Intraoperative Frozen Section Diagnosis in Surgical Pathology – Our Experience At A Tertiary Care Centre

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ABSTRACT

Introduction: Frozen section is a valuable technique for immediate diagnosis in intraoperative management of patients. Accuracy and limitation of frozen sections vary according to different anatomical sites. Study objective was to evaluate the diagnostic accuracy and limitation of frozen sections.

Material and methods: This was a prospective study incorporating 53 tissues from 40 cases for a period of 15 months (october 2018 – December 2019).

Results: The diagnostic accuracy of frozen section was found to be 96.2%. Discordant rate is 3.77%. Most common frozen section analysis was primary diagnosis or typing of neoplasms (62.5%). Discordant rate or false negative diagnosis was because of technical and interpretative error. No false positive case was detected. Average turnaround time was 20 minute in most of the cases(88.67%).

Conclusion: Frozen section is a rapid diagnostic process which helps surgeons to choose best therapeutic approach. It confirms various benign and malignant lesions and also provides information about margins and nodal status. 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: Intra- operative, Frozen Section

INTRODUCTION

Frozen section plays an important role in surgical pathology and help the surgeon in intraoperative and preoperative patient management.[1] The technique was first used by William H Welch from John Hopkins Hospital in 1891 for intra operative consultation.[2] Later on 1905 this technique was further developed by Wilson and Mc carty for immediate evaluation of frozen tissue.[2] Since then in 1959 after the development of cryostate frozen section become much easier and pathologist began to play a critical role in assisting and determination of the best approach during surgery.[1,3]

The main indication for frozen section is the immediate/ intra operative determination of nature of the lesion particularly differentiating between benign and malignant neoplasm to guide intra operative patient management.[4,5] . Apart from these, frozen section also done to see the status of surgical margins, identification of lymph node metastasis in malignant lesions and confirmation of presence of representative samples for paraffin section diagnosis.[1,3] Other indications are enzyme histochemistry, immunohistochemistry and immunoflorescence .[1]

The diagnostic accuracy of frozen section varies according to the specific anatomical sites.[3] Indication and limitation of frozen section are different for different organs. Diagnostic discrepancy commonly occur due to technical problem, sampling error or interpretation error.[4]

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

MATERIAL AND METHODS

This was a prospective study conducted over a period of 15 months(October 2018 – December2019) on 53 tissues from 40 cases received from surgical departments for intraoperative consultation. Fresh tissues were received in a clean container without any fixative along with requisition form with complete clinical details from the surgical departments. Gross examination of the specimen were done, painted and thin sections were taken from representative area. Cryostat was set at a temperature between 20- 28 degree C. Sections were frozen and cut by cryostat machine using tissue freezing medium as embedding medium. Sections were cut at a thickness of 4-5μ and were immediately fixed in 95% isopropyl alcohol. After that rapid haematoxilin and eosin staining was done. Frozen section diagnosis was done under light microscope and immediately conveyed to the operating surgeon over phone. Analysis of clinical diagnosis and frozen section diagnosis was done and time taken for frozen section procedure was recorded. Remaining tissue were fixed in 10% buffered formalin solution and sent for routine processing and staining for histopathological examination.

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.

RESULTS

During this study 53 tissues from 40 cases were analyzed. The primary indication of frozen section was primary

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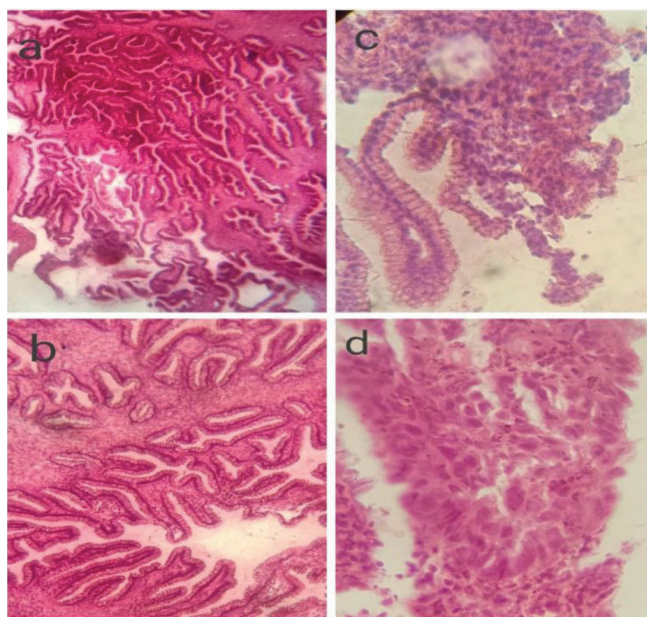
Figure-1: Photomicrograph of Frozen section of Ovarian Mucinous cyst- adenoma with focal borderline changes (Rapid H&E; a,b-10X10; c,d-40X10)

