Original Research Article

Accuracy of Intraoperative Frozen Section inthe Diagnosis of Ovarian Neoplasms in a Tertiary Care Centre

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Abstract

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Background: Frozen section is an important tool in the intraoperative diagnosis of ovarian tumours which guides the surgeon in tailoring the surgical therapy, especially in younger women. *Aim*: To determine the accuracy of frozen section in ovarian neoplasms and to study the possible sources of discordance. *Methods*: Retrospective study of 78 ovarian tumours sent for frozen section from July 2016 to July 2018. The frozen and paraffin section reports were compared and accuracy, sensitivity, specificity, positive predictive value and negative predictive value of frozen section was determined individually for benign, borderline and malignant tumours. *Statistical Analysis*: Sensitivity, specificity, positive predictive value and negative predictive value were calculated for benign, borderline and malignant tumours separately. *Results*: The overall accuracy of frozen section in diagnosis of ovarian tumours was 97.4%. The sensitivity and specificity for benign tumours was 100%; for borderline tumours it was 100% and 97% respectively; for malignant tumours 92% and 100% respectively. The major source of discordance was found to be in regard to borderline mucinous tumours, with 28.5% showing invasion on final paraffin section. *Conclusion*: Accuracy of frozen section is high in benign and malignant ovarian tumours. The accuracy rate declines in cases of borderline tumours especially the mucinous type. Deferring the frozen section report to paraffin section is indicated when the diagnosis of borderline versus invasion is difficult or suspected.

Keywords: Accuracy; Borderline; Frozen Section; Mucinous; Ovarian tumors.

Introduction

Ovarian neoplasms are a heterogeneous group of tumours which include surface epithelial tumours, germ cell tumours, sex cord stromal tumours and secondary malignancies, each with greatly different surgical management. Among the surface epithelial tumours, the surgical options differ for benign,

borderline and malignant tumours. The latter is presently managed by a staging laparotomy with total abdominal hysterectomy, bilateral salpingo-oophorectomy, pelvic, para-aortic lymph node dissection, peritoneal sampling and omentectomy. Fertility sparing procedures can be carried out in cases of benign, borderline and some low grade malignant ovarian tumours. This includes removal of the ovarian mass only or, additional omental sampling with omission of lymph node dissection if clinically not enlarged. Despite the number of pre-operative tests available in the form of imaging studies and serum markers, it is not always possible to reach a pre-operative diagnosis. In such instances, frozen section plays a crucial role in providing an intra-operative diagnosis that guides the surgical management of the patient, especially in younger individuals where preservation of fertility is desired [1]. The accuracy of frozen section varies from 73% to 93% [2]. The accuracy is high for most benign and malignant tumours. In case of borderline ovarian tumours, frozen section analysis is difficult with a relatively low specificity and accuracy. These tumours contribute to the discordance between the frozen and paraffin section diagnosis of ovarian neoplasms.

Aim

The aim of the current study is to determine the accuracy of frozen section in the intra-operative diagnosis of benign, borderline and malignant ovarian tumours and to study the sources of discrepancies between the two.

Material and Methods

In this retrospective study, 78 cases of ovarian tumours from females aged between 19–68 years, sent for frozen section from July 2016 to July 2018 were included. The specimen were received in the Department of Pathology of a Teaching Hospital. Gross examination finding including tumour site, tumour size, capsular integrity, external appearance andpresence of solid/cystic areas/papillary excrescences were noted. Depending on the type of mass received, multiple sections were given from the relevant areas and the tissue was processed for frozen section. Following frozen section reporting, the remaining tissue from the frozen section blocks as well as additional sections were processed for routine paraffin blocks. The tumours were reported as surface epithelial, germ cell, sex cord stromal and metastatic.

The surface epithelial tumours were further categorized as benign/borderline/malignant and serous/mucinous/seromucinous. Paraffin section report was taken as gold standard and the accuracy of frozen section in regard to benign, borderline and malignant tumours was analysed individually through determination of sensitivity, specificity, positive predictive value and negative predictive value.

Statistical Analysis

Tests to determine the sensitivity, specificity, positive predictive value, negative predictive value and overall accuracy of frozen section in the diagnosis of surface epithelial tumours were done.

