Diagnostic Accuracy of Frozen Section in detecting malignant ovarian tumour

Dr. Khairun Nahar[1], Dr. Dr. Rowson Ara[2], Dr. Suraiya Khanam[3], Dr. Tanzila Halim[4], Dr. Nasrin Akter[5], Dr. Shamima Akter[6]

Correspondent:

[1]*Assistant Professor, Department of Gynecological Oncology, BSMMU, Shahbag, Dhaka. e -mail: khairunnaharshaon@gmail.com*

[2]*Assistant Professor, Department of Obstetrics and Gynecology, BSMMU, Shahbag, Dhaka*

[3]*Assistant Professor, Department of Gynecological Oncology, BSMMU, Shahbag, Dhaka*

[4]*Assistant professor, Department of Obstetrics and Gynecology, BSMMU, Shahbag, Dhaka.*

[5]*Medical Officer, Department of Gynecological Oncology, BSMMU, Dhaka*

[6]*Junior Consultant, Gynecological Oncology, BSMMU, Dhaka*

KEYWORDS

Ovarian tumour, malignant, Frozen Section

ABSTRACT

Background: Early detection of the nature of the tumor is crucial for the management of patients with ovarian tumor. Ovarian cancer is a leading cause of death for women with gynecological cancers. Accurate frozen sections are crucial for improving the outcome and quality of life for patients with ovarian tumors.

Objective: To compare the accuracy of Frozen Section in detecting malignant ovarian tumour.

Materials and Methods: It was a cross sectional analytical study Department of Gynecological Oncology, Bangabandhu Sheikh Mujib Medical University (BSMMU) and National Institution of Cancer Research & Hospital (NICRH), Dhaka during May 2022 to April 2023. Total 65 patients attending at the inpatient department at BSMMU and NICRH with ovarian tumor was enrolled for the study. A total data on 65 patients were collected who were operated frozen sections were sent intraoperatively. The results were compared with the final histopathology report, and the accuracy, sensitivity, specificity, positive predictive value, and negative predictive value were analyzed for diagnosing benign, borderline, and malignant masses.

Results: The sensitivity was highest for benign ovarian tumors, which were 90%; the specificity, accuracy, positive and negative predictive values for benign ovarian tumors were 91.43%, 91.43%, 90.0%, and 91.43%, respectively; and the specificity, accuracy, positive and negative predictive values for borderline ovarian tumors were 96.77%, 91.67%, 50.0%, and 94.12%, respectively. Malignant ovarian tumors had sensitivity, specificity, accuracy, positive and negative predictive values of 87.50%, 84.85%, 87.50%, 84.85, and 87.50%, respectively.

Conclusion: Intra-operative frozen section is a valuable and necessary test for identifying both benign and malignant ovarian tumors, yet there are certain limitations when it comes to detecting borderline ovarian malignancies.

Introduction

Ovarian cancer is the second most common genital tract cancer in women next to the uterine cervix, Diagnosis is easier for the uterine cervix as it can be visualized and examined in an outdoor clinical setup and due to the availability of a proven screening method as well. Because of the anatomical location of the ovary, it is not detected early unless it becomes symptomatic or incidentally found on imaging tests.[1]

Ovarian cancer has an age standardized (World) incidence of 3.9 per 100,000 women and mortality rate 2.9 per 100,000 women.[2] In Bangladesh, the incidence and mortality rate of ovarian cancer are 2% and 1.9% respectively.[2]

It is a leading cause of mortality among women with gynecological cancers. The accuracy of frozen section is vital to the outcome and life quality of the patient with ovarian tumour. Pre-operative evaluations are generally done according to the results of imaging studies and determination of serum levels of tumor markers of patients with an ovarian tumour.[3]

For preoperative evaluation of abdominal malignancies, computed tomography (CT) has usually been used as the first line investigation. A CT scan uses a series of X-rays to create a picture of the abdomen or pelvis. It may be used to aid in diagnosis, but is more often used in staging cancer. It is a good test to evaluate lymph nodes, the intestine, the liver and the lungs (chest CT scan) for any evidence that cancer has spread.[4]

