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Ultrasonography guided fine needle aspiration cytology of benign and malignant ovarian masses with histopathological correlation

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Abstract
Background: In recent past image guided fine needle aspiration cytology of ovarian masses is being used for the pre-operative diagnosis of neoplastic ovarian lesions, The imaging may be in the form of routinely performed ultrasonography and fine needle aspiration cytology is done from the solid component of lesion.
Material and Methods: A prospective study was conducted at our tertiary care center over the period of two years. The 32 patients with ovarian masses encountered. The sensitivity, specificity and diagnostic accuracy of FNAC was calculated. Pitfalls and limitations of cytological evaluation and histopathological diagnosis has been highlighted.
Results: The sensitivity of fine needle aspiration cytology in this study is 81.81%, Specificity is 95.23% and diagnostic accuracy is 90.60%.
Conclusion: The Ultrasonography guided FNAC is less invasive, economic, rapid diagnostic mode of early evaluation of benign and malignant ovarian tumors and helps in early management.

Keywords: Fine needle aspiration cytology, histopathology, ovarian mass lesions, ultrasonography

1. Introduction
Fine needle aspiration cytology (FNAC) is cost effective, simple and reliable diagnostic method for variety of female genital tract neoplasm [1]. However in past the role of FNAC as a preoperative diagnostic procedure to distinguish between benign and malignant ovarian masses was hesitated by many clinicians [2].
The image guided aspiration can be done under ultrasonography (USG) or computed tomography (CT) scan. USG guidance is regarded as method of choice for diagnosis of ovarian mass lesions [3]. Although the possibility of malignant cells seeding within the abdominal cavity was overestimated, it has not been pathologically confirmed [4, 5].

1.1 Aims and objectives
This study was undertaken
1. To evaluate the role of USG guided preoperative fine needle aspiration cytology diagnosis in the cases of ovarian masses.
2. To calculate the sensitivity, specificity and diagnostic accuracy of USG guided FNAC and to correlate the results of this with gold standard post-operative histopathological examination.
3. To compare the results of this study with available published reports.

2. Materials and Methods
A prospective study was done over the period of two years, from 1 June 2017 to 31 May 2019. Ethical approval was taken from the institutional ethical committee. The sensitivity, specificity and diagnostic accuracy of FNAC was calculated. Pitfalls and limitations of cytological evaluation have been highlighted.
Histopathological analysis was done as per WHO classification of ovarian tumors. After detail history and clinical examination, consent from each and every patient had been taken and ultrasonography guided FNAC was done by using 22 or 24 guage needle and 10 ml

syringe. In deep seated lesions lumbar puncture needle was used and slides were prepared. After drying Leishman Staining done, few special staining was done whenever necessary.

Post operative gross specimen was examined thoroughly in the pathology department and representative areas sampled and tissue processing done, block made then after section cutting slides were stained with eosin and hematoxylin stain.

2.1 Inclusion criteria

- All Patients presenting with ovarian mass lesions diagnosed on USG, attending gynecology OPD (Out patient department) or admitted to tertiary care hospital.
- All patients of ovarian mass lesions operated in our hospital and sample processed in the department of pathology.
- Informed consent was taken from each patient.

2.2 Exclusion criteria

- Patients in which only FNAC done without histopathology.

3 Results

In this study 32 patients with ovarian masses was diagnosed over the period of two years. The age ranges from younger patient to oldest patient was 18 years to 75 years. The mean age is 38 years. Most common age group for ovarian tumors in this study was 41 to 50 years and 61 to 70 years equally i.e 28.12%. Among these only 2 cases (6.25%) were bilateral. The benign lesions are common in early age group but malignant lesions are seen more in later decades.

Table 1: Age distribution

Age groups	Number of cases	percentage
11-20	1	3.12%
21-30	2	6.25%
31-40	5	15.62%
41-50	9	28.12%
51-60	4	12.5%
61-70	9	28.13%
71-80	2	6.25%
Total cases	32	100%

This study included 32 cases of ovarian mass lesions. Out of 32 patients the cytopathological diagnosis was- 22(68.75%) were benign cases and remaining 10 cases i.e (31.25%) were malignant ovarian tumors.

