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Original Research Article

Assessment of Frozen Section Results and its Diagnostic Accuracy: A Comparative Study

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Abstract

Aim: The aim of this study was to analyse the frozen section results and compare it with final paraffin sections and evaluate the diagnostic accuracy.

Material & Methods: A retrospective study of 100 specimens of intra operative FS were carried out in histopathology section of IGIMS, Patna, Bihar, India in between July 2016 to Jan 2018. The diagnoses given on frozen section were compared with the final diagnosis given on permanent paraffin sections. The results were categorized into concordant and discordant.

Results: In this retrospective study, total 100 cases were received for intraoperative consultation (frozen section) in 30 months. In all cases, cryostat sections (FS) plus squash smears were prepared. The ages of the patients ranged from 1 month to 75 years. Out of 100 cases, 52 were males and 48 were females. Out of 100 cases, 70 (70%) cases were concordant, 30 (30%) cases were discrepant with diagnostic accuracy of 70%.

Conclusion: Frozen section is a rapid diagnostic process which helps surgeons to choose best therapeutic approach. It confirms various benign and malignant lesions. When unexpected disease process is found and require a definite diagnosis and to take a definite decision on extent of surgery frozen section is very much helpful. However, one needs to be aware of its limitations. By avoiding its limitation diagnostic accuracy can be improved.

Keywords: Frozen Section, Histopathological Diagnosis, Accuracy.

Introduction

Intraoperative "frozen section" (FS) also termed as fresh tissue diagnosis, quick section, cryogenic sectioning, cryosection, cryoultramicrotomy, intraoperative pathologic diagnosis and intraoperative consultation is an investigation which helps in guiding the surgeon to plan for further management at the time of operation. [1,2] The technique was first used by William H Welch from John Hopkins Hospital in 1891 for intra operative consultation.[2] Intra-operative histology consultation was introduced for rapid examination of surgical specimens in 1905 by Dr.Louis B Wilson on request of Dr. William Mayo now widely used for guidance of surgeons for surgical treatment.[3] The different modalities used for intra-operative consultation are squash smear cytology, frozen sections and fluid cytology. These investigations help to provide a preliminary diagnosis, enabling

the surgeon to decide further management at the operating table. Since then, in 1959 after the development of cryostat frozen section become much easier and pathologist began to play a critical role in assisting and determination of the best approach during surgery.[4,5] The criteria's for requesting an intraoperative diagnosis vary but the major criteria include the following: (i) if intraoperative management will be influenced by the diagnosis (ii) if an unexpected lesion is seen at surgery which is different from what was suspected clinically (iii) if the main aim is to obtain a biopsy diagnosis (iv) to assess margins if radical excision is planned [6,7,8] (v) Other indications are enzyme histochemistry, immunohistochemistry and immunofluorescence.

The ideal method for providing intra-operative diagnosis, apart from being rapid and accurate, should also allow tissue to be preserved for paraffin embedding and other ancillary studies if required. Intra-operative histology has long been applied as an effective diagnostic method for neoplastic as well as non-neoplastic lesions for multiple reasons namely organ identification, confirmation of clinical diagnosis of malignancy, determining per-operative extent of disease and margin status.[9] Accurate intra-operative diagnosis requires clinical correlation and correlation with preoperative findings.

Hence the aim of study was to analyze the frozen section results and compare it with final paraffin sections and evaluate the diagnostic accuracy and to assess the discrepancies in our cases.

Material & Methods

A retrospective study of 100 specimens of intra operative FS were carried out in histopathology section of Pathology Department of IGIMS, Patna, Bihar, India in between July 2016 to Jan 2018. Fresh tissues were received in a clean container along with requisition form with complete clinical details from the surgical departments. Gross examination of the specimen was done, then from some part of tissue squash smears were prepared and then tissue sent to cryostat. Cryostat was set at a temperature between -20 to -28 0C. Sections were frozen and cut by cryostat machine using tissue freezing medium as and were immediately fixed in 95% isopropyl alcohol. After that rapid hematoxylin and eosin staining was done. Frozen section diagnosis was done under light microscope and immediately conveyed to the operating surgeon over phone. The diagnosis given on frozen section were compared with the final diagnosis given on permanent sections (and additional material if received), as indicated on the frozen section and final pathology report. All cases which were sent from surgical departments for frozen section are included in the study. Inadequate specimens and inconclusive cases were excluded from the study.

