

Original Research Article

## A Study on Accuracy of Frozen Section Diagnosis and Turnaround Time

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### ABSTRACT

**Context:** Frozen section is an intraoperative diagnostic tool which provides the operating surgeon a rapid diagnosis and helping him to make a timely intraoperational decision which may have significant consequences in the future. Hence the efficiency of this technique has to be periodically reviewed to ensure quality of the sections and agreement between frozen section diagnosis and final diagnosis remain at an acceptable level.

**Aim:** This study aimed at to find the accuracy of Frozen Section diagnosis by correlating it with the final histopathological diagnosis and to find the turnaround time for performing a frozen section and to analyse the pathology practice variables that influence it.

**Materials and Methods:** In this study consecutive 140 Frozen Section biopsies over a period of 1 year were reviewed and correlated with final histopathological diagnosis. The Frozen Section turnaround time was also looked by reviewing the records.

**Results:** Out of the total 140 cases, frozen section biopsy reports of 137 cases matched with the paraffin section diagnoses with a concordant diagnostic frequency of 97.85% and there were 3 discordant cases (diagnostic frequency of 2.15%). The average turnaround time of frozen section diagnosis in this study ranged from 10-20 minutes with an average of 15 minutes.

**Conclusion:** The accuracy of frozen sections diagnosis in this study can be interpreted as comparable with the most international quality control series. Interdepartmental cooperation by proper communication between the operating surgeon and the reporting pathologists can help to reduce the Frozen section turnaround time and can bring it comparable to the international standards.

**Keywords:** Frozen Section, Histopathology, Turnaround time.

### INTRODUCTION

Frozen section (FS) technique is used for the rapid diagnosis of intraoperative samples in which the surgical pathologist's morphologic expertise complemented by an awareness of the clinical setting and a familiarity with a given disease process helps the surgeon in making therapeutic decisions. In 1891 William H. Welch from Johns Hopkins hospital introduced this technique and it was further developed as an intraoperative pathological diagnostic tool by Louis. B. Wilson in 1905. [1] After introduction of

the modern Cryostat in 1960s, this technique has emerged as a highly reliable intra operative or perioperative diagnostic tool. The main indications for frozen section are usually to diagnose unknown pathological entities, evaluation of surgical resection margins, identifying metastasis in lymph nodes, confirmation of representative samples for diagnosis in paraffin section and to find out the nature of a lesion which may require confirmation by ancillary tests.

Frozen section turnaround time is the time interval between the reception of

the Frozen section specimens in Pathology department to the reporting of the diagnoses to the operating surgeons. Turnaround time is a common standard by which clinicians judge the quality of pathology departments.

This study was conducted to find the degree of diagnostic accuracy of frozen sections and to analyse the concordance, discrepancies and deferrals for all the cases.

The study also aimed to assess the intraoperative turnaround time for performing a frozen section and to analyse the pathology practice variables that influence it.

## **MATERIALS AND METHODS**

In this study consecutive 140 Frozen Section biopsies over a period of 1 year were reviewed. The fresh tissue is usually sent to pathology department for Frozen section diagnosis from the operating room with a requisition form. The specimen for frozen section diagnosis was first examined grossly and the suspected lesions were sampled and placed in a mounting medium and cut on LEICA or MICRON Cryostat machine in 4 mm thick slices with microtome blades and stained with Hematoxylin and Eosin (H & E). For smaller tissue samples, imprint preparations were made. A Team of Pathologists were involved in reporting the Frozen section biopsies. A second opinion from the senior consultants was taken wherever needed. The results were delivered to the operating surgeons by phone and also by hand written reports. The results were entered into the computerized database of the service. For permanent section, the remaining tissue is fixed in 10% formalin, grossed and adequate representative sections are taken according to the standard guidelines. The sections are then evaluated in Haematoxylin and Eosin stain and if required, special stains and immunohistochemistry were used.

The reports made at the time of frozen section were compared with the permanent paraffin section reports. Several frozen sections performed during one operation were counted as one case. The results were considered concordant when the final diagnosis in paraffin biopsy result was the same as suggested by the frozen biopsy. The main indications for performing the tests and the anatomical sites involved with diagnostic disagreements were categorised and analysed. The Frozen Section turnaround time was also looked by reviewing the records.

## **RESULTS**

A total of consecutive 140 Frozen Section biopsies were taken for the study. The various indications of the frozen section biopsies are shown in Table.1. The major indication of Frozen Section biopsy in this study was verification and categorisation of neoplasms [80 cases (57.1%)]. The rest were lymph nodes for tumour metastasis [28 cases (20%)], assessment of tumour margins [20 cases (14.3%)] and intraoperative assessment of Hirschsprung disease [12 cases (8.5%)]. None of the frozen section diagnosis was deferred to the operating surgeons.

