Ultrasound Guided Fine Needle Aspiration Cytology In Ovarian Neoplasms: An Assessment Of Diagnostic Accuracy And Efficacy And Role In Clinical Management

S Goel, D Agarwal, N Goel, M Naim, T Khan, Ekrammulah

Citation

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Abstract

Background: Ovarian masses are one of the most frequent finding in reproductive age group. The pre-surgical diagnosis of ovarian masses as to benign and malignant lesion is commonly made by clinical and sonographic findings while post-surgical diagnosis relies on specimen biopsy. Ultrasonography-guided aspiration can prove to be an efficient diagnostic modality in young patients who need conservative surgery to preserve fertility. Aims and objectives: To evaluate the diagnostic utility of ultrasound guided fine needle aspiration cytology in detection of ovarian tumors, benign and malignant.Methodology: The study was conducted on 78 cases of ovarian masses. After clinical assessment and relevant investigations, ultrasound guided fine needle aspiration cytology was performed .The cytological diagnosis was correlated with histological diagnosis whenever available.Results: Of the total 78 cases, cytological diagnosis was offered in 65 cases of which 45 were benign and 20 malignant. Cytological correlation with histological specimens was possible in 50 cases only. Concordant diagnosis was achieved in 45 cases with a diagnostic accuracy of 93.88%, sensitivity of 85% and specificity 100%. Borderline epithelial tumors (serous and mucinous cystadenoma) constituted the grey zone where histopathology settled the final diagnosis. Conclusion: Considering the procedure's safety and reliability with its added advantages like diagnostic accuracy and increased patient acceptability, it can be concluded that image guided fine needle aspiration holds a key position in the diagnosis and management of ovarian neoplasms, although borderline epithelial tumors may require further confirmation.

INTRODUCTION

Ovarian cancers account for about 6% of all cancers in females.[1] Ovarian neoplasms are a heterogenous group of benign and malignant tumors of epithelial, stromal and germ cell origin.

Most of the ovarian tumors cannot be easily distinguished from one another on the basis of their clinical or gross characteristics alone. Therefore, cytologic interpretation of ovarian neoplasms is both interesting and challenging.[2,3] Unlike the cervix and uterus, ovaries are not clinically accessible, with only a few biochemical or immunological diagnostic techniques available to diagnose any suspected pathology. Fine needle aspiration cytology (FNAC) under ultrasonography (USG) or CT guidance can be regarded as the investigation of choice for diagnosis of abdominal masses in the early stages of disease.[4] It can help in typing of uterine adnexal tumors, thus avoiding unnecessary surgical intervention.[5] The concurrent use of both the techniques (USG and CT) can ensure greater accuracy and reduction in false negativity in the assessment of tumors by increasing the yield of cytological specimens. Differing from blind procedure, ultrasound guided FNAC can identify the most suspicious areas in tumor mass and therefore help in taking the most representative sample.[4,5,6] Geier and Strecker[7] have suggested that FNAC should be used for (1) recurrent and metastatic tumors, (2) suspected benign ovarian cysts and (3) when the patient's condition is unsuitable for laprotomy. Despite the obvious advantages, the frequent use of image-guided FNAC for routine investigation and diagnosis of ovarian neoplasms is a controversial field and has been the subject of much debate.

This study was carried out to assess the diagnostic accuracy of ultrasound guided FNAC as well as to evaluate the role of cytology as a rapid and inexpensive means of diagnosing ovarian tumors.

MATERIAL AND METHODS

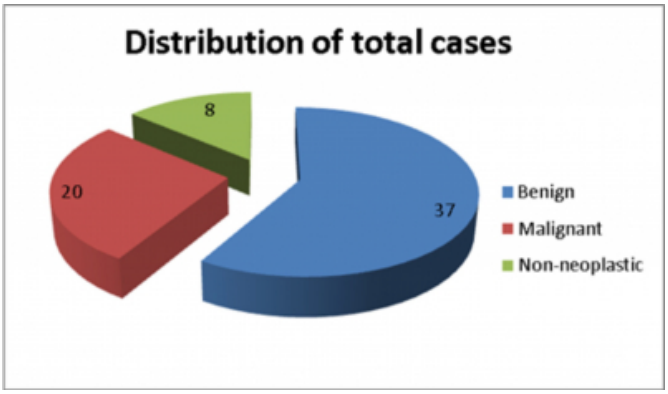
The study was conducted on 78 patients over a period of one year, at Jawaharlal Nehru Medical College, AMU, Aligarh after approval from ethical review board. Patients who presented at outpatient and inpatient department of obstetrics and gynecology with clinical features of ovarian masses were evaluated for ultrasonographic examination after written/informed consent. On confirmation of mass sonographically, fine needle aspiration was performed under guidance from suspected areas. Taking the most convenient route, a 20-22 gauge needle attached to a10 ml syringe was used. Several passes were made when the needle was visualized within the lesion. Smears were made from aspirate, fixed in 95% alcohol and stained in hematoxylin and Eosin and Papanicolou stain. Fluid aspirates were processed using the cytospin technique. Tissue obtained after surgery was sent for histopathology evaluation. Cytology results were compared with histopathology diagnosis wherever possible.

