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Radio-Histopathological Spectrum of Ovarian Specimens Following Cystectomy

Nagina Khaliq[1*], Huma Khaliq[2], Saima Gulzar[3], Saima Yaqoob[1], Farah Bano Niazi[4] and Amna Khalid[5]

[1]Department of Obstetrics and Gynaecology, Pakistan Atomic Energy Commission General Hospital, Islamabad, Pakistan
[2]Department of Radiology, Family Health Hospital, Islamabad, Pakistan
[3]Department of Histopathology, Pak Red Crescent Medical and Dental College, Lahore, Pakistan
[4]Department of Histopathology, Shaikh Zayed Medical Complex, Lahore, Pakistan
[5]Department of Radiology, Fauji Foundation Hospital, Rawalpindi, Pakistan

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ABSTRACT

Ovarian cysts can be benign or malignant and requires accurate diagnosis for efficient treatment. **Objective:** To characterize the radiological and histopathological spectrum of ovarian specimens following cystectomy. **Methods:** This retrospective study was conducted at Pakistan Atomic Energy Commission General Hospital, Islamabad from 1st April 2022 to 31st December 2022. Eighty patient's samples from cystectomy patients who were suffering from ovarian cysts were included. Each patient underwent radiological examination before ovarian cystectomy through laparoscopic surgery except two cases of urgent laparotomy. Gross histopathological specimen examination was conducted. The data were analysed using SPSS version 26.0, wherein p value <. 0.05 was considered as significant. **Results:** The mean age of the patients enrolled in this study was 35.5 ± 5.9 years. Hemorrhagic cysts were having a reticular pattern of internal echoes with soli appearing area with concave margins and no internal flow, while endometrioma cysts were having homogenous low level internal echoes with non-solid component and tiny echogenic foci in the walls. While within the neoplastic cysts 4/8 were having cystic external surface and 1/8 presented with ovarian mass. The surface epithelial tumor presented of 2 cases with carcinoma detection on histopathology slides while in the germ cell tumor 1 cases each of strumaovarii, dysgerminoma and mixed germ cell tumor was observed. **Conclusions:** Surface epithelial tumors were the most common category of ovarian tumors and majority of the cysts were benign cystadenomas. Radiological imaging provides a precise non-invasive tool for categorizing various ovarian cysts and histopathological findings further confirms the exact category of tumors.

INTRODUCTION

Ovarian cystectomy, the surgical removal of cysts from the ovary, is a pivotal procedure in gynaecological practice, addressing both benign and potentially malignant conditions [1]. Ovarian cystectomy is a critical procedure for both diagnostic and therapeutic purposes. The worldwide prevalence of ovarian cyst is reported as 8% and 18% between premenopausal and postmenopausal females depending upon their genetic, creed and geographical life style. There is a wide variance between the exact prevalence of ovarian cyst among females all over the globe. Cyst of ovaries are many time filled with fluid which are mostly developing on or within the ovaries and can range from benign, asymptomatic growths to complex, potentially malignant tumors [1, 2]. While many ovarian cysts resolve on their own, others may cause significant symptoms such as pelvic pain, bloating, and irregular menstrual cycles, necessitating surgical intervention [3]. The decision to perform an ovarian cystectomy is influenced by factors including the size and type of the cyst, the patient's age, symptoms, and overall health, as well as concerns about malignancy. This procedure not only alleviates discomfort and prevents complications like cyst rupture or torsion but also facilitates histopathological examination to rule out cancer [3, 4]. Accurate diagnosis and effective treatment planning hinge on the integration of histopathological and radiological findings [5].

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Histopathological examination involves the microscopic analysis of excised tissue, providing critical insights into the cellular and structural characteristics of ovarian cysts [6]. Meanwhile, radiological imaging, including ultrasound, MRI, and CT scans, plays a crucial role in the preoperative evaluation by delineating the size, location, and morphological features of the cysts [7, 8]. By understanding the significance of correlating histopathological and radiological findings, healthcare professionals can improve patient outcomes, ensuring that benign and malignant conditions are appropriately identified and treated and the fact that understanding an ovarian cyst is highly critical in its treatment therefore requiring a precise identification method. Radiological imaging and histopathological finding can be an efficient method of ovarian cyst diagnosis [8]. The correlation between these diagnostic modalities is essential for validating the initial imaging assessments and ensuring a comprehensive understanding of the cystic lesions. This synergistic approach not only enhances diagnostic precision but also informs clinical decision-making, ultimately improving patient management and outcomes [9, 10]. This importance of correlating histopathological and radiological findings in ovarian cystectomy specimens, emphasizing their complementary roles and the benefits of an integrated diagnostic strategy. It will also highlight the strengths and limitations of each approach and discuss their synergistic role in the diagnostic process.

