

Neuroendoscopic Biopsy of Brain Lesions; Accuracy and Complications

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ABSTRACT

Objective: To assess the accuracy of neuroendoscopic biopsy of brain lesions and complications associated with it.

Study Design: Retrospective study.

Place and Duration of Study: This study was conducted at the Department of Neurosurgery, Nishtar Hospital Multan from January 2010 to March 2020.

Materials and Methods: There were 347 cases of neuroendoscopic processes performed in different patients during a period of almost 10 years. We selected 40 patients with intra-ventricular or periventricular lesions according to the database present and obtained the biopsy samples from these patients. Only life threatening complications were taken into account. Bleeding was considered as major complication that leads to execution of the procedure, requirement of unplanned EVD insertion or if detected postoperatively cause further surgery. All the data was subjected to statistical analysis with the help of computer software SPSS version 23. Frequency and percentages were calculated for categorical variables while mean and standard deviation was calculated for continuous variables.

Results: Total 33 (82.5%) samples were accurately diagnosed as 12 of these were reconfirmed by new sample, 13 patients' diagnoses showed compatibility with the ongoing treatment, and diagnosis of 8 patients was compatible with the follow up. Total 5 (12.5%) samples were inaccurately diagnosed as new biopsy results varied in 3 patients, clinical course was not aligned with the diagnosis in one patient and indecisive findings were observed in one patient. Of 40 biopsies, 38 samples were included in complete study because one patient died and one patient lost follow up.

Conclusion: The results of our study show that the use of the new method to assess the accuracy of endoscopic biopsy revealed high accuracy in diagnostic biopsy.

Key Words: Neuroendoscopic Biopsy, Brain, Lesions, Intraventricular, Periventricular, Hemorrhage, Endoscope.

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INTRODUCTION

Endoscopic brain biopsy was a technique first established by Fukushima in 1973 with a flexible fiberoptic ventriculofiberscope¹. Later on after 5 years he reported that out of 21 endoscopic biopsies in patients with intraventricular tumors only 11 patients had correct histopathological diagnosis.² Now-a-days endoscopy is an important technique for management of intra- and periventricular tumors^{3,4,5}. It is a highly acceptable by the clinicians and preferable technique by the clinicians for tissue sampling.

A variety of diagnostic outcomes for endoscopic procedures were reported in spite of its high acceptance⁶. Literature review on the technical aspects of the endoscopic biopsy of brain tumors showed its success rate and accuracy, as they relate to the diagnostic outcomes of the procedure.

Use of neuroendoscopic procedures has spread enormously due to latest developments in the optics and lens technologies. There are some reports on the use of neuroendoscopic biopsy in order to obtain tissue samples of brain^{6,7,8}. On the other hand, there are a number of studies present already dealing with same issue but there is still no clarification regarding accuracy of this technique. In many reports there is no comparative study of endoscopy with any other technique or any other developed treatment and along with this, only cases of tumor were studied in almost all of the literature papers. As there is difference in the techniques and very few cases have been assessed in studies, the complication rate varies study to study. In our study aim was to evaluate the accuracy by comparison of neuroendoscopic biopsy with other biopsy techniques in previous studies and thereby evaluating the treatment evolution. The difficulties and other complications during the neuroendoscopic biopsy

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procedure are presented and compared with those reported in other study present.

MATERIALS AND METHODS

In the Department of Neurosurgery in Nishtar Hospital Multan, there were 347 cases of neuroendoscopic processes performed in different patients during a period of almost 10 years from January 2010 through March 2020. We selected 40 patients with intra-ventricular or periventricular lesions according to the database present and obtained the biopsy samples from these patients. Sample size was calculated using the reference study by Giannetti et al.⁹ Non probability consecutive type of sampling technique was used to collect the sample. There was no age limitation for the patients in this study. Furthermore, patients having any pathology of walls of the supratentorial ventricular system (inside or outside the wall) and biopsy plans in spite of its success were a part of inclusion criteria for this study. Patients, in whom procedures like tumor resection such as for colloid cysts, cyst aspiration, or cyst removal were performed, were not included. After approval from the Ethics Committee of the Hospital for the research projects, patients were called for the follow-up after reviewing their charts and histopathology reports. In case of CSF flow obstruction, CSF diversion process was done along with biopsy using different techniques on the basis of site CSF flow obstruction. Tissues were stained by H and E staining, after embedded in the paraffin, while few were stained by immunohistochemical staining later on.