RESULTS

Out of the total 78cases where USG guided FNAC was performed, cytological diagnosis was possible only in 65 cases, while in 13 cases no opinion was given due to inadequate sampling. These cases were advised histopathological examination, post-surgery, for an exact diagnosis. Out of 65 cases in which cytological diagnosis were given, 45 cases were labeled as non-neoplastic or benign and the rest 20 cases as malignant (Fig 1).

Figure 1

Fig 1: Distribution of cases based on cytological analysis



Among the 37 benign tumors, 18 were serous cystadenomas and 15[21.9%] were mucinous cystadenomas. Corpus luteal and Endometriotic cyst accounted for 4 cases each in non-neoplasic category. Among the 20 malignant tumors, 10 (42.3%) were serous cystadenocarcinomas. 3 metastatic tumors were encountered in which 2 were Krukenberg tumors and 1 was metastatic endometrial carcinoma.

Majority of the tumors belonged to the age group 31-40 [38%] and 21-30 [23.8%]. In the benign group of tumors 90.2% cases were below the age group of 40 years. The minimum age recorded was 9 years with a histological diagnosis was dysgerminoma and the maximum age recorded was 69 years where a diagnosis was poorly differentiated papillary cystadenocarcinoma was offered.

A low parity [0-2] was observed in 54.2% patients. Pain abdomen was the commonest complaint [93.3%] followed by lump abdomen [80%].Menstrual pattern varied from normal menstruation [52.3%] to menstrual disturbances [27.6%] and postmenopausal bleeding [3.8%].

Comparison of cytologic and histologic diagnosis was possible in only 50 cases as many benign tumors were not operated and hence not available for histological correlation. Cytological diagnosis was concordant with the histological diagnosis in 45 cases (Table 1).

Figure 2

Table1: Cytological and histopathological correlation

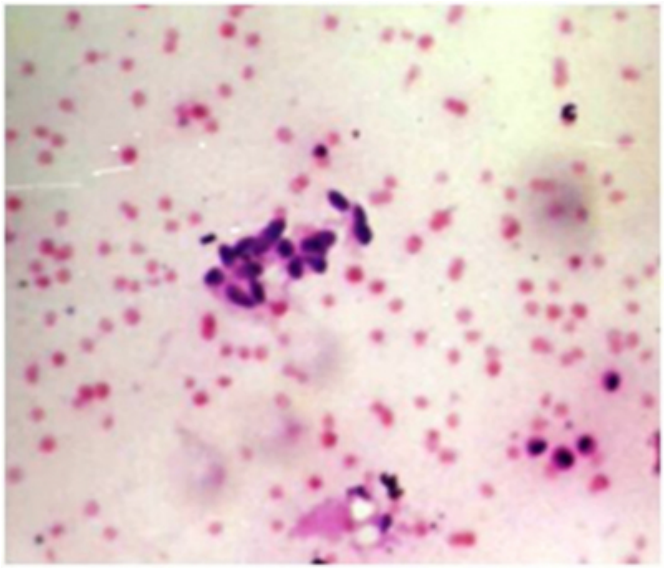
Tumors	Cytological diagnosis	Histopathological Correlation	Concordant	Discordant
Benign				
1.Serous cystadenoma	18	17	15	2
2.Mucinous cystadenoma	15	5	4	1
3.Mature teratoma	4	3	2	1
Malignant				
1.Serous cystadenocarcinoma	10	10	9	1
2.Mucinous cysadenocarcinoma	2	2	2	-
4.Endodermal sinus tumor	1	1	1	-
5.Immature teratoma	1	-	-	-
6.Granulosa cell tumor	2	-	-	-
7. Dysgerminoma	1	1	1	-
8.Metastatic tumor	3	3	3	-
Non-neoplastic lesion				
1.Corpus luteal cyst	4	4	4	-
2.Endometriotic cyst	4	4	4	-
Total	**65**	**50**	**45**	**5**

