Original Article

Accuracy of Frozen Sections

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ABSTRACT

Background and Objective: Intraoperative consultation by frozen section is a high – risk procedure with important consequences. Therefore, it is critical to determine efficiency of frozen section performance periodically. This study was performed to determine the accuracy of frozen section in Urmia University of Medical Sciences.

Materials & Methods: In this cross sectional study, we compared the results of 200 consecutive cases of frozen sections with their final permanent section diagnoses in teaching hospitals of Urmia University of Medical Sciences during March 2001 to March 2008.

Results: A total of 155 neoplastic and 45 nonneoplastic specimens were studied. The overall accuracy of frozen sections was 96.5%. In diagnosis of neoplastic lesions, sensitivity, specificity, positive and negative predictive values and accuracy were 93.1%, 97.7%, 96%, 95% and 95.9%, respectively.

Conclusion: In this university interpretation of frozen sections is done with high accuracy and is valuable to help surgeons to plan the best management of the operation.

Keywords: Frozen Section, Specificity, Sensitivity

Introduction

Intra-operative consultation is an important and high risk procedure to obtain a tissue diagnosis at the request of the surgeons with important consequences (1, 2).

Frozen section (FS) is necessary to identify the nature of the lesion, to evaluate the involvement of surgical margins in malignant

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tumors and to determine the adequacy of diagnosable material (1). Frozen section is chiefly performed to determine whether the tissue being sampled is malignant or benign (3). Also, it may aid in staging a known tumor and identifying a particular histological type, intra-operatively (3). The overall accuracy of frozen section reported in different studies vary from 91.5 to 97.4% (3,4). However, limitation in use of FS must be recognized (5). There were occasions in which the F.S slides were suboptimal because of necrosis, hemorrhage, calcification, nonrepresentative sampling or other technical factors (6). Therefore determination the efficiency of frozen section by regular re-evaluation is important and should be done as part of quality assurance (5). So, it is important and sometimes critical to determine the efficiency of FS performance periodically (1,7).

The purpose of this study was to determine the accuracy of FS in Urmia University of Medical Sciences during 2001- 2008.

Materials and Methods

This cross sectional study was performed on 200 consecutive cases of FS in teaching hospitals of Urmia University of Medical Sciences, East Azerbaijan Province, Iran including Imam Khomeini and Shahid Motahari Hospitals during March 2001 – March 2008.

The histopathology reports of both FS and their final permanent sections (PS) were retrieved from the files from these two hospitals. The final histopathological diagnoses were assumed to be accurate. Comparison of FS results and PS as gold standard was done according to tissue origin (including ovary, breast, lymph node, …), type of the lesion (neoplastic or nonneoplastic and then benign, borderline or malignant and also histologic subtype of the tumor in neoplastic category) and size of the sampled tissue (smaller than 1 cm^3, 1- 2 cm^3 and larger than 2 cm^3). Finally, data analysis was performed with the software SPSS. Sensitivity, specificity, negative and positive predictive values (N.P.V, P.P.V) and accuracy of FS were calculated.

Results

Permanent section diagnosis of all 200 specimens revealed 77% (155 cases) neoplastic and 23% (45 cases) nonneoplastic lesions. In neoplastic group, 56% of tumors were benign, 39% malignant and 5% borderline.

From the point of tissue origin, most of the specimens were from ovary (102 cases) and breast (37 cases).

The most common types of tumors seen in this study were invasive ductal carcinoma (I.D.C) of breast (24 cases) and ovarian serous cystadenoma (24 cases), ovarian mucinous cystadenoma (18 cases) and ovarian dermoid cyst (17cases).

Overall accuracy of FS was 96.5%. In the case of neoplastic diseases sensitivity, specificity, P.P.V, N.P.V and accuracy of FS were 93.1% 97.7%, 96%, 95% and 95.9%, respectively. The agreement between FS and final PS in diagnosis of nonneoplastic lesions was 62.3%.

In diagnosis of histologic subtypes of the tumors, FS diagnoses were compatible with final permanent section diagnoses in 72.5% of cases. The results of FS according to site are summarized in Table 1.

Table 1- Number and percent of concordant, discordant and deferral cases

Site	Concordant cases	Discordant Cases	Deferral Cases
Ovary	77	2	23
Breast	30	5	2
Thyroid	5	0	6
Uterus	6	0	3
Gastrointestinal tract	6	0	0
Urinary tract			
Other	5	0	0
	20	1	9
Total (Number & %)	149(74.5%)	8(4%)	43(21.5%)

The deferral cases were those that subtyping of the lesion was not possible in FS but there was not any problem to diagnose the samples as benign, intermediate or malignant.

Sensitivity, specificity, positive and negative predictive values and accuracy of F.S in diagnosis of ovarian and breast tissue lesions were high and even higher in ovarian tumors (Table 2).

