Original Article

Diagnostic Efficacy of Ovarian Fluid Cytology in the Identification of Ovarian Tumors in Adolescents and Young Adults

Role of Cytology in Diagnosis of Ovarian Tumors

Aisha Akbar[1], Huma Riaz[2], Nosheen Nabi[1], Nazia Khan[3], Mehreen Mushtaq[3] and Ahmareen Khalid[3]

ABSTRACT

Objective: To determine the role of cytology in the diagnosis of ovarian tumors in adolescent and young adults.
Study Design: Retrospective study.
Place and Duration of Study: This study was conducted at the Department of Pathology, Rawal Medical and Dental College, Islamabad from January 2014 to December 2015.
Materials and Methods: We retrospectively reviewed 80 cases of females presenting with ovarian masses in adolescent and reproductive age group. At least four slides were prepared for each case by fixing them in 95% ethanol. Hematoxylin and Eosin stain was used to stain cytology smears. Ovarian fluid cytology was compared with histopathological diagnosis keeping histopathology as gold standard.
Results: The median age at the time of diagnosis was years (range 11-40 years). Benign tumors occurred in 34 (42.5%) of the patients. Increasing percentage of malignant tumors was seen with the age comprising 42.5%cases above 30 years. There was increased incidence of germ cell tumor in adolescents and young adults comprising 42 (52.5%). Of these cases mature cystic teratoma was the commonest. Epithelial tumors were common in the reproductive age group comprising 46 % of the cases.91% of benign tumors were correctly diagnosed as benign on cytology. Out of 46 (57.5%) malignant cases, 80% were correctly diagnosed as malignant on cytology. Overall sensitivity and Specificity of ovarian fluid cytology was 80.4% and 94% respectively.
Conclusion: Cytology is a simple, rapid and economical diagnostic tool with high accuracy rate and can be utilized to differentiate between histological subtypes and nature of the tumor in adjunct with histopathology for suitable treatment regimens in adolescents and young adults.
Key Words: Cytology, Adolescents, Reproductive age, ovarian tumor

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INTRODUCTION

Ovarian tumor comprises 10-20% of all tumors in adolescents and approximately 25-30 % in reproductive age group.[1] There is clear association between the histological subtype of the tumor and prognosis of the patient therefore it is important to determine the type of tumor for its proper treatment.[2] Since surgery is considered as primary treatment for ovarian tumors, it is important to correctly diagnose ovarian tumors for the ovarian salvage and fertility preservation in this age group.[3] Cytology has been underutilized modality for the primary diagnosis of ovarian tumors owing to the overestimated concept about seeding of tumor implants and incorrect diagnosis by inexperienced pathologists.[4] Cytology of an ovarian mass plays an important role in distinguishing between non-neoplastic cyst and malignant tumors particularly in young women.[5,6]

[1.] Department of Pathology, Rawal Medical and Dental College, Islamabad.
[2.] Department of Anatomy, Gulab Devi Educational Complex, Lahore.
[3.] Department of Histopathology- PIMS, Islamabad.

Correspondence: Dr. Aisha Akbar, Associate Professor Pathology, Rawal Medical and Dental College, Islamabad
Contact No: 03335712227
Email: aisha.akbar@gmail.com

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MATERIALS AND METHODS

80 cases of different types of ovarian masses were reviewed for cytology and histopathology. Age range of the patients was 11-40 years. Out of these 32 clinically benign cases were subjected to ultrasound guided FNAC. In vitro aspiration of surgically resected specimen was done in 48 cases. Four slides were prepared of each case and fixed in 95% ethanol. Slides were stained with Hematoxylin and Eosin stain. The smears were evaluated for cellularity, configuration of cells and type of cells. Background was labeled as clear, necrotic proteinaceous or mucoid depending upon the cytology. Hemorrhagic only aspirates were

excluded from the study. Cytology results were compared with histological diagnosis..

RESULTS

Most cases presented in age range of 30-40 years (42.5%).

