and NPV 90.47% and overall diagnostic accuracy was 83% (Table-I).

Frozen Section	Histopathology		Total
	Positive	Negative	
Positive	26	11	37
Negative	06	57	63
Total	32	68	100

Sensitivity = (26÷ 32) × 100 = **81.25%**
Specificity= (57 ÷ {57+11}) × 100= **83.82%**
Positive predictive value = (26 ÷ 37) × 100 = **70.27%.**
Negative predictive value = (57÷63) × 100 = **90.47%**
Diagnostic Accuracy = (83÷100) x 100 = **83**%

Table-I. 2×2 Contingency table for calculation of diagnostic accuracy of frozen section (FS) for diagnosis of malignant neoplasm taking histopathology as gold standard.

DISCUSSION

Frozen section (FS) reporting provides information regarding primary diagnosis intra-operatively and help the surgeon to decide appropriate surgical options. It gives important information like either the biopsy is from appropriate area, and adequacy of the specimen taken to make final diagnosis.[10] However, interpretation of FS is not an easy challenge for histopathologists. There are many factors which can limit the diagnosis such as very fragile nature of brain tissues, inappropriate specimen volume, extreme vascularity, necrosis and unconventional cellular morphology. Moreover, surgeons also use cautery for tumor dissection that can also alter tumor morphology due to burning trauma.[11] Experience of consultant,

and failure to recognize technical errors are also factors leading to misdiagnosis.[11] So, the diagnosis of brain tumors is always based on a combination of clinical assessment, radiological findings and histopathological reporting.

CNS tumors are a major health concern because of increasing frequency, high morbidity, high mortality and poor prognosis. These neoplasms comprise 2% of all cancers and in children is the second most common type of cancer.[12,13]

Brain tumor is highly aggressive among all malignancies, the grade IV gliomas are among the worst prognosis cases, with a median survival of only 12 months, while only 4% patients have survival of more than 5 years after diagnosis. Prognosis is based on patients age and grading of tumor.[14,15]

In present study, sensitivity of FS was 81.25%, specificity 83.82%, PPV 70.27% and NPV 90.47% and overall diagnostic accuracy was 83%.

A study by Khoddami et al. involving 273 specimens reported that FS reporting has accuracy of 99.5%, sensitivity of 91.4%, specificity 99.7%, PPV of 88.4% and NPV of 99.8%.[16]

Another study from Pakistan by Nasir-Ud-Din et al. reported that FS has a diagnostic accuracy of 88.9%, sensitivity of 94.8%, specificity 87.5%, PPV of 98.6% and NPV 63.6%.[17]

Higher the diagnostic accuracy of the frozen section, the lower are the chances of false negative or false positive results about the nature of specimen. Thus, with an acceptably high diagnostic accuracy, the surgeon can more confidently rely on the results of FS, with its direct impact on whether to proceed with surgery or be content with biopsy alone in case of eloquent area, deep seated or extensive and diffuse type tumors.

CONCLUSION

The Diagnostic accuracy of frozen section (FS) in detection of brain malignant gliomas was found to be satisfactory. Sensitivity of FS was 81.25%, specificity 83.82%, PPV 70.27% and NPV 90.47% and overall diagnostic accuracy was 83%.

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AUTHORSHIP AND CONTRIBUTION DECLARATION

Sr. #	Author(s) Full Name	Contribution to the paper	Author(s) Signature
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2	Badar Uddin Ujjan	Experimentation / Study conduction.	
3	Naveed Zaman Akhunzada	Analysis / Interpretation / Discussion.	
4	Saad Bin Anis	Manuscript writing / Designing.