Two cases reported as serous cystadenoma on FNAC were diagnosed as one each of serous cysadenocarcinomas and serous cystadenoma of low malignant potential on histopathology. One case diagnosed as mucinous cystadenoma on FNAC was diagnosed as borderline mucinous cystadenocarcinoma on histopathology. In 1 case a diagnosis of serous cystadenocarcinoma was rendered on FNAC, although the histological typing was of metastatic endometrial carcinoma.

In serous cystadenoma, clear/straw colored fluid was obtained. Smears were scantily cellular and showed few aggregates of benign looking epithelial cells with some inflammatory cells and some histiocytes in the background (Fig. 1).

Figure 3

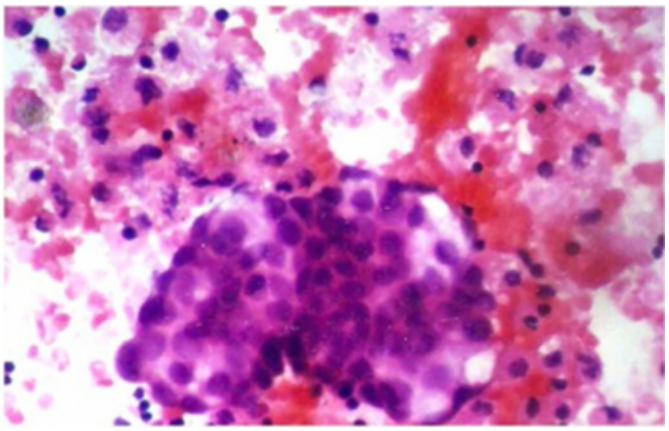
Fig 2: Serous cystadenoma [FNAC,H&E×50]: Aggregates of benign epithelial cells



In cases of mucinous cystadenoma cytology showed groups of tall columnar cells with basal nuclei and clear cytoplasm (Fig. 2).

Figure 4

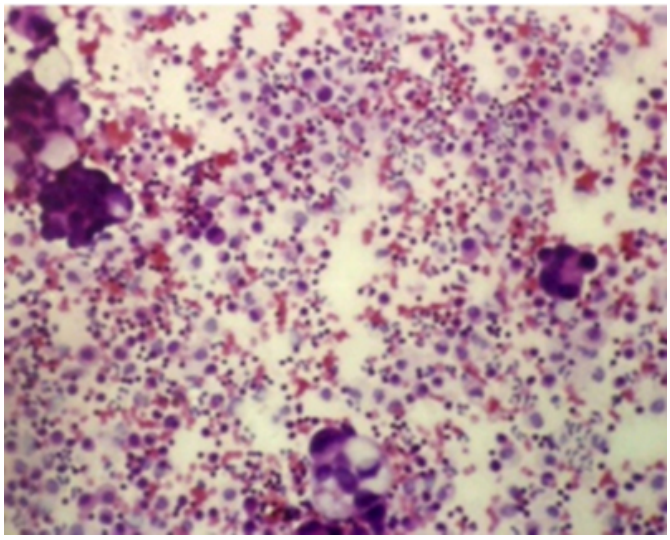
Fig 3: Mucinous cystadenoma [FNAC,H&E×250]: Groups of mucin secreting columnar cells



In serous cystadenocarcinoma, on aspiration turbid fluid was obtained which showed papillary aggregates of columnar cells with hyperchromatic nuclei and nucleocytoplasmic ratio. Sheets and clusters of neoplastic coloumnar cells with prominent vacuolization of cytoplasm forming signet ring cells were seen in mucinous cystadenocarcinoma (Fig. 3).