Table 2: Cyto-Histopathological correlation of benign ovarian masses

FNAC diagnosis	Diagnosis on FNAC (n=22)	Histopathological Diagnosis	
		Concordant (n=20)	Discordant(n=2)
Serous Cystadenoma	10(31.25%)	8(25%)	2(6.25%)=Borderline Serous Cystadencarcinoma
Mucinous Cystadenoma	6(18.75%)	6(18.75%)	0
Endometroid tumor	1(3.12%)	1(3.12%)	0
Clear cell tumor	1(3.12%)	1(3.12%)	0
Granulosa Cell tumor	2(6.25%)	2(6.25%)	0
Sex cord tumor with annular tubules	1(3.12%)	1(3.12%)	0
Teratoma	1(3.12%)	1(3.12%)	0

The break up of 22 bening cases on FNAC - 10 (31.25%) were serous cystadenoma which were on histopathological examination 8(25%) correlated very well but 2 (6.25%) were borderline cystadenocarcinoma i.e discordant cases, 6 (18.75%) cases were mucinous cystadenoma, 1(3.12%) case each endometroid tumor, clear cell tumor, benign teratoma and a rare case - sex cord tumor with annular tubules, 2(6.12%) cases of granulosa cell tumor were diagnosed on FNAC and correlated on histopathological examination.

Table 3: Cyto-Histopathological correlation of malignant ovarian masses

FNAC diagnosis	Diagnosis on FNAC (n=10)	Histopathological concordant (n=9)	Diagnosis Discordant (n-1)
Serous cystadenocarcinoma	3(9.37%)	3(9.37%)	0
Mucinous Cystadenocarcinoma	3(9.37%)	2(6.25%)	1=Benign borderline Mucinous Cystadenoma.
Endometroid carcinoma	1(3.12%)	1(3.12%)	0
Malignant granulosa cell tumor	1(3.12%)	1(3.12%)	0
Malignant sertoli cell tumor	1(3.12%)	1(3.12%)	0
Dysgerminoma	1(3.12%)	1(3.12%)	0

Malignant ovarian masses –In this study overall incidance of malignant ovarian mass lesions was 10 (31.25%). Which were diagnosed as malignant lesions on FNAC. Out of ten malignant cases, 3(9.37%) cases were serous cystadenocarcinoma which were correlated on histopathological examination next 3 (9.37%) mucinous cystadenocarcinoma among these 2(6.25%) correlated on histopathological examination but one case was borderline benign mucinous cystadenoma i.e discordant case.

One (3.12%) case each endometroid carcinoma, malignant granulosa cell tumor, malignant sertoli cell tumor and dysgerminoma were diagnosed on FNAC and correlated on histopathological examination.

Table 4: Combine table showing benign and malignant ovarian mass lesions with cyto-histopathological correlation

	Histopathological examination.(HPE)			
Cytopathological Diagnosis on FNAC		**Malignant Cases**	**Benign Cases**	**Total on FNAC**
	Malignant Cases	9	1	10
	Benign Cases	2	20	22
		11	21	32

4. Discussion

We encountered 32 patients of ovarian mass lesions among these, on fine needle aspiration cytology 22(68.75%) patients were diagnosed as benign ovarian mass lesions and remaining 10 (31.25%) cases diagnosed as malignant ovarian tumors. The most common clinical complaints were pain and presence of lump in lower abdomen.

In malignant ovarian mass lesions FNAC was used for diagnosis and follow up of recurrence in the field of gynaecologic oncology. Due to ulta sound guidance technique advancement, FNAC provides more accurate results in recent years [5]. In few borderline tumors, the cytological diagnosis may be difficult as observed in our study. The paucicellular aspirate or bloody field may poses diagnostic difficulties [6].

Here are some interesting cases with photomicrographs and cyto-histopathological correlated features discussed.

Benign serous cystadenoma

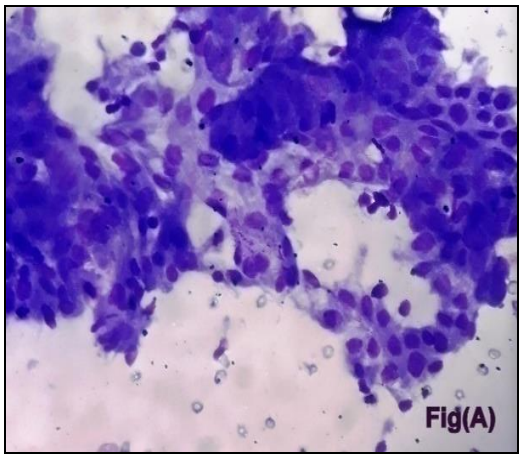

Fig A: Photomicrograph of serous cystadenoma on FNAC shows sheets and papillary clusters of small round epithelial cells with uniform nuclei, Leishman stain 100x

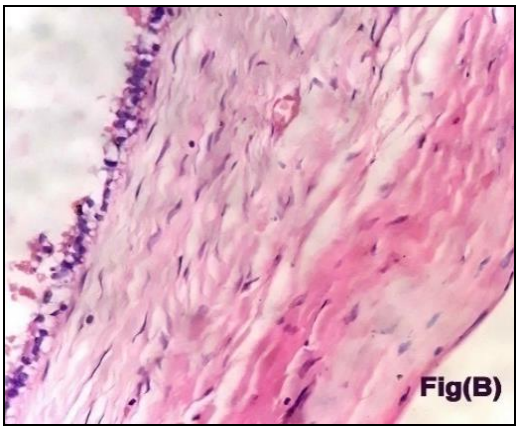

Fig B: Photomicrograph on histopathological examination (HPE) shows single layer of bland looking epithelial cells of cyst wall. (Hematoxylin and Eosin stain) H and E stain, 100x

