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ORIGINAL RESEARCH

Study of efficacy of intra-operative imprint cytology in ovarian tumors: A Pilot project

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ABSTRACT

Background: To assess the overall accuracy of intra-operative diagnosis of ovarian tumors by imprint cytology technique and to compare those cases with histopathological diagnosis and to determine whether the addition of cytologic preparations provides useful information in the intra-operative management.Aims and Objectives: To establish the validity and reliability of imprint cytology and its accuracy in intra-operative diagnosis of ovarian tumors and to get an overview of the incidence of ovarian malignancies in our hospital. Materials and Methods: A Prospective study of 2 years conducted from November 2011 to October 2013. The study includes all cases of ovarian tumors and excludes patients who have received treatment and cases of functional ovarian cysts. Intra-operative imprint cytology diagnosis was compared with histopathological report.Results: A total of 30 cases were studied. Age range of the patients was 13 to 69 years. Out of 30 cases, 2 cases were excluded. On histopathological diagnosis out of 28 cases, 18 were benign, 1 was borderline,8 were malignant and 1 case with no tumor(Infected cyst) . On comparing the imprint cytology diagnosis with histopathological diagnosis, 25 out of 28 cases were concordant and the diagnostic accuracy of imprint cytology was 96.4%.Conclusion: Imprint cytology is a less expensive, simple and a quick method of diagnosis. Unlike frozen section it does not affect the utility of the specimen for histopathology. It is helpful especially in young patients who need conservative surgery in order to preserve fertility.

Keywords: Ovarian tumors, imprint cytology, histopathological examination.

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INTRODUCTION

The ovaries are the major endocrine glands, the source of female fertility and at the same time site of origin of the most complex as well as lethal neoplasms. Among cancers of female genital tract, the incidence of ovarian cancer ranks next to carcinoma of cervix and endometrium[1].The most important indication for IOC is to establish or confirm diagnosis rapidly[2]. Imprint cytology is the only method which gives the intra-operative diagnosis of ovarian tumors within 20 minutes, thus helping in tailoring the extent of surgery[3]and also avoids unnecessary removal of contralateral ovary in young females and helps preserve fertility[4]. Although cytology imprint smears have been used by pathologists for many years

as an adjunct to frozen sections in many organs, this has not been the case for the ovary[5].The diagnosis of ovarian neoplasms depend mainly on histopathological examinations, as they are inaccessible for cytological techniques, except when they are approached through imaging techniques[3].Even though ovarian masses can be approached by laproscopy and ultrasound guided aspiration, there are controversial views regarding their safety[3].Advantages of IOC are its simple, inexpensive, excellent preservation of cellular details, with no loss of tissue as occurs with cryostat sections[2].

AIMS AND OBJECTIVES

1. To establish the validity and reliability of imprint cytology and its accuracy in intra-operative diagnosis of ovarian tumors.
2. To get an overview of the incidence of ovarian malignancies in the tertiary care centre.

MATERIAL AND METHODS

It is a prospective study conducted at Vijayanagara Institute of Medical Sciences, Ballari a tertiary care hospital based in North Karnataka, covering border villages of Andra Pradesh.
Patients of ovarian masses were subjected to thorough clinical examination including lab work and radiological study. Detailed clinical history was taken.
Imprint slides were taken in the operative theatre as soon as the mass was extracted. Glass slides were clean, dry & dust free. Usually 2 slides per case were made & 4 slides in case of varied morphology. Slides were numbered before itself. One slide was air dried for Toulidine Blue and others were fixed in 95% ethanol for rapid H&E.On receiving the specimen, the measurements were taken and gross findings noted. Depending on whether the mass was solid/ cystic/ solid-cystic, a clean cut was taken at the maximum diameter.
Cut-section features noted for any papillary projections, cysts- uni/ multi locular areas, solid areas and grumous material. Imprints from various areas taken after draining the cyst fluid and mopping of excess mucus/ fluid.
The entire procedure including staining and reporting took 15 minutes maximum. (this was due to the fact that slides were made in the OT and shifted to Central diagnostic lab for staining and reporting- delay in transport).
After imprints were taken, the specimen was placed in an appropriate labelled container with adequate amount of 10% buffered formalin & sent to the Department of Pathology VIMS, Ballari for further processing and reporting on histopathology.

