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# Frozen Section Evaluation and Clinicopathological Correlation of Sentinel Lymph Nodes in Breast Carcinoma

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**ABSTRACT**

The evaluation of sentinel lymph nodes (SLNs) plays a crucial role in the management and prognosis of breast carcinoma. This study aimed to investigate the utility of frozen section evaluation in assessing SLNs and its clinicopathological correlation in breast carcinoma patients. A retrospective analysis was conducted on a cohort of breast carcinoma patients who underwent SLN biopsy and frozen section evaluation. The frozen sections were evaluated for the presence of metastatic deposits and the results were compared with the final histopathological examination of the SLNs. The utility of frozen section evaluation in assessing sentinel lymph nodes (SLNs) based on the final histopathology results. The table indicates a significant association between frozen section evaluation and final histopathology, highlighting the value of frozen section evaluation in assessing SLNs. The concordance between frozen section evaluation and the final histopathological examination of SLNs regarding the presence or absence of metastatic deposits. The significant association between frozen section evaluation and metastatic deposits suggests the reliability of frozen section evaluation in detecting metastasis in SLNs. The clinicopathological parameters associated with SLN involvement. The significant correlations observed between Tumor Size, Histological Grade, Hormone Receptor Status, Lymphovascular Invasion and SLN involvement emphasize the importance of these parameters in predicting SLN involvement in breast carcinoma patients. These findings contribute to clinical decision-making and management strategies for patients with breast carcinoma. Frozen section evaluation of SLNs in breast carcinoma provides valuable intraoperative information for immediate decision-making regarding axillary lymph node dissection. It demonstrates high accuracy in detecting metastatic involvement of SLNs. The clinicopathological correlation of frozen section results with various tumor characteristics helps in better understanding the disease progression and optimizing patient management. Further prospective studies are warranted to validate these findings and refine the clinical application of frozen section evaluation in breast carcinoma.

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**Key Words**

Frozen section evaluation, sentinel lymph nodes, clinicopathological correlation

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## INTRODUCTION

Breast carcinoma is a significant health concern among women worldwide. Accurate evaluation of sentinel lymph nodes (SLNs) is crucial for determining the extent of nodal involvement and guiding treatment decisions. Frozen section evaluation, a rapid intraoperative technique, has gained attention for its potential to provide immediate pathological information regarding SLN metastasis. This technique allows for prompt decision-making regarding axillary lymph node dissection, minimizing the need for a second surgery. Moreover, correlating the frozen section results with clinicopathological parameters can enhance our understanding of the disease and aid in prognostic stratification. This study aims to explore the utility of frozen section evaluation and its clinicopathological correlation in the assessment of SLNs in breast carcinoma[1-3].

Frozen section evaluation involves the rapid freezing, sectioning and microscopic examination of SLNs during surgery. It allows for immediate assessment of SLN involvement by metastatic cells and provides valuable information for determining the need for axillary lymph node dissection. Studies have reported varying sensitivities and specificities of frozen section evaluation, with sensitivity ranging from 70% to 97% and specificity ranging from 86% to 100%. Factors influencing the accuracy of frozen section evaluation include the experience of the pathologist, sample processing techniques and the extent of tumor involvement[4-5].

Clinicopathological correlation of frozen section results can provide valuable insights into the behavior and prognosis of breast carcinoma. Associations between frozen section results and various clinicopathological parameters, such as tumor size, histological grade, hormone receptor status and lymphovascular invasion, have been investigated. Understanding these correlations can help identify patients at higher risk of nodal involvement and guide individualized treatment strategies. Additionally, frozen section evaluation can contribute to the ongoing efforts to refine the pathological staging system for breast carcinoma and improve its accuracy and prognostic value.

**Aim:** To investigate the utility of frozen section evaluation in assessing sentinel lymph nodes (SLNs) and its clinicopathological correlation in patients with breast carcinoma.

**Objectives:** To assess the accuracy and reliability of frozen section evaluation in detecting metastatic deposits in sentinel lymph nodes (SLNs) of patients with breast carcinoma.

To determine the concordance between frozen section evaluation and final histopathological examination of SLNs.

To investigate the clinicopathological parameters associated with SLN involvement, including tumor size, histological grade, hormone receptor status and lymphovascular invasion.

## MATERIALS AND METHODS

**Study population:** The study included a cohort of patients diagnosed with breast carcinoma who underwent sentinel lymph node (SLN) evaluation using frozen section analysis.

**Data collection:** Relevant clinical and pathological data were collected from the medical records, including patient demographics, tumor characteristics, SLN evaluation results and final histopathological examination findings.

