

## Accuracy of Intra-Operative Frozen Section in the Diagnosis of Ovarian Tumors

Mayuri Kute<sup>1</sup>, Rajendra Chaudhari<sup>2</sup>, Preeti Bajaj<sup>3</sup>, Jyoti Kasture<sup>4</sup>

<sup>1</sup> JR-3, Department of Pathology, Dr. Vasant Rao Pawar Medical College, Hospital and Research Centre, Nashik

<sup>2</sup> Associate Professor, Department of Pathology, Dr. Vasant Rao Pawar Medical College, Hospital and Research Centre, Nashik

<sup>3</sup> Professor and Head, Department of Pathology, Dr. Vasant Rao Pawar Medical College, Hospital and Research Centre, Nashik

<sup>4</sup> Associate Professor, Department of Pathology, Dr. Vasant Rao Pawar Medical College, Hospital and Research Centre, Nashik

---

Received: 20-04-2023 / Revised: 17-05-2023 / Accepted: 10-06-2023

Corresponding author: Dr. Jyoti Kasture

Conflict of interest: Nil

---

### Abstract

**Introduction:** Discrimination of benign and malignant tumors during surgery in gynaecologic patients with adnexal masses is important for the management of the patient. Intra-operative frozen section analysis gives information about the characteristics of masses.

**Objectives:** To compare frozen-section results with definitive histopathological results of ovarian tumors diagnosed intra-operatively.

**Materials and Methods:** Specimens sent in Normal Saline (NS) for frozen examined for gross features (Sample size -39). Sections are then submitted from representative areas. Further processing of frozen takes place followed by staining. The sections are then studied. The results are then conveyed to the operating surgeon within 25-30 minutes. The same specimen is then allowed to fix in 10% buffered formalin for approximately 24 hours and then submitted for routine paraffin procedure. The final reporting is done on these paraffin sections.

**Results:** Frozen section results of the patients with a final diagnosis of ovarian tumors operated at our institute between September 2019 and September 2022 were analyzed. Data of 39 patients was analysed. Among 39 cases on frozen section, 27 (69.2%) cases were benign and 12 (30.8%) cases malignant. The results of paraffin block showed 26 (66.7%) cases to be benign and 13 (33.3%) cases as malignant. One case was reported to be false negative.

**Conclusion:** Intra-operative frozen section is useful in situations where the nature of the ovarian tumor is uncertain whether benign or malignant. It is a highly sensitive and specific modality and thus helps the surgeon in planning further surgical management.

**Keywords:** Ovarian tumors, frozen section, benign, malignant, histopathology.

---

This is an Open Access article that uses a funding model which does not charge readers or their institutions for access and distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>) and the Budapest Open Access Initiative (<http://www.budapestopenaccessinitiative.org/read>), which permit unrestricted use, distribution, and reproduction in any medium, provided original work is properly credited.

---

### Introduction

In modern day oncologic surgeries, use of the frozen section as an intraoperative guide for surgeons is gaining popularity. The

technique was devised a little more than 100 years ago and has advanced in terms of technical expertise and improved

microscopic optics. While the role of the frozen section in certain oncologic surgeries like evaluation of margins in squamous cell carcinoma of head and neck and sentinel lymph node evaluation in breast cancer is deemed essential, its role is still a matter of debate in ovarian surgeries. [1-3] Ovarian cancer is the third most common malignancy in this part of the world, and its incidence is on the rise especially in young age women [9]. Discrimination of benign and malignant tumors during surgery in gynaecologic patients with adnexal masses is important for the management of the patient. Intra-operative frozen section analysis gives information about the characteristics of masses. [5,6]

When faced intra-operatively with an apparent early stage ovarian cancer, the surgeon will have two management options: to manage each case as a potential cancer and therefore perform an optimal staging procedure or to manage the case as benign without staging. The former option will result in unnecessary surgery in about 30% of cases, and the latter will result in suboptimal staging in cancer cases requiring either a second surgical staging procedure or empirical chemotherapy. [1-3] The use of frozen section analysis has had a great impact on these patients and has become indispensable in diagnosing malignancies. The results of the frozen examination determine the course of surgery. [4]

#### Aims and Objectives:

To compare frozen-section results with definitive histopathological results of ovarian tumors diagnosed intra-operatively.

