



COMPARATIVE STUDY OF FROZEN SECTION DIAGNOSES WITH HISTOPATHOLOGY

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ABSTRACT

Introduction – The correlation of intraoperative frozen section diagnosis with final diagnosis on permanent section is an integral part of quality assurance in surgical pathology.

Aims and objectives – To assess the accuracy of frozen section, to detect the number and type of discrepancies and to assess the causes for discrepancies.

Material and Methods – We retrospectively reviewed frozen sections performed in the pathology department at tertiary care hospital during a period of 1 year. The results were compared to the permanent sections to evaluate diagnostic accuracy. Discordant cases were reassessed to find the reasons for discrepancy.

Results and discussion - Total 74 cases were studied by frozen section method and paraffin section method (routine H&E stain) and comparison were made. The overall diagnostic accuracy was 93.2% including the partially correct diagnosis. The incidence of false positive cases was 1.35% while that of false negative cases was 5.40%. Incidence of partially correct diagnosis was 9.45%. There were not any cases of deferred diagnosis.

Conclusion – Frozen section is an accurate and valuable test and can be relied on in surgical managements. Most of the discrepancies can be prevented by providing more clinical information to the pathologist and more accurate sampling.

KEYWORDS : Frozen section, Histopathology

Introduction –

Welch of John Hopkin is credited for performing frozen section for the first time in 1891; and by then frozen section examination has become a routine procedure in most of the hospitals. [1,2,3,4]

The principle of cutting frozen sections is simple; when the tissue is frozen, the water within the tissue turns into the ice and in this state the tissue is firm, the ice acting as the embedding medium.[5]

The main purpose of frozen section is to provide rapid diagnosis, to guide intra or perioperative patient management.

Other indications of frozen sections are evaluation of margins, identification of lymph node metastasis and confirmation of presence of representative samples for paraffin section diagnosis. [6,7]

A college of American pathologist (CAP) sponsored review of over 90000 FS at 461 institutions showed a concordance rate of 98.52%. The study reasons that the main causes for the discrepancies were either misinterpretation of the original frozen section (31.8%), absence of diagnostic tissue in the frozen material but present in the unsampled tissue or in the corresponding permanent section (31.4%). [8]

In this retrospective study, we compare the diagnosis of intraoperative FS consultation with the final diagnosis using permanent tissue section and analyze the reasons for discordant diagnosis.

Aims and objectives –

1. Correlation of frozen section diagnosis with final histopathological diagnosis.
2. To assess the accuracy of frozen section diagnosis.
3. To detect the number and type of discrepancies.
4. To assess the causes for the discrepancies.

Materials and methods–

The present study was carried out in the department of pathology at JNMC, Sawangi for 1 year. During this period of 1 year 74 frozen sections were reported and compared with final histopathology diagnosis.

The fresh tissue without any preservative was processed for frozen section and same specimen was preserved in formalin for further

histopathology examination for correlation. The cryostat with cutting microtome was used to obtain the section at different temperatures and sections were stained by rapid hematoxyline and eosin stain. Final histopathological examination was done on same tissue after paraffin embedding.

The frozen section diagnoses were compared with the definitive diagnoses on paraffin embedded tissue used as controls. The test results of frozen section biopsies were then divided into two groups after comparing the results of biopsies in paraffin; consistent and inconsistent which were subdivided into false positives and false negatives. The examinations were considered consistent when the final diagnosis in paraffin biopsy result were the same as suggested by the frozen section and inconsistent when the results were not same.

Results –

Total 74 cases were studied by frozen section method and paraffin section method (routine H&E stain) and comparison were made. The overall diagnostic accuracy was 93.2%. The incidence of false positive cases was 1.35% while that of false negative cases was 5.40%. Incidence of partially correct diagnosis was 9.45%. There were not any cases of deferred diagnosis.

Table 1. Organwise final analysis of total no. of cases

Sr. no.	Organ/tissue	Total cases	Consistent diagnosis	False positive	False negative	Partially correct
1	Oral cavity	24	22	-	2	-
2	Breast	13	11	-	1	1
3	Skin&Soft tissue	08	01	-	-	1
4	Thyroid	07	07	-	-	-
5	Ovary	05	-	1	-	4
6	GIT	06	05	-	-	1
7	Lymph node	04	04	-	-	-
8	Urinary tract	03	02	-	1	-
9	CNS	01	01	-	-	-
10	Salivary gland	01	01	-	-	-
11	MGS	02	02	-	-	-

In our series, out of 74 cases maximum 24 cases were from oral cavity (32.44%) and minimum 1 (1.35%) case each from salivary gland and CNS.

The frozen and permanent diagnoses of false positive and false negative cases are compared in Table 2 and 3

Table 2. False positive case

No.	Organ	Frozen section diagnosis	Paraffin section diagnosis
1	Ovary	Secondary deposits of adenocarcinoma on ovary	Mesothelial hyperplasia

Table 3. False negative cases

No.	Organ	Frozen section diagnosis	Paraffin section diagnosis
1	Kidney	Xanthogranulomatous pyelonephritis	Transitional cell carcinoma
2	Breast	Sclerosing adenosis	Infiltrating duct carcinoma
3	Oral cavity	Acute ulcerative inflammatory lesion	Verrucous carcinoma
4	Oral cavity (Tongue)	Pseudoepitheliomatous hyperplasia	Early squamous cell carcinoma of tongue

In the present study, there were 7 partially correct diagnosis, out of which 4 cases belong to ovary, 1 case each to breast, soft tissue and peritoneum.