Inclusion criteria

Patients subjected to surgery for ovarian mass/ adnexal mass.

Exclusion criteria

1. Patients on chemotherapy/ radiotherapy.
2. Suspicious inflammatory mass.
3. Functional cysts.

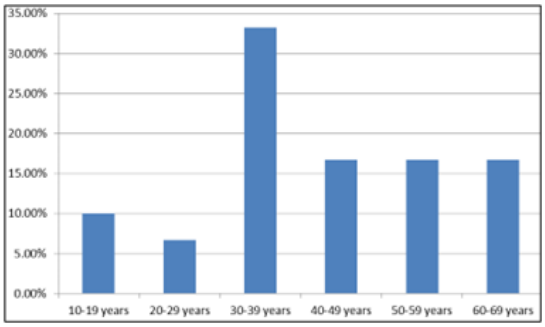
RESULTS

Present study comprised of 30 cases of ovarian tumors sent to the Department of Pathology, VIMS, Bellary over a period of 24 months. The patients age in the study sample ranged from 13 to 69 years with a mean age of 41.97 years. The clustering of cases were seen in the age group of 30-39 years (33.2%) (Graph-1). Most common complaint was pain abdomen(22 cases) followed by mass per abdomen(18 cases).
Out of 30 cases studied, 2 cases were excluded as 1 case was of CA- Pancreas with metastasis and another was suspected case of GIST, mistaken to be ovary on USG. Out of 28 cases, 18 cases (64.3%) were epithelial tumors and 10 cases (35.7%) were non- epithelial tumors on histopathology. All these cases were further classified into benign (18 cases),

borderline (1 case) and malignant (8 cases) and 1 case with no tumor (oophoritis) (Table2). The correlation between the imprint cytology diagnosis and final histopathological diagnosis is shown in (Table1).

A diagnostic concordance was observed in 25 cases of the 28 cases (Table3).3 cases diagnosed on imprint cytology which did not correlate with the final histopathological diagnosis included 1 case of mucinous cystadenoma which was misdiagnosed as serous cystadenoma, 1 case of benign (mucinous cystadenoma) which was misdiagnosed as borderline (mucinous cystadenoma) and 1 case reported as borderline epithelial tumor did not show any evidence of malignancy on histopathology (oophoritis).

Overall accuracy for diagnosing ovarian tumors by imprint cytology in comparison with histopathology is satisfactory with 96.4% (Table-4).



Graph 1: Age wise distribution of study subjects

Table 1: Final Histopathological diagnosis with cytological correlation by imprint cytology

	Imprint	Percentage	Histopathology	Percentage
Epithelial tumours				
Serous				
Benign	5	16.67%	6	20.00
Borderline	0	0.00%	0	0.00
Malignant	3	10.00%	3	10.00
Mucinous				
Benign	8	26.67	7	23.33
Borderline	3	10.00	1	3.33
Malignant	1	3.33	1	3.33
Endometrioid				
Benign	0	0.00	0	0.00
Malignant	0	0.00	0	0.00
Germ cell tumour				
Yolk sac tumour	1	3.33	1	3.33
Mixed Germ Cell Tumour	1	3.33	1	3.33
Mature cystic teratoma	0	0.00	0	0.00
Dysgerminoma	1	3.33	1	3.33
Sex cord stromal tumour				
Fibroma	1	3.33	1	3.33
Metastatic adenocarcinoma	1	3.33	1	3.33
Benign Cyst	3	10.00	3	10.00
Mixed Serous Mucinous Cystadenoma	0	0.00	1	3.33
No evidence of tumour	0	0.00	1	3.33

Table 2: Comparison of cytohistological distribution of ovarian tumors

Nature of lesion	Imprint Cytology	Histopathology
Malignant	08(28.6%)	08(28.6%)
Benign	17(60.7%)	18(64.2%)
Borderline	03(10.7%)	01(03.6%)
No tumour [oophoritis]	--	1(03.6%)
Total	28(100%)	28(100%)