Statistical Analysis

The frozen section diagnosis was then compared to the diagnosis made on routine histopathological sections, and subsequent statistical analysis was done using the IBM SPSS statistical package version 23. The sensitivity, specificity, positive predictive value, negative predictive value and accuracy of frozen section diagnoses were determined according to the status of malignancy (benign, borderline or malignant).

Results

Table 1: Distribution of various frozen section specimen according to its diagnosis

Histological diagnosis of frozen section		
Diagnosis	**No. of cases**	**Percentage**
Astrocytoma grade II	10	10

Meningioma	10	10
Glioblastoma	5	5
Schwannoma	3	3
Medulloblastoma	6	6
Pilocytic Astrocytoma	3	3
Pitutary Adenoma	4	4
Oligodendroglioma	2	2
Metastatic carcinoma	2	2
Ependymoma	5	5
Ductal cancer	3	3
Tuberculosis	1	1
Low Grade Glioma	3	3
High Grade Glioma	6	6
Craniopharyngioma	3	3
Central Neurocytoma	6	6
Papillary tumor of pineal region	1	1
Pleomorphic sarcoma	1	1
Fibroadenoma	1	1
CNS Embryonal tumor	3	3
Anaplastic Astrocytoma	1	1
Anaplastic Oligodendroglioma	1	1
Choroid plexus papilloma	1	1
Chordoma	1	1
Central round cell tumor	1	1
Squamous cell carcinoma	1	1
Non-Hodgkin Lymphoma	1	1
Basal cell carcinoma	1	1
Esthesioneuroblastoma	1	1
Follicular Adenoma of thyroid	1	1
Aneurysmal Bone Cyst	1	1
Phyllodes	1	1
Pleomorphic Xanthoastrocytoma	1	1
Chondrosarcoma	1	1
Solitary Fibrous Tumor	1	1
Tumor margin	2	2
Cholesteatoma	1	1
Hemangiopericytoma	1	1
Pilomyxoid Astrocytoma	1	1
Atypical Teratoid/Rhabdoid tumor	1	1
Ossifying fibromyxoid tumor	1	1
Total	100	

In this retrospective study, total 100 cases were received for intraoperative consultation (frozen section) in 30 months. In all cases, cryostat sections (FS) plus squash smears were prepared. The ages of the patients ranged from 1 month to 75 years. Out of 100 cases, 52 were males and 48 were females.

Table 2: Comparison of discrepant cases with Biopsy diagnosis

Histological discrepant cases in our study (Total-30)		
Frozen Diagnosis	**Final diagnosis**	**No of cases**
Central Neurocytoma (WHO Grade II)	Small cell type glioblastoma	2
Low Grade Glioma	Cryptococcus	1
Metastatic Adenocarcinoma	Metastatic Squamous cell carcinoma	1
Medulloblastoma (WHO Grade IV)	Ependymoma	1
High Grade Glioma	Diffuse Astrocytoma (WHO Grade II)	1
Meningioma	Ependymoma	2
Diffuse Astrocytoma (WHO Grade II)	Atypical Teratoid/Rhabdoid Tumor	1
Fibroadenoma	Phyllodes	2
Aneurysmal Bone Cyst	Mammary Analogue Secretory Carcinoma	1
Medulloblastoma	High Grade Glioma	2
Spindle cell Tumor	Medulloblastoma	1
Choroid Plexus Papilloma	Ependymoma	1
Astrocytoma	Oligodendroglioma	1
Low Grade Glioma	Pleomorphic Xanthoastrocytoma	1
Medulloblastoma	Anaplastic Oligodendroglioma	1
Low Grade Glioma	Glioblastoma (WHO Grade IV)	1
Metastatic Carcinoma	Anaplastic Ependymoma	1
Ependymoma	Anaplastic Oligodendroglioma	1
Meningioma	Schwannoma	1
Diffuse Astrocytoma (WHO Grade II)	Glioblastoma	1
Metastatic Carcinoma	Microcystic Meningioma	1
Craniopharyngioma	Pilomyxoid Astrocytoma	1
Anaplastic Oligodendroglioma	Glioblastoma	1
High Grade Glioma	Pleomorphic Xanthoastrocytoma	1
Ependymoma	Low Grade Astrocytoma	1
Pleomorphic sarcoma	Ganglio neuroblastoma	1