The cases were diagnosed as malignant on cytology which included germ cell tumors, surface epithelial tumors and poorly differentiated neoplasm. Germ cell tumor were the most common comprising 42 (52.5%) of the cases. Followed by epithelial tumors comprising 37 (46.25%) cases.

Out of 34 (42.5)% benign cases on histopathology, 31 (91%) were correctly labeled as benign. 03(9%) cases were considered as malignant (false positive) on cytology. Most common benign tumor was Mature cystic teratoma giving diagnostic accuracy of 100% in these cases.

Table No.1: Data analyzed by descriptive statistics

Benign Tumors (n=)	Correct Cytological diagnosis(n=)	False +ve cytological diagnosis	False -ve cytological diagnosis
Mature cystic Teratoma16)	**16 (100%)**	**0**	**0**
Mucinous cystadenoma (10)	**9 (90%)**	**01 (10%)**	**0**
Serous cystadenoma (8)	**06 (75%)**	**02 (25%)**	**0**
Total 34 (42.5%)	**31 (91%)**	**03 (9%)**	**0**

Table No.2: Data analysis.

Malignant Tumors (n=)	Correct Cytological diagnosis (n=)	False +ve cytological diagnosis	False -ve cytological diagnosis
Immature teratoma (2)	**1 (50%)**	**0**	**1 (50%)**
Dysgerminoma (13)	**13 (100%)**	**0**	**0**
Yolk sac tumor (4)	**4 (100%)**	**0**	**0**
Mixed Germ cell tumor (7)	**4 (57%)**	**0**	**3 (43%)**
Serous cystadenocarcinoma (13)	**9 (69%)**	**0**	**4 (31%)**
Mucinous cystadenocarcinoma (3)	**2 (67%)**	**0**	**1 (33%)**
Endometrioid adenocarcinoma (3)	**3 (100%)**	**0**	**0**
Undifferentiated (1)	**1 (100%)**	**0**	**0**
Total 46 (57.5%)	**37 (80%)**	**0**	**9(20%)**

Most common malignant tumors comprised of Dysgerminoma and Serous cystadeno carcinoma comprising 28% of all malignant tumors each.

Out of 46 (57.5)%malignant cases on histopathology, 37(80%)were correctly labeled as malignant. Out of these 9 (20%) cases were diagnosed as benign (false negative) on cytology.

Data was analyzed using descriptive statistics. True positive cases (TP) were 37 (80%).

False positive (FP) cases were 3(9%). True negative cases were 31 (91%). False negative cases were 9 (20%).

Positive predictive value (PPV) was 92.5%. Negative predictive value (NPV) was 77.5%.

Overall Sensitivity and Specificity was found to be 80.4% and 94% respectively.

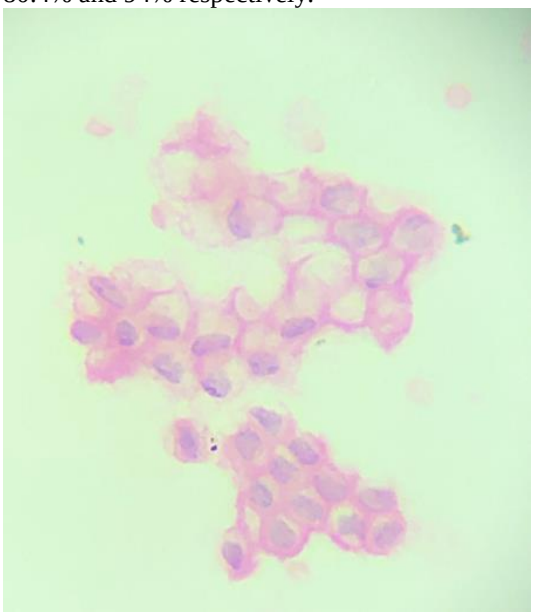

Figure No.1: Mucinous cyst adenoma- Clusters of benign cells with eccentric nucleus and empty-looking cytoplasm containing mucin. (H&E x400)