Table 2- Sensitivity, Specificity, Positive and Negative Predictive Value and Accuracy of F.S in diagnosis of ovary and breast tumors

	Ovary (%)	Breast (%)
Sensitivity	95.4	92.3
Specificity	100	80
P.P.V	100	96
N.P.V	98.4	66
Accuracy	98.8	90.3

Statistical analysis was not done for specimens from tissues other than ovary and breast, because of small numbers of specimens in each group.

We would like to stress that there was complete agreement about being benign or being malignant in these small groups but in some cases disagreement was seen in histological subtyping of the lesions.

In the case of I.D.C, serous cystadenoma, ovarian mucinous cystadenoma and ovarian dermoid cyst which were the common subtypes of tumors, all indices were 100% (Table 3).

Table 3- Sensitivity, Specificity, P.P.V*, N.P.V** and Accuracy of FS*** in diagnosis of common subtypes of the tumors

	I.D.C ****	Serous Cystadenoma (%)	Mucinous Cystadenoma (%)	Dermoid cyst (%)
Sensitivity	100	100	100	100
Specificity	100	100	100	100
P.P.V	100	100	100	100
N.P.V	100	100	100	100
Accuracy	100	100	100	100

* Positive Predictive Value ** Negative Predictive Value *** Frozen Section

**** Invasive Ductal Carcinoma

There were many other histologic types of tumors (33 types). Because of small numbers of cases in each group, statistical analysis was not done.

It should be mentioned that only one specimen was smaller than 2 cm^3 and all other ones were larger. So, we did not do any statistical analysis according the size of the specimens.

Discussion

The accuracy of FS diagnosis in general practice is reported to vary from 91.5% to 97.4% (3, 4). In our study, overall accuracy of FS was 96.5%.

In diagnosis of neoplastic diseases, sensitivity, specificity, P.P.V, N.P.V and accuracy of F.S were 93.1%, 97.7%, 96%, 95% and 95.9% respectively. These results are similar to results of Rahbar *et al.* in Kermanshah, Iran (8). They found sensitivity, specificity, P.P.V and accuracy of 91.9%, 100%, 92.5% and 95.5%, repectively.

In our study, sensitivity and specificity of FS in diagnosis of breast tumors were 92.3% and 80% respectively, which are not as good as the results seen in study of Kadiver *et al.* in Iran University of Medical Sciences, Tehran, Iran. They found sensitivity and specificity of 100% for FS in diagnosis of breast tumors (9).

The sensitivity and specificity of FS in diagnosis of I.D.C of breast in our study was 100% which is higher than the results of Hormozdi *et al.* in Tehran University of Medical Sciences, Tehran, Iran (10). They found sensitivity of 78.3% for FS in diagnosis of I.D.C of breast.

In our study, overall accuracy of FS in diagnosis of ovarian tumors was 98.8%. In Shahid Beheshti University of Medical Sciences, Tehran, Iran, Rakhshan *et al.* found overall accuracy of 95.7% in diagnosis of ovarian neoplasms (11). Maheshwari *et al.* in India found overall accuracy of 91.2% for FS in diagnosis of ovarian tumors (12). The accuracy of FS in diagnosis of ovarian tumors in study of Ilvan *et al.* in Turkey was 97% (13).

Overall discordant frequency in study of Geramizadeh *et al.* in Shiraz, Iran was 3.3% and the concordant rate was 96.7%. In our study the discordant rate was 4% and the concordant one 74.5%. We had a deferral rate of 21.5% in subtyping the lesions (not diagnosis of benignicity). Geramizadeh *et al.* did not have point to deferral cases.

In the case of ovary and breast the discrepancy of our study was 1% and 2.5% respectively and in study of Geramizadeh, *et al.* was 3.8% and 3%, in that order (14).

The limitation of our study was very small

numbers of specimens from different tissues other than ovary and breast. Though, overall accuracy of our study was high (96.5%), we could not do any specific statistical analysis according tissue origin. In addition, with the same reason we did not have any statistical analysis on various histologic types of tumors except than I.D.C, serous cystadenoma, mucinous cystadenoma and dermoid cyst. It seems that extensive study of variable types of tumors and different kinds of tissue is necessary to achieve more reliable results.

Conclusion

We conclude that in Urmia University of Medical Sciences, interpretation of FS was done with high accuracy and the results are similar and in some cases better than the results of other pathology centers in Iran. However, as FS is an intra-operative consultation carrying a high risk of misdiagnosis, and thus responsibility and guide the surgeon to plan the best management of the operation, we think that regular re-evaluation or consultation concerning disagreement between FS diagnosis and final PS diagnosis should be conducted by both surgeon and pathologist as part of quality assurance to determine the most appropriate intra –operative management.

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