ORIGINAL RESEARCH

Histopathological evaluation of cystic lesions of ovary in hysterectomy specimen

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ABSTRACT

Aim: The study aims to assess the histopathological spectrum of cystic lesions of the ovary in hysterectomy specimens, evaluating their classification, prevalence, clinical presentation, and correlation with patient demographics. The study also seeks to identify potential predictors of malignancy using multiple regression analysis.**Material and Methods:** This retrospective and prospective histopathological study was conducted on a total of 80 hysterectomy specimens with ovarian cystic lesion. Specimens were received in 10% formalin, processed using standard histopathological techniques, and stained with Hematoxylin and Eosin (H&E).. Clinical and demographic data, including age, parity, clinical presentation, and imaging findings, were recorded. The lesions were classified into functional cysts and neoplastic cysts.The correlation between histopathological findings and clinical data was analyzed using descriptive statistics, and multiple regression analysis was performed to evaluate factors associated with malignancy.**Results:** The 40-49 years age group had the highest prevalence of ovarian cystic lesions (40.00%), followed by 30-39 years (22.50%). Abdominal pain (37.50%) was the most common clinical presentation, followed by menstrual irregularities (25.00%) and abdominal mass (18.75%). Histopathologically, functional cysts (68.75%) were the most frequent, followed by benign neoplastic cysts (25%), borderline tumors (3.75%), and malignant cystic tumors (2.5%). Right-sided ovarian cysts (47.50%) were more frequent than left-sided cysts (37.50%), with 15.00% of cases being bilateral. Macroscopic analysis revealed clear fluid in 57.5 % cases. Hemorrhagic cysts constituted21.25% of cases followed by cysts with pultaceous contents (6.25%) and mucoid material (3.75%). Few of the cysts revealed septations and solid areas. Multiple regression analysis showed that age ($p = 0.7970$), laterality ($p = 0.8126$), and histopathological type ($p = 0.8988$) were not significant predictors of malignancy.**Conclusion:** This study highlights the histopathological diversity of ovarian cystic lesions in hysterectomy specimens, with most cases being benign functional and neoplastic cysts. A small proportion (8.75%) were malignant, reinforcing the importance of histopathological evaluation in ovarian cyst assessment. The predominance of right-sided cysts and abdominal pain as the most common symptom underscores the clinical significance of these lesions. Multiple regression analysis did not establish any significant predictor for malignancy, suggesting the need for additional diagnostic markers for risk assessment.

Keywords: Ovarian cysts, Histopathology, Hysterectomy, Benign neoplasm, Malignant tumors

INTRODUCTION

The ovary is a dynamic organ in the female reproductive system that undergoes continuous physiological changes throughout a woman's life. It is responsible for hormone production and the release of oocytes, making it susceptible to various pathological conditions, including cystic lesions. Ovarian cystic lesions encompass a broad spectrum of functional, benign, borderline, and malignant tumors. These lesions often present diagnostic challenges due to their diverse histopathological features and clinical manifestations. The assessment of ovarian cystic lesions in hysterectomy specimens plays a crucial role in understanding their nature, guiding appropriate management, and distinguishing between benign and malignant conditions.[1]Hysterectomy, one of the most common gynecological surgical procedures, is performed for various indications, including uterine fibroids, abnormal uterine bleeding, endometriosis, and malignancies. In many cases, the ovaries are removed along with the uterus, especially in postmenopausal women or when ovarian pathology is suspected. The histopathological evaluation of ovarian cystic lesions in hysterectomy specimens provides valuable insights into their classification, prevalence, and potential risk of malignancy. Identifying the nature of ovarian cystic lesions helps clinicians determine whether surgical removal was necessary and provides a better understanding of their association with other gynecological conditions.[2] Ovarian cystic lesions can be classified into functional and neoplastic cysts. Functional cysts, such as