Results

Between July 2016 and July 2018, a total number of 244 specimens were received for frozen section diagnosis, of which 98 (40.1%) were gynaecological specimens. The most commonly received specimens were ovarian masses, which accounted for 78 out of the total frozen section specimens, (31.96%). Of these 78, 44 (56.4%) were benign; 21 (26.9%) were malignant; 7 (8.97%) were borderline tumours and 6 (7.69%) were non-neoplastic on frozen section diagnosis. The final paraffin sections revealed 44 (56.4%) benign; 23 (29.48%) malignant and 5 (6.41%) borderline ovarian tumours. The most common benign tumour was serous cystadenoma 24/78 (30.7%) followed by mucinous cystadenoma 8/78 (10.25%) and benign cystic teratomas 6/78 (7.69%). On frozen section, the most common malignant tumour was the granulosa cell tumour 8/78 (10.25%) followed by serous cystadenocarcinoma 5/78 (6.41%); mucinous cystadenocarcinoma and dysgerminoma 3/78 (3.84%). Of the 7 borderline tumours reported on frozen section, 5 (6.41%) were of mucinous type and 2 (2.5%) were serous type. Two of these 5 borderline mucinous tumours showed foci of invasion on final paraffin section indicating discrepancy between the frozen and paraffin sections. (Fig. 1a and 1b).

The sensitivity and specificity of frozen section for borderline tumours is 100% and 97% respectively. The overall of frozen section was 97.4%.

The sensitivity, specificity, positive predictive value and negative predictive value of frozen section in benign, borderline and malignant ovarian tumours are given in Table 1.
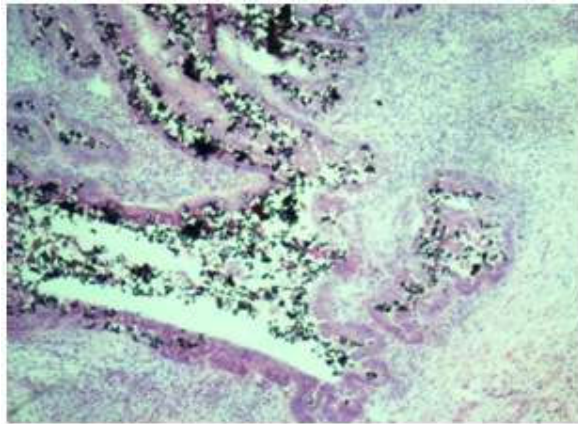
Fig. 1a: Tumour diagnosed as borderline mucinous on frozen section.
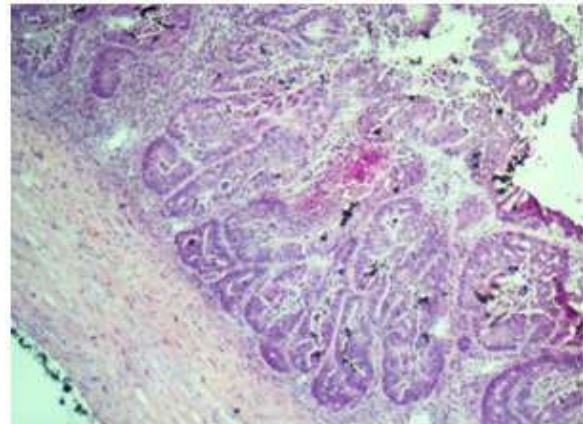
Fig. 1b: Paraffin section of same tumour demonstrating destructive stromal invasion.

Table 1: Sensitivity, Specificity, Positive predictive value, Negative predictive value and Accuracy of frozen section.

Tumour	Sensitivity (%)	Specificity (%)	Positive predictive value (%)	Negative predictive value (%)
Benign	100	100	100	100
Borderline	100	97	71	100
Malignant	92	100	100	96

Discussion

Intra-operative diagnosis of ovarian tumours is very important as it aids in determining the extent of surgery. This is particularly important in young females desiring to preserve fertility, borderline tumours, metastatic tumours and some cases of endometriosis which can be difficult to distinguish from carcinoma. To use frozen section as a reliable diagnostic tool for ovarian neoplasms, consistently high rates of accuracy are needed.

