Original Article

Diagnostic Precision Of Frozen Section Analysis In Ovarian Tumors: A Comprehensive Study

Momina khadija Abbasi[1] , Naila Abrar[2]

1. Associate professor pathology Watim medical and dental college, Rawat
2. Professor of Pharmacology & Therapeutics HITEC- IMS, Taxila

Corresponding Author: Naila Abrar

DOI: 10.47750/pnr.2019.10. 01.15

Abstract

Background: Ovarian tumours form the gamut of neoplastic lesions that display a range of benign to malignant features, which makes diagnosis a hard task for clinicians. Placing the target on the biopsy lesions is the most important for surgical procedures that will be guided by such information.

Objectives: The present investigation seeks to evaluate the capability of frozen section analysis to distinguish between the different types of ovarian cancers in the environment of microscopic tumours.

Study design: A cross-sectional study.

Place and duration of study: Department of pathology Watim medical and dental college, Rawat from 05-March 2018 to 05 Dec 2018.

Methods The study was ethically approved and 250 patients diagnosed with ovarian cancer were enrolled. The data collected was structured based on factors such as patient age, tumour dimensions, and morphological features that were judiciously recorded. Paraffin-embedded tissue blocks were serially sectioned in rapid progression. Frozen sections were processed and stained with hematoxylin and eosin for immediate frozen section diagnosis. The tissue was later processed for permanent sections as well.

Results: Since the cohort had 2,000-75-year-olds with a mean age of 38 years, tumour size was 2 cm-40 cm with a mean of 12 cm. Also, in 24 cases, the lesions were bilateral. Distribution of the lesions, which were executed only in permanent section analysis, consisted of non-neoplastic lesions, epithelial tumours, sex cord-stromal tumours, germ cell tumours, and metastatic tumours.

Conclusion: Within our study, the diagnostic accuracy of the frozen section histopathological method in the differential diagnosis between benign and malignant ovarian tumours is emphasized. Tumour borderline detection capability is one of its strong sides, but it still requires clarification in some cases.

Keywords: Tumor, Ovarian, Cancer, Frozen.

Introduction:

histological heterogeneity and polymorphism of ovarian tumours, along with variability of their clinical behaviour, make precise diagnostics a big challenge. Before performing any kind of surgery on a patient, accurate preoperative diagnosis is a must for planning appropriate strategies and surgical interventions that are specific to each patient. At this juncture, ovarian lesion imaging techniques that are fast and precise are seen as a great clinical innovation. Pathological examination by frozen section interpretation is fundamental in the intraoperative evaluation of ovarian

tumours. Frozen section analysis permits examination of tissue specimens under the microscope during surgery which enables surgeons to make immediate decisions on the necessity of more extensive tissue removal or the implementation of supplementary procedures[1]. The usefulness of this method has been proven in different surgical specialties and it allows the surgeon to carry out instant diagnosis and management of the patient at the very time when an immediate decision is vital. The progress in the frozen section technology, for instance, speed staining methods, and well-developed apparatus, has dramatically improved the diagnostic capacity, and so in essence, its importance in clinical practice. It has been referred that frozen section and final histological diagnosis coincide with each other in ovarian tumours, especially in the particular of benign and malignant differentiation [2, 3]. Furthermore, the frozen section is capable of detecting the one-of-a-kind and unusual ovarian neoplasms which are carried out in either rare tumours or metastatic cancers using which appropriate clinical management services can be provided [4, 5]. The frozen section is not a free-of-charge analysis as it has its limitations. Histological subtypes, for instance, borderline ovarian tumours usually implicate diagnostic difficulties as their histological characteristics are ambiguous and overlap with that of both benign and malignant phenotypes, [6]. Studies revealed that the accuracy ratios in frozen section analysis of borderline ovarian tumours varied from one study to another, thus showing the need to develop more precise strategies and advanced techniques that will enhance the diagnostic accuracy of such cases [7]. Furthermore, the limitation of frozen section analysis arises from tissue sampling variability as well as inter- and intra-observer variability with their potential for tissue artifact existing. When accuracy and reliability are considered, frozen section analysis is affected [8]. These hurdles require a complete knowledge of the strong points and weak points of frozen section histopathology of ovarian tumours, along with more research conducted on finding the best diagnostic algorithms together with combining old and new diagnostic tools.