Indication of frozen section	Total numbers of cases
Primary diagnosis / typing of neoplasms	62.5%(25)
Lymphnodes status	32.5%(13)
Assessment of margins	05.05%(02)
Total	100%(40)
Table-1: Numbers of cases according to indications of frozen section diagnosis	

diagnosis of the tissues (typing of neoplasm, benign or malignant), surgical margin clearance and assessment of nodal status(Table:1). Out of 53 tissues 51 were concordant and 2 tissue were discordant(table:2). Diagnostic accuracy of frozen section was 96.2% . While compared with paraffin sections two cases were discordant due to false negative diagnosis. Discordant rate was 05%. Discordance was due to misinterpretation error. Not a single case was diagnosed as false positive.
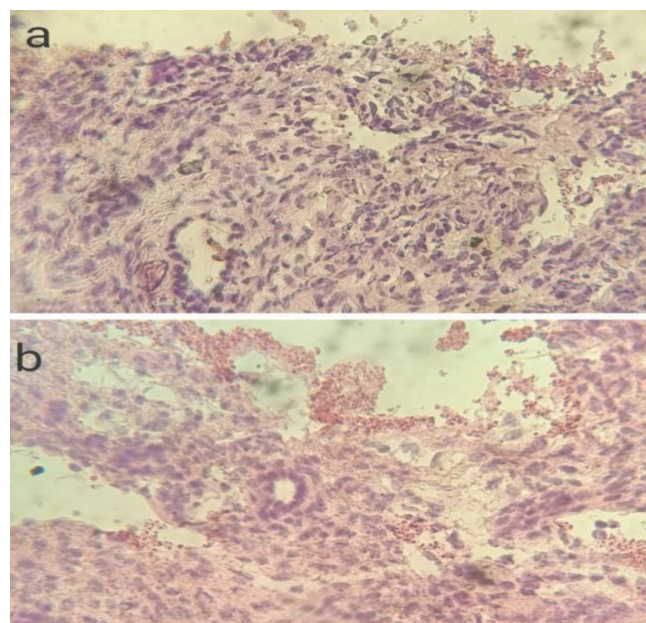

Figure-2: Photomicrograph of Frozen section of Ovarian endometriotic Cyst (Rapid H&E; a,b-10X10; c,d- 40X10)

S.N	Site	No. of cases	No.of tissues	Concordant Cases	Discordant Cases	Accuracy (%)
1.	Ovary	13	17	11	02	84.61%
2.	Lymphnode	13	15	13	00	100%
3.	Breast	06	07	06	00	100%
4.	Gallbladdar	03	03	03	00	100%
5.	Liver	02	02	02	00	100%
6.	Testis	01	01	01	00	100%
7.	Margins Evaluation (Stomach,Oral cavity)	02	08	02	00	100%
8.	Total	40	53	38 (51 tissues)	02	
Table-2: Concordant and discordant cases according to sites						

Authors (Studies)	Diagnostic accuracy
Dr Pragati P.P, Dr. Sarita D (5)	90.7%
Nageswar Sahu (4)	90.68%
Saumya Mishra et al (2)	96.2%
Patil P et al (2[8])	96.9%
Ahmad Z et al (2[9])	97.1%
Ray et al(2[11])	97.6%
Shrestha S et al (2[1])	94.6%
Agarwal Preeti et al (4[9])	94.2%
RDP Silva et al (4[5])	93.3%
Present study	96.2%
Table-3: Comparision of diagnostic accuracy of different studies	

In the present study primary indication of frozen section was diagnosis of neoplasm in 30 tissues followed by clearance of margins in 2 cases (8 margins), nsodal status in 15 tissues.