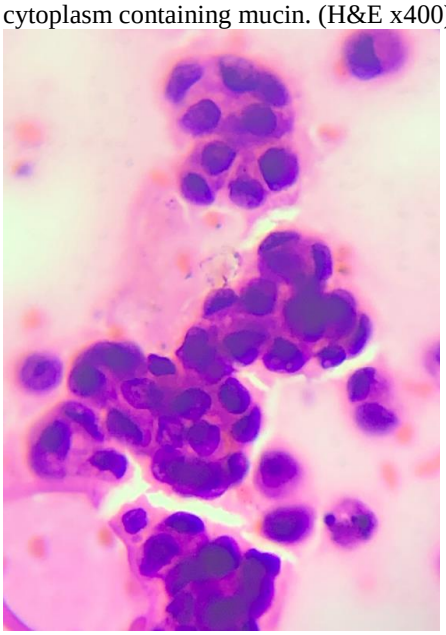

Figure No.2: Serous cyst adenocarcinoma- Cells showing stratification and tufting with scanty cytoplasm. Nuclei are pleomorphic with fine nucleoli. (H&E x400)

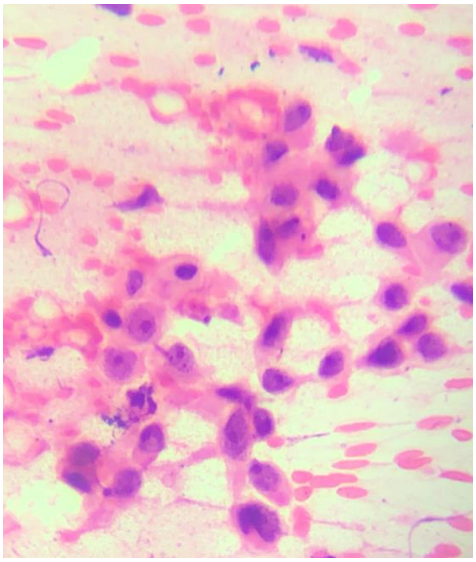

Figure No.4: Dysgerminoma: Cells show well defined cell boundaries, clear to granular cytoplasm, vesicular nuclei and prominent eosinophilic nucleoli. Dispersed lymphocytes seen in the background. (H&E x400)

DISCUSSION

Most cases of malignant tumor were seen in older age group showing increased incidence of these tumors with age.

The main purpose of the cytological evaluation was to exclude malignancy in young patients to fertility. Results of the latest studies are comparable to our results.[7] Cytology has proved to have high accuracy rates in adjunct to histopathology.[8,9] Low sensitivity of cytology was seen in few cases due to inconclusive cases.[7] Few cases were also excluded in our study in which cytology did not result in a diagnosis, making cytology redundant in these cases that may be due to procedural or processing error.[10] Overall diagnostic accuracy of this study was 85% comparable to the accuracy by Khan et al.[9] Sood et al and Bandyopadhyay et al also showed high diagnostic accuracy in case of ovarian fluid cytology.[11,12]

38(90.4%) cases of Germ cell tumors were correctly diagnosed as benign or malignant on cytology. Mature teratoma on cytology showed squamous cells with keratin debris and few inflammatory cells in the background. Findings were similar to the study by Sood et al where predominantly squamous cells and keratin flakes were seen.[11] The case of Immature teratoma was however under diagnosed as similar findings were seen in the cytology but histopathology revealed immature neural tissue.

Few cases of mixed germ cell tumors were also labeled as mature cystic teratoma as the cytology smears revealed keratin and benign squamous cells only but on histopathology foci of other malignant germ cell tumors were also seen. Similar diagnostic difficulty was also observed by Kadivar et al.[13] Literature show that scrape cytology increases the efficacy of diagnosing ovarian lesions in cytology.[7]

All cases of dysgerminoma were accurately identified on cytology. The cells showed well defined outlines with prominent nucleoli and lymphocytes in the background. High diagnostic accuracy was also seen by Afroz et al. The smears were moderately cellular with cells having prominent eosinophilic nucleoli.[9]

Groups of cells showing cytoplasmic vacuolation was seen in the cytology of yolk sac tumors. All cases were confirmed on histopathology.[5]

Cases of Endometrioid carcinoma were also correctly diagnosed on cytology as malignant but as serous cyst adenocarcinoma. Studies show that at times it is difficult to differentiate between the two owing to the presence of columnar cell morphology and ovoid nuclei.[14] However we did not experience the difficulty due to presence of columnar cells with occasional glandular configuration.

