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# Interaoperative frozen section consultation: an analysis of accuracy in a teaching hospital.

Farrukh Aijaz
*Aga Khan University*

Suhail Muzaffar
*Aga Khan University*

Akbar Shah Hussainy
*Aga Khan University*

Shahid Pervez
*Aga Khan University*, shahid.pervez@aku.edu

Sheema H. Hasan
*Aga Khan University*

***See next page for additional authors***

**Authors**
Farrukh Aijaz, Suhail Muzaffar, Akbar Shah Hussainy, Shahid Pervez, Sheema H. Hasan, and Hizbullah Sheikh

# Lntraoperative Frozen Section Consultation: An Analysis of Accuracy in a Teaching Hospital

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Farrukh Aijaz, Suhail Muzaffar, Akbar Shah Hussainy, Shahid Pervez, Sheema H. Hasan, Hizbullah Sheikh ( Department of Pathology, The Aga Khan University Hospital, Karachi. )

## Abstract

This Is a retrospective quality assurance study of all frozen sections done at The Aga Khan University Hospital during a six year period (1986 to 1991). There were 1,031 frozen sections out of a cumulative total of 42,985 surgical specimens (2.39%). Nine hundred and seventy-six (94.66%) were concordant. In 92(8.9%) fresh specimens were brought from other hospitals of Karachi, in 37 cases (3.58%) the diagnosis was deferred till the evaluation of permanent paraffin sections and 18 (1,74%) were discordant with 7 (0.67%) false positive and 11(1,06%) false negative. Among the discordant cases, 9 were attributed to misinterpretation, 7 due to sampling errors and 2 due to technical reasons. Some of these errors might have been avoided, but appear to be an Irreducible minimum (J PMA 43:253, 1993).

## Introduction

The interpretation of frozen section is perhaps the most stressful and high risk task performed by a histopathologist and after some initial pessimism and reluctance[1], this procedure is now firmly entrenched as an indispensable tool in the management of operating room patients. Accuracy rates for this technique are well published in western literature[2-6] and few reports have also originated from the third world countries[7]. The correlation of intra-operative frozen section diagnosis with paraffin section is a standard quality assurance and control mechanism in a histopathology laboratory[8]. Very few institutions in Pakistan provide frozen section services on a regular basis and to the best of our knowledge, comprehensive data regarding the accuracy of this technique in Pakistan are non-existent. We report an audit of all frozen sections done at our laboratory in a six year period from the beginning of 1986 till the end of 1991.

## Materials and Method

All cases were retrieved from the files of the Surgical Pathology Department of Aga Khan University Hospital, Karachi. This institute is a 400 bed teaching hospital which also functions as a major referral centre for Southern Pakistan. During the six year period, a total of 1031 frozen section cases were received out of 42,985 routine surgical specimens. Breast, thyroid, lymph nodes and gastrointestinal tract were the common organ systems requiring frozen sections. All frozen section specimens were initially aamined by staff pathologists who also selected appropriate tissue for freezing. The cryostat used was Tissue Tek II (Miles Laboratories). Specimens were frozen in optimal cutting temperature solution (OCT) up to -20°C in cryostat. 4-5 um thick sections were cut The cryostat is provided with an anti-roll plate, however, some technologists were more comfortable in not using it. The sections were stained by H&E method. Frozen section diagnosis was. directly reported by the staff pathologist by telephone to the operating rooms. After the completion of frozen section, the frozen tissue was then formalin fixed and processed for paraffin embedding. The initial frozen section diagnosis was recorded and became part of the final surgical pathology report. All frozen section diagnoses were compared with the final diagnosis rendered after evaluation of paraffin embedded sections. Any discrepancy was

noted and all cases which were discordant as regards the benign versus malignant were reviewed. The review process included the re-examination of all slides with categorization of the reasons for discordance in three categories, i.e., interpretative errors, sampling errors (gross and microscopic) and technical errors. Patient charts and notes were available in most cases for review to determine any harm resulting from a discordant diagnosis. Records for one discordant case from a city hospital was not available for review. Deferred cases were the ones on which the consultant pathologist, at the time of frozen section preferred not to give a conclusive diagnosis. In most cases, the pathologist conveyed to the surgeon his or her inability in reaching a definite diagnosis as regards to benign versus malignant. Appropriateness of deferral was not evaluated.

**Results**

Of 1031 cases of frozen sections requested 92 (8.9%) were fresh specimen brought from other hospitals of Karachi. Breast was the commonest tissue requiring frozen section followed by gastrointestinal tract, lymph nodes and thyroid tissue (Table I).

**Table I. Organwise distribution of frozen section of cases.**

| Organs | No. | % |
|---|---|---|
| Breast | 221 | 21.4 |
| G.I. tract | 166 | 16.1 |
| Lymph node | 158 | 15.3 |
| Thyroid | 118 | 11.4 |
| Others | 368 | 35.7 |

In 976 cases (94.66%) the frozen section diagnosis was concordant and in 18 (1.74%) discordant with final diagnosis on permanent paraffin embedded sections. In 37 cases (3.58%) no diagnosis was rendered at the time of frozen section. Seven cases were false positive (malignant on frozen section, benign on permanent sections) and 11 cases were false negative (benign on frozen section, malignant on permanent sections).