#### Material and Methods:

Intra-operative sample once removed is sent to histopathology laboratory in Normal Saline (NS). The specimen is then very well inspected by the pathologist and the gross features of the same are noted down. Cut section of the same is examined and made note of. Sections are then submitted from representative areas. Further processing of frozen takes place followed by staining. The sections are then studied. The results are then conveyed to the operating surgeon within 25-30 minutes. The same specimen is then allowed to fix in 10% buffered formalin for approximately 24 hours. The sections submitted for frozen are also formalin fixed. These sections and additional sections from formalin fixed specimen are then submitted for routine paraffin procedure. The final reporting is done on these paraffin sections.

#### Results:

Frozen section results of the patients with a final diagnosis of ovarian tumors operated at our institute between September 2019 and September 2022 were analyzed. Data of 39 patients was analyzed. The concordance of frozen section diagnosis was determined by comparing the frozen section results with the final pathological diagnosis. Sensitivity, specificity, positive predictive value and negative predictive value were calculated.

Among 39 cases on frozen section, 27 (69.2%) cases were benign and 12 (30.8%) cases malignant. The results of paraffin block showed 26 (66.7%) cases to be benign and 13 (33.3%) cases as malignant (Table 1). One case was reported to be false negative.

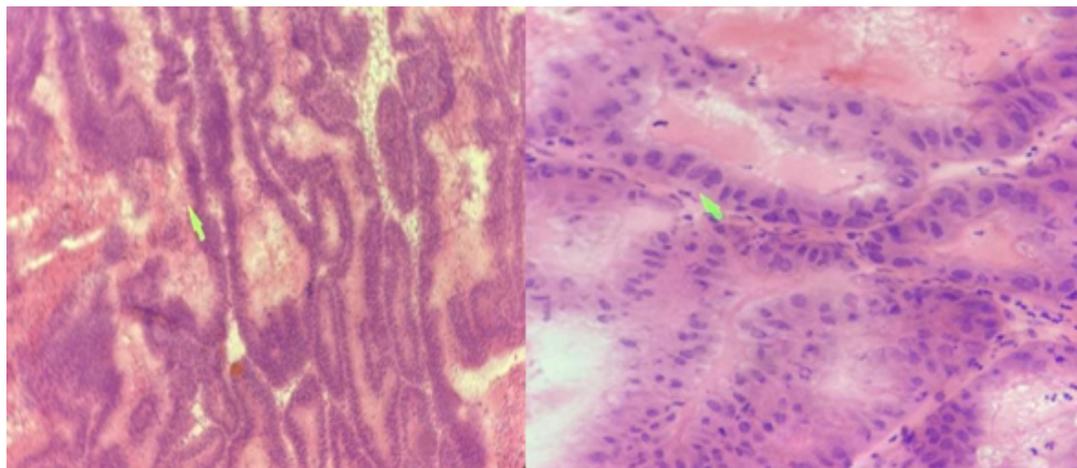
**Table 1: FS- frozen section result; PS- final paraffin section result**

	PS Benign	PS Malignant	Total
FS Benign	26	01	27
FS Malignant	00	12	12
Total	26	13	39

Table 2 gives values of sensitivity, specificity, positive predictive value and negative predictive value of frozen section in determining the malignancy in ovarian tumors.