There was no suggested treatment approach in case of the benign and unresectable neoplasms or ependymitis resulting to cysticercosis. For measuring the accuracy and diagnostic confirmation of biopsy specimen comparison between, histopathological outcomes and specimen taken postoperatively (after open surgery), reaction to the treatment plan as medical treatment, chemotherapy, and/or radiotherapy and the clinical and radiographic findings was necessary. When histopathological diagnosis and sample obtained during craniotomy matched, there was consistency between the treatment and the diagnosis, the diagnosis and follow-up symptoms were well-matched then endoscopic biopsy was believed to be correct.

On the other hand, when each new sample taken during craniotomy required new diagnosis or changing in tumor rank leading to change in treatment strategy or prognosis and difference in treatment response in follow-up patients than expected response, endoscopic biopsy was considered inaccurate. Minor complications of endoscopic procedure were not considered in this type of retrospective study and were underestimated and only life threatening complications were taken into account.

Shunt related dysfunctions were also ignored because this study did not included patients with hydrocephalus.

Bleeding was considered as major complication that leads to execution of the procedure, requirement of unplanned EVD insertion or if detected postoperatively cause further surgery. The cause of these complications may relate directly to biopsy, or to the opening of the third ventricle, or to the endoscopic navigation. Other hemorrhagic conditions were excluded. CSF examination and positive culture were carried out for diagnosing bacterial meningitis or ventriculitis. In case of any complication reoperation was considered i.e. any second surgery, but EVD insertion was not regarded as second surgery (even not scheduled before). All the data was collected in the form of a predesigned proforma by the researcher himself. All the data was subjected to statistical analysis with the help of computer software SPSS version 23. Frequency and percentages were calculated for categorical variables while mean and standard deviation was calculated for continuous variables.

RESULTS

Successful biopsy was performed in 40 patients and histopathological diagnosis was made. Most common tumor was glioma grade II and it was present in 5 (12.5%) of the patients. High grade glioma (III & IV) and Cysticercosis were diagnosed in 4 (10 %) patients each. Pilocytic astrocytoma, Pineoblastoma and Germinoma were diagnosed in 3 (7.5 %) patients each. Cryptococcosis, Epidermoid tumor, Craniopharyngioma, Leukoencephalopathy, Medulloblastoma (metastasis), Paracoccidioidomycosis and Toxoplasmosis, each was diagnosed in 2 (5.0 %) patients. Non-specific finding was observed in 3 (7.5 %) biopsy samples, while one (2.5 %) sample consisted of normal tissue. Table-1

Table No.1: Histopathological diagnosis of 40 biopsy samples

Diagnosis	Number	Percentage
Glioma grade II	5	12.5 %
High-grade glioma (III & IV)	4	10.0 %
Cysticercosis	4	10.0 %
Pilocytic astrocytoma	3	7.5 %
Pineoblastoma	3	7.5 %
Germinoma	3	7.5 %
Cryptococcosis	2	5.0 %
Epidermoid tumor	2	5.0 %
Craniopharyngioma	2	5.0 %
Leukoencephalopathy	2	5.0 %
Medulloblastoma (metastasis)	2	5.0 %
Paracoccidioidomycosis	2	5.0 %
Toxoplasmosis	2	5.0 %
Non-specific	3	7.5 %
Normal tissue	1	2.5 %

Total 33 (82.5%) samples were accurately diagnosed as 12 of these were reconfirmed by new sample, 13 patients' diagnoses showed compatibility with the ongoing treatment, and diagnosis of 8 patients was compatible with the follow up. Total 5 (12.5%) samples were inaccurately diagnosed as new biopsy results varied in 3 patients, clinical course was not aligned with the diagnosis in one patient and indecisive findings were observed in one patient. Of 40 biopsies, 38 samples were included in complete study because one patient died and one patient lost follow up. Table-2.