Ovary was the commonest tissue received for frozen section. All the specimens were for primary diagnosis (typing of neoplasms). There were 13 cases and all total 17 tissues. All frozen section diagnosis were concordant with histopathological diagnosis except two tissues which showed diagnostic discordant with paraffin sections. Both the cases were diagnosed as borderline mucinous tumor of ovary on frozen section(Fig.1) whereas in histopathology they were came out as mucinous cystadenocarcinoma.

Out of 15 lymph nodes that were sent for frozen section to assess the nodal status in different malignant cases four showed evidence of metastatic deposits rest were reactive. All fifteen tissue were concordant with histopathological diagnosis.(Fig.3;Metastatic melanoma)

All breast tissues(7) sent for frozen sections were concordant with histopathological diagnosis, Concordant rate(100%) (Fig.4;infiltrating duct carcinoma). Three cases(breast) were evaluated for margin status along with primary diagnosis which were positive for margin involvement.

Three tissues of gall bladdar were received for frozen section. In all three cases clinical diagnosis was carcinoma gall bladdar whereas frozen section diagnosis came out as chronic cholecystitis. Final histopathological result also came out as features of chronic cholecystits.

Two tissues (2) of hepatic origin were evaluated, one was benign hepatic nodule and another one omental deposit of malignant hepatic tumor. In both the cases frozen section diagnosis were concordant with histopathological diagnosis.

One case of testicular mass(R) was evaluated. Frozen section diagnosis was seminoma which was concordant with histopathological diagnosis.

Two cases, one carcinoma stomach another one squamous cell carcinoma oral cavity were evaluated for margins status. In both the cases frozen section diagnosis was concordant
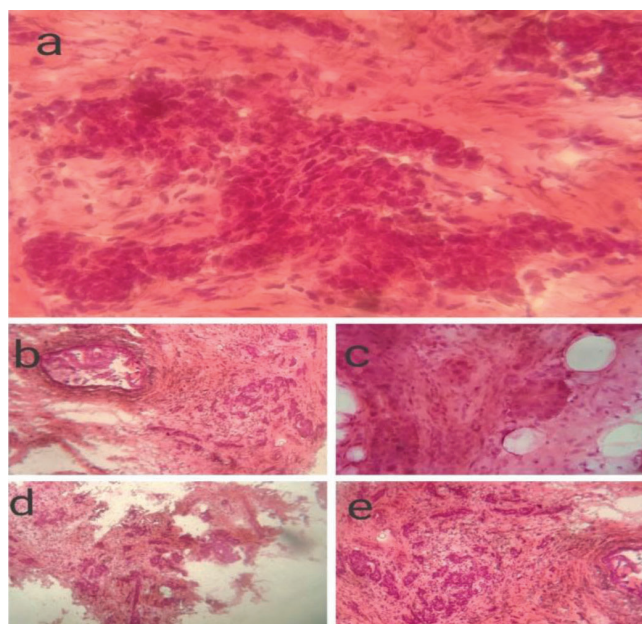

Figure-4: Photomicrograph of Frozen section of infiltrating duct carcinoma breast (Rapid H&E; a- 40X10; b,c,d,e- 10X10)

with histopathological diagnosis.

Overall time from receipt of specimen to frozen section diagnosis was 15-25 minutes in all the cases. Most of the specimen took 20 minutes, however the large specimen with margins status evaluation took 25 minutes. One case took 30 minutes because request were made to send more tissue (known case of breast carcinoma for margin evaluation).

Technical difficulties observed in few cases due to freezing procedure which leads to obscure nuclear details.