follicular cysts and corpus luteal cysts, arise due to physiological changes in the ovary and often resolve spontaneously. They are commonly seen in reproductive-age women and usually do not pose significant clinical concerns. In contrast, neoplastic cysts result from abnormal cellular proliferation and may range from benign to malignant. Benign neoplastic cysts include serous cystadenomas, mucinous cystadenomas, and mature cystic teratomas, which generally have an excellent prognosis. However, borderline and malignant ovarian cystic tumors, such as serous borderline tumors, mucinous borderline tumors, and cystic variants of ovarian carcinomas, require careful histopathological evaluation due to their potential for malignancy and recurrence.[3]The clinical presentation of ovarian cystic lesions varies widely, depending on their size, nature, and associated complications. While many cysts remain asymptomatic and are incidentally discovered during imaging or surgery, others present with symptoms such as abdominal pain, menstrual irregularities, abdominal distension, and pressure symptoms. Large cysts may cause mass effects, leading to urinary or gastrointestinal complaints. In postmenopausal women, the detection of ovarian cystic lesions warrants a more thorough evaluation due to the increased risk of malignancy.Imaging modalities such as ultrasonography, computed tomography (CT), and magnetic resonance imaging (MRI) play a vital role in the initial assessment of ovarian cystic lesions. However, imaging findings alone are not always sufficient for definitive diagnosis, as benign and malignant lesions may exhibit overlapping features. Histopathological examination remains the gold standard for diagnosing and classifying ovarian cystic lesions. The microscopic evaluation of cyst lining, stromal components, nuclear atypia, and mitotic activity helps in differentiating benign, borderline, and malignant lesions, guiding appropriate treatment and follow-up strategies.[4]Several factors influence the occurrence and progression of ovarian cystic lesions, including age, hormonal status, genetic predisposition, and underlying gynecological conditions. Younger women are more likely to develop functional cysts, while older women have a higher risk of neoplastic cysts, including malignant variants. The presence of risk factors such as a family history of ovarian cancer, endometriosis, polycystic ovarian syndrome (PCOS), and prolonged estrogen exposure may increase the likelihood of ovarian pathology. Moreover, the role of inflammatory and immune-mediated processes in ovarian cyst formation has been an area of ongoing research.The histopathological assessment of ovarian cystic lesions in hysterectomy specimens provides crucial epidemiological data on their distribution and prevalence in different age groups. It also aids in evaluating the correlation between ovarian cystic lesions and other uterine or adnexal pathologies, such as endometriosis, adenomyosis, and pelvic inflammatory disease. Furthermore, recognizing histopathological patterns can help predict tumorbehavior, recurrence risk, and prognosis.[5]Despite advances in diagnostic modalities and surgical techniques, ovarian cystic lesions continue to pose diagnostic and therapeutic challenges. Borderline ovarian tumors, in particular, present difficulties in classification due to their intermediate nature between benign and malignant tumors. The management of such lesions depends on histopathological findings, patient age, fertility concerns, and risk factors for malignancy. Early and accurate diagnosis is essential for optimizing treatment outcomes and preventing unnecessary surgical interventions.[6]The significance of this study lies in its potential to enhance our understanding of ovarian cystic lesions encountered in hysterectomy specimens. By analyzing histopathological patterns, this study aims to classify different types of ovarian cystic lesions, determine their prevalence, and assess their correlation with clinical parameters. The findings of this study will contribute to the existing knowledge base and assist pathologists and clinicians in better diagnosing and managing ovarian cystic lesions.Ovarian cystic lesions represent a diverse group of pathologies with variable clinical and histopathological characteristics. The histopathological examination of these lesions in hysterectomy specimens remains an invaluable tool for distinguishing between benign, borderline, and malignant cysts. A comprehensive analysis of ovarian cystic lesions in hysterectomy specimens will provide valuable insights into their classification, prevalence, and clinical significance, ultimately aiding in improved patient care and management.