The present study aimed to determine the radiological and histopathological correction findings in pre and post ovarian cysts. This research provided significant information and data on radiological diagnostic accuracy of various ovarian cysts especially complex ones will provide a screening method and assisted in deciding which patients need biopsy correlation and further treatment. In addition to this the current study will benefit in providing histopathological diagnosis aids knowing the exact incidence of various entities as well as other epidemiological features, also early diagnosis leads to better management.

METHODS

This retrospective study was conducted at Pakistan Atomic Energy Commission General Hospital, Islamabad from1st April 2022 to 31st December 2022 vide letter no. PGHI-IRB (Dme)-RCD-06-038. The study was ethically cleared from the review committee before its initiation and enrolment of participants. A total of 80 samples from cystectomy patients were included. The sample size was generated by applying the cystectomy prevalence as 28% and 95% confidence interval, 5% margin of error with 80% power of test [4]. A written consent was taken from each patent for its participation in the study. The inclusion criteria included those who were suffering from ovarian cysts having any suspicion of cancerous or benign tumor in the ovaries in it requiring the removal of the cyst. The age of the patients was between 20-55 years. Patients suffering from metastasis, autoimmune disease or complications related with diabetes, hypertension were not included. Any sample that was not sent via surgical excision was excluded from the study. Autolyzed-specimen were excluded whereas resected ovarian cysts samples were included in the study. Each patient underwent radiological examination through pelvic USG, CT scan, MRI, testing before ovarian cystectomy. The radiological analysis was done to accurately identify the location and size of tumor. This further assisted in understanding the case and resulted in precise planning required during surgery. The ultrasound features which suspected malignancy or any form of nodule as well as pelvic mass and ascites were referred to the oncologist. All cysts larger than 10 cm were taken a suspicion for malignancy. Other featured included high Doppler flow with colour, irregularities, solid or other wose papillary with ascites present. Laparoscopic procedure was opted for cystectomy in all patients except two who underwent criticality and required laparotomy. A minute camera with light at the top was inserted through a small incision in the abdomen, providing a view of the pelvic and reproductive organs of the patients. Two other small incisions were made for surgical tools to insert and drain. The ovarian cysts were removed through the incision. A well-structured questionnaire was designed to record the patient's demographic details, radiological imaging data, specimen type and diagnosis. A gross histopathological specimen examination was conducted about its size concerning external and mucosal surface, size as well as wall thickening. Acquired specimens were corrected in buffered-neutral formalin for 12-24 hours and further submitted for processing. Post routine paraffin processing, a section of 3–5 µm was taken and stained by H and E staining protocol. The histopathological results post-cystectomy was analysed for accuracy. Data were analysed by using SPSS version 26.0 wherein the results interpretations were performed through mean ± SD for quantitative variables while percentages and frequencies were used for qualitative variable analysis. Chi square tool was used for results analysis with a p-Value <0.05 as significant.

RESULTS

The mean age of the patients enrolled in this study was 35.5 ± 5.9 years, which majority of the patients between the age group of 31-45 years. The radiological assessment was mainly conducted by Doppler sonography followed by CT scan and MRI scan if required. Various types of cysts were identified based on sonographic imaging. Haemorrhagic cysts were having a reticular pattern of internal echoes with soli appearing area with concave margins and no internal flow, while endometrium cysts were having

