

## Accuracy of intra-operative frozen section in the diagnosis of ovarian mass

Shahla Yazdani<sup>1</sup>, Zinatossadat Bouzari<sup>2</sup>, Mohammad Abedisamakoush<sup>3,\*</sup>, Majid Sharbatdaran<sup>4</sup>

<sup>1</sup> Infertility and Reproductive Health Research Center, Health Research Institute & Department of Obstetrics & Gynecology, Clinical Research Development Unit of Rouhani Hospital, Babol University of Medical Sciences, Babol, Iran

<sup>2</sup> Cellular & Molecular Biology Research Center, Department of Obstetrics & Gynecology, Babol University of Medical Sciences, Babol, Iran

<sup>3</sup> Department of Nephrology, Mazandaran University of Medical Sciences, Sari, Iran

<sup>4</sup> Clinical Research Development Unit of Rouhani Hospital, Pathology Department-Rohani Hospital of Babol, Babol University of Medical Sciences, Babol, Iran

Received: 27 Sep 2015

Accepted: 23 Oct 2015

### Abstract

**Background:** Ovarian cancer is the most common cause of cancer death from gynecological tumors in Iran. Despite the fact that intra-operative frozen section, which is widely used in diagnosis of ovarian tumors, there are problems associated with the diagnostic procedure in this setting. The aim of this study was to compare the intra-operative frozen section with the permanent histopathological sections in the diagnosis of ovarian cancer at Rouhani Hospital in north of Iran.

**Methods:** The intra-operative frozen section diagnosis was conducted on 126 women with ovarian masses, who underwent surgery between January 2006 and July 2011. The results of the intra-operative frozen section were compared with those of the past histopathological diagnoses of permanent sections as the gold standard.

**Results:** The overall accuracy of intra-operative frozen section diagnosis was 94.4%. There were 0.9% cases with false-positive as well as 1.8% cases with false-negative. The sensitivity and specificity values were 66.7% and 100% for malignant tumors, 80.0% and 95.9 % for borderline tumors, and 99.1% and 90.0% for benign tumors, respectively. All inaccurate diagnoses were for the epithelial tumors.

**Conclusion:** The intra-operative frozen section diagnosis is a reliable method for the surgical management of the patients with an ovarian mass. Diagnostic problems can occur during the intra-operative frozen section examination. The clinicians and pathologists must be aware of the pitfalls of this method; therefore, there is an urgent need to establish a good communication among them in order to obtain more accurate results.

**Keywords:** Diagnostic accuracy, Intra-operative frozen section, Ovarian tumors

### Introduction

The most common cause of mortality in women with gynecological cancers is ovarian malignancy (1, 2). Ovarian mass may contain benign, borderline, and

malignant tumors (3). The best prognostic method in the case of the malignant ovarian tumor is the timely surgical removal of the tumor. It is not easily possible to diagnose the benign and malignant tumors visually (4). Therefore, the use of intra-operative frozen section

\*Corresponding author: Dr. Mohammad Abedisamakoush, Mazandaran University of Medical Sciences, Sari, Iran, Tel: +989111148769, E-mail: [masnirasb@gmail.com](mailto:masnirasb@gmail.com)

is a suggested method in order to determine the appropriate extent of the surgical field (2, 5-7). The overall accuracy of the intra-operative frozen section diagnosis for ovarian tumors was reported to be ranging from 89.8 to 97.0% (4, 8-14). Despite the fact that intra-operative frozen section, which is widely used in diagnosis of ovarian tumors, there are problems associated with the diagnostic procedure in this setting. Therefore, the accuracy of this procedure in the diagnosis of ovarian tumors is very important. We conducted this study to compare the intra-operative frozen section with the permanent histopathological sections in the diagnosis of ovarian cancer at Rouhani Hospital in north of Iran.

## Materials and Methods

In this study, the data from 126 women with benign, borderline and malignant ovarian tumors, who had undergone intra-operative frozen section in Rouhani hospital between January 2006 and July 2011, were thoroughly reviewed. All women gave their informed consent to participate in the study, which was approved by the local ethics committee of Babol University of Medical Sciences. After the tumor removal, the fresh surgical specimen was immediately taken to the department of pathology at the same university. A pathologist prepared the specimens from the representative regions, froze them in a cryostat, and cut them into slices with a microtome. The slices were mounted on a glass slide, stained with haematoxylin and eosin, and then were ready for microscopic evaluation. Permanent histo-pathological sections were obtained from a paraffin block, which contained fixed tissue specimens taken from the tumors, and were further considered (15) providing an accurate diagnosis. All of these slides were examined and reported by an expert pathologist. The permanent histopathology reports included histological cell types and potential of malignancy, which were divided into benign, borderline, and malignant types.

The statistical analysis was performed using SPSS version 18 and Chi-square test. The overall accuracy was defined by the total number of agreements between the frozen section and the permanent diagnosis divided by the total number of tests performed. For the purposes of this study, the final histopathology diagnoses were assumed to be correct. The sensitivity and specificity and predictive values of

**Table 1.** The comparison between the frozen section diagnosis and the permanent diagnosis (n = 126)

Frozen sections	Permanent sections			
	Benign	Borderline	Malignant	Total
Benign	105	1	1	107
Borderline	1	4	4	9
Malignant	0	0	10	10
Total	106	5	15	126

the frozen sections for the diagnosis of various categories of benign, borderline, and malignant tumors were calculated.