Ovarian mass is not an uncommon imaging finding in women of all age groups. Hence, frozen section plays a very important role in determining the nature of the mass and, thus, deciding the appropriate surgical procedure.[5]

Intraoperative frozen sections provide important information that helps gynecologic surgeons make decisions on the surgical management of ovarian masses. The accuracy of intraoperative frozen-section diagnosis of ovarian neoplasms has been extensively reported. Decreased diagnostic accuracy of frozen sections of ovarian tumors was associated with large tumor size, mucinous histology, and LMP tumor category.[6] Frozen section has been a reliable diagnostic procedure that helps in the categorization of tumors as benign, borderline, and malignant and is widely used to decide the surgical management. This study was attempted to evaluate the accuracy and role of frozen section in the diagnosis of ovarian tumors in the present setting.

Materials and Methods

It was a cross sectional analytical study Department of Gynecological Oncology, Bangabandhu Sheikh Mujib Medical University (BSMMU) and National Institution of Cancer Research & Hospital (NICRH), Dhaka during May 2022 to April 2023. Total 65 patients attending at the inpatient department at BSMMU and NICRH with ovarian tumor was enrolled for the study. A total data on 65 patients were collected who were operated frozen sections were sent intraoperatively. The results were compared with the final histopathology report, and the accuracy, sensitivity, specificity, positive predictive value, and negative predictive value were analyzed for diagnosing benign, borderline, and malignant masses. Frozen section diagnosis and histopathological diagnoses were concordant when both the diagnoses were within the same group of malignancy. The results of the permanent sections were considered as the gold standard. The cases with discordant diagnosis between frozen section and permanent section were reviewed as well as those that were deferred to establish if the deferral was surely appropriate. The deferred cases were excluded from the statistical analysis data. According to the status of malignancy, the overall accuracy and four conventional indices (sensitivity, specificity, positive predictive value, and negative predictive value) of frozen section diagnoses were determined. Appropriate data was collected by using a

preformed data sheet. After taking verbal consent from the patients following introducing and informing the study purpose and objectives, data was collected by face-to-face interview ensuring privacy and confidentiality by using the questionnaire. All other required data was collected from history sheet, investigation papers, per-operative findings and follow up records. After that, all data was compiled, modified and finalized. Statistical analyses were carried out by using the Statistical Package for Social Sciences version 25.0 for Windows (SPSS Inc., Chicago, Illinois, USA). The mean values were calculated for continuous variables. The sensitivity, specificity, accuracy, positive predictive value, and negative predictive value of the Colour Doppler USG and CT scan diagnosis evaluation of malignant ovarian tumor were computed for the validity of the study outcome, using the histopathology report as the gold standard. Level of significance was assumed at p value <0.05.

Results

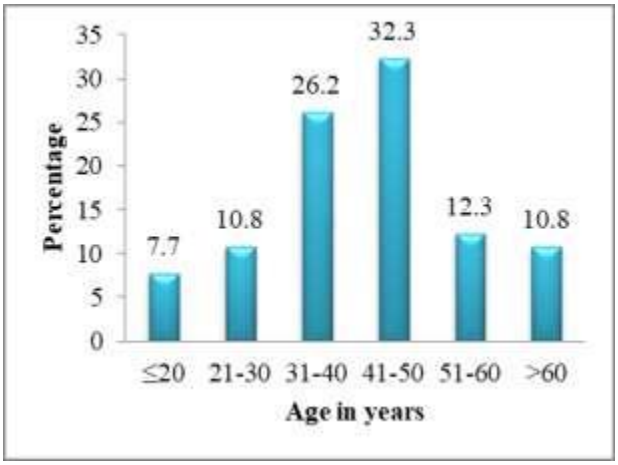

Figure I: Age distribution of the study population (n=65)

The mean age of the participants was 42.4 years with a standard deviation of 13.7 years, and the age range was 16-75 years. The majority of the participants were in the age range of 31-50 years, comprising 58.5% of the total sample (Figure I).