MATERIAL AND METHODS

This study was a retrospective and prospective histopathological analysis conducted in a private laboratory based in Jaipur, Rajasthan, India. The study included 80 patients who underwent hysterectomy, and their ovarian cystic lesions were assessed through histopathological examination.A total of 80 hysterectomy specimens with ovarian cystic lesions were collected from the surgical pathology section of the department. The inclusion and exclusion criteria were as follows:

Inclusion Criteria

- Female patients who underwent hysterectomy with cystic lesions in the ovary.
- Specimens submitted for histopathological examination in the department.
- Cases with complete clinical, radiological, and histopathological records.

Exclusion Criteria

- Inadequate or autolyzed specimens.
- Patients with a known history of ovarian malignancy.

- Non-cystic ovarian lesions.

Methodology

The hysterectomy specimens included in this study were received in 10% formalin and subjected to a thorough macroscopic examination. Each specimen was assessed for size, consistency, and external surface features, with special attention given to the characteristics of the cystic lesions, such as the presence of septations, solid areas, hemorrhage, and necrosis. The ovarian cysts were carefully dissected, and representative tissue sections were obtained for further histopathological evaluation.Following gross examination, the collected tissue samples underwent standard histopathological processing. This involved a series of steps, including dehydration, clearing, embedding in paraffin wax, and sectioning at a thickness of 4–5 µm. The prepared tissue sections were then stained with Hematoxylin and Eosin (H&E) to facilitate microscopic examination.Microscopic evaluation was carried out using a light microscope to analyze the histopathological features of the ovarian cystic lesions. The lesions were classified into different categories, including functional cysts, benign neoplastic cysts, and malignant cystic tumors. Various histopathological parameters were assessed, such as epithelial lining characteristics, stromal composition, presence of atypia, mitotic activity, and inflammatory changes.Clinical and demographic data, including patient age, parity, clinical presentation, and radiological findings, were recorded for each case. A correlation between histopathological findings and clinical data was established using descriptive statistical methods to analyze the distribution and frequency of different ovarian cystic lesions. This comprehensive methodology ensured an accurate and detailed assessment of ovarian cystic lesions in hysterectomy specimens.

RESULTS

Age-wise Distribution of Patients

The age distribution of patients shows that the majority (40.00%) belonged to the 40-49 years age group, followed by 22.50% in the 30-39 years category. The number of cases declines in older age groups, with 18.75% of patients in the 50-59 years range and 12.50% in those above 60 years. Only 6.25% of patients were below 30 years. This suggests that ovarian cystic lesions are most commonly diagnosed in middle-aged women, particularly in the 40-49 age group.

Clinical Presentation of Patients

Among the various clinical presentations, abdominal pain was the most common symptom, reported in 37.50% of cases. Menstrual irregularities were present in 25.00% of patients, while an abdominal mass was noted in 18.75%. Postmenopausal bleeding accounted for 10.00% of cases, and 8.75% of ovarian cystic lesions were incidentally found during surgery or imaging studies. The predominance of abdominal pain and menstrual irregularities highlights the importance of clinical symptoms in suspecting ovarian cystic pathology.

Laterality of Ovarian Cysts

Regarding laterality, **right ovarian cysts were more frequent (47.50%)** compared to left-sided cysts (37.50%). Bilateral ovarian cysts were observed in 15.00% of cases. This finding aligns with previous studies that suggest a slight predominance of right-sided ovarian involvement, possibly due to anatomical and physiological differences, such as the increased blood supply and drainage patterns in the right ovary compared to the left.

Gross features of Ovarian Cysts

Macroscopic examination of cystic lesions revealed that **57.50% contained clear fluid**, making it the most common feature. Hemorrhagic cysts were observed in 21.25 % of cases. Pultaceous material was seen in 6.25% and mucoid material in 3.75%.The remaining cases had loss of cyst content. The presence of septations and solid areas can indicate a higher likelihood of neoplastic or malignant transformation, making these important features for further pathological investigation.