homogenous low level internal echoes with non-solid component and tiny echogenic foci in the walls. The dermoid cysts had focal /diffuse hyperechoic component with lines and dots. There was an area of acoustic shadowing with no internal flow (Figure 1).
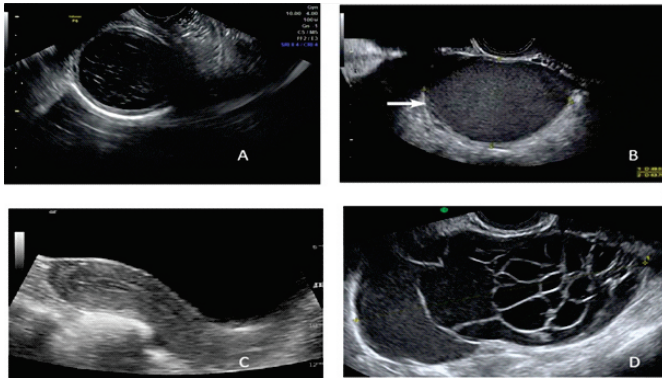

Figure 1: A: Hemorrhagic Ovarian Cyst, B: Endometrioma Ovarian Cyst C: Demoid Ovarian Cyst D: Bengin Mucinous Cystadenoma

The laterality of the non-neoplastic cyst had shown that cysts was identified as 50% (40/80) as left while 43.75% (35/80) as right side with majority having an external cystic surface while solid cut surface was identified in 9 cases (p value 0.033) (Table 1).

Table 1: The Non-Neoplastic Cysts Characteristics (n=80)

Variables	N (%)	p-Value
Laterally		
Left	40 (50%)	
Right	35 (43.7%)	0.212
Bilateral	5 (6.3%)	
External Surface		
Cystic	67 (83.7%)	0.032
Unremarkable	13 (16.3%)	
Cut Surface		
Cystic	60 (75%)	
Solid	9 (11.3%)	0.012
Unremarkable	11 (13.7%)	

While within the neoplastic cysts there were 8 which were malignant with 50% (4/8) having cystic external surface and 12.5% (1/8) presented with ovarian mass (Table 2).

Table 2: Neoplastic Cyst Characteristics (n=80)

External Surface	Benign	Malignant	p-Value
Cystic	44	4	0.022
Unremarkable	27	3	0.043
Ovarian Mass	1	1	–

The various type of tumors identified showed that bilaterality was presented in 3 germ cell tumor while 1 sex cord stromal tumor (p value 0.002) (Table 3).

Table 3: Association of Tumor Type with Bilaterality

Tumor Type	Bilaterality	Number
Sex Cord Stromal	1	2

Germ Cell	3	12
Surface Epithelial	4	28
Other (Metastatic)	–	2

The surface epithelial tumor, figure 2 presented presence of 2 cases with carcinoma detection on histopathology slides while in the germ cell tumor 1 cases each of strumaovarii, dysgerminoma and mixed germ cell tumor was observed (Figure 2).
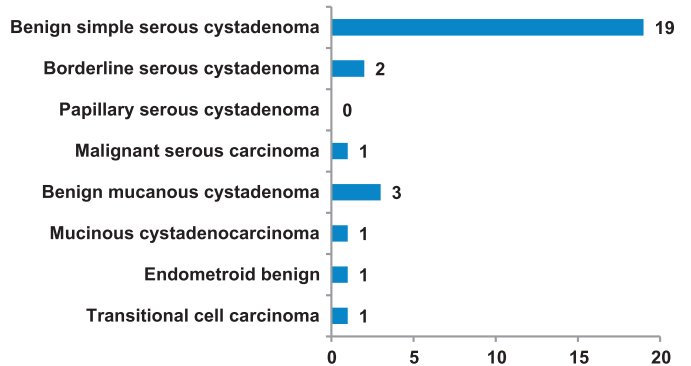

Figure 2: Histopathological Finding with Surface Epithelial Tumor

Within Germ Cell Tumor cases of teratoma, mixed germ cell tumor, dysgerminoma and struma ovarri in figure 3.
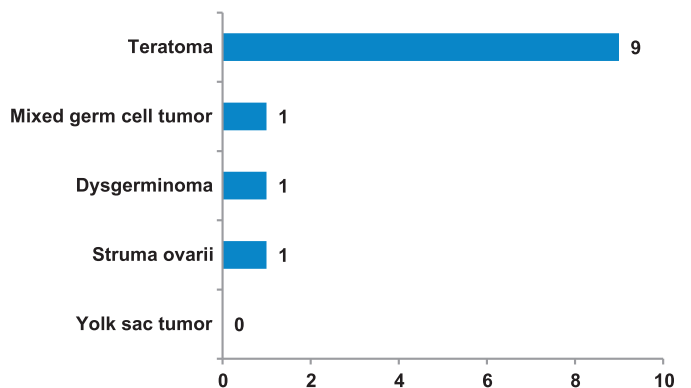