4.2 Mucinous cystadenoma

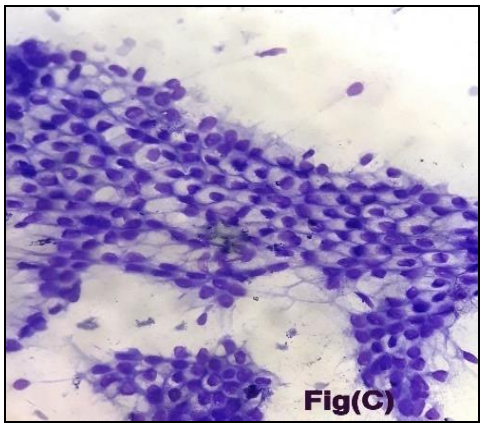

Fig C: Photomicrograph of FNAC of mucinous cystadenoma shows sheets and strips of columnar epithelial cells with abundant pale vacuolated cytoplasm (Honey -comb pattern). Leishman stain, 400x.

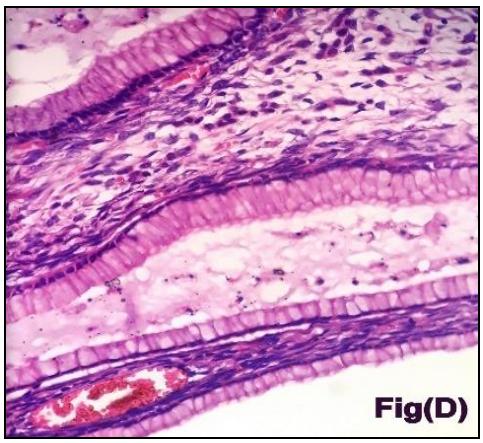

Fig (D): Photomicrograph of histopathological examination of mucinous cystadenoma. Single layer of tall columnar epithelium with cytoplasmic mucin, H and E stain, 400x.

4.3 Sex cord tumor with annular tubules

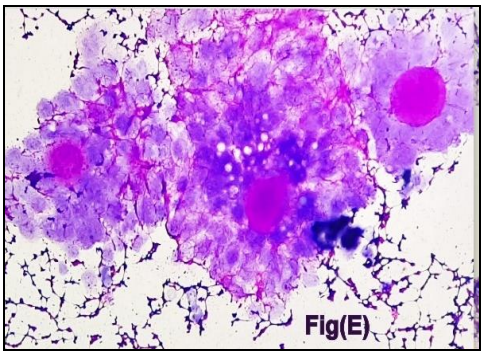

Fig E: Photomicrograph of FNAC showing central hyaline drop with round to oval regular nuclei surrounding it, under Leishman stain, 400x

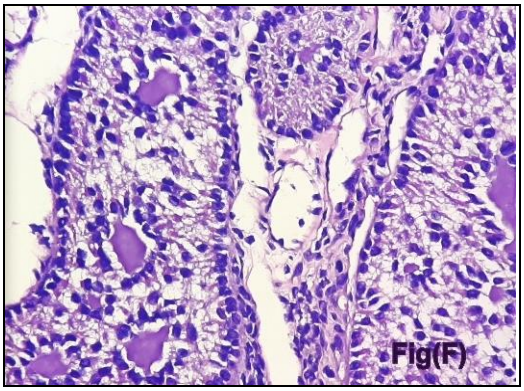

Fig F: Photomicrograph of HPE showing sex cord tumor with annular tubules- eosinophilic hyaline bodies and stellate cells, H and E stain 400x

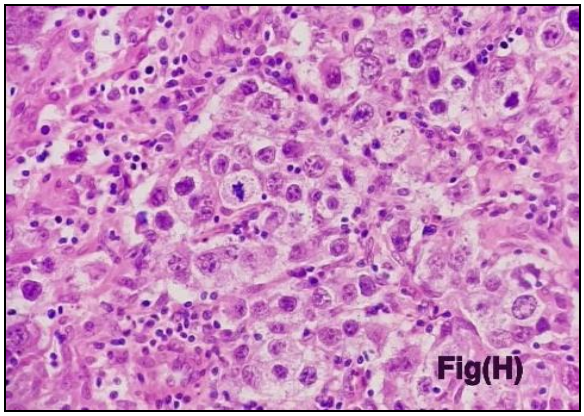

Fig H: Photomicrograph on HPE Examination showing few polyhedral tumor cells with round nuclei and lymphocytic infiltration, few mitotic figures. H and E stain, 400x