Table 3: Validity of Imprint cytology report

Imprint cytology	Frequency	Percentage
Correlated with HPE	25	89.3
Not correlated with HPE	03	10.7
Total	28	100

Table 4: Accuracy of Imprint cytology for diagnosing malignant ovarian tumours

Imprint cytology	Histopathology		Total
	Present	Absent	
Present	27	01	28
Absent	00	00	00
Total	27	01	28

DISCUSSION

Dudgeon and Patrick were first to introduce touch imprint cytology as an important diagnostic procedure in intraoperative consultation[6].In the areas of the world where access to frozen section is limited, imprint cytology is probably the only means of rapid intraoperative consultation[7].

We have done intraoperative imprint cytological examination in 30 cases and followed it up histologically. On imprint cytology, most common tumors were surface epithelial tumors (79.17%), predominantly mucinous in nature(40%) and most cases were benign. Of the 8 malignant tumors, one was a case of metastatic adenocarcinoma/Krukenbergtumor (Signet Ring Cell type) which was diagnosed as primary ovarian tumor clinically. Following imprint cytology, signet ring cells were seen and helped to locate the primary tumor in stomach.

The overall diagnostic accuracy of imprint cytology in comparison with histopathology in this study was 96.4% and was comparable with other studies done by KarTushar*et al.* [4] (89.55%), Suen KC *et al.* [8](93.8%) and Colin[9](97.8%).

Touch imprint cytology is used for quick microscopic analysis of a pathological lesion[5].The ability to deliver an immediate diagnosis makes it an important part of treatment at places where frozen section facility is not available, which needs an advanced set up[10].The smears can be prepared from multiple sites. It helps to differentiate between neoplastic and inflammatory conditions[11].

Thus this study has shown that imprint cytology is a very important cost-effective tool for intraoperative diagnosis of ovarian tumors.

CONCLUSION

Imprint cytology is a simple and rapid diagnostic technique, which does not require any sophisticated equipment. Considering its high accuracy it may be routinely used as an adjunct to frozen section especially when cryostat machines or microwave tissue processors are not available for rapid diagnosis.

Since imprint of freshly resected specimen yields smears with excellent cytological clarity owing to the single cell thickness that the smears offer, it still holds a unique status even in the current perspective. Hence, imprint cytology can be considered as imperative procedure for rapid intra-operative evaluation of the type of lesion and for making decisions regarding the extent of surgery and management thereafter.

LIMITATIONS

1. Frozen section not available to compare the results of imprint cytology.
2. Limited number of cases.

Figures

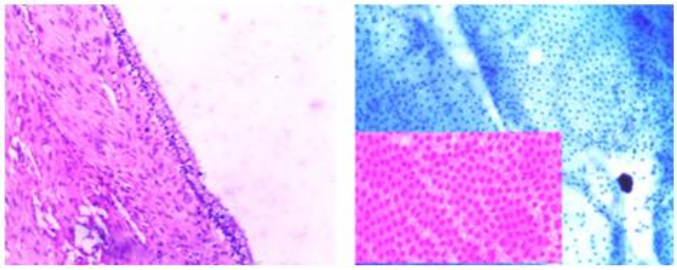


FIGURE 1: Mucinous cystadenoma ovary; HPE shows cyst wall lined by columnar cells in a single row with no nuclear atypia (H&E 40x) and imprint shows monolayered sheets of tumor cells with vacuolated cytoplasm. (H&E, 100X, Toulidine Blue 40x)

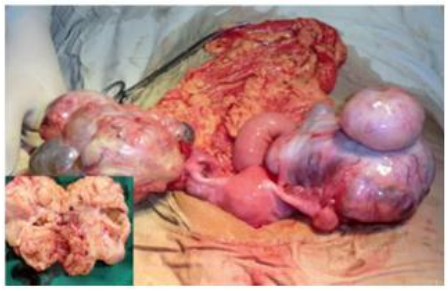


FIGURE 2: Bilateral cystadenocarcinoma ovary (intraop) Inset : Cut section shows papillary excrescences and areas of focal necrosis.