Table 1: Distribution of the study subjects by frozen biopsy report (n=65)

Frozen biopsy report	**Frequency**	**Percentage**
Benign	30	46.2
Borderline	2	3.1
Malignant	33	50.8
Colour Doppler USG		
• Malignant	44	67.69
• Benign	21	32.31
CT scan		
• Malignant	42	64.62
• Benign	23	35.38

The table shows the distribution of 65 study subjects by frozen biopsy report. Of the total, 46.2% were diagnosed as benign and 53.9% as malignant, Colour Doppler USG 21(32.31%) were diagnosed as benign and 67.69% as malignant, CT scan 23(35.38%) were diagnosed as benign and 64.62% as malignant (Table-1).

Table 2: Comparison between frozen biopsy report with Colour Doppler USG and CT scan of ovarian tumour (n=65)

	Frozen biopsy report			Total	P value
	Benign (n=30)	Borderline (n=2)	Malignant (n=33)		
Colour Doppler USG					
• Malignant	12	2	30	44	<0.001
• Benign	18	0	3	21	
CT scan					
• Malignant	13	2	27	42	0.004
• Benign	17	0	6	23	

P value reached from chi square test

Table 2 shows that Colour Doppler USG and CT scan were statistically significant compared with frozen section diagnosis ($p<0.05$).

Table 3: Distribution of the study subjects by histopathological diagnosis (n=65)

Histopathological diagnosis	Frequency	Percentage
Benign	30	46.2
Borderline	03	4.6
Malignant	32	49.2

The table 3 shows the distribution of 65 study subjects by their histopathological diagnosis. Of the total, 46.2% were diagnosed as benign, 4.6% as borderline and 49.2% as malignant. Specifically, 30 subjects were diagnosed as benign, 3 as borderline and 32 as malignant.

Table 4: Comparison between frozen biopsy report with histopathology report of ovarian tumour (n=65)

Frozen biopsy report	Histopathology report			Total	P value
	Benign (n=30)	Borderline (n=3)	Malignant (n=32)		
Benign	27	0	3	30	<0.001
Borderline	0	1	1	2	
Malignant	3	2	28	33	
Total	30	3	32	65	

P value reached from chi square test

Table 4 shows the comparison between the frozen and Histopathological diagnosis in benign, borderline, and malignant ovarian tumors (n=65). When a benign ovarian tumor was diagnosed by means of frozen section analysis, the histopathological findings corresponded in 91.3% (27/30) of cases while 8.7% (3/30) findings were under diagnosi. When a borderline ovarian tumor was diagnosed by means of frozen section analysis, the histological findings corresponded in 50% (1/2) of cases, while 50% (1/2) findings were under diagnosis 50% (1/2) on account of malignant ovarian tumors. In cases of malignant ovarian tumors, the findings at frozen section diagnosis in 3/33 benign upper diagnosis, 2/3 border line upper diagnosis and 28/33 cases in agreement malignant the findings at the histological diagnosis, as there was perfect diagnosis result on frozen section.

Table 5: Sensitivity, specificity, positive predictive value (PPV), and negative predictive value (NPV) for intra-operative frozen sections in benign, borderline, and malignant ovarian tumors (n=65).

Test of validity	**Benign (%)**	**Borderline (%)**	**Malignant (%)**
Sensitivity	93.10	33.33	84.85
Specificity	91.43	96.77	87.10
Accuracy	92.19	91.67	95.94
Positive predictive value	90.00	50.0	87.50
Negative predictive value	94.12	94.12	84.38

Table 5 presents the performance of diagnostic tests, With respect to the malignant potential, the sensitivity was highest for benign ovarian tumors that is, 90%, the specificity, accuracy, positive and negative predictive values, for benign ovarian tumors were 91.43%, 91.43%, 90.0%, and 91.43% respectively, whereas the sensitivity was lowest for the borderline ovarian tumors, that is, 33.33%, the specificity, accuracy, positive and negative predictive values for borderline ovarian tumors were 96.77%, 91.67%, 50.0%, and 94.12%, respectively. The sensitivity, specificity, accuracy, positive and negative predictive values for malignant ovarian tumors were 87.50%, 84.85%, 87.50%, 84.85 and 87.50% respectively.

