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## Research Article

# COMPARATIVE STUDY OF FROZEN SECTION DIAGNOSIS WITH HISTOPATHOLOGY IN A TERTIARY HEALTH CARE CENTRE

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### ABSTRACT

**Introduction:** Correspondence of intraoperative diagnosis on the frozen section with final diagnosis on the permanent section is an integral part of review in surgical pathology. **Aims and objectives:** To study the effectiveness of frozen section in the diagnosis of various surgical pathologies compared to histopathology as a gold standard. **Material and Methods:** In this retrospective study, we compared 200 serial frozen section performed between August 2019 and December 2021 at Dr. Vasant Rao Pawar Medical College and Hospital, Nashik, Maharashtra. Results of this section compared with their permanent diagnosis. **Results:** For the frozen section, the 205 specimens were studied; but only 200 specimens were received for the histopathological study. The 200 specimens included 188 neoplastic lesions (45 benign and 143 malignant lesions) and 12 non-neoplastic lesions in this study. **Conclusion:** Frozen section is a useful adjuvant, rapid intraoperative diagnosis for further management of the patient.

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### INTRODUCTION

Frozen section forms a rapid intraoperative diagnostic aid. It is widely used for diagnosis of malignancy during surgical procedures so that modification of surgery can be decided upon.

The frozen section technique was first proposed by the famous pathologist William Welch, 1891 from Johns Hopkins Hospital. By the early and mid-1920s, the technique had grown in popularity and was used in daily practice for intraoperative consultation.<sup>(1-5)</sup>

This was developed by Wilson and McCarty at the Mayo Clinic in 1905. This practice evolved after the development of the freezing thermostat in 1959.

The classic indication for frozen section examination is the need an immediate intraoperative decision to differentiate benign tumors from malignant tumors for intraoperative or perioperative management of the patient carry out.<sup>(1-5, 16)</sup>

Indications for frozen sectioning are identification of known tissues and unknown disease processes, assessment of resection margins, identification of lymph node metastasis, confirmation of the presence of representative specimens for paraffin section

diagnosis and determination of the nature of the lesion, which may require additional testing like ancillary test.<sup>(6, 7)</sup>

### AIMS AND OBJECTIVES

1. To study the effectiveness of frozen section in the diagnosis of various surgical pathologies compared to histopathology as a gold standard.
2. To study the pattern of discrepancies between the frozen section and histopathology diagnosis in various surgical pathologies

### MATERIALS AND METHODS

**Study Design:** Evaluation of a diagnostic test.

**Study Setting:** The study was conducted in the Department of Pathology, at Dr. Vasant Rao Pawar Medical College and Hospital, Nashik.

**Duration of Study:** August 2019 to December 2021

**Study Participants:** Sample Size: Minimum 200 cases

#### Eligibility Criteria

#### Inclusion Criteria

1. All samples for frozen section received in the department of pathology.

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- Surgical pathology specimens that need frozen section should be fresh, and not in formalin.
- Sample section thickness should be (4-5 µm).

**Exclusion Criteria**

Tissue from non-representative area.

**METHODOLOGY**

**Procedure and Method**

Frozen sections were cut on a cryostat machine and evaluated in Hematoxylin and Eosin (H&E) stain. Subsequently, for the permanent section, specimens were fixed in 10% formalin, grossed and adequate representative sections were taken according to the standard guidelines. The sections were then evaluated in H&E stain.

The advantages of frozen section technique are:

- It allows rapid diagnosis.
- Shows lipids, which are destroyed during routine handling.
- Used to demonstrate enzymes in Immunohistochemistry.
- Better penetration of dye and fluorescent antibody technologies.

The disadvantages of frozen section technique are:

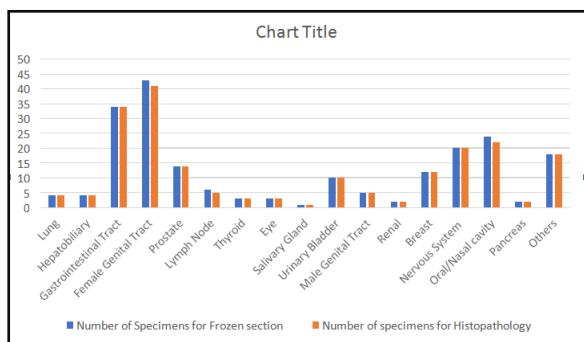
- Reports require experience and skill.
- Insufficient preservation of permanent sections and slides as stains will fade.

**OBSERVATIONS AND RESULTS**

During the 2 years of our study, 205 samples of frozen sections from 205 surgical cases were received.

