Original Article Open Access

Archives Of Breast Cancer

DOI: 10.19187/abc.201634130-134

Comparison of the Accuracy of Frozen Section in Morning and Afternoon Working Hours for Axillary Lymph Node Biopsy

Fezzeh Elyasinia[a], Mohammad Reza Keramati*[a], Farham Ahmadi[a], Mohammad Ashouri[a], Vahid Moghadas[a], Fahimeh Elyasinia[a], Maryam Yaghoubi[a], Armita Aboutorabi[b], Ahmad Kaviani[a, b]

[a] *Department of Surgery, Tehran University of Medical Sciences, Tehran, Iran*
[b] *Kaviani Breast Diseases Institute (KBDI), Tehran, Iran*

ARTICLE INFO

Received:
20 October 2016
Revised:
4 November 2016
Accepted:
16 November 2016

Keywords:
Breast cancer,
frozen section,
working hour,
lymph node dissection

ABSTRACT

Background: The role of diagnostic pathology has become more prominent. This study aimed to compare the accuracy of frozen section compared with permanent section in the morning and afternoon working hours.

Methods: In this cross-sectional study, 99 patients with stage 1 and 2 breast cancer who underwent sentinel and non-sentinel lymph node biopsy between 2013 and 2015 were included.

The results of frozen section and permanent pathology of the lymph nodes were compared with one another. The time of pathologic evaluation including morning (before 2pm) and afternoon (after 2 pm) was also considered in the comparative analysis.

Results: The mean age of the patients was 48.58±8.96 years. The accuracy of frozen section biopsy of the sentinel lymph node was 79.80%, 81.0%, and 78.0% in general, before 2 pm, and after 2 pm, respectively. The accuracy of frozen section biopsy of the non-sentinel lymph node was 62.32%, 65.1%, and 57.7% in general, before 2 pm, and after 2 pm, respectively.

Conclusions: There was no difference in the accuracy of the frozen section biopsy before and after 2 pm for the sentinel or non-sentinel lymph node biopsy.

Introduction

Breast cancer is the most common cancer among women and the second leading cause of cancer death among women. Due to screening programs, it is very important to find patients in the early stages of this cancer for breast conservation surgery. Therefore, the results of the intraoperative frozen section have a crucial role in determining the surgical approach.[1-3]

Intraoperative pathologic frozen section evaluation of the tissue samples was introduced in 1891 by William M. Welsh.[4] This technique can be used by surgeons to gain good information in a short time for decision making and choosing proper approaches.[5-12] However, important diagnostic errors might occur based on wrong pathologic results.[13-19] The frozen section method is widely used in breast surgery for detection of underlying malignancy within margins of the surgical resection during a surgical procedure. Several studies have been done to determine the efficiency and accuracy of frozen section results in breast surgery. In these articles, many factors affecting the accuracy of this method have been also assessed.[6,20,21]

Working time arrangement has been mentioned as a key issue because it links the human capacity with production means. Due to the development of new technologies requiring continuous human assistance and control 24 hours a day, this issue has

Address for correspondence:
Mohammad Reza Keramati, MD
Address: Department of Surgery, Imam Khomeini Complex Hospital, Keshavarz Blvd., Tehran, Iran
Tel: +98 9121147406
Fax: +98 21 66581657
Email: dr_morezak@yahoo.com

become increasingly important. Therefore, the daytime work difference might affect human processes such as pathologic evaluation of surgical samples.

This study aimed to evaluate and compare the accuracy of frozen section in relation to the results of the permanent section in the morning (before 2 pm) and afternoon (after 2 pm) working hours.

Methods

In this cross-sectional analytic study, patients suffering from early breast cancer with a breast mass smaller than 5 cm (T1 or T2) and no palpable mass on examination or diagnostic imaging in the visible region of the axilla were included. This study was conducted at a tertiary and referral university hospital between 2013 and 2015. Sampling was done using the convenience sampling method.

The exclusion criteria were multifocal breast cancer, inflammatory breast cancer, history of previous mastectomy or oncologic breast surgery, pregnancy, or ductal carcinoma in situ (DCIS).

Demographic data and information related to clinical findings and diagnostic imaging were collected. The results of the frozen section taken from the margin of the tumor in cases who underwent Sentinel Lymph Node Biopsy (SLNB) in addition to the results of the frozen section study of the lymph nodes were also recorded. Data were analyzed using SPSS version 20.0. Quantitative data are demonstrated as mean and standard deviation, and qualitative data are shown as frequency and percentage. A p-value of less than 0.05 was considered statistically significant.

Results

In this study, 99 patients were studied. The mean age of the participants was 48.58± 8.96 years (range: 28 – 76 years). The mean body mass index (BMI) of the patients was 26.98±3.59 kg/m^2. Seventy-one patients (71.7%) had a BMI above 25.0 kg/m^2. The mean tumor size was 2.35 ± 0.93 mm. Moreover, 56.7% of the masses were detected in the right breast, and 43.3% were in the left breast. A total of 58 tissue samples were taken (58.6%) within the morning working hours (before 2 pm) and 41 samples (41.4%) were taken during the afternoon working hours (after 2 pm). All samples were sent for both frozen section and permanent pathologic evaluation afterwards.

Of the 99 pathologically evaluated sentinel node samples evaluated by frozen section, 46 patients (46.5%) had malignant tissues and 53 (53.5%) had no proof of malignancy. Of the 99 permanent pathologic samples of the sentinel node, 66 cases (66.7%) had evidence of malignancy while 33 cases (33.3%) had no signs of malignancy. Of the 69 non-sentinel lymph node samples evaluated by frozen section, 16 cases (23.2%) had evidence of malignancy and 53 (76.8%) had no signs of malignancy. Of 69 non-sentinel lymph node samples as a permanent section, 40 patients (58.0%) had malignant tissues while 29 cases (42.0%) had no signs of malignancy.