4.4 Dysgerminoma

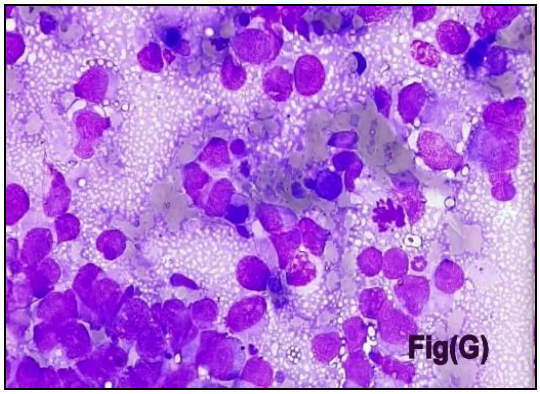

Fig G: Photomicrograph of dysgerminoma on FNAC showing tigroid background, poorly cohesive fragile malignant cells, vesicular nuclei with prominent nucleoli. Leishman stain, 400x.

4.5 Mucinous cystadenocarcinoma:

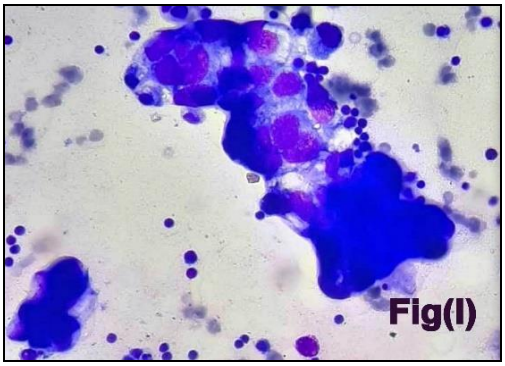

Fig I: Photomicrograph showing FNAC finding: fragments of papillary fronds, pleomorphic malignant glandular cells with cytoplasmic mucin, Leishman stain 100x

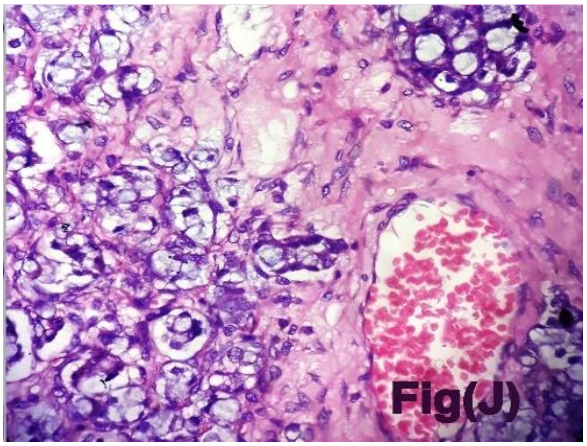

Fig J: Photomicrograph of HPE finding shows malignant cells with pleomorphic nuclei, cytoplasmic mucin, with few abnormal mitosis,H and E stain,100x

Table 5: Comparison of this study with other published reports.

Parameters	Present study	Khan *et al.* [2]	Ray *et al.* [5]	Gajender *et al.* [8]	Pal *et al.* [9]
Sensitivity	81.81%	79.2%	83%	82.3%	95.23%
Specificity	95.23%	90.6%	97%	92.3%	95.83%
Diagnostic accuracy	90.60%	89.9%	93%	84.2%	93.94%

Our study concluded sensitivity 81.81%, specificity 95.23%, Diagnostic accuracy is about 90.60%.

One of the study conducted on ovarian masses of young girls and children had low sensitivity.[7] Studies by Khan *et al*. Gajender S *et al*. and Ray *et al*. showed near about same sensitivity but Pal *et al*. showed more sensitivity as compare to this study. The diagnostic accuracy is high in Pal *et al*. study and slightly low in Ray *et al* study. The specificity is

high in Ray *et al* study as compare to others [2, 5, 8, 9]
Agarwal *et al* noted that sensitivity and specificity of FNAC diagnosis were 77.2% and 97.9% respectively [10]. Bandyopadhyay *et al*. found overall accuracy was 94.5% [11]. Chandibhamar BS showed sensitivity, specificity and diagnostic accuracy were 87.52%, 97.15%, 94% respectively [12].

5. Conclusion
Ultrasonography guided fine needle aspiration cytology is less invasive, economic and rapid preoperative diagnostic mode of evaluation of benign and malignant ovarian tumors and helps in the management.
It is fairly accurate method, however interpretation of some borderline epithelial tumors on FNAC may pose diagnostic difficulties as noted in our study.

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