Out of 100 cases, 70 (70%) cases were concordant, 30 (30%) cases were discrepant with diagnostic accuracy of 70%.

Discussion

Intra-operative histology consultation was introduced for rapid examination of surgical specimens in 1905 by Dr. Louis B Wilson on request of Dr. William Mayo now widely used for guidance of surgeons for surgical treatment.[3] The different modalities used for intra-operative consultation are squash smear cytology, frozen sections and fluid cytology. These investigations help to provide a preliminary diagnosis, enabling the surgeon to decide further management at the operating table. The ideal method for providing intra-operative diagnosis, apart from being rapid and accurate, should also allow tissue to be preserved for paraffin embedding and other ancillary studies if required. Intra-operative histology has long been applied as an effective diagnostic method for neoplastic as well as non-neoplastic lesions for multiple reasons namely organ identification, confirmation of clinical diagnosis of malignancy, determining per-operative extent of disease and margin status.[9] Intraoperative "frozen section" (FS) also termed as fresh tissue diagnosis, quick section, cryogenic sectioning, cryosection, cryoultramicrotomy, intraoperative pathologic diagnosis and intraoperative

consultation is an investigation which helps in guiding the surgeon to plan for further management at the time of operation.[10,11]

FS test is a technically demanding one, which requires the necessary equipment (CRYOSTAT), sufficient staff with the necessary skills and expertise and experienced pathologist.[12] Intra-operative histology is indicated for confirmation of an intra-operative impression, confirmation of malignancy and assessment of surgical margins at vulnerable sites where the extent of removal directly influences the surgical outcome. According to various studies the accuracy of Intra-operative histology diagnosis ranges from 87% to 97%. The studies with higher accuracy had a different study design in terms of type of specimen and inclusion of different categories. Some included squash smears in addition to frozen section, whereas in others, the authors only included tumours or tumours plus infections and/ or other miscellaneous lesions.[13-16]

In this retrospective study, total 100 cases were received for intraoperative consultation (frozen section) in 30 months. In all cases, cryostat sections (FS) plus squash smears were prepared. The ages of the patients ranged from 1 month to 75 years. Out of 100 cases, 52 were males and 48 were females. Out of 100 cases, 70 (70%) cases were concordant, 30 (30%) cases were discrepant with diagnostic accuracy of 70%. The entities with complete correlation with remnant diagnosis were identification of organ. Jaafar et al in 2006 has highlighted the possible reasons of misinterpretation in frozen section.[17] As far as interpretative errors are concerned careful examination, ordering additional sections help in their reduction. Second most important thing is despite of pressure of timely reporting a pathologist should never hesitate in ordering additional sections. Repercussions' of incorrect interpretation may lead to litigations. Finally, low power examination is more helpful in decision making than high power examination as the cells swell up due to freezing and may lead to spurious interpretation of nucleomegaly.

Conclusion

Our results show a reasonably good percentage of accuracy in the intraoperative diagnosis of lesions. However, there are limitations and some lesions pose a diagnostic challenge. Careful observation, skill of the pathologist and knowledge of limitations help in improving the overall diagnostic utility of frozen section. Despite the advancements in histological and molecular techniques; this investigation, clearly remains a valuable tool during operative procedures. Hence, there is a need to improve our own diagnostic skills and establish better communication with neurosurgeons.

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