**Table 2: PPV- positive predictive value; NPV- negative predictive value**

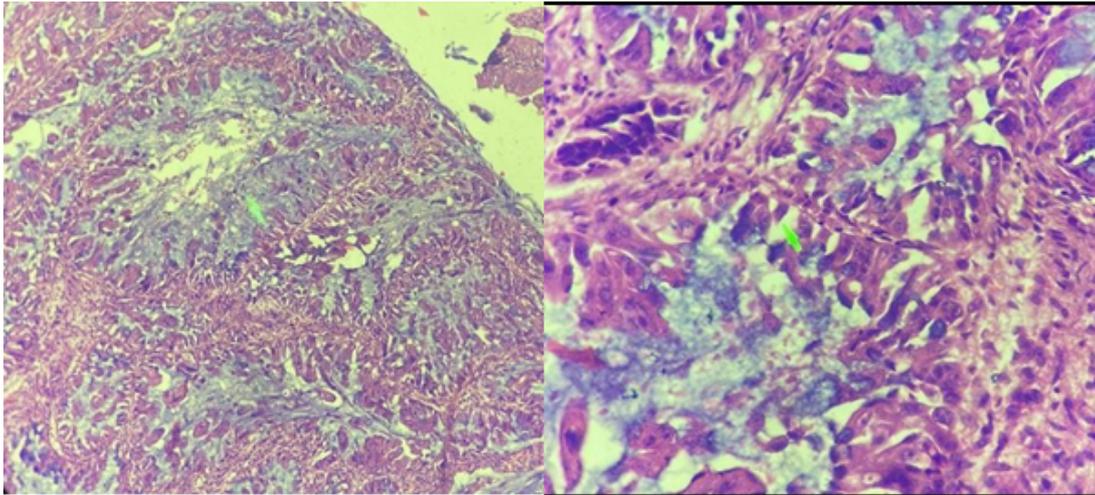
Statistic	Value
Sensitivity	92.31%
Specificity	100.00%
PPV	100.00%
NPV	96.30%
Accuracy	97.44%



**Figure 1 & 2: showing microscopic picture of frozen section- Malignant epithelial ovarian tumor-High Grade Mucinous Cystadenocarcinoma**

**Table 3: shows the definitive histopathological diagnosis of the studied ovarian tumors.**

	HPE diagnosis	Number of cases
<b>Benign:</b>		26
	Functional cyst	01
	Benign serous cystadenoma	11
	Benign mucinous cystadenoma	08
	Mature Cystic Teratoma (Dermoidcyst)	03
	Cellular fibroma	01
	Serous Cystadenofibroma	02
<b>Malignant:</b>		13
	Epithelial ovarian tumor	08
	Germ cell tumor	02
	Other	03



**Figure 3 & 4: showing microscopic picture of paraffin section- High Grade Mucinous Cystadenocarcinoma**

### Discussion:

Frozen section is an important step in gynaecologic surgery with proven reliability. The purpose of frozen section of ovarian tumors is to detect the patients who need more comprehensive surgery intra-operatively and to spare the group who could be treated with a more limited surgery. The overall accuracy of frozen section at the diagnosis of ovarian tumors has been reported to be between 86% and 97% in different studies. [4,5,7]

The accuracy of the frozen section for ovarian tumors varies among different institutions. [8] Subbian et al. in a study involving 135 cases of ovarian tumors found an overall accuracy of 84.2 %. They found the lowest sensitivity for borderline tumors (31.2 %) especially of the mucinous category. [10] On the other hand, Suprasat et al. in a review of 112 cases revealed a sensitivity of 100, 84, and 92 %, respectively, for benign, borderline, and malignant tumors. [10] In another retrospective review of 282 cases, sensitivities of the frozen section for benign, borderline, and malignant tumors were 97.5, 95.8, and 95.6 %, and corresponding specificities were 97.5, 97.6, and 100 %, respectively. They found the lowest positive predictive value in borderline group (79.3 %), all of them with

mucinous type epithelium as described by other authors [11].

In our study, the accuracy rate in determining malignant tumors was 97.44%. In our study, the false positive rate was 0%. There was only 1 false negative report. One case was found to be benign on frozen section which turned out to be malignant of paraffin section reporting which was supposed to be due to inadequate history.

The larger tumor size and multilocular pattern of mucinous tumors is reported to have a negative effect on the accuracy of frozen-section diagnosis [4]. Some authors have suggested that underdiagnosis was due to sampling errors, and they advised using greater numbers of frozen sections to minimize the underdiagnosis of tumors, recommending one section per 10 cm of the mass. [5,6] Some recent studies have indicated that after sampling errors, the absence of an expert pathologist is responsible for misdiagnosis of tumors. [7] In contrast to these studies, Menzin et al. found no correlation between pathologist and frozen section misdiagnosis. Atif Ali Hashmi et al suggested that matriculate sampling is needed in ovarian tumors specifically from areas where wall appears thick or there is evidence of solid growth. [12]

**Conclusion:**

Intra-operative frozen section is useful in situations where the nature of the ovarian tumor is uncertain whether benign or malignant. It is a highly sensitive and specific modality and thus helps the surgeon in planning further surgical management.