**Discussion**

Frozen section is a reliable and now a routine method for rapid and instant diagnosis. In simplest terms the only indication for a frozen section is to make a therapeutic and management decision during surgery[9]. These indications can be stratified in the order of increasing difficulty in diagnosis as follows[3,5]:

1. Identification and verification of unknown tissue
2. Tissue adequacy for further diagnostic study
3. Extent of tumour spread and margin assessment
4. Detection of lymph node metastasis
5. New diagnosis of an unknown process

The surgeon and pathologist should be aware of the potential pitfalls and limitations of this procedure and both should accept certain responsibilities so that the patients can gain maximum benefit. From the

pathology perspective comparison of diagnosis rendered at the time of frozen section to that of permanent sections is of utmost importance. This quality control and assurance mechanism is now routine in all histopathology laboratories providing frozen section services[8]. Our figures for concordant, deferred and discordant diagnosis are comparable with other published series (Table II).

**Table II. Comparison with other studies.**

| | FS (n) | FS rate % | FS deferred % | FS discordant % |
|---|---|---|---|---|
| Rogers at al, 1987[2] | 1,414 | 4.70 | 3.70 | 1.50 |
| Sawady et al, 1988[3] | 482 | - | 2.90 | 2.90 |
| Oneson et al, 1989[4] | 1,000 | 8.40 | 6.10 | 3.70 |
| CAP Q-Probe study, 1991[5] | 52,464 | 5.60 | 4.20 | 1.70 |
| AKUH study, 1993 | 1,031 | 2.39 | 3.58 | 1.74 |

More recently, upper limits of acceptable discordant and deferred rates of 3% and 10% are recommended[8]. Half of our discordant results were due to interpretation (Table III).

**Table III. Discordant diagnosis.**

| Specimen | Frozen section diagnosis | Paraffin section diagnosis | Reason |
|---|---|---|---|
| Margin for Skin tumour | Sq. cell Ca | Ben. ɔn | Interpretation |
| Parotid | Benign | Adenoid cystic Ca | Interpretation |
| Lymph node | Benign | Metastatic adenocarcinoma | Sampling |
| Lymph node | Benign | Metastatic adenocarcinoma | Sampling |
| Retroperitoneum | Benign | Non-Hodgkin's lymphoma | Interpretation |
| Pancreas | Benign | Adenocarcinoma | Sampling |
| Breast | Benign (fat necrosis) | Infiltrating ductal Ca | Interpretation |
| Thyroid | Benign | Papillary Ca | Sampling |
| Liver | Adenocarcinoma | Bile duct adenoma | Technical |
| Thyroid | Focus of papillary Ca | Benign | Interpretation |
| Breast | Benign | Intraductal Ca | Sampling |
| Maxillary margin of malignant tumour | Malignant | Benign | Technical |
| Thyroid | Papillary Ca | Benign | Interpretation |
| Gall bladder | Benign | Adenocarcinoma | Interpretation |
| Lymph node | Metastatic sq. Ca | Nodal angiomatosis | Interpretation |
| Lymph node | Metastatic Ca | Benign | Interpretation |
| Oral mucosal margin | Benign | Sq cell Ca | Sampling |
| Breast | Benign | Infiltrating ductal Ca | Sampling |

Interpretative errors however, are extremely difficult to evaluate retrospectively. In some cases, technical reasons such as thick sections, folded sections, air drying and staining were partially responsible. In others, inadequate history and lack of communication between surgeons and pathologist resulted in erroneous interpretation. Nevertheless, we categorized interpretative errors as such where other factors were minor in nature. Some interpretative errors are bound to occur in the stressful situation of frozen section diagnosis and these usually involve cases that are difficult to diagnose even under ideal circumstances. Constraints of time may not allow performance and evaluation of deeper sections and consultation with colleagues. Any pathologist can make these mistakes and inexperienced pathologists may tend to err more than experienced pathologists. Sampling was also a major reason for

discordance. Sampling errors could occur at the time of initial gross evaluation of the specimen if unrepresentative sections were selected for freezing. Sampling errors could also occur at the microscopic level if pertinent pathology appears on the deeper sectioning of the paraffin embedded block. These errors can be minimized by meticulous gross examination, careful selection of representative material and deeper sectioning when appropriate. No serious consequences were noted in these discordant cases after careful review of the patient charts. One case from an outside hospital was not available for review. In Pakistan, frozen section services are exceptions rather than routine and consequently reliable figures of accuracy of this technique to the best of our knowledge are non-existent There is, on the other hand a definite need and demand for this service in the community and this is reflected by a continual Increase in the frozen sections done on the specimens brought from other city hospitals of Karachi to our laboratory. It is our feeling that the present breed of pathology trainees are not adequately exposed to this procedure and this will significantly affect the practice of surgery and pathology in future. This &ct should be given needed importance by the organizations that oversee the training and conduct examinations in histopathology.

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