## Results

A total number of 126 women with ovarian mass and a mean age of  $42.0 \pm 13.6$  years (range 27 to 57 years) underwent intra-operative frozen section diagnosis. Nineteen percent of the patients were nulliparous, and 31% were menopause. The final diagnoses were benign in 106 cases (84.1%), borderline in 5 cases (4%), and malignant in 15 cases (11.9%). The Histological cell type of these tumors were epithelial cell tumors in 65 cases (51.58%), germ cell tumor in 34 cases (26.98%), and other types in 27 cases (21.42%) of women with ovarian mass. Out of the 126 ovarian tumors, 7 cases (5.5%) had frozen section diagnoses incompatible with the permanent sections (paraffin section). There were 2 (1.8%) false negatives for which the frozen section could not be identified as malignant or borderline tumors. One of the two cases was borderline tumor (serous) and the other case was malignant tumor (mucinous). There was 1(0.9%) benign tumor, which was diagnosed as borderline tumor (mucinous) by frozen section (false positive). Also, there were 4 borderline tumors (two of them endometrioid, one mucinous and one serous tumor), which were diagnosed as borderline tumors. Table 1 shows the correlation between the frozen section assessment and the permanent pathological diagnoses for all cases.

It should be noted that the diagnosis 'benign' included such benign ovarian neoplasms and benign non-neoplastic conditions as corpus luteal cysts, endometriosis, etc. The overall accuracy of the test was 94.4%. Table 2 shows the performance of the intra-operative frozen section in the three categories of ovarian tumors in our patients. The frozen section had

**Table 2.** Sensitivity, specificity and the positive and negative predictive values for the frozen section in ovarian tumors diagnosis

Factors	Benign	Borderline	Malignant
Sensitivity (%)	99.1 (97-100)	80.0 (45-100)	66.7 (43-91)
Specificity (%)	90.0 (77-100)	95.9 (92- 99)	100.0 (97-100)
Positive Predictive Value (PPV) (%)	98.1 (96-100)	44.4 (12-77)	91.0(74-100)
Negative Predictive Value (NPV) (%)	94.7(85-100)	99.1 (97-100)	95.7 (92-99)

high sensitivity, specificity, and positive predictive values (PPV) and negative predictive values (NPV) for benign conditions. But it had higher sensitivity (80%) for borderline tumors, lower sensitivity (66.7%) for malignant tumors and lower PPV (44.4%) for borderline tumors.

### Discussion

The frozen-section examination determines the extent of the surgery being performed; therefore, the surgeon should know about the correlation between the frozen and the permanent histopathological diagnoses in their clinics (15). The pathologic result of the frozen section diagnosis of ovarian masses in our study was high (94.4%) and was within the range of the previously reported cases (16-19). The results of this study compared with those of Yarandi et al. (with 88.1% false positives and 83.1% false negatives) had less false positives (0.9%). This study had the same false negatives compared with the study of Tempfer et al. (with zero false positives and 28.0% false negatives) and more false positives and much fewer false negatives because he focused only on borderline tumors of the ovary (18, 20).

In this study, the sensitivity and the specificity of the frozen section technique were related to benign (99.1%) and malignant (100%) tumors, whose result is similar to those of the previous studies (21). But the sensitivity of the method in this study for borderline tumors was 80.0%, which was higher compared with those of other studies because of few numbers of borderline tumors in ovary (10, 12, 22). The sensitivity of frozen section technique, related to malignant tumors in this study, was calculated to be 66.7%, which is less compared with those of the previous studies. This is probably due to the weakness in the recognition of the kind of tumor. In a research study, conducted by Gol and et al. in France in 2003, the sensitivity of this technique for malignant tumors was reported to be 88.7%, (14) but it was 86.1% in another study by Wootipoom et al. (17).

The positive and negative predictive values for benign tumors were reported to be 86.1% and 97.4%, respectively, which was similar to the assessed amounts of the previous studies (16, 18, 22). The positive and negative predictive values for borderline tumors were reported to be 44.4% and 99.1%, respectively, which was similar to the assessed amounts of the previous studies (17, 18, 22). Also, the positive and negative predictive values for malignant tumors were reported to be 100% and 95.7%, respectively, which was similar to the assessed amounts of the previous studies (16, 18, 23). In a recent study, false negative cases were related to mucinous and serous tumors (20% false negatives for mucinous tumors). In another study by Gorisec et al. in Slovenia, false negative cases were related to mucinous tumors (with 23.1% false negatives) (16), which is probably due to the heterogeneous histology of this type of tumor and the centrality of malignancy in some of these cases, which can disturb the diagnosis and also demands broad sample taking as well as a precise macroscopic analysis of the tumor by the surgeon and the pathologist (24).

For exact diagnosis, it is necessary to have adequate tissue sampling. In this study, however, there was a limited tissue sampling for the pathologist, which is regarded as a limitation for this study.

### Conclusion

Our data confirms the fact that frozen section diagnosis is a reliable method for the surgical management of patients with an ovarian mass. However, diagnostic problems can occur during the frozen section examination. The clinicians and pathologists must be aware of the pitfalls of this method; therefore, there is an urgent need for a good communication between them in order to obtain more accurate results and minimize the number of missed cases.

### Acknowledgements

We would like to thank the personnel of the operating room and the Clinical Research Development Unit of Rouhani Hospital in Babol.

### Conflict of interest

The authors vividly declare that they have no competing interests.

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