Discussion

This cross-sectional analytic study was carried out in the Department of Gynecological Oncology, Bangabandhu Sheikh Mujib Medical University (BSMMU), and the National Institution of Cancer Research & Hospital (NICRH), Dhaka. The study involved 65 consecutive patients with ovarian tumors who were seen in the inpatient departments of BSMMU and NICRH. The aim of the study was to compare the accuracy of color Doppler ultrasound with CT scan for detection of benign and malignant ovarian tumor.

It was observed that the mean age of the participants was 42.4 years with a standard deviation of 13.7 years, and the age range was 16-75 years. The majority of the participants were in the age range of 31-50 years, comprising 58.5% of the total sample. Similar observation was found in

different study, in study of Neelam et al. reported the mean age of the study participants was 46.63±14.6 years.[7]

In this study showed that 46.2% were diagnosed as benign, 3.1% as borderline and 50.8% as malignant by frozen biopsy report. Specifically, 30 subjects were diagnosed as benign, 2 as borderline, and 33 as malignant. In the current study, 24.7% of borderline tumors at IFS were upgraded to malignant tumors at final diagnosis. The figure was similar to the reported average upgrade rate of 21%.[8] Diagnoses were considered concordant when the IFS diagnosis was borderline or at least borderline with final malignant pathology, as these cases were managed in a similar way intra-operatively.[9] Mohammed et al.[10] reported four cases had the diagnosis at the time of FS deferred (6.6%). In the remaining 56 patients, the FS diagnoses were benign in 24 (40%), borderline in 9 (15%), and malignant in 23 (38.4%).

The present study showed the distribution of 65 study subjects by their histopathological diagnosis. Of the total, 46.2% were diagnosed as benign, 4.6% as borderline, and 49.2% as malignant. Specifically, 30 subjects were diagnosed as benign, 3 as borderline, and 32 as malignant. Ghazal et al.[11] reported the 42 adnexal masses studied in group A, 8 (19.0%) were malignant, 33 (78.6%) were benign and 1 (2.4%) was borderline. On the other hand, of the 32 masses examined in group B, 7 (21.9%) were malignant, 23 (71.9%) were benign and 2 (6.3%) were borderline. Vijay et al.[12] observed out of total 50 cases of adnexal masses, 24 (48%) were benign and 26 (52%) were malignant.

In this study showed the sensitivity was highest for benign ovarian tumors that is, 90%, the specificity, accuracy, positive and negative predictive values, for benign ovarian tumors were 91.43%, 91.43%, 90.0%, and 91.43% respectively, whereas the sensitivity was lowest for the borderline ovarian tumors, that is, 33.33%, the specificity, accuracy, positive and negative predictive values for borderline ovarian tumors were 96.77%, 91.67%, 50.0%, and 94.12%, respectively. The sensitivity, specificity, accuracy, positive and negative predictive values for malignant ovarian tumors were 87.50%, 84.85%, 87.50%, 84.85 and 87.50% respectively. The diagnosis of ovarian malignancy is problematic in the absence of tissue histology. The correct management approach depends on accurate diagnosis and staging. The diagnosis achieved intra-operatively can also inform the surgeon about the possibility that it may represent metastasis. Frozen section accuracy plays a vital role in the correct surgical approach. The accuracy rates have consistently improved over the past decades, thus mirroring improvements in this technique. In the Abudukadeer et al.[3] study, the overall accuracy was 92.6% (474/512), which was comparable to the accuracy rates of previously reported studies.[13,14] Pongsuvareeyakul et al.[6] reported frozen-section diagnosis of ovarian mucinous tumors Sensitivity, Specificity, Positive Predictive Value and Negative Predictive Value were 85.7%, 98.9%, 85.7% and 98.9% respectively. Approximately agreement with our study conducted by Kennedy et al.[15] study they showed the validity statistics of frozen section, using final histology as the gold standard the accuracy values of frozen section were 86.7%, 88.1%, and 88.1% for benign, malignant, and borderline lesions respectively. The malignant lesions, they were 77.8%, 95.1%, 91.3%, 86.5%, while for borderline lesions, they were 81.2%, 90.3%, 72.2%, 93.9% respectively. The frozen section to diagnose benign lesions were 85.7%, 97.2%, 79.2%, 91.5% respectively.

