e-ISSN: 0975-5160, p-ISSN: 2820-2651

Available online on www.ijtpr.com

International Journal of Toxicological and Pharmacological Research 2023; 13(11); 219-222

Original Research Article

The Role of Intraoperative Imprint Cytology in Case of Radiologically Proven Ovarian Complex Space Occupying Lesion

Sumana Pal[1], Srinka Mukherjee[2], Prabodh S. Soreng[3], Manami Roy[4], Senjuti Dasgupta

[1]Senior Resident, Department of Obstetrics and Gynaecology, Serampore Walsh Hospital, Hooghly.
[2]Senior Resident, Department of Obstetrics and Gynaecology, T. L. Jaiswal Hospital, Liluah.
[3]Associate Professor, Department of Obstetrics and Gynaecology, Jalpaiguri Medical College and Hospital.
[4]Assistant Professor, Department of Obstetrics and Gynaecology, Medical College and Hospital, Kolkata.
[5] Associate Professor, Department of Pathology, Medical College & Hospital, Kolkata.

Received: 16-09-2023 / Revised: 24-10-2023 / Accepted: 24-11-2023
Corresponding Author: Dr. Manami Roy
Conflict of interest: Nil

Abstract

Objective: To determine the role of intraoperative IC in radiologically proven ovarian complex SOL & to compare it with that of histopathology.

Background of Present Study: Ovarian neoplasms are a heterogenous group of benign & malignant tumours classified depending on different cells of origin. HPE however remains the gold standard in tissue diagnosis but takes about 10 to 15 days for results. Intraoperative pathology consultation is often required for guiding immediate surgical decisions to limit the extent of surgery or to perform radical surgery. Till date FS is the preferred method for providing rapid intraoperative diagnosis though it is technically more difficult than various cytological techniques. IC is easy to perform, gives results in minutes, does not need any expensive machines and is thus useful in resource poor countries.

Methodology: This study was carried out in Medical College Kolkata in approximately 12 month's time period. A total number of 40 cases was studied. Surgical specimens from the operations done for radiologically proven ovarian complex SOL were taken in this study. During intra operative period IC was done on the operated specimens and they were also sent for HPE. The accuracy and diagnostic utility of IC was correlated with that of the HPE.

Results: Of the 40 lesions studied by IC, 17 lesions were labelled as benign, 21 lesions as malignant and 2 lesions were borderline. Final histological diagnoses labelled 15 lesions as benign, 20 as malignant and 5 as borderline. Sensitivity, specificity were 100% and 95% respectively for malignant tumours.

Introduction

Ovarian neoplasms are a heterogeneous group of benign & malignant tumors of epithelial, stromal & germ cell origin. Ovarian neoplasm is usually called as silent killer as in maximum cases it is diagnosed in late stages. Its prognosis correlates with the extent of residual diseases after primary debulking surgery. [1] The primary purpose of the intra-operative (IO) pathologist consultation is to guide immediate surgical management. [2] Two methods for intra-operative diagnosis commonly in use are imprint cytology and frozen section (FS). [3] Though FS is one of the most valuable intra-operative methods for providing rapid intra-operative accurate diagnosis it involves teamwork among pathologists, pathology trainees, and sometimes pathology assistants. [4] On the other hand imprint cytology is simple, inexpensive, rapid diagnostic method. The diagnosis of ovarian neoplasm is mainly based on histopathology because of the simple reason that ovaries arc inaccessible for cytological techniques except when approached by imaging techniques. Fine needle aspiration cytology in the preoperative investigation of ovarian tumors has been discouraged since puncture of a cystic carcinoma might cause intra peritoneal seeding. But intraoperative IC enables a rapid diagnosis without fear of dissemination of ovarian cancer.

This study was designed to investigate the accuracy and feasibility of imprint cytology in cancer diagnosis and in resection of margins. The results were compared with corresponding HPE which is the gold standard.

Materials & Methods

This prospective, observational study was conducted at the department of obstetrics and gynaecology & pathology from May 2020 to

December 2021 for a period of 18 months after approval from ethical committee & proper informed consent from the patients. Total 40 cases, irrespective of ages, with radiologically proven ovarian complex SOLs, who underwent surgery in Eden hospital, Medical College and Hospital after fulfilling the inclusion & exclusion criteria, were included. Clinical, laboratory & radiological data were collected for each case. Smears were quickly fixed in 95% alcohol in order to avoid air drying artefact and stained with a variant of Papanicolaou's stain. The accuracy of the imprint method was assessed by comparing the imprint diagnosis with the corresponding paraffin section histopathological diagnosis.