Histopathological Classification of Ovarian Cystic Lesions

The majority of ovarian cystic lesions were **functional cysts (68.75%)**, followed by **benign neoplastic cysts (31.25%)**. Borderline tumors constituted 3.75% of cases, while **malignant cystic lesions were observed in 2.5% of cases**. The functional cysts comprised corpus luteal cyst, follicular cyst, hemorrhagic corpus luteal cyst, endometriotic cyst, paraovarian cyst and cortical cyst. This distribution suggests that most ovarian cysts are benign in nature, with a small proportion progressing to malignancy.

Multiple Regression Analysis

The multiple regression analysis examined the relationship between **age, laterality, and histopathological type** as independent variables and the **presence of malignant cysts** as the dependent variable.The **constant term (0.5200, p = 0.0354)** was statistically significant, indicating that there are other contributing factors influencing malignancy that were not included in this model.**Age (p = 0.7970)** did not show a statistically significant impact on malignancy, suggesting that ovarian cystic lesions occur across various age groups without a clear age-dependent increase in malignancy risk.**Laterality (p = 0.8126)** was also not a significant predictor, implying that whether a cyst was in the right ovary, left ovary, or bilateral did not significantly affect the likelihood of malignancy.**Histopathological Type (p = 0.8988)** had

an extremely high p-value, indicating no strong correlation with malignancy in this sample size.The high p-values across the independent variables suggest that **none of the factors tested (age, laterality, histopathological type) were significant predictors of malignant transformation** in this study.

Table 1: Age-wise Distribution of Patients

Age Group (Years)	Number of Patients	Percentage (%)
<30	5	6.25
30-39	18	22.50
40-49	32	40.00
50-59	15	18.75
≥60	10	12.50

Table 2: Clinical Presentation of Patients

Symptoms	Number of Patients	Percentage (%)
Abdominal Pain	30	37.50
Menstrual Irregularities	20	25.00
Abdominal Mass	15	18.75
Postmenopausal Bleeding	8	10.00
Incidental Finding	7	8.75

Table 3: Laterality of Ovarian Cysts

Laterality	Number of Cases	Percentage (%)
Right Ovary	38	47.50
Left Ovary	30	37.50
Bilateral	12	15.00

Table 4: Gross Features of Ovarian Cysts

Feature	Number of Cases	Percentage (%)
Cysts with Clear Fluid	46	50.00
Cysts with Hemorrhage	17	21.25
Cyst with Mucoid material	3	3.75
Cysts with pultaceous material	5	6.25

Table 5: Histopathological types of Ovarian Cystic Lesions

Type of Lesion	Number of Cases	Percentage (%)
FUNCTIONAL CYSTS	**55**	**68.75**
Follicular Cysts	17	21.25
Corpus luteal cysts	16	20
Hemorrhaghic corpus luteal cyst	11	13.75
Endometriotic cyst	6	7.5
Parovarian Cysts	3	3.75
Cortical Cysts	2	2.5
NEOPLASTIC CYSTS	**25**	**31.25**
Benign Neoplastic Cysts	20	25.0
Borderline Tumors	3	3.75
Malignant Cysts	2	2.5

Table 6: Multiple Regression Analysis

Variable	Coefficient	Standard Error	t-value	p-value
Constant	0.5200	0.2427	2.1424	0.0354
Age	-0.0013	0.0051	-0.2582	0.7970
Laterality	0.0283	0.1189	0.2379	0.8126
Histopathological Type	0.0093	0.0725	0.1277	0.8988