Out of the total 140 cases, frozen section biopsy reports of 137 cases matched with the paraffin section diagnoses with a concordant diagnostic frequency of 97.85%. There were only 3 discordant cases (diagnostic frequency of 2.15%) where the frozen section of an adrenal mass was reported as “Dense lymphoid infiltrates” (? lymph node) with a note to await paraffin for exact categorisation and the paraffin section report of the same turned out to be lymph node with crush artefact with focal infiltration by Neuroblastoma of undifferentiated type. Frozen section tends to alter the architectural and cellular morphology and the pathologist may have

diagnostic dilemmas in diagnosing these difficult entities.

The other two discordant cases were categorising the borderline ovarian tumours. Identifying the foci of frank malignancy in large borderline ovarian tumours is always challenging because of the need to take multiple representative samples from the Frozen Section specimen. Most laboratories find this task as labor intensive and beyond their working capabilities. [2] The average

turnaround time of frozen section diagnosis in this study ranged from 10-20 minutes with an average of 15 minutes.

**Table 1: Distribution of frozen section diagnoses by indication.**

Indication of frozen section	Total cases (%)
Verification and categorisation of neoplasms	80 (57.1%)
Lymph nodes for tumour metastasis	28 (20%)
Assessment of tumour margins	20 (14.3%)
Intraoperative assessment of Hirschsprung disease	12 (8.5%)
Total	140 (100%)

**Table 2. Literature overview on frozen section accuracy.**

Study	Study period	Number of cases	Concordant rate %	Discordant rate%
Present Study	1 year	140	97.85	2.15
Zubair et al. [3]	1 year	356	97.08	2.9
Wendum et al. [4]	1 year	847	98.2	1.7
Winther et al. [5]	1 year	4785	95.1	4.9
Geramizadeh et al. [6]	4 years	759	97.7	3.3
Abbasi et al. [7]	7 years	200	96.5	4.5
Chbani et al. [8]	1 year	261	95	5
Patil et al [9]	2 years	100	97	3
Howanitz P J et al [10]	1 year	1952	96.5	3.5

## DISCUSSION

The achieved results in this study (with a concordant rate of 97.85% and discordant rate of 2.15%) is comparable with the published results where the accuracy ranged from 92% to 98% with a deferred rate of 3 to 4.6% (Refer Table 2).

The discordant cases in this study are due to interpretation error. Pathologist's morphologic expertise, typing and grading errors, Freezing artefact, obscuring cytological detail, heterogeneous behaviour of the tumours are the other likely causes for discrepancies.

Taking multiple bits from different areas of a lesion and using smear cytological technique along with the frozen section can reduce the error. [11] Determining the presence of malignancy without sub typing or a judicious deferral can be the best option to decrease the discrepancies. If Frozen section biopsies are reported by several individuals on a rotation basis, it is important for a senior pathologist to periodically review the material to ensure quality of the sections and agreement between frozen section

diagnosis and final diagnosis remain at an acceptable level. These periodic reviews can also point out patterns of use and misuse of the frozen section procedure by various departments and its individual members.

In this study it was found that the turnaround time of frozen section diagnosis ranged from 10-20 minutes with an average of 15 minutes and was quite comparable with international standards. The reasons for delay in turnaround time were when more than one pathologist involved in the Frozen section diagnosis in cases where a second opinion has to be taken, lack of adequate clinical details and tissue sample, simultaneously occurring more than one frozen request at the same time, reviewing previous case material details and technical issues including unexpected instrument malfunctions.

CAP's Anatomic Pathology checklist question ANP.11820, supported by a CAP QProbe study [12] suggests that 90% of frozen sections should be completed within 20 minutes. On multiple block frozen section specimens, the CAP Surgical Pathology Committee's

consensus is that a pathology laboratory should aim for approximately the same turnaround time per specimen- multiplied by the number of specimens and divided by the number of cryostats and available cutters. Acquisition of more trained technical staff, Coordination from the operating surgeon for providing adequate clinical information and adequate material can greatly improve the frozen turnaround time. Retrieving and reviewing previous case material can increase Frozen section turnaround time which can be reduced by devising a system to review the previous case material at some convenient time prior to performing the Frozen section biopsies. Advance planning in performing intraoperative consultations is needed to overcome the factors like simultaneously occurring many frozen requests at the same time, need for reviewing previous case material and unexpected instrument malfunctions.

## CONCLUSION

The accuracy of frozen sections diagnosis in this study can be interpreted as comparable with the most international quality control series. Interdepartmental cooperation by proper communication between the operating surgeon and the reporting pathologists, involving more trained technical staffs in the Frozen section procedure, advanced planning before performing the Frozen section biopsies and usage of senior pathologist's morphologic expertise can help to reduce the Frozen section turnaround time and can bring it comparable to the international standards.

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