Conclusion

In conclusion, intra-operative frozen section is a useful and essential test for identifying both benign and malignant ovarian tumors, albeit there are certain restrictions when it comes to identifying borderline ovarian cancers. When the surgeon and the pathologist are fully aware of the benefits and limitations of intra-operative consultation, frozen section service can be more effective. This is especially true for borderline tumors, when frozen section service should be used sparingly.

Acknowledgments: Department of Gynecological Oncology, Bangabandhu Sheikh Mujib Medical University (BSMMU).

Reference

1. Baral G, Sharma R, Shrestha O, Marahatta SB, Singh S. Diagnostic Accuracy of Tumor Imprint Cytology for Ovarian Cancer. Asian Pacific Journal of Cancer Biology. 2024 Nov 23;9(4):537-40.
2. Chowdhury MZ, Mubin N, Mohib T, Chowdhury N, Chowdhury TF, Laskar AM, Sultana S, Raihan M, Turin TC. Cancer screening research in Bangladesh: Insights from a scoping review. Global Public Health. 2024 Dec 31;19(1):2351186.
3. Abudukadeer A, Azam S, Zunong B, Mutailipu AZ, Huijun B, Qun L. Accuracy of intra-operative frozen section and its role in the diagnostic evaluation of ovarian tumors. Eur J Gynaecol Oncol. 2016 Apr 10;37(2):216-0.
4. Tarver T. American cancer society. cancer facts and figures 2018. J Consumer Health Internet. 2018;16:366-7.
5. Goel P, Rathore SB, Sethi N, Gupta S, Kalani A. Diagnostic accuracy of frozen section in ovarian masses: A single centre study. Medical Journal Armed Forces India. 2023 Oct 17.
6. Pongsuvareeyakul T, Khunamornpong S, Settakorn J, Sukpan K, Suprasert P, Siriaunkgul S. Accuracy of frozen-section diagnosis of ovarian mucinous tumors. International Journal of Gynecological Cancer. 2012 Mar 1;22(3):400-6.
7. Neelam S, Hayat Z, Jawairiah JS, Sarwat A. Efficacy of Doppler Ultrasound in Detection of Ovarian Malignancy. Pakistan Journal of Medical & Health Sciences. 2022 Oct 24;16(08):878-.
8. Ratnavelu ND, Brown AP, Mallett S, Scholten RJ, Patel A, Founta C, Galaal K, Cross P, Naik R. Intraoperative frozen section analysis for the diagnosis of early stage ovarian cancer in suspicious pelvic masses. Cochrane Database of Systematic Reviews. 2016(3).
9. 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.
10. Mohammed AB, Ahuja VK, Farghaly H. Role of frozen section in the intraoperative management of ovarian masses. Middle east fertility society journal. 2015 Jun 1;20(2):97-101.
11. Ghazal K, El Hasan J, Hijasi H, Koulaima E. Accuracy of ultrasonography and color Doppler in diagnosis of ovarian masses and its correlation with histopathological findings. International Journal of Reproduction, Contraception, Obstetrics and Gynecology. 2020 Dec 1;9(12):4812-20.

12. Tampubolon DP, Herawati L. The Role of Mean Arterial Pressure (MAP) Roll Over Test (ROT) and Body Mass Index (BMI) in Preeclampsia Screening in Indonesia. Indian Journal of Public Health Research & Development. 2020;11(1):1050-3.

13. Gorišek B, Stare MR, Krajnc I. Accuracy of intra-operative frozen section analysis of ovarian tumours. Journal of International Medical Research. 2009 Aug;37(4):1173-8.
14. Subbian A, Devi UK, Bafna UD. Accuracy rate of frozen section studies in ovarian cancers: a regional cancer institute experience. Indian journal of cancer. 2013 Oct 1;50(4):302-5.
15. 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 4;10:268-73.