Table 4. Cases of partially correct diagnosis

No.	Organ	Frozen section diagnosis	Paraffin section diagnosis
1.	Breast	Fibrocystic disease	Duct ectasia
2.	Soft tissue	Lipoma	Neurofibroma
3.	Peritoneum	Neuroblastoma	Nonhodgkin's lymphoma
4.	Ovary	Papillary adenocarcinoma	Endometrioid carcinoma
5.	Ovary	Papillary mucinous cystadenocarcinoma	Granulosa cell tumor
6.	Ovary	Serous cystadenocarcinoma	Serous papillary cystadenocarcinoma
7.	Ovary	Mucinous cyst adenoma	Papillary serous cystadenoma

Frozen section is a well established procedure for the rapid diagnosis of intraoperative samples, which allows the surgeon the diagnosis of an lesion and determines the extent of resection, thus helping in making therapeutic decisions. Its accuracy should be high so that the surgeon can have confidence in the approach to be used. [9]

In this study, 74 frozen sections were performed for obtaining decision on type of surgery on operation table, extension of surgery in cases of maxillofacial surgery/oral surgery and radical surgery like breast.

The overall diagnostic accuracy was 93.2% when frozen section diagnoses were compared with paraffin section diagnoses, however other studies show even higher levels ranging from 94.8% to 98.3%. [10,11]

The false positive diagnosis was made in a case of ovary, which was diagnosed as secondary deposits of adenocarcinoma in ovary in frozen section which latter on diagnosed in paraffin section as mesothelial hyperplasia. So incidence of false positive diagnosis was 1.35%. The reason for false positive diagnosis in this case was presence of reactive mesothelial cells which morphologically got confused with malignant mucinous cells of ovarian adenocarcinoma. These discrepancy was due to lack of interpretation error. Interpretation error may result from artifacts of the freezing procedure and rarity of the lesion or inexperience on the part of pathologist. [10,13] Coffey et al. state that the accuracy is lower in mesenchymal and mucinous tumors of ovary. Using intraoperative cytological techniques including fine needle aspiration biopsy and touch imprint cytology can provide clear nuclear and cytoplasmic details without freezing artifact. [14]

False negative diagnoses were made in cases of kidney, breast, oral

cavity, (2 cases) which were diagnosed as xanthogranulomatous pyelonephritis, sclerosing adenosis, acute ulcerative inflammatory lesion and pseudoepitheliomatous hyperplasia in frozen section which latter on diagnosed as transitional cell carcinoma, infiltrating duct carcinoma, verrucous carcinoma and early squamous cell carcinoma of tongue in routine paraffin section respectively. So incidence of false negative diagnosis was 5.40% in this study. The reasons for false negative diagnosis in the present study are as follows.

In the case of xanthogranulomatous pyelonephritis given on frozen section, the diagnosis was given because of presence of foamy histiocytes, chronic inflammatory cells and occasional giant cells. Latter on same case was proved as transitional cell carcinoma on paraffin section. when paraffin section slide was studied carefully, along with features of transitional cell carcinoma there were presence of above mentioned cells which were supposed to be present in xanthogranulomatous pyelonephritis. These cells were noticed in transitional cell carcinoma because of the obstructive pathology developed by the tumor. During frozen section, section was taken from lesion of obstructive pathology. In a case of acute ulcerative inflammatory lesion given on frozen section, the section was taken from ulcerated area and not from the representative area which latter on proved to be the verrucous carcinoma on paraffin section. Sampling error was the main reason for these discrepancies. Many studies have mentioned about taking multiple bits from different areas of a lesion and using smear /squash cytological technique along with the frozen section to reduce the error. [03]

The literature mentioned that sclerosing adenosis could be misdiagnosed as well differentiated invasive duct carcinoma because it can mimic carcinoma both mammographically and histologically. Particular difficulty can occur with frozen sections and small tissue samples. [15]

In the literature it is mentioned that pseudoepitheliomatous hyperplasia could be misdiagnosed as squamous cell carcinoma (early change). The careful application of time honoured diagnostic criteria, close clinicopathological correlation and a selective request for a further, deeper or wider biopsy remain the most useful strategies to clinch the correct diagnosis. A careful search for an inciting infective process should be carried out with examination of deeper levels. [16]

Partially correct diagnosis were given in 7 cases. This was due to loss architectural pattern and freezing artifacts. Many authors believe that determining the presence of malignancy without subtyping or a judicious deferral can be the best option to decrease the discrepancies. [17,18]

The overall accuracy in the present series is 93.2% when partially correct diagnosis are taken together with fully correct diagnosis and false positive and false negative diagnosis are considered as erroneous diagnosis.

Conclusion -

Frozen section diagnosis is very useful and highly accurate procedure. Gross inspection, sampling by pathologist, frozen complemented with cytological and 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.

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