8(78.3%) cases of Surface epithelial tumors were correctly diagnosed as benign or malignant on cytology. Smears from cases of serous cystadenoma showed epithelial cells in papillary configuration with bland ovoid nuclei. Zhou et al also reported aggregates of benign epithelial cells with uniform nuclei.[10]

One case of benign serous cystadenoma was over diagnosed as malignant where the smears were hypo cellular and papillary aggregates showed stratification and overlapping nuclei. Histopathology revealed focal stratification of cells. According to literature focal stratification without significant atypia can be seen in benign serous tumors.[15] No stromal invasion was seen in the histopathology slides which is essential to label it malignant.[16]

Although borderline malignancies have overall a better prognosis than malignant ovarian tumors, these tumors were included in the malignant category in the study as they share common morphological features to their malignant counterparts, may show peritoneal implants and can develop into invasive carcinoma.[17]

All cases of mucinous cyst adenoma were correctly diagnosed on cytology. The smears revealed clusters of cells with bland eccentric nuclei and mucin. Good diagnostic accuracy was seen by Herman et al in case of mucinous neoplasms.[18]

9 (69%) cases of serous cystadenocarcinoma were accurately diagnosed on cytology. 4 (31%) cases was labeled as benign on cytology as the cluster of cells did not show significant nuclear atypia. However pleomorphic cells and stroma invasion was seen on histopathology. Similar diagnostic difficulty was experienced by Ouladshaebmadarek et al and preparing more slides and keeping account of clinical information was suggested.[19]

1(33%) case of Mucinous cystadenocarcinoma was diagnosed as Mucinous cystadenoma. The result was

falsely interpreted as the slides showed abundant mucin and inflammatory infiltrate. Similar finding was experienced by Afroz et al.[9]

All cases of endometrial carcinoma were correctly diagnosed on cytology giving diagnostic accuracy of 100% due to the presence of glandular architecture by atypical columnar cells similar to the findings by Pacheco et al.[20]

In our study high diagnostic accuracy was seen in the determining the histological group of the tumor and discrimination of benign from malignant lesions. 100% diagnostic accuracy was seen in determining correct histological group of the tumor which is comparable to 96% accuracy by Ganjei et al.[21] 85% diagnostic accuracy was seen in determining nature of the lesions in the present study.

Afroz et al found sensitivity and specificity of 79.2 and 90.6% which is comparable to the sensitivity and specificity of our study, 80.4% and 94% respectively. Diagnostic accuracy of our study is 85 % which is less as compared to the 96% diagnostic accuracy of Moran et al and comparable to 89.9% accuracy by Afroz et al.[9]

Few limitations experienced during the study was low cellularity and interobserver bias. Taking multiple samples from different foci and collaboration between pathologists can improve the overall diagnostic yield of ovarian fluid cytology.

CONCLUSION

Ovarian fluid cytology is a quick and cheap diagnostic procedure useful in making accurate diagnosis of histological subtypes and nature of the tumor for appropriate treatment regimens in adolescents and young adults.

Author's Contribution:

Concept & Design of Study:	Aisha Akbar
Drafting:	Huma Riaz, Nosheen Nabi
Data Analysis:	Nazia Khan, Mehreen Mushtaq, Ahmareen Khalid
Revisiting Critically:	Aisha Akbar, Huma Riaz
Final Approval of version:	Aisha Akbar

Conflict of Interest: The study has no conflict of interest to declare by any author.

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