The frozen section tissues submitted were primarily from the female reproductive tract, digestive tract, nervous system and oral/nasal cavities. (Fig. 1)

For the frozen section, the 205 specimens were studied, but for the histopathological study, only 200 specimens were received, in the present study. (Fig. 1)



**Fig 1.** Distribution of frozen specimens and Histopathology specimens

**Table 1** Study of Specimen based on Frozen section and Histopathology

S.No	Site	Non-Neoplastic	Benign	Malignant	Total
1	Lung	1	-	3	4
2	Hepatobiliary	-	1	3	4
3	Intestine	8	6	20	34

4	Female genital system	-	24	17	41
5	Prostate	-	3	11	14
6	Lymph node	2	-	3	5
7	Thyroid	-	1	2	3
8	Eye	-	-	3	3
9	Salivary Gland	-	-	1	1
10	Pancreas	-	1	1	2
11	Bladder	-	-	10	10
12	Male Genital system	-	-	5	5
13	Renal	-	1	1	2
14	Breast	-	3	9	12
15	CNS	-	-	20	20
16	Oral/ Nasal cavity	-	2	20	22
17	Others	1	3	14	18
18	Total	12	45	143	200

Non-neoplastic lesions were 12 cases which were diagnosed on frozen section and were compared with final histopathological diagnosis. (Table 1)

Out of a total of 205 specimens diagnosed on frozen section, 200 specimens were compared with histopathology (Fig. 2-6). Out of the 200 specimens, 45 specimens were diagnosed as benign lesions in this study. (Table 1)

Malignancy was seen in 143 out of 200 which were diagnosed after comparison with final histopathological study. (Table 1) Sensitivity- 99.5%, Positive predictive Value- 100%.

**Table 2** Comparison of Frozen diagnosis with Histopathological diagnosis in false negative cases

Site (Total No. of cases)	Frozen Section Diagnosis	Histopathological Diagnosis	Reason for Discrepancy
Thyroid (1)	Benign Colloid nodule	Multiple foci of papillary microcarcinoma with extrathyroid extension	Sampling Error

All the 3 cases were compared with histopathology, out of which one case showed discordance; that is on frozen section it showed morphology of Benign colloid nodule and on histopathology it showed multiple foci of papillary microcarcinoma with extrathyroid extension. (Table 2)

The diagnostic accuracy rate of 200 frozen sections in this study was 99.5%. False negative was 0.5% in this study. There were 2 cases of lung lesions seen in age group of 55-65 years. These accounted for 50% of total cases. A total of 4 cases of lung tissue were evaluated, out of which 2 cases (50%) was diagnosed as moderately differentiated adenocarcinoma. Hepatobiliary lesions were more frequent in the 40-60 age group, representing 50% (2 cases).

In this study, the male/female ratio was 1:3. Out of 4 cases of hepatobiliary system, 2 cases were diagnosed as metastasis. Among the digestive cases, 8 cases (23.52%) were mainly in the age group of 60-70 years. Amongst the 34 cases of

gastrointestinal system, male (61.76%) was most commonly affected as compared to female that is (38.23%). Out of 34 cases of gastrointestinal system, most commonly cases were diagnosed as adenocarcinoma (41.17%). Least commonly cases diagnosed was metastasis and squamous papilloma.

Among 43 female reproductive tract cases, the most common diagnosis was squamous cell carcinoma. Squamous cell carcinoma was the most frequent (11 cases, 25.58%), followed by Atypical hyperplasia and Benign serous cystadenoma (5 cases, 11.62%). It was seen that overall lymph node cases showed male: female ratio of 4:2. Out of 6 lymph node cases received for frozen section, 2 cases were diagnosed as metastatic adenocarcinoma.

All the 3 cases were compared with histopathology, out of which one case showed discordance; that is on frozen section it showed morphology of Benign colloid nodule and on histopathology it showed multiple foci of papillary microcarcinoma with extrathyroid extension. Single case of low-grade cribriform cystadenocarcinoma of parotid gland was seen in the age group of 10-20 years.

In all cases of pancreas, it was seen that only males were affected (100%). Out of the 10 bladder cases, 9 cases were of males (90%). Transitional cell carcinoma was most commonly seen in 7 cases (70%) followed by squamous cell carcinoma (2 cases, 20%). Male genital tract 5 cases in 3 cases from 40 to 50 years old. Squamous cell carcinoma of Penis were 3 cases (60%) followed by seminoma of Testis (40%) seen in this study. In renal cases, male: female ratio of 1:1 was seen. Renal cell carcinoma was observed in 50% of cases in this study.

In the breast, the most frequent cases occur in the 50-60 age group. Total of 12 cases in this single case of recurrent phyllodes of low-grade malignant potential was seen; resection margin and base being free from tumour. In this study, out of 20 cases of nervous system, 25 % cases were affected in age group of 0-10 and 40-50 years. In 20 cases of nervous system, most commonly affected were males (65%) followed by females (35%). Meningioma was most commonly seen (in 9 cases, 45%) (Fig.6), followed by Astrocytoma (4 cases, 20%) and Medulloblastoma (2 cases, 10%). One specimen (Lateral border of tongue and its margin) was received for frozen and histopathology which show poorly differentiated Squamous cell carcinoma and dysplastic mucosal lining.