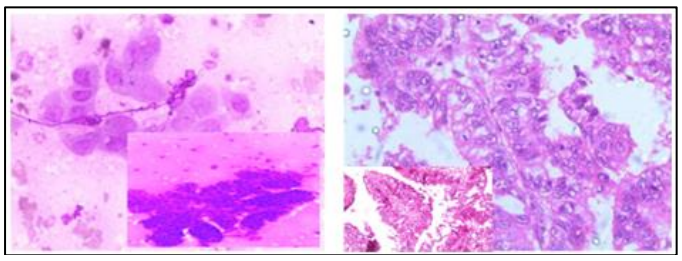


FIGURE 3: Serous cystadenocarcinoma ovary; Imprint cytology shows scattered clusters of epithelial cells with high N/C ratio, prominent nucleoli (H&E 100x)Inset: complete papillary frond (H&E 40x). HPE shows abundant sheets of papillae lined by pleomorphic cells with high N/C ratio, prominent nucleoli (H&E 400x). Inset: complete papillary frond with fibrovascular core(H&E 40x)

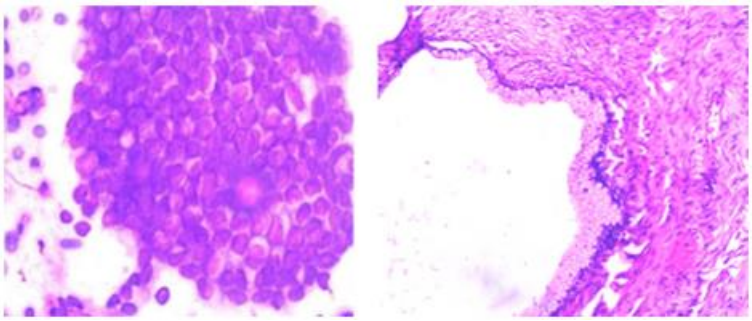


FIGURE 4: Borderline Mucinous Cystadenoma ovary; Imprint smears show abundant cohesive clusters of cells with moderate increase in N/C ratio & coarse chromatin(H&E 100x) and HPE shows multilayered cells with moderate increase in N/C ratio(H&E 40x)

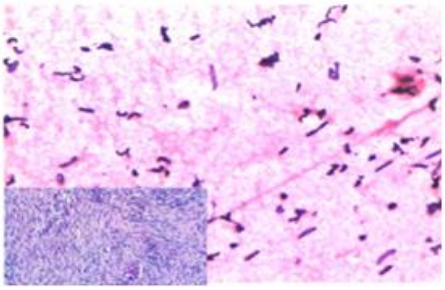


FIGURE 5: Fibroma:Imprint smears show scattered wavy fibroblasts with bland nuclei in a proteinaceous background (H&E 100x) Inset: On HPE, hypercellular areas with storiform pattern,wavy bland nuclei noted (H&E 40x)

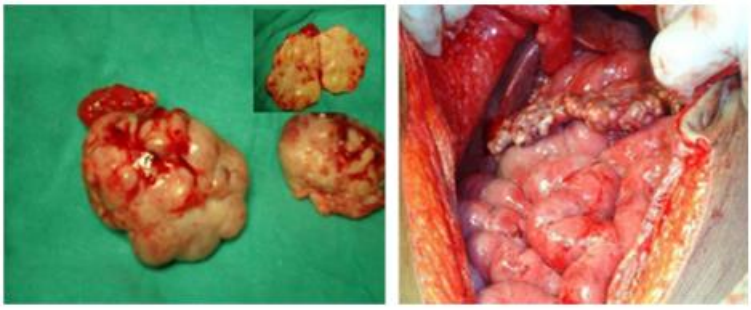


FIGURE 6: Metastatic signet ring cell carcinoma ovary; Bilateral bossellated ovaries with intact capsule .Inset: Homogenous firm gray white tumor involving the entire ovary. Intraoperative finding of omental cake with liver & spleen metastasis