For statistical analysis data were entered into a Microsoft excel spreadsheet and then analyzed by SPSS (version 27.0; SPSS Inc., Chicago, IL, USA) and Graph Pad Prism version 5. Cytology- and histology- positive cases were labeled true positive, histology-positive and cytology-negative cases were labeled as false negative, histology and cytology-negative cases were labeled as true negative and histology-negative and cytology-positive cases were labeled as false positive.

Inclusion Criteria:

- patients of any age group
- radiological (USG &/or CT scan) proven ovarian complex SOL
- patient has to undergo surgery for ovarian SOL

Exclusion Criteria:

- ovarian simple cyst
- patients who are unfit for surgery
- patients who already received chemo &/or radio therapy
- patients who are not giving consent

Result

In our study, total 40 cases of ovarian complex sols were taken & their imprint cytology and HPE were done. The age ranged from 11 years to ≥ 60 years, among them 20 cases were premenopausal & 20 were post menopausal.

In our study, 32 (80%) patients had Epithelial Origin in, 6 (15.0%) patients had GCT in Origin and 2 (5.0%) patients had Sex Cord Stromal Tumor in Origin.

Table 1: Distribution of Origin of Tumor

HPE: Origin	Frequency	Percent
Epithelial	32	80.0%
GCT	6	15.0%
Sex Cord Stromal Tumor	2	5.0%
Total	40	100.0%

IC & final HPE diagnosis correlated in all 40 cases when it comes to detection of origin of ovarian complex SOL.

6 patients had Clear Cell Carcinoma, 1 patient had Dysgerminoma, 4 patients had Endometriod Carcinoma, 2 patient had Fibroma, 1 patient had Immature Cystic Teratoma, 3 patients had Mature Cystic Teratoma, 1 patient had Mucinous Borderline Ovarian Tumor, 3 patients had Mucinous Cyst Adenocarcinoma, 5 patients had Mucinous Cystadenoma, 4 patients had Serous Borderline Tumor, 6 patients had Serous Cyst Adenocarcinoma, 3 patients had Serous Cystadenoma and 1 patient had Struma Ovarii.

Table 2: Distribution of Specific type of tumor in HPE

Specific type of tumor in HPE	Frequency	Percent
Clear Cell Carcinoma	6	15.0%
Dysgerminoma	1	2.5%
Endometriod Carcinoma	4	10.0%
Fibroma	2	5.0%
Immature Cystic Teratoma	1	2.5%
Mature Cystic Teratoma	3	7.5%
Mucinous Borderline Ovarian Tumor	1	2.5%
Mucinous Cyst Adenocarcinoma	3	7.5%
Mucinous Cystadenoma	5	12.5%
Serous Borderline Tumor	4	10.0%
Serous Cyst Adenocarcinoma	6	15.0%
Serous Cystadenoma	3	7.5%
Struma Ovarii	1	2.5%
Total	40	100.0%

IC did not correlate with HPE in case of 2 serous borderline tumour, 1 serous cystadenoma, 1 endometriod carcinoma, 1 mucinous cystadenocarcinoma & 1 mucinous cystadenoma.

In our study, 15 (37.5%) patients had Benign tumor in HPE, 5 (12.5%) patients had Borderline tumor in HPE and 20 (50.0%) patients had Malignant tumor in HPE.

Table 3: Distribution of tumor type in HPE

HPE Type	Frequency	Percent
Benign	15	37.5%
Borderline	5	12.5%
Malignant	20	50.0%
Total	40	100.0%

In our study, 15 (37.5%) patients had Benign tumor in HPE, 5 (12.5%) patients had Borderline tumor in HPE and 20 (50.0%) patients had Malignant tumor in HPE.

Table 4: Distribution of tumor type in HPE

HPE Type	Frequency	Percent
Benign	15	37.5%
Borderline	5	12.5%
Malignant	20	50.0%
Total	40	100.0%

IC showed, 17 (42.5%) patients had benign tumor in Imprint cytology, 2 (5.0%) patients had Borderline tumor in Imprint cytology and 21 (52.5%) patients had malignant tumor in Imprint cytology.