The sensitivity and specificity of frozen section in the diagnosis of sentinel lymph node involvement was 69.70% (CI = 57.15% to 80.41%) and 100% (CI = 89.42% to 100.00%), respectively. The positive and negative predictive value of the frozen section in the diagnosis of sentinel lymph node involvement was 100% (CI = 92.29% to 100.00%) and 62.26% (CI = 47.89% to 75.21%), respectively. In general, the accuracy of frozen section in the diagnosis of sentinel lymph node samples was 79.80%. The sensitivity and specificity of frozen section in the diagnosis of non-sentinel lymph node samples was 37.50% (CI = 22.73% to 54.20%) and 96.55% (CI = 82.24% to 99.91%), respectively. The positive and negative predictive value of frozen section in the diagnosis of non-sentinel lymph node samples was 93.75% (CI = 69.77% to 99.84%) and 52.83% (CI = 38.64% to 66.70 %), respectively. The accuracy of frozen section in the diagnosis of non-sentinel lymph node samples was 62.32%.

Of the samples taken from sentinel lymph nodes, 58 samples (58.6%) were taken before 2 pm and 41 samples (41.4%) after 2 pm. The frozen section results of 47 samples taken before 2 pm and 32 samples taken after 2 pm were concordant with the results of permanent section. Therefore, the accuracy of frozen section for sentinel lymph node samples before and after 2 pm was 81.0% and 78.0%, respectively. There was no significant relationship between the results of frozen and permanent section and the time of pathologic evaluation before and after 2 pm (P value = 0.716). Of the samples taken from non-sentinel lymph nodes, 43 samples (62.3%) were taken before 2 pm and 26 samples (37.7%) were taken after 2 pm. Of these samples, the results of 28 and 15 frozen section samples taken before and after 2pm matched the results of permanent section. So, the accuracy of frozen section for non-sentinel lymph node samples before and after 2 pm was 57.7% and 65.1%, respectively. No significant relationship was detected between the results of frozen and permanent section at the time of pathologic evaluation (P value = 0.537).

Comparison of the results of permanent and frozen section is demonstrated in Table 1.

Table 1. Results of frozen section and permanent section evaluation of samples

		Permanent section	
		Sentinel nodes	
		with malignancy	without malignancy
Frozen section	with malignancy	46 (46.5%)	0
	without malignancy	20 (22.2%)	33 (33.3%)
		Non-sentinel nodes	
		with malignancy	without malignancy
	with malignancy	15 (21.7%)	1 (1.4%)
	without malignancy	25 (36.2%)	28 (40.6%)

The results of frozen section and permanent section according to the time of sentinel and non-sentinel lymph node biopsy are depicted in Table 2.

Table 2. Results of frozen and permanent section evaluation in each working shift for sentinel and non-sentinel lymph node biopsy

	Time of sentinel lymph node biopsy	
Frozen section versus permanent section	Before 2 pm	after 2 pm
Match	47 (47.5%)	32 (32.3%)
Miss match	11 (11.1%)	9 (9.1%)
	Time of non-sentinel lymph node biopsy	
Frozen section versus permanent section	Before 2 pm	after 2 pm
Match	28 (40.6%)	15 (21.7%)
Miss match	15 (21.7%)	11 (15.9%)

Discussion

According to clinical experience, there is a relationship between working time, work shift duration, and fatigue with the final outcome of procedures. Hospital staff may make medical errors due to fatigue.[22-29] In most studies, fatigue can increase the error rate over the working time.[30-32]

Studies have shown the important role of frozen section in determining the surgical approach. The intraoperative frozen section can also be of help in axillary dissection.[1-3,20] Therefore, effective communication between the pathologist and surgeon is important, as well. In this study, the accuracy of the frozen and permanent pathologic evaluation of sentinel and non-sentinel lymph node biopsy specimens was investigated.

According to our analysis, the accuracy of frozen section results of sentinel lymph node biopsy specimens was 79.80%, 81.0%, and 78.0% in general, before 2 pm, and after 2 pm, respectively. There was no significant difference in the accuracy of the results of the frozen section before and after 2 pm in this study (P value = 0.716). Moreover, the accuracy of frozen section evaluation of non-sentinel lymph node biopsy specimens was 62.32%, 65.1%, and 57.7% in general, before 2 pm, and after 2 pm, respectively. There was no significant difference in the accuracy of frozen section results before and after 2 pm (P value = 0.537). Considering the higher sensitivities reported in some other previous studies compared to our study, more studies are required to clarify the reasons.[33,34]

In a study of Rogers *et al.*, the frozen section results of 1414 samples matched the results of permanent pathology.[35] The accuracy of frozen section in the diagnosis of malignant cells in this study is similar to other similar studies, including a study by Weiser *et al.*, and a study by Van Diest *et al.*[3,36]

Previous studies have proposed that repetitive processes may be affected more than other procedures by fatigue during shift times.[21, 37-42] In a study by Sanaka *et al.*, the time of performing colonoscopy was an independent predictor for detection of adenoma.[38] In another study by Sanaka *et al.*, performing colonoscopy in the afternoon compared to the morning was an independent predictor of incomplete colonoscopy.[39] According to a study by Parsaei *et al.*, breast surgery with a later start time might have a lower quality.[43] These reports are in contrast to our findings. However, Mehta *et al.*, showed that doing ERCP in the morning or in the afternoon did not seem to affect the cannulation success, procedure completion rate, length of the procedure, or adverse events.[37] This result is similar to our findings.

According to our findings and analyses, there is no difference in the accuracy of the results of frozen section analysis for sentinel and non-sentinel biopsy before and after 2 pm. However, further studies with more cases are recommended.

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