Table 2 shows the findings of accuracy, sensitivity and specificity of frozen section in ovarian tumours in different studies [1-4].

The sensitivity, specificity, PPV and NPV and overall accuracy of frozen section in ovarian tumours in this study is in concordance with other studies.

The accuracy of frozen section in benign tumours in this study is 100%.

In our study, two cases of borderline histology on frozen section showed stromal invasion in the final paraffin section. This contributed to the inaccuracy of frozen section for mucinous borderline and malignant tumours.

In our study, the sensitivity of frozen section of borderline tumours was 100%, specificity was 97% and PPV was 71%. This was found to be similar to other studies. However, Subbain *et al.* reported an accuracy of 45.4%. This was attributed to the restricted sampling of bits in large tumours. Table 3 compares the positive predictive value of frozen section in borderline tumours among various studies.

Borderline ovarian tumours are an independent entity which represent a unique intermediate stage of ovarian neoplasia. Although certain histological features suggest malignant behaviour, they are classified as tumours of "low malignant potential" since their prognosis is excellent when compared with that of invasive ovarian carcinoma [5].

The current study suggests that frozen section is reliable in the diagnosis of borderline serous tumours. However borderline mucinous tumours posed a diagnostic challenge. The overall accuracy for borderline mucinous tumours is low. Serous epithelial tumours are uniformly benign, borderline or malignant. Mucinous tumours on the other hand, are extremely heterogeneous neoplasms with a single tumour exhibiting areas of benign, borderline and malignant pathology. Therefore, extensive sampling is needed for these tumours which is a limitation during a time constraint procedure like frozen section. Various authors have reported that at least 25% of frozen section of borderline mucinous tumours will show carcinoma in the final paraffin sections [8]. This is a potential concern in using frozen section diagnosis to guide surgical decisions due to the risk of inadequate staging done in borderline cases. Hence the diagnosis of "at least borderline" is given in these cases. Another problem faced by the pathologist in regard to mucinous tumours is to distinguish primary mucinous malignancies from secondary

mucinous metastatic cancer. In such cases, clinical correlation with the status of the other ovary, history of GI malignancy and status of the appendix have to be taken into account if a mucinous carcinoma is reported on frozen section [4-8].

Table 2: Sensitivity, specificity and overall accuracy of frozen section diagnosis of current study compared with other studies.

Author	Overall accuracy (%)	Sensitivity (%)	Specificity (%)
1. Subbian et al. [2]	84.25		
Benign		90.4	82.6
Borderline		31.2	94
Malignant		91.5	98.2
2. Ali Hashmi et al. [1]	99%		
Benign		100	97
Borderline		83	99
Malignant		96	100
3. Sennur Ilvan [3]	97%		
Benign		100	97
Borderline		87	98
Malignant		87	100
4. Manipatil et al. [4]	95%		
Benign		99.3	92.6
Borderline		86.66	97
Malignant		96.3	100
5. Current Study	97.4		
Benign		100	100
Borderline		100	97
Malignant		92	100

Table 3: Comparison of Positive Predictive Value of frozen section of borderline tumours in current study with various others. [1,2,4,5,6]

Author	Positive Predictive Value (%)
Houck *et al.* [6]	89.3
Tempfer CB *et al.* [7]	84.3
Subbian *et al.* [2]	45.4
Ali Hashmi *et al.* [1]	83.33
Manipatil *et al.* [4]	68.42
Current Study	71

Conclusion

The accuracy of intraoperative frozen section diagnosis is relatively high for benign and malignant tumours and can be used safely in the surgical management of these tumours. Discordancy arises in tumours with borderline and mucinous. Though imaging and clinical findings suggest a diagnosis of borderline or malignant ovarian tumour, the final diagnoses is based on the appreciation of destructive invasion of the storm by the tumour. Although frozen section can demonstrate this feature, it can also be overlooked in the same. Therefore paraffin sections of widely sampled areas of mucinous borderline tumours are needed for the accurate diagnosis of these tumours.

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