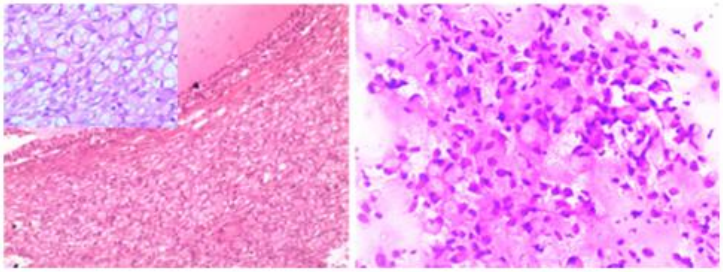


FIGURE 7: Metastatic signet ring cell adenocarcinoma; HPE shows normal follicular cells lining a cyst with dense infiltrate of signet ring cells in the stroma (H&E 40x).Inset: variable sized signet ring cells with single large vacuole pushing the nucleus to periphery (H&E 400x). Imprint smears show highly cellular smears of signet ring cells in sheets & clusters (H&E 100x)

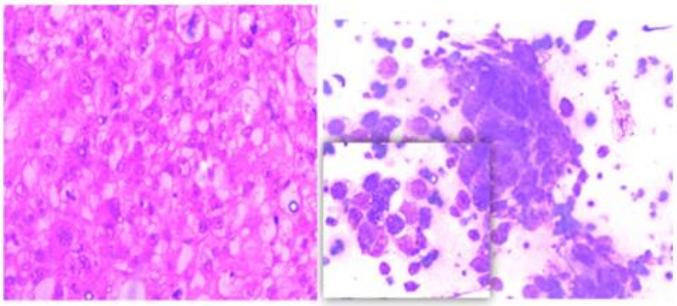


FIGURE 8: Dysgerminoma:On HPE shows uniform tumor cells in well defined nests separated by fibrous strands infiltrated by lymphocytes. Cells have large vesicular nucleus, prominent nucleolus(H&E 100x). Imprint smears show highly cellular smears composed of large tumor cells with abundant cytoplasm large vesicular nucleus, prominent nucleolus(H&E 100x)Inset: H&E 400x

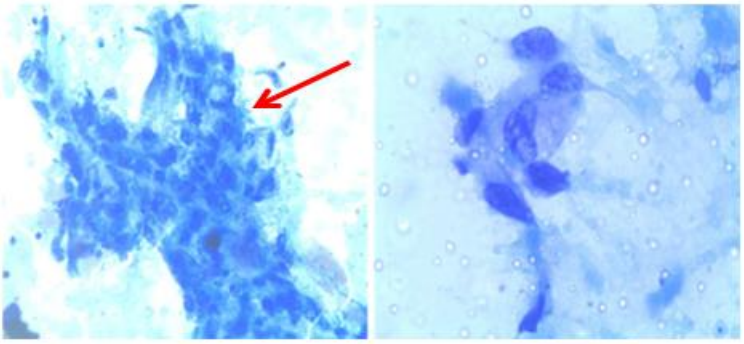


FIGURE 9: Yolk sac tumor; Imprint smears are highly cellular, few areas show microcystic (arrow) & reticular patterns (Toulidine blue 100x), nucleus is highly pleomorphic cells with irregular coarse chromatin (Toulidine blue 400x)

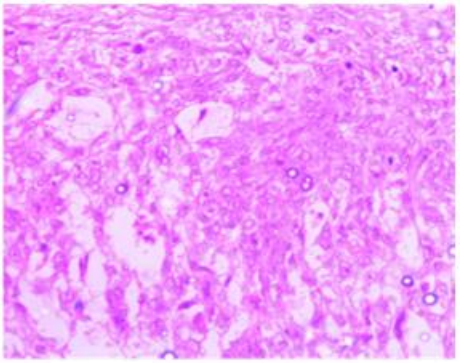


FIGURE 10: Yolk sac tumor ; HPE shows reticular, microcystic pattern with solid sheets of tumor cells with small nucleus. Focal areas show hyaline globules (H&E 100x)

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