Figure 3: Histopathological Finding with Germ Cell Tumor

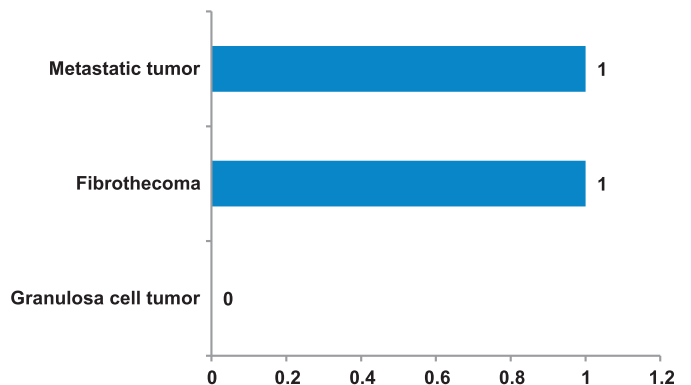Within the Sex cord stromal tumor one each case of metastatic tumor and fibrothecoma was presented in figure 4.

Figure 4: Histopathological Findings of Sex Cord Stromal Tumor

DISCUSSION

Ovarian lesions present the most challenging issue in today's gynecological practice due to their late diagnosis and diverse morphologies. The mortality rate with ovarian tumors was even higher than the combined mortality rate of cervical and endometrial cancers [11, 12]. Our study focused on the histopathological and radiological correction of findings in ovarian cystectomy specimens which hold great clinical significance for improving treatment, prognosis, and disease management. In the present study, ovarian tumors were categorized based on WHO classification: into neoplastic and non-neoplastic groups. The neoplastic lesions were further divided into benign and malignant categories. This research revealed that the common cause of non-neoplastic ovarian lesions was benign cystadenoma, followed by corpus luteal cysts. The findings of the present study were similar with the studies of Mannan R et al., and Prakash A et al [13, 14]. Mannan R et al., indicated that out of 145 cases examined, 75 were non-neoplastic and the remaining 70 were neoplastic [13]. This indicates a remarkably high prevalence of follicular cysts. Similarly, in a study by Prakash A et al., follicular cysts were the predominant non-neoplastic lesions at 45.5%, followed by orpus luteum cysts at 25% [14]. The study by Gaikwad SL et al., found that corpus luteal cysts were the common non-neoplastic lesion [12]. The present study has the similar findings which correlated with the previously reported data. In this study, surface epithelial tumors were the most common neoplastic lesions of the ovary, while metastatic tumors were the least frequent. Tejani AS et al., stated that they encountered surface epithelial tumors most frequently (63%), followed by germ cell tumors (29%) out of 258 cases [15]. Additionally, Wetterwald L et al., found that 70.2% of cases were surface epithelial tumors [16]. In a study conducted by Kipp B et al., revealed that 67.9% of all tumorsaccounted for surface epithelial tumors and 73% of the malignant group [17]. The distribution of sex cord-stromal tumors was very low at 5.3%. According to literature, endometrioid ovarian carcinoma makes up 10-25% of ovarian carcinomas. Consistent with our findings, previous studies have also indicated that among surface epithelial tumors, benignserous cystadenoma was most common[18-22].

CONCLUSIONS

Surface epithelial tumors were the most common category of ovarian tumors and majority of the cysts were benign cystadenomas. Radiological imaging provides a precise non-invasive tool for categorizing various ovarian cysts and histopathological findings further confirms the exact category of tumors.

Authors Contribution

Conceptualization: NK

Methodology: NK, HK, SG, SY, FBN, AK

Formal analysis: NK

Writing, review and editing: NK, HK, SG, SY, FBN, AK

All authors have read and agreed to the published version of the manuscript.

Conflicts of Interest

The authors declare no conflict of interest.

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