Table No.2: Accuracy of Neuroendoscopic biopsy results

Results	N (%)
Accurate	
Diagnosis confirmed by new sample	12
Diagnosis compatible with treatment response	13
Diagnosis compatible with follow-up	8
Total accurate	33(82.5%)
Inaccurate	
New biopsy results varied	3
Clinical course not align with diagnosis	1
Indecisive finding	1
Total inaccurate	5 (12.5%)
Total included	38
Excluded	
Death	1
Lost follow up	1
Total excluded	2 (5.0%)
Total biopsies	40

DISCUSSION

Many studies related to use of endoscopic biopsy for managing intraventricular and periventricular lesions have been conducted in recent past years. There was variation of diagnostic yield for this procedure ranging from 69.6% and 100% and these variations can be described by the methodological differences^{10,11,12}. The past studies covered topics of tumors only,^{10,11} and only tumors of specific single site e.g. pineal region and patients of specific age limit such as children were considered^{10,13} in these articles. Variation in types of endoscope used either rigid or flexible¹⁴, in tumor forceps cups size^{10,14}, in the number of samples taken¹⁴, and in surgeon's experience were included in the factors related to the success rate of this technique^{6,10, 15,16}. On the other hand, on literature review of past studies most significant factor was how authors define the accuracy of technique. Patients with unsuccessful biopsies were excluded by most of the authors in the past studies¹⁰ while some diagnosed even histopathological abnormalities^{11,12,17}.

Non-specific histopathological outcomes of the biopsy were not considered positive in order to institute a

possible treatment. According to a study pathological report was classified by Depreitere et al. into four levels; Level I, completely diagnostic with no uncertainties, Level II diagnostic but with few uncertainties along with strong arguments for the preferred diagnosis by the pathologist, Level III certainly showing abnormal or neoplastic tissues but with problematic in the specific diagnosis and Level IV neither show any tissue abnormality nor able to make any explanation¹⁸.

In a recent study conducted by Constantini et al. over 293 cases from different countries, 27% of the patients (78 of them) underwent open surgery whose biopsy findings were believed to be informative. Two samples were compared, 82% had fully matching diagnosis while 6.4% with not matching but meaningful and 11.5% with mismatched and meaningful diagnosis⁶.

Our study was conducted to provide solution to methodological issues because our study included all types of patients (along with patients without neoplastic disease). But still it was in spite of fully correct diagnosis all of the patients were not going to show same response to the treatment strategies. Similarly, the patients not adherent to the treatment plans also had different nature of the disease as compared to those completed the treatment. Apart from this if such methodological issues were present these can affect the outcomes of our study.

Rates of morbidity and mortality were little with the use of endoscopic biopsy. Minor complications which can be underestimated were ignored and were not included in our retrospective study. Hemorrhage was the major complication and major concern while performing the endoscopic procedure. Although the hemorrhage is a subjective term but different authors define "important hemorrhage" differently. In different studies the hemorrhage was classified as mild, moderate, and severe type of complication^{6,11,12}. According to our definition of "important hemorrhage" it is the type of bleeding that lead to need of an EVD insertion, causes execution of the process and second surgery is required for sufficient management.

CONCLUSION

The results of our study show that the use of the new method to assess the accuracy of endoscopic biopsy revealed high accuracy in diagnostic biopsy. When compared to the previous studies this method of assessing the accuracy is safer and effective as well.

Author's Contribution:

Concept & Design of Study: Syed Zahid Hussain Shah
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 Revisiting Critically: Syed Zahid Hussain Shah, Shoaib Saleem Khan

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Conflict of Interest: The study has no conflict of interest to declare by any author.

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