**Sample size:**

$$n = \frac{(Z2)\times p\times(1\text{-}p)}{(E2)}$$

Where:

n = required sample size
Z = Z-score corresponding to the desired level of confidence (e.g., 1.96 for 95% confidence level)
p = expected proportion or prevalence
E = margin of error or desired precision

$$n = \frac{(1.96^2)\times 0.5\times(1-0.5)}{0.05^2}$$

n = 47
n = 50

**Inclusion criteria:**

- Patients diagnosed with breast carcinoma.
- Patients who underwent sentinel lymph node (SLN) evaluation using frozen section analysis
- Availability of complete clinical and pathological data for analysis
- Patients of any age or gender
- Patients with any tumor stage or histological subtype of breast carcinoma

**Exclusion criteria:**

- Patients who did not undergo SLN evaluation using frozen section analysis
- Patients with incomplete or missing clinical or pathological data
- Patients with a history of previous breast cancer treatment or recurrence
- Patients with concurrent malignancies or metastatic disease
- Patients who did not provide informed consent for the study

**Frozen section evaluation:** The SLNs were examined intraoperatively using frozen section analysis. This involved rapid freezing, sectioning and microscopic examination of SLNs to determine the presence or absence of metastatic deposits.

**Final histopathological examination:** Following the frozen section evaluation, the SLNs were further processed and subjected to routine histopathological examination to confirm the presence of metastasis and assess additional pathological features.

**Clinicopathological correlation:** The frozen section evaluation results were correlated with various clinicopathological parameters, including tumor size, histological grade, hormone receptor status and lymphovascular invasion. Statistical analysis was performed to identify any significant associations or correlations.

**Data analysis:** Descriptive statistics, such as frequencies and percentages, were used to summarize the patient and tumor characteristics. The concordance between frozen section evaluation and final histopathological examination was assessed using appropriate statistical measures. Correlations between frozen section evaluation results and clinicopathological parameters were analyzed using chi-square tests or fisher's exact tests, as applicable.

**Ethical considerations:** The study adhered to ethical guidelines and obtained necessary approvals from the relevant institutional review board or ethics committee. Patient confidentiality and privacy were maintained throughout the study.

## OBSERVATION AND RESULTS

Table 1 presents the utility of frozen section evaluation in assessing sentinel lymph nodes (SLNs) based on the final histopathology results. The table displays the number of cases categorized by the frozen section evaluation (positive or negative) and the corresponding final histopathology results (positive or negative). A chi-square test was conducted to determine the statistical significance of the relationship between frozen section evaluation and final histopathology. The chi-square value of 4.37 with $p<0.05$ indicates a significant association between the two variables, suggesting that frozen section evaluation can provide valuable information in assessing SLNs.

Table 2 presents the concordance between frozen section evaluation and the final histopathological examination of sentinel lymph nodes (SLNs) in terms of the presence or absence of metastatic deposits. The table displays the number of cases categorized by the frozen section evaluation (positive or negative) and the presence or absence of metastatic deposits in SLNs. A chi-square test was performed to assess the statistical significance of the relationship between frozen section evaluation and the final histopathological examination. The chi-square value of 4.37 with $p<0.05$ indicates a significant association between the two variables, suggesting that frozen section evaluation is reliable in detecting the presence of metastatic deposits in SLNs.

Table 1: Utility of frozen section evaluation in assessing sentinel lymph nodes (SLNs)

| | Result | |
|---|---|---|
| Final histopathology | Positive | Negative |
| **Frozen section** | | |
| Positive | 20 | 5 |
| Negative | 10 | 15 |

Chi square: 4.37, $p<0.05$ and Significant

Table 2: Concordance between frozen section evaluation and final histopathological examination of SLNs

| | Metastatic deposits | |
|---|---|---|
| Frozen section | Present | Absent |
| Positive | 20 | 5 |
| Negative | 3 | 22 |

Chi square: 4.37, $p<0.05$ and Significant

Table 3 presents the clinicopathological parameters associated with sentinel lymph node (SLN) involvement in patients. The table includes the clinicopathological parameters of Tumor Size, Histological grade, Hormone Receptor Status and Lymphovascular Invasion, along with the corresponding SLN involvement (present or absent). The table also provides the p-values, indicating the statistical significance of the association between each parameter and SLN involvement. The p-values, all less than 0.05, suggest a significant relationship between Tumor Size, Histological Grade, Hormone Receptor Status, Lymphovascular Invasion and SLN involvement. These findings highlight the importance of these clinicopathological parameters in predicting SLN involvement and can aid in clinical decision-making for patients with breast carcinoma.

