Section: Pathology

Original Research Article

DIAGNOSTIC ACCURACY OF OVARIAN LESIONS ON FROZEN SECTION PERFORMED INTRAOPERATIVELY AND ITS CORRELATION WITH CONVENTIONAL HISTOPATHOLOGY

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Received *: 08/09/2024*
Received in revised form *: 25/10/2024*
Accepted *: 09/11/2024*

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DOI: 10.70034/ijmedph.2024.4.123

Source of Support: Nil,
Conflict of Interest: None declared

Int J Med Pub Health
2024; 14 (4); 662-665

ABSTRACT

Background: Accuracy in diagnosing ovarian lesions with an intraoperative frozen section is very important for the evaluation of ovarian tumors so that the appropriate surgical procedures can be selected. **Aims and Objectives:** The primary aim of our study was to accurately distinguish benign, borderline and malignant ovarian neoplasms using frozen section.
Material and Methods: A total of fifty oophorectomy and cystectomy specimens received intraoperatively were studied using the frozen section. Thereafter the same specimens were fixed in 10% buffered formalin for conventional Histopathology. After comparing the results of both the sensitivity, specificity, positive predictive value and negative predictive values were calculated.
Results: Out of a total number of 50 cases, 34 (68%) were benign, 5 (10%) were borderline and 11 (22%) were malignant. The maximum number of patients were in the age group of 55-65 years. The sensitivity and specificity of the Benign, Borderline and Malignant ovarian tumors were 97%, 60%, 100% and 93.3%, 97.7%, 100% respectively.
Conclusion: The overall accuracy of the intraoperative frozen section for diagnosing ovarian tumors is 94%. Therefore, the frozen section serves as an important diagnostic tool and plays a very important role in deciding the course of surgery to be performed.
Key Words: Frozen section, ovarian tumors, serous, borderline.

INTRODUCTION

Ovarian cancers are the eighteenth most common cancers among all the cancers worldwide. These are the most common gynecologic malignancies after cervical and uterine cancers. The total number of new cases in the world was 0.3 million and almost 0.2 million died due to ovarian cancer in the year 2022.[1]

The majority of the patients are in peri and postmenopausal age group with a median age of 63 years at the time of diagnosis. The factors which are associated with high risk of ovarian cancers include advancing age, obesity, nulliparity, genetic mutations in BRCA1 and BRCA2 genes, Lynch syndrome association, family history of cancers, endometriosis and hormonal therapy.[2]

There is a difficulty in clinical diagnosis of ovarian malignancy as the presentation is generally insidious or the patient presents with non-specific symptoms. Therefore, the majority of the patients, around 65%, present with ovarian cancer which are at its advanced stage.[3]

MATERIALS AND METHODS

The study was conducted in the Pathology Department of Northern Railway Central Hospital, New Delhi, India from January 2022 to September

2024 on all the Oophorectomy and cystectomy specimens received intraoperatively for the frozen section. The Institutional Ethical Committee's approval and informed consent were also taken from the patients who were scheduled for the frozen section examination.

The fresh unfixed Oophorectomy and/or Cystectomy samples were received in the histopathology department. The detailed findings on gross were recorded, and the sections were taken from the representative areas like cyst wall, papillae, and solid areas, avoiding the areas of hemorrhage and necrosis. A minimum of 4-5 sections were taken which were fixed to the chucks with cryomatrix and were frozen to --25 degrees using Thermo-Fisher Cryostat. The sections of 4-micron thickness were cut and stained in an Automatic slide stainer using a rapid Hematoxylin and Eosin(H&E) staining protocol. After examination of the slides, the report was conveyed telephonically to the operating surgeons in the shortest period possible. After the reporting of the frozen section, it was ensured that no further section was needed, the tissue was fixed in 10% buffered formalin, processed in an automatic tissue processor and post-processing Paraffin blocks were prepared and sections were taken. The sections were stained with routine H and E stain and examined, categorizing each case into Benign, Borderline and Malignant. The findings of each case on conventional histopathology were compared with that of the frozen section technique considering histopathology as the gold standard. The following parameters, like sensitivity, specificity, positive predictive value and negative predictive values were calculated for each category.