Table 5: Distribution of tumor type in Imprint cytology

Imprint cytology Type	Frequency	Percent
Benign	17	42.5%
Borderline	2	5.0%
Malignant	21	52.5%
Total	40	100.0%

Imprint cytology benign tumor detection potential: sensitivity: 100%, specificity: 92%, positive predictive value: 88%, negative predictive value: 100%.

Imprint cytology malignancy detection potential: Sensitivity: 100%, Specificity: 95%, Positive Predictive Value: 95.2%, Negative Predictive Value: 100%.

Imprint cytology borderline tumor detection potential: sensitivity: 40%, specificity: 100%, positive predictive value: 100%, negative predictive value: 92%.

Discussion

Ovarian neoplasms are a diverse group of tumours which shows a range of morphological characteristics, clinical manifestations, genetic alterations, and tumor behaviors. This high degree of variability presents a major challenge in both diagnosis and treatment. IC provides rapid intra operative diagnosis which guides immediate surgical management. Intra-operative consultations are sought by surgeons for various reasons, including diagnosis of a previously undiagnosed lesion (mainly benign versus malignant), assessment of margin status, detection of spread of disease, for example, lymph nodes metastasis and instant evaluation of the adequacy of surgically resected tissue. [2] Pre-operative evaluation of patients with an ovarian mass is usually made by clinical examination, radiological investigation and serum tumor markers. [3] Intraoperative methods which can differentiate between benign and malignant lesion can guide surgeon to tailor the extent of surgery [4]. These intraoperative diagnostic procedures can reduce regret of doing incomplete surgery for malignant tumors or radical surgery for benign conditions. Though histopathological examination is gold standard for diagnosis of ovarian neoplasms but it has its own limitations. It is a time consuming process. Two methods for intra-operative diagnosis commonly in use are imprint cytology and frozen section (FS). [5] Though FS is one of the most valuable intra-operative methods for providing rapid intra-operative accurate diagnosis it involves teamwork among pathologists, pathology trainees, and sometimes pathology assistants. [6] Several factors can influence the accuracy of FS diagnoses, such as tumor size, histologic type, and the pathologist's experience. [7] In 1927 Dudgeon and Patrick introduced cytology as a method of intra operative evaluation. There are several advantages of IC over FS such as [6,7,8,9] rapidity of the preparation which is not at the expense of accuracy, simple and in expensive method, excellent preservation of cellular details without freezing artefacts, possibility of identifying focal microscopically undetectable neoplastic lesions in large tissue fragments, possibility of examining adipose, necrotic and calcified tissue, diagnosis of

Malignancy when the tissue is limited in quantity, avoidance of contamination and safe handling.

But imprint cytology has some pitfalls also [3,10,11]: the depth of infiltration can't be assessed, well differentiated tumor with dense fibrous stoma and mucinous adenocarcinoma cannot be interpreted properly through this method.

HPE is the gold standard for diagnosis of ovarian SOL. But HPE result can only be obtained after few days of surgery. As due to anatomical location and fear of cancer seeding pre operative sample collection for histology or cytology is not possible/ discouraged .

In head and neck tumor resections, surgeons often plan to perform reconstructive surgery immediately after definitive resection and for that establishing the presence of negative margins intraoperatively is crucial.[3] Successful reconstruction of the defect is extensively limited by the oncological clearance at margins. The surgeon modifies his surgical plan based on the intraoperative consultation from the pathologist [4].

This study was designed to investigate the accuracy and feasibility of imprint cytology in cancer diagnosis and in resection of margins. The results were compared with corresponding HPE which is the gold standard.

In our study, all the GCTs & Sex cord stromal tumours were properly identified by IC. Diagnostic dilemma occurred in case of epithelial ovarian neoplasm. There were 1 false positive endometriod neoplasm and 1 false negative serous ovarian tumour. 1 tumour showed features of both serous & mucinous carcinoma.

In this study, IC showed 2 false positive benign tumour, 3 false negative borderline tumour & 1 false positive malignat tumour.

Imprint cytology benign tumor detection potential: sensitivity: 100%, specificity: 92%, positive predictive value: 88%, negative predictive value: 100%.

Imprint cytology malignancy detection potential :Sensitivity: 100%, Specificity: 95% , Positive Predictive Value: 95.2%, Negative Predictive Value: 100%.

Imprint cytology borderline tumor detection potential: sensitivity: 40%, specificity: 100%, positive predictive value: 100%, negative predictive value: 92%.

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