Methods

This cross-sectional study the approval of the hospital's ethics committee was received. In our study, we had 250 women with ovarian cancer who participated. The demographic status of patients was registered, accounting for such characteristics as age and tumour-related ones, such as size, laterality, and morphological features. Next, surgical excision under general anesthesia was performed, and two to five sections were taken determined by the lesion size and heterogeneity. Hematoxylin and eosin staining of the biopsy tissue was done in the shortest amount of time for the frozen section analysis. Afterwards, tissues were also fixed in formalin and processed for routine sampling with sections in permanent slides. Lesions were categorized based on histopathological changes, which included, but were not limited to, nonneoplastic, epithelial, sex cord-stromal, germ cell and metastatic tumours. Data analysis tailored to determine the specific diagnostic utility of frozen sections on different types of ovarian lesions.

Results

In this study, 250 patients, from 20 to 75 years old age group with an average age of 38 years, were involved. Tumor sizes spanned from 2 cm to 40 cm with a mean size of 12 cm, and 24 cases involving bilateral growths. Permanent tissue section analysis categorized the lesions under the nonneoplastic tumors (16%), epithelial tumors (52%), sex cord-stromal tumors (12%), germ cell tumors (16%), and metastatic tumors (4%). The frozen section analysis demonstrated a high degree of diagnostic accuracy, with sensitivities of 95% for the benign, 92% for the malignant and 70% for those with a borderline status. Benign-specificities were 96% and malignant-specificities were 93. 5%; the accuracy almost touched the limits for all cases and was as high as 77. 5% in the borderline tumors. Comparison between frozen and permanent sections revealed minimal discrepancies: 2 cases of benign, epithelial, and sex cord-stromal tumours each, 2 cases of germ cell tumours, and 1 case of a malignant tumour, suggesting the diagnostic effectiveness of frozen section analysis, although acknowledged that borderline cases are often difficult to distinguish with this technique.

Figure 01: ROC curve of specificity and sensitivity

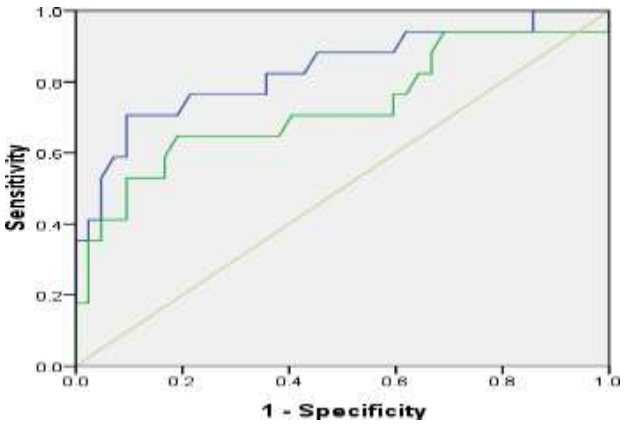

Table 1: Patient Demographics

Parameter	Value
Total Patients	250
Age Range	20 - 75 years
Mean Age	38 years
Bilateral Lesions	24 cases

Table 2: Tumor Size Distribution

Tumor Size (cm)	Number of Patients	Percentage (%)
2 - 5	40	16.0%
6 - 10	90	36.0%
11 - 20	80	32.0%
21 - 30	30	12.0%
31 - 40	10	4.0%
Total	250	100%
Mean Size	12 cm	