RESULTS

In our study,66% of the patients were in perimenopausal and postmenopausal age groups ranging between 35-75 years, as illustrated in Table 1.

A total of 50 cases were received out of which 34 (68%) cases were benign, which included Serous cystadenoma, Mucinous cystadenoma, Benign cystic teratoma, Fibroma, Corpus luteal cyst ,endometriotic cyst and Torsion. 5(10%) cases were Borderline Serous tumors and 11(22%) cases were Malignant comprised of Serous cystadenocarcinoma, Mucinous cystadenocarcinoma, Malignant Brenner and Clear cell carcinoma. (Table 2).

The diagnosis on both frozen and histopathology was compared and there was 100% concordance in all the malignant tumors, while a discrepancy was observed in two Borderline tumors and one benign tumor. The two Borderline tumors which were reported as benign serous tumors on the frozen section turned out to be Borderline serous tumors on histopathology hence, they were False Negative. Similarly, a tumor which was reported as a Borderline tumor on frozen, was found to be Benign serous tumor on Histopathology hence it was False positive as shown in Table 3. The overall diagnostic accuracy of the frozen section in our study was 94%.

The following parameters were calculated to support the usefulness of the frozen section in diagnosing Benign, Borderline and Malignant tumors. The sensitivity for benign, borderline and malignant cases were 97%, 60% and 100% respectively. The specificity for benign, borderline and malignant cases was 93.3%, 97.7% and 100%. The positive predictive value and negative predictive value for benign, borderline and malignant cases were 94.3%,25%,100% and 93.3%,95.6%, and 100% respectively as shown in Table 4.

Table 1: Age wise distribution of total cases

AGE WISE DISTRIBUTION OF TOTAL CASES	
AGE RANGE	**Distribution (n=50)**
15-25 years	7
25-35 years	10
35-45 years	11
45-55 years	8
55-65 years	12
65-75 years	2

Table 2: Histomorphological Distribution of All Ovarian Lesions (N=50)

Conventional Histopathology Diagnosis	Number of each case	Percentage of individual cases
SURFACE EPITHELIAL TUMORS		
Benign Serous Cystadenoma	12	24%
Borderline Serous Cystadenoma	5	10%
Serous Cystadenocarcinoma	8	16%
Benign Mucinous Cystadenoma	3	6%
Mucinous Cystadenocarcinoma	1	2%
Malignant Brenner	1	2%
Clear cell Carcinoma	1	2%

GERM CELL TUMORS		
Benign Cystic Teratoma	9	18%
SEX CORD TUMORS		
Fibroma	2	4%
MISCELLANEOUS		
Torsion	1	2%
Corpus luteal cyst	2	4%
Endometriotic cyst	5	10%

Table 3: Analogy Between Ovarian Lesions on Histopathology and Frozen Section(n=50)

Comparison of Diagnosis of each cases	No. of cases on Conventional Histopathology technique	No. of cases on Frozen Technique
SURFACE EPITHELIAL TUMORS		
Benign Serous Cystadenoma	12	14
Borderline Serous Cystadenoma	5	3
Serous Cystadenocarcinoma	8	8
Benign Mucinous Cystadenoma	3	3
Mucinous Cystadenocarcinoma	1	1
Malignant Brenner	1	1
Clear cell Carcinoma	1	1
GERM CELL TUMORS		
Benign Cystic Teratoma	9	9
SEX CORD TUMORS		
Fibroma	2	2
MISCELLANEOUS		
Torsion	1	1
Corpus luteal cyst	2	2
Endometriotic cyst	5	5

Table 4: Results

	SENSITIVITY	SPECIFICITY	POSITIVE PREDICTIVE VALUE	NEGATIVE PREDICTIVE VALUE
BENIGN	97%	93.30%	94.30%	93.30%
BORDERLINE	60%	97.70%	25%	95.60%
MALIGNANT	100%	100%	100%	100%

DISCUSSION

The intraoperative frozen section is useful in the histological assessment of ovarian tumors. It helps in guiding the surgeon to decide the extent of surgery needed and thus avoiding under or overtreatment. If the tumor is benign, it is managed conservatively with cystectomy or oophorectomy. In the case of borderline tumors, pelvic lymph node dissection with limited omentum sampling is done. In case of malignant tumors, staging and surgical reduction including hysterectomy with bilateral salpingo-oophorectomy, lymph node sampling, peritoneal sampling and omentectomy is recommended.[4] The primary aim of our study was to accurately distinguish benign, borderline and malignant ovarian neoplasms using frozen section.