**DISCUSSION**

In this study, we examined frozen sections performed in the pathology department of a tertiary care centre over a 2-year period to assess the diagnostic accuracy of tests at this facility.

To determine the extent of surgery for malignancy, intraoperative diagnosis by frozen section is very important. This is particularly useful in young patients, borderline tumours, metastatic tumours, or certain conditions that are difficult to differentiate from malignancy.<sup>(9)</sup>

The precision of the examination of frozen sections must therefore be assessed in order to consider this diagnostic tool as reliable.

In this study, the whole accuracy rate was 99.5%, comparable to preceding studies by Khoo Jj, Da Silva Rd and Shayan K et al., ranging from 94% to 98%.<sup>(9-11,13)</sup>

**Table 3:** Comparative study for Implication of frozen section

Novelist	Evaluation of margin	Evaluation of nodal status
Patil P et al. (20)	34%	11%
Roy S et al.(21)	30.6 %	3.8%
Chbani L et al. (22)	7.3%	-
White V et al. (14)	26%	28%
Saumya Mishra et al (18)	13.5%	-
Present study	2%	3%

In our study showed 2% and 3% cases of assessment of margin and nodal status which is similar to previously published studies i.e. (14,18,20,21,22). **(Table 3)**

**Table 4** Literature overview on frozen section diagnostic accuracy.

Novelist	Study Period (year)	Number of Cases	Concordance Rate %	Discordance Rate %
Patil P et al.(20)	2	100	96.9	3.1
Roy S et al.(21)	9 months	327	97.6	2.4
Chbani L et al.(22)	1	261	95	5
Ahmad Z et al. (23)	1	342	97.1	2.9
Saumya Mishra et al(18)	2	52	96.2	3.8
Present study	2	205	99.5	0.5

In the present study showed discordance is 0.5 % which is alike to preceding issue studies i.e. (18,20,21,22,23). **(Table 4)**

**Table 5** Preceding studies show limitations observed during frozen diagnosis.

Novelist	Total cases	Technical error (%)	Sampling error (%)	Interpretation errors (%)	Lack of clinical details (%)
Patil P et al.(20)	3/100	-	1.0	2.0	-
Evans CA et al.(19)	3/240	-	0.4	0.8	-
Saumya Mishra et al(18)	12/52	23.07	1.92	1.92	3.84
Present study	1/200	-	0.5	0.0	-

Sampling error due to the lack of appropriate tissue taken from site which show discordant result in single case of thyroid that is on frozen section it shows benign colloid nodule and on histopathology sample show multiple foci of papillary microcarcinoma with extrathyroid extension.<sup>(16,17)</sup> **(Table 2,5)**

This study show accurate evaluation for ovarian lesions was 100%. It was found to be comparable to studies by Abdelgehany A et al.<sup>(18,20)</sup>

Intraoperative diagnosis of ovarian malignancy by frozen section is important for determining the extent of surgery in young women who wish to preserve fertility by sparing the contralateral ovary and for the diagnosis of borderline tumours.<sup>(19)</sup>

Males were more commonly affected with Hirschsprung’s disease compared to female in this study. Similar finding was seen in study Shayan K et al.<sup>(13)</sup>

Interpretation of frozen sections expertise plays a vital part to lower delays and error rates when specimens are reviewed by more experienced pathologists.

Gross examination supplemented by cytopathology and histopathology provides surgeons with the fast, reliable, and cost-efficient information needed for optimal patient care.

**SUMMARY AND CONCLUSION**

- Out of a total of 205 cases, 200 cases samples were compared with histopathological diagnosis. All cases of frozen section showed similar morphology on histopathology except one of thyroid case.
- All the 3 cases of thyroid lesions were compared with histopathology, out of which one case showed discordance; that is on frozen section it showed morphology of Benign colloid nodule and on histopathology it showed multiple foci of papillary microcarcinoma with extrathyroid extension.
- Despite advances in histological and molecular techniques, this examination clearly remains a valuable tool in surgery.
- The diagnostic frozen section is a very useful and very accurate procedure.
- Gross inspection, sampling by pathologist, frozen complemented with histological review and intimal cooperation with surgeon, good communication between surgeon and pathologist can avoid certain limitations and provide rapid, reliable, cost-effective information necessary for optimum patient care.
- Macroscopic examination, sampling by the pathologist, frozen histology and close collaboration with the surgeon, good communication between the surgeon and the pathologist makes it possible to avoid certain limitations and to provide rapid, reliable and economical information, for optimal management of the patient.

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