**References:**

1. Ureyen I, Turan T, Cirik DA, Tasci T, Boran N, Bulbul D, Tulunay G. Frozen section in borderline ovarian tumors: is it reliable? *Eur J Obstet Gynecol Reprod Biol.* 2014;181:115–8.
2. Gizzo S, Berretta R, Di Gangi S, Guido M, Zanni GC, Franceschetti I, Quaranta M, Plebani M, Nardelli GB, Patrelli TS. Borderline ovarian tumors and diagnostic dilemma of intraoperative diagnosis: could preoperative He4 assay and ROMA score assessment increase the frozen section accuracy? A multicenter case-control study. *Biomed Res Int.* 2014;2014:803598.
3. Takemoto S, Ushijima K, Kawano R, Fukui A, Terada A, Fujimoto T, Imaishi H, Kamura T. Validity of intraoperative diagnosis at laparoscopic surgery for ovarian tumors. *J Minim Invasive Gynecol.* 2014;21(4):576–9.
4. Mukherjee T, Mukherjee S, Sanyal P, Bharadwaj V, Sampath S. Correlation of Biomarkers and Frozen Section Diagnosis with Paraffin Histopathological Diagnosis in Suspected Ovarian Cancer. *International Journal of Molecular and Immuno Oncology.* 2019 Sep 14;4(3):67-71.
5. Ilker A, Aykut B, Muge H, Ibrahim HM, Ulku OB, Sener G, Suna S. Accuracy of intra-operative frozen section in the diagnosis of ovarian tumours. *JPMA-Journal of the Pakistan Medical Association.* 2011 Sep 1;61(9):856.
6. Ureyen I, Turan T, Cirik DA, Tasci T, Boran N, Bulbul D, Tulunay G. Frozen section in borderline ovarian tumors: is it reliable?. *European Journal of Obstetrics & Gynecology and Reproductive Biology.* 2014 Oct 1;181:115-8.
7. Song T, Choi CH, Kim HJ, Kim MK, Kim TJ, Lee JW, Bae DS, Kim BG. Accuracy of frozen section diagnosis of borderline ovarian tumors. *Gynecologic oncology.* 2011 Jul 1;122(1):127-31.
8. Kennedy NT, Sebastian A, Thomas DS, Thomas A, Gupta M, Kumar RM, Peedicayil A. Diagnostic Accuracy of Frozen Section and Its Influence on Intraoperative Management of Indeterminate Epithelial Ovarian Tumors. *Indian Journal of Surgical Oncology.* 2019 Jun;10(2):268-73.
9. Bhurgri Y, Shaheen Y, Kayani N, Nazir K, Ahmed R, Usman A, Bashir I, Setna F, Bhurgri A, Hasan SH, Zaidi SM. Incidence, trends and morphology of ovarian cancer in Karachi 1995–2002. *Asian Pac J Cancer Prev.* 2011;12(6):1567–71.
10. Subbian A, Devi UK, Bafna UD. Accuracy rate of frozen section studies in ovarian cancers: a regional cancer institute experience. *Indian J Cancer.* 2013;50(4):302–5.
11. Açikalin A, Torun G, Bağır E, Bayram F, Zeren H, Güleç U, Güzel AB, Gümürdülü D. Intraoperative frozen section in ovarian neoplasms; a tertiary center experience. *Turk Patoloji Derg.* 2014;30(3):184–8.
12. Atif Ali Hashmi, Samreen Naz, Muhammad Muzzammil Edhi, Naveen Faridi, Syed Danish Hussain, Shazia Mumtaz & Mehmood Khan *World Journal of Surgical Oncology* volume 14, Article number: 91 (2016) Accuracy of intraoperative frozen section for the evaluation of ovarian neoplasms: an institutional experience.