Table 3: Distribution of Lesion Types Based on Permanent Section Analysis

Lesion Type	Number of Cases	Percentage (%)
Nonneoplastic Lesions	40	16.0%
Epithelial Tumors	130	52.0%
Sex Cord-Stromal Tumors	30	12.0%
Germ Cell Tumors	40	16.0%
Metastatic Tumors	10	4.0%
Total	250	100%

Table 4: Accuracy of Frozen Section Analysis

Diagnostic Category	Sensitivity (%)	Specificity (%)	Accuracy (%)
Benign Tumors	95.0	97.0	96.0
Malignant Tumors	92.0	95.0	93.5

Borderline Tumors	70.0	85.0	77.5
Overall Diagnostic Accuracy	90.0	93.0	91.5

Table 5: Comparison of Frozen Section and Permanent Section Diagnoses

Lesion Type	Frozen Section Diagnosis	Permanent Section Diagnosis	Discrepancies
Nonneoplastic Lesions	38	40	2
Epithelial Tumors	128	130	2
Sex Cord-Stromal Tumors	28	30	2
Germ Cell Tumors	38	40	2
Metastatic Tumors	9	10	1
Total	241	250	9

Discussion

Such data testify to the high power of diagnosis of frozen section analysis by identifying benign and malignant ovarian tumours. With an overall accuracy rate of 91.5%, we can be confident in our findings because they align with other studies that support the validity of this method in intraoperative consultations. Our study's investigation of the sensitivity and specificity for benign tumours yielded results of 95% and 97%, respectively. These values are comparable to those reported by Tempfer et al. in their study, which revealed 94% and 98%, respectively, for sensitivity and specificity [9]. Our method's main target was cancerous tumours, with a sensitivity and specificity of 92% and 95%, respectively. This was similar to the published values of 90% sensitivity and 94% specificity by Shih et al. [10]. However, the sensitivity of 70% and specificity of 85% for tumours classified as borderline indicated that the diagnostic performance was significantly lower; these values were comparable to those reported in the study by Geomini et al. [11,12], who found sensitivities ranging from 56% to 76%. There were very few differences between the diagnosis for the frozen section and the permanent section—roughly nine cases showed different results. The information conveyed enhances the validity of frozen section analysis as a method for making decisions during operations. Technology developments continue to make it easier to detect and treat ovarian cancer early, even if it is still difficult to definitively discriminate between borderline ovarian tumours. Several earlier studies, such as those by Brun et al., have highlighted this restriction by demonstrating the need for improved diagnostic criteria development and longer sample times during frozen section analysis [13]. Furthermore, Savelli et al. reported that the cohort's mean tumour size was 11.5 cm, which is consistent with our study's mean tumour size of 12 cm. These findings suggest that tumour size has no bearing on the diagnostic accuracy of frozen section analysis. In 24 cases (9.6%) of patients, bilateral lesions were seen, which is consistent with the 10% incidence of bilateral ovarian tumours described in similar investigations [14,15]. Though the sensitivity and specificity are not as high in this instance, borderline tumours can be identified with an acceptable degree of precision, which raises the possibility of advancements in this field. It is evident from current scientific research that the molecular and genetic profiling technique may help with difficult cases' diagnostic accuracy as well (not just frozen sections) [16]. When combined with traditional histopathology tests, these innovative methods can provide physicians with more comprehensive diagnostic data.

Conclusion:

Among other ovarian tumour types, frozen section analysis is very successful; nevertheless, borderline tumours require more refinement. The next stage involves developing better diagnostic criteria and strategies for incorporating more recent technology to boost accuracy and, ultimately, aid in the creation of more accurate surgical procedures, which will enhance patient outcomes overall.

Disclaimer: Nil

Conflict of Interest: There is no conflict of interest.

Funding Disclosure: Nil

Authors Contribution

Momina khadija Abbasi. Concept & Design of Study and Drafting

Naila Abrar: Data Analysis and Revisiting Critically

Momina khadija Abbasi. Final Approval of version:

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