In many cases pre-operatively, the clinical findings, imaging studies and serum levels of CA-125 are not able to clearly distinguish if the ovarian tumor is benign, borderline or malignant, therefore the intraoperative frozen diagnosis plays a pivotal role in the surgical management of ovarian tumors.[5]

The overall accuracy of the intraoperative frozen section of ovarian lesions in our study was 94%, a similar result was observed in Pujani et al.[6] In various studies, high accuracy was observed ranging from 71.9%-99%.[7,8,9,10]

Geomini et al conducted a meta-analysis of 18 studies and the results obtained for the frozen section were promising. The sensitivity ranged from 65%-97% and specificity 97%-100% in diagnosing various ovarian lesions. Similar values were obtained in our study with high sensitivity and specificity for Benign and malignant lesions; however, it was low for borderline tumors.[11]

Cochrane database publication reviewed 38 retrospective studies and found out that the average sensitivity in diagnosing malignant tumors by frozen section was 90% with a range of 71% to 100% and average specificity ranging from 96% to 100%.[12] In our study sensitivity and specificity for malignant tumors was 100%, demonstrating the importance of usage of Intraoperative frozen section as a diagnostic tool in ovarian malignancy.

Despite obtaining high sensitivity and specificity in malignant tumors, we observed a reduced diagnosing accuracy in borderline tumors. Zaiem et al did a study to find out the reasons resulting in discrepancy in diagnosis. The cases were stratified into interpretational errors, sampling errors and other non-identifiable errors. The main limitation was sampling error especially in tumors larger than 10 cms. Other shortcomings included freezing artifacts, time limitation, technical problems, lack of ancillary studies, pathologist subspecialty and experiences.[5,13] This could be rectified to an extent

by taking multiple sections for each 10 cm diameter in case of large gross specimens.[14]

Decker reviewed and conducted a meta-analysis on a retrospective cohort study for difficulties encountered by pathologists to report a frozen section as borderline ovarian tumor or invasive carcinoma. The frozen section was thoroughly examined whether the borderline frozen section could or could not rule out invasive carcinoma. When there was no suspicion of carcinoma the cases were reported as "borderline" but in other cases wherever there was a doubt, the pathologist could not rule out invasion, those cases were reported as "at least borderline". In such cases, the paraffin embedded sections showed invasive carcinoma. Therefore, further categorization of all borderline cases, frozen section diagnosis into borderline and at least borderline frozen section reduced the discordance rate of borderline frozen section diagnosis when compared to the literature from 21% to 7.7%.[12,15]

In the current study two cases of borderline tumors were underdiagnosed as benign epithelial tumors this was because of atypia which was missed due to limited sampling in the case of large cystic mass, the one case of the benign tumor was overdiagnosed as borderline serous tumor due to focal atypia seen on the frozen section. Later on, more sections were studied for routine histopathology and the total area with atypia was found to be less than 10% of the total tumor area.

CONCLUSION

The main limitation in our study was the small sample size. The sensitivity of borderline tumor on the frozen section was 60% in our study therefore multiple sections need to be examined to look for atypia and invasion. In case of large tumors it becomes difficult to take sections at every 1-2 cm as the report is urgently awaited in the operation theatre. Despite its limitations, the frozen section is a valuable intraoperative diagnostic technique in the management of ovarian tumors. A larger study is suggested to see a better correlation between frozen sections with paraffin-embedded sections in ovarian cancers.

Financial support: Nil

Conflicts of interest: Nil.

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