Figure 5

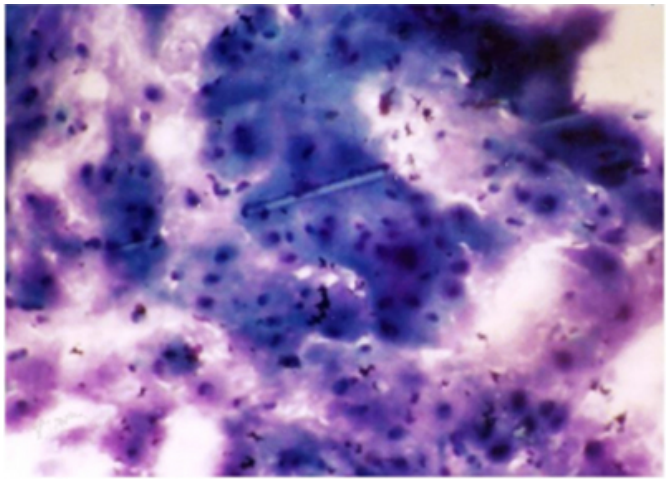
Fig. 4: Mucinous cystadenocarcinoma [FNAC,H&E]:Groups of signet ring cells



In cases of mature teratoma, the aspiration yielded a greasy material showing nucleate and anucleate squamous cells along with inflammatory cells (Fig. 4).

Figure 6

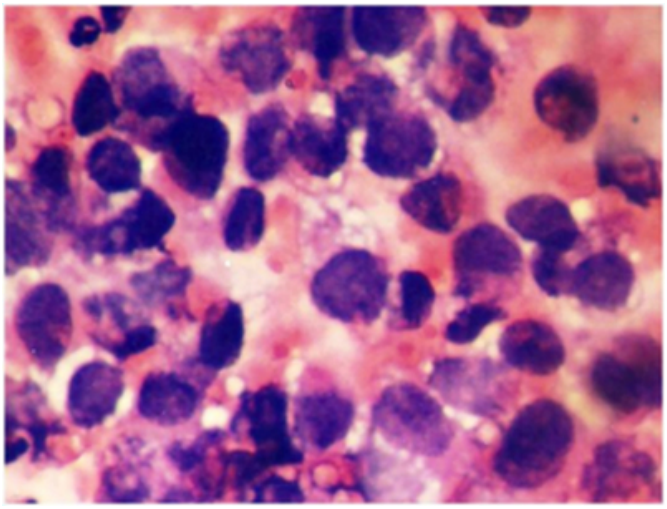
Fig 5: Mature teratoma [FNAC,PAP×250]: Anucleate squames, squamous cells and proteinaceous debris



In one case, the final histological diagnosis was given as immature teratoma. There was 1 case of Endodermal sinus tumor which was diagnosed successfully on FNAC (Fig. 5).

Figure 7

Fig 6: Endodermal sinus tumor [FNAC,H&E×500]: Loose clusters of malignant cells with prominent vacuolization of cytoplasm



The aspirate of luteal cysts showed numerous large foamy cells with small vesicular nuclei.

Diagnostic efficiency of ultrasound guided FNAC revealed a Sensitivity of 85%, Specificity of 100%, Positive predictive value of 100%, Negative predictive value 90.6% and Diagnostic accuracy of 94% in our study.

DISCUSSION

Adnexal tumors with or without symptoms are very frequent in women. In reproductive age, follicular and luteal cysts are most frequent, while in perimenopausal age group, benign neoplasms are more common.[8] Several diagnostic methods like vaginal ultrasonography, color Doppler flow examination and serum CA 125 levels have been used to distinct between benign and malignant ovarian mass, though, each have their limitations if performed alone.[9,10,11] Nowadays, ultrasonographic or laparoscopic aspiration biopsy of ovarian masses is more preferable, especially for young women who wish to sustain their reproductive capability.[12,13]

Till date, worldwide the gynaecologists are hesitant to accept the role of FNAC on pelvic masses owing to the controversial risk of intraperitoneal tumor implantation following cyst wall puncture.[14] This risk of carcinomatous seedlings is overestimated and has not been clinically or pathologically documented.[5,6,15] In patients without peritoneal carcinosis, cytological smears from the peritoneal cavity at the subsequent operation did not disclose any tumor cells or secondary implantation during our study. We also did not register any immediate complications such as bleeding or inflammation following abdominal cytology.