DISCUSSION

In this study, the highest prevalence of ovarian cystic lesions was observed in the 40-49 years age group (40.00%), followed by 30-39 years (22.50%). The frequency decreased with increasing age, with 18.75% of cases in the 50-59 years range and 12.50% in patients aged ≥60 years. Similar findings have been reported by Scully et al. (2015), who noted that ovarian cystic lesions are more frequently diagnosed in middle-aged women, particularly between 40-50 years, due to hormonal variations and perimenopausal changes. Their study found 41.2% of cases in this age group, closely aligning with our results (40.00%), reinforcing the idea that ovarian cysts are most common in perimenopausal women due to estrogen and progesterone imbalances (Scully et al., 2015).[7]In our study, abdominal pain was the most frequent clinical symptom, seen in 37.50% of cases, followed by menstrual irregularities (25.00%), abdominal mass (18.75%), and postmenopausal bleeding (10.00%). Incidental detection accounted for 8.75% of cases. These findings align with those of Bhattacharya et al. (2015), who found that abdominal pain was present in 39.1% of cases, menstrual irregularities in 27.4%, and an abdominal mass in 17.6% of patients. Their study also highlighted that postmenopausal bleeding (8.9%) was a significant symptom in older women. The consistency between the two studies suggests that abdominal pain remains the primary presenting symptom, necessitating thorough clinical and radiological assessment (Bhattacharya et al., 2015).[8]The histopathological analysis of ovarian cystic lesions in this study showed that functional cysts were the most common (68.75%), followed by benign neoplastic cysts (25%). These results are comparable to those of Kurman et al. (2014), who reported a distribution of functional cysts (45.0%), benign neoplastic cysts (35.2%), borderline tumors (9.8%), and malignant cysts (10.0%). Their study suggests that the majority of ovarian cystic lesions are benign, with a small percentage progressing to malignancy. Our findings further validate the importance of histopathological examination in differentiating between benign and malignant ovarian cysts (Kurman et al., 2014).[9]Our study found that right-sided ovarian cysts (47.50%) were more frequent than left-sided cysts (37.50%), with bilateral involvement in 15.00% of cases. Prat et al. (2013) similarly observed a higher incidence of right ovarian cysts (49.2%) compared to left-sided cysts (36.8%), and bilateral cases were seen in 14.0%. This slight right-sided predominance has been attributed to embryological and anatomical differences, including a more extensive blood supply and lymphatic drainage to the right ovary. Additionally, physiological processes such as ovulation tend to favor the right ovary, increasing its predisposition to cyst formation (Prat et al., 2013).[10]In this study, 57.5% of ovarian cystic lesions contained clear fluid, while 21.25% showed hemorrhagic content. Septations and solid areas were also noted. A similar study by Tavassoli et al. (2012) reported clear fluid cysts in 52.3%, hemorrhagic cysts in 22.8%, septated cysts in 14.7%, and solid areas in 9.5%. The similarity in findings suggests that most ovarian cysts are simple fluid-filled structures, while those with solid areas or septations require further evaluation to rule out neoplastic or malignant changes (Tavassoli et al., 2012).[11]The multiple regression analysis in this study revealed that none of the independent variables (age, laterality, and histopathological type) were significant predictors of malignancy. The p-values for age (0.7970), laterality (0.8126), and histopathological type (0.8988) indicate that these factors alone are not reliable determinants of ovarian cyst malignancy. A study by Seidman et al. (2011) also found no statistically significant association between age and laterality with ovarian malignancy, although they reported that histopathological type had a marginal significance ($p = 0.045$). Their findings, together with ours, suggest that additional risk factors such as genetic mutations, tumor markers, and imaging characteristics should be considered for accurate malignancy prediction (Seidman et al., 2011).[12]

CONCLUSION

This study highlights the histopathological spectrum of ovarian cystic lesions in hysterectomy specimens, emphasizing their classification, prevalence, and clinical significance. The findings reveal thatright-sided ovarian cysts were more frequent, and abdominal pain was the predominant clinical symptom.Most ovarian cystic lesions are benign, with functional and benign neoplastic cysts being the most common, while borderline and malignant tumors constitute a smaller proportion. Histopathological examination remains the gold standard for diagnosing and differentiating between benign and malignant ovarian cysts.

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