DISCUSSION

This study was conducted to determine the pattern of frozen section and to evaluate the diagnostic accuracy of frozen section. Frozen section is a intraoperative procedure to guide the surgeon in taking the decision about the extent of resection in various surgical procedure. Accuracy of frozen section should be high so that the surgeon can have confidence over it .[3]

In the present study all total 53 frozen section examinations were done to get the diagnosis during operative procedure. In the present study overall diagnostic accuracy of frozen section was 96.2% which is comparable to other studies shown in the table no.3.[5,1,2,6,7,8,9,10,11]

In the present study out of 53 tissues 2 tissues (3.77%) were discordant. Common cause of discordant result was false negative diagnosis. According to various literature review discordance rate ranging from 1.4% to 12.9% in different anatomical site.[2,11,12,13] Saumya Mishra et al, Patil et al, Ahmed Z et al, Roy S et al, Shrestha et al reported discordance rate 3.8%,3.1%, 2.9%, 2.4%,5.4% respectively.[2,6,7,8,9] In our study false negative cases were from ovarian lesions. Two cases of mucinous cyst adenocarcinoma were interpreted as borderline mucinous neoplasms. Interpretation error was the cause of discordance in our study. It was because of some technical shortcomings i.e inferior quality of sections compared to paraffin section and sampling error. Sections
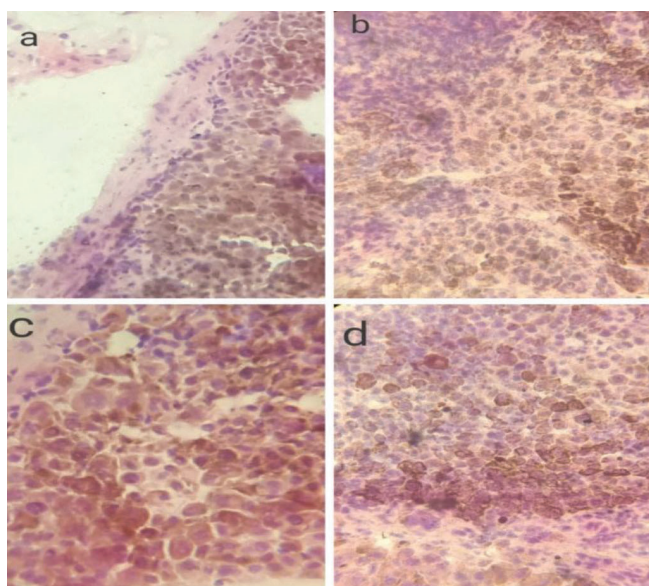

Figure-3: Photomicrograph of Frozen section of Metastatic Malignant Melanoma (Rapid H&E; a,b,c,d- 40X10)

were thick and there was loss of architectural pattern due to freezing artifacts which hampered the proper visualization which leads to error in interpretation . Nageswar Sahu et al reported misinterpretation of ovarian tumor because of freezing artefacts.[1] Other studies also reported that interpretation error was the main cause of discrepancy [13,14,15,16].

No false positive case was detected in this study which is comparable to Rafael Denadaj Pigozzi D Silva et al .[3]

The diagnostic accuracy of ovarian tumor in reported studies was 90- 97% .[17] In the present study diagnostic accuracy in ovarian tumor was 84%. Interpretation error was the main cause of diagnostic discrepancy .In other sites such as breast, hepatobiliary, testis, margin assessment, lymph node, the diagnosis of benign and malignant lesions were identified correctly (D.A was 100%).

Apart from freezing artefacts and sampling error another limitation of frozen section was grading error during interpretation. It was due to loss of architectural pattern because of freezing . According to some authors to decrease the discrepancies diagnosis of malignancy without typing and grading is the best option.[18]

In the present study we found the turn around time from receiving of the tissues to frozen section diagnosis ranged from 15- 20 minute in 88.67% cases, Which is comparable to the other studies.[19,6,7] In 5 (9.4%) cases it was >25 minute where specimens were large and we had to take multiple sections from different areas. In one case (1.8%) specimen was exhausted and we had to ask for more tissue.

CONCLUSION

Frozen section is a rapid accurate method which should be done for intraoperative patient management, by doing more accurate sampling avoiding technical error in sectioning with combination of accurate interpretation and knowledge about clinical history and presentation can reduce the limitation and increase the diagnostic accuracy. However communication between surgeon and pathologist is recommended to reduce discordant rate. More studies with large sample size should be done to support our findings and increase the rate the diagnostic accuracy.

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