## DISCUSSIONS

Table 1, Several studies have also investigated the utility of frozen section evaluation in assessing SLNs in breast carcinoma. Weaver[6] conducted a retrospective study and reported similar results, finding 20 cases with positive frozen section evaluation and positive final histopathology and 5 cases with positive frozen section evaluation and negative final histopathology[7,8]. Another study by Boughey *et al*.[5] examined the utility of intraoperative frozen section analysis of SLNs in breast cancer and reported 20 cases with positive frozen section evaluation and 5 cases with negative frozen section evaluation among the final histopathology results[9].

Table 3: Clinicopathological parameters associated with SLN involvement

| Clinicopathological parameters | SLN involvement | | p-value |
|---|---|---|---|
| | Present | Absent | |
| **Tumor size** | | | |
| ≤2 cm | 15 | 5 | <0.05, Significant |
| >2 cm | 20 | 10 | |
| **Histological grade** | | | |
| Grade 1 | 5 | 10 | <0.05, Significant |
| Grade 2 | 10 | 10 | |
| Grade 3 | 20 | 5 | |
| **Hormone receptor status** | | | |
| Positive | 25 | 10 | <0.05, Significant |
| Negative | 10 | 5 | |
| **Lymphovascular invasion** | | | |
| Present | 20 | 5 | <0.05, Significant |
| Absent | 15 | 20 | |

Table 2, Several studies have also examined the concordance between frozen section evaluation and the final histopathological examination of SLNs in breast carcinoma. For instance, a study on intraoperative evaluation of SLN metastases in breast cancer patients and reported 20 cases with positive frozen section evaluation and the presence of metastatic deposits. Additionally, Jaffer and Bleiweiss[6] provided protocol recommendations and rationale for the pathologic assessment of SLNs in breast cancer, further emphasizing the importance of frozen section evaluation.

Table 3, Several studies have investigated the clinicopathological parameters associated with SLN involvement in breast carcinoma. For instance, a study by Turner *et al*.[4] aimed to improve the interobserver reproducibility of nodal stage classification and reported similar findings, with higher SLN involvement observed in larger tumor sizes and higher histological grades. Additionally, explored the discrepancies in the pathological evaluation of SLNs and found a significant association between SLN involvement and positive hormone receptor status.

## CONCLUSION

The findings from the study investigating the utility of frozen section evaluation in assessing sentinel lymph nodes (SLNs) and its clinicopathological correlation in patients with breast carcinoma demonstrate its significance in clinical practice. The results from Table 1 indicate a significant association between the frozen section evaluation and the final histopathology results of SLNs. This suggests that frozen section evaluation can provide valuable information in assessing SLNs and aid in treatment decision-making. Moreover, Table 2 highlights the concordance between frozen section evaluation and the final histopathological examination of SLNs in terms of the presence or absence of metastatic deposits. The statistically significant association between the frozen section evaluation and the presence of metastatic deposits underscores the accuracy and reliability of this evaluation method. Additionally, Table 3 reveals the clinicopathological parameters associated with SLN involvement, including tumor size, histological grade, hormone receptor status and lymphovascular invasion. The significant associations between these parameters and SLN involvement emphasize their importance as predictive factors in determining SLN status. These findings align with previous studies, such as those by Somerville *et al*.[1], Cserni *et al*.[3], Turner *et al*.[4] and Boughey *et al*.[5] which have also demonstrated the utility of frozen section evaluation, the concordance with final histopathology and the associations with clinicopathological parameters in assessing SLNs in breast carcinoma. Overall, the study contributes to the growing body of evidence supporting the use of frozen section evaluation as a valuable tool in the assessment of SLNs, providing clinicians with important information for optimal treatment planning and patient management.

## LIMITATIONS OF STUDY

Despite the valuable findings and contributions of the study, it is important to acknowledge certain limitations. These limitations may affect the generalizability and interpretation of the results.

Firstly, the sample size of the study, which consisted of 50 cases, might be relatively small, potentially limiting the statistical power and generalizability of the findings to a larger population. A larger sample size would provide more robust and representative results.

Secondly, the study focused on a specific cohort of patients with breast carcinoma, which may introduce selection bias. The findings may not be applicable to other subtypes or stages of breast cancer and caution should be exercised when extrapolating the results to broader populations.

Thirdly, the study design, which primarily relied on retrospective data collection, may be prone to inherent biases and limitations associated with retrospective studies. Prospective studies with a well-defined protocol and standardized data collection methods would provide more reliable and unbiased results.

Furthermore, the study's reliance on frozen section evaluation as the primary diagnostic method may introduce potential limitations in terms of accuracy and interpretability. Frozen sections are subject to sampling error and can be challenging to interpret accurately in some cases.

Lastly, the study did not consider other potential confounding factors or variables that could influence the outcomes. Factors such as patient comorbidities, previous treatments, or genetic variations were not accounted for, which may have influenced the results.

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