With sonographic support, any structure visualized radiologically can usually be reached precisely and in any desired plane, thus increasing the cytological yield. Nevertheless, as with any technique, image-guided FNAC has its shortcomings; false-negative results are usually due to failure of the needle to enter the mass and failure to sample representative areas.[9,14]

In present study, all the 65 cases of ovarian masses had a solid lesion or solid/cystic lesion ultrasonically where aspiration was performed. The sensitivity and specificity of 85% &100% in our study is in concordance with other researchers viz. Nazoora et al [15] [79.2% and 90.6%], Ganjei et al [16] [94.2% & 75%] and Roy et al [17] [91.4%&100%]. In contrast, Moran et al [11] in 1993, observed a very low sensitivity of 26% with high specificity of 100% in their research. This could be due to high number of cystic samples with small size for meaningful correlation with stage and histological categorization.

Several factors may explain the non-concordant diagnosis seen in 5 of our cases. First, ovarian cyst fluid may have an inadequate number of cells to accurately assess. Second, malignant cells in an ovary may not be uniformly distributed in the ovary. The number of malignant cells within ovarian cysts may be insufficient or absent to detect with needle aspiration. Tumors of low malignant potential or borderline tumors were difficult to diagnose with accuracy on cytological examination and often could not be clearly distinguished from well-differentiated cystadenocarcinoma [17,18] or even cystadenomas[19,20], as was seen in 3 of our cases. This category of ovarian neoplasms constitutes a grey zone and is subject to inter-observer variations. Histopathology is a pre-requisite for assessing the presence or absence of stromal invasion and for the sub-typing of a tumor with low malignant potential. A high index of suspicion and careful evaluation of nuclear features is therefore essential.[21]

Serous and mucinous cystadenocarcinomas, are the most frequent types of ovarian carcinoma, can thus usually be correctly classified cytologically.[9] Mucinous carcinomas should theoretically be easier to diagnose based on a presence of a mucin film in the background of smear[21,22] although, our evaluation failed to detect mucin in some cases, probably due to secondary hemorrhage or

degeneration of cyst fluid in ovaries. Endometrioid and metastatic endometrial carcinoma proved difficult to identify cytologically, and was classified a s serous cystadenocarcinomas in most cases. This is understandable since these types may be difficult to distinguish even histologically. The configuration and growth pattern of the epithelial strands are important criteria for histologic classification of these tumors.[19] In our study one case of metastatic endometrial carcinoma was misdiagnosed as serous cystadenocarcinoma on cytological examination.

A concordant cyto-histological correlation was observed in 90% of cases. A total of 5 cases (10%) could not be accurately classified on cytology. It was noted that borderline epithelial tumors (3 cases) were most frequently misdiagnosed and classified as either their benign counterparts.

None of the benign ovarian tumors identified by histological analysis in our study was diagnosed as malignant by cytologic evaluation. We achieved an overall high rate of accuracy [93.88%] in diagnosing ovarian tumors, both benign and malignant. High rates of accuracy have been reported by other workers such as Mehdi et al [9] [80.9%], Nazoora et al [15] [89.9%], Moran et al [11] [96%], Salehpour et al [8] [84%] and Tushar et al [3] [89.55%].

The role of ultrasound guided FNAC as a first-line diagnostic modality in ovarian tumors is still debatable.[22] Though, there is no doubt on the accuracy of diagnosis, the concerns raised on tumor rupture and spillage leading to potential upstaging of malignant tumor will require more awareness among treating clinicians and further researches with large sample sizes to clearly establish this risk.

CONCLUSION

Aspiration of ovarian masses under image guidance is a relatively quick, easier, precise and a patient-friendly procedure with minimal morbidity, although borderline cases form a grey zone and require further histopathological confirmation.. It is particularly useful in investigating young patients, with functional cysts of ovary to avoid unnecessary surgery. We recommend using the combination of ultrasonographic approach with needle aspiration for diagnostic evaluation of ovarian neoplasms.

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Author Information

Seema Goel, M.D Pathology
Assistant Professor, Department of Pathology, Santosh Medical College and Hospitals

Deepti Agarwal, M.D Pathology
Associate Professor, Department of Pathology, Teerthankar Mahaveer Medical College

Narendra Goel, M.D Paediatrics
Senior Resident, Department of Paediatrics

Mohd. Naim, M.D Pathology
Professor, Department of pathology, Jawahar Lal Nehru Medical College

Tamkin Khan, M.D Gynaecology
Associate Professor, Department of Obstetrics and Gynaecology, Jawahar Lal Nehru Medical College

Ekrammulah, M.D Radiology
Professor, Department of Radiology, Jawahar Lal Nehru Medical College