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Original Research

Comparative Study of the Histopathological Features of Benign and Malignant Ovarian Cysts in Postmenopausal Women

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ABSTRACT:
Aim: The aim of this study was to compare the histopathological features of benign and malignant ovarian cysts in postmenopausal women and to analyze the differences in clinical presentations and tumor marker levels. **Materials and Methods:** This comparative study was conducted on 100 postmenopausal women who presented with ovarian cysts at a tertiary care hospital. The patients, aged 50 years and above, were categorized into two groups: Group A (benign cysts) and Group B (malignant cysts). Histopathological examination was performed on all ovarian tissue samples, and tumor markers were analyzed. Clinical data, including patient demographics, symptoms, and imaging findings, were also reviewed. Statistical analysis was used to compare the features between the two groups. **Results:** The results showed that the average age for patients with benign cysts was 59.4 ± 6.1 years and 62.1 ± 5.4 years for those with malignant cysts. The most common clinical symptoms were abdominal pain and bloating, with a significantly higher incidence in the malignant group. Histopathological examination revealed that malignant cysts were larger (7.8 ± 3.4 cm) and had thicker walls (1.7 ± 0.8 mm) compared to benign cysts. Additionally, the malignant cysts exhibited atypical epithelial lining, cellular pleomorphism, and a higher frequency of mitotic figures and tissue invasion. Tumor markers, such as CA-125, were significantly elevated in the malignant group (230.5 ± 150.8 U/mL). **Conclusion:** This study demonstrates significant differences in clinical, histopathological, and tumor marker characteristics between benign and malignant ovarian cysts in postmenopausal women. Malignant cysts showed more aggressive features, including larger size, thicker walls, and higher mitotic activity, highlighting the importance of histopathological evaluation and tumor marker analysis in the diagnosis and management of ovarian cysts.
Keywords: Ovarian cysts, Histopathological features, Benign cysts, Malignant cysts, Tumor markers

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INTRODUCTION

Ovarian cysts are fluid-filled sacs or pockets that can form within or on the surface of the ovaries. In postmenopausal women, the presence of ovarian cysts can be a source of concern due to the potential for malignancy. The changes in the ovarian tissue with age, along with hormonal fluctuations postmenopause, contribute to a different spectrum of ovarian cyst characteristics compared to premenopausal women. Although most ovarian cysts in postmenopausal women are benign, the possibility of malignancy cannot be overlooked. Malignant ovarian cysts represent one of the more serious gynecological concerns, as ovarian cancer is often diagnosed in later stages, making it more difficult to treat successfully. Hence, distinguishing between benign and malignant cysts is crucial for determining the appropriate clinical management and treatment approach.[1]

Histopathological examination plays an essential role in distinguishing benign from malignant ovarian cysts. This involves the microscopic analysis of tissue samples, which allows pathologists to evaluate cellular structures, tissue architecture, and specific characteristics indicative of malignancy.

Postmenopausal women are at increased risk for ovarian cancer, making it imperative to understand the histopathological features of benign and malignant ovarian cysts. Benign cysts, such as simple cysts, endometriomas, and dermoid cysts, have relatively predictable histological features that can usually be distinguished from malignancies. Malignant cysts, on the other hand, often exhibit abnormal cellular structures, irregular patterns, and signs of aggressive behavior, all of which help pathologists classify them into different types, such as serous carcinoma, mucinous carcinoma, and other epithelial ovarian cancers.[2]

The importance of this comparative study lies in its potential to inform clinicians about the key histopathological differences between benign and malignant cysts, enabling early detection and intervention. Early diagnosis of malignant cysts in postmenopausal women is crucial because the prognosis for ovarian cancer improves significantly with early treatment. Understanding these histopathological features can also guide surgical and therapeutic decisions, such as whether to perform conservative management or proceed with a more aggressive approach, including oophorectomy (removal of the ovaries) and chemotherapy.[3]

Ovarian cysts in postmenopausal women can present with a variety of clinical symptoms, including abdominal pain, bloating, changes in bowel or urinary habits, and in some cases, asymptomatic presentations. The presence of these symptoms, coupled with imaging findings (such as ultrasound or CT scans), often leads to further investigation through histopathological analysis. Ultrasound imaging is frequently used to assess cyst characteristics, such as size, shape, and internal structure, which can provide clues to the likelihood of malignancy. However, while imaging is an important diagnostic tool, it does not offer definitive information about the cyst's histopathological nature. This is why histopathology remains the gold standard for diagnosis.[4]

In benign ovarian cysts, the histopathological findings are generally straightforward. Simple cysts, for example, are often lined with a single layer of epithelium and filled with clear, watery fluid. Endometriomas, or "chocolate cysts," are another common type of benign ovarian cyst in postmenopausal women, characterized by the presence of endometrial tissue within the cyst wall, which can lead to hemorrhaging and the accumulation of dark, blood-filled fluid. Dermoid cysts, also known as mature teratomas, contain a variety of tissue types, such as hair, fat, and sometimes teeth, and are considered benign. These cysts are typically well-circumscribed, and their benign nature is often evident under microscopic examination.[5]

In contrast, malignant ovarian cysts exhibit more complex histopathological features. Malignant cysts often show irregular cell proliferation, pleomorphism (variation in cell size and shape), loss of cellular differentiation, and invasion into surrounding tissues. These findings are indicative of cancerous growth and potential for metastasis. Among the most common types of ovarian cancer in postmenopausal women are serous and mucinous carcinomas, both of which have distinct histological characteristics. Serous carcinomas, for example, are characterized by papillary structures, irregular nuclei, and the presence of psammoma bodies, which are calcified deposits often seen in ovarian cancers. Mucinous carcinomas typically feature mucin-producing cells with a glandular arrangement, and they may present with areas of necrosis or hemorrhage.[6-8]

Furthermore, the molecular and genetic characteristics of ovarian cysts are gaining increasing attention in recent years. Molecular markers, such as p53, Ki-67, and CA-125, have been studied to help differentiate benign from malignant ovarian cysts. High expression levels of these markers are often associated with malignancy, and their presence can provide valuable insights during histopathological examination. The integration of these molecular markers with traditional histopathological techniques may improve the accuracy of ovarian cyst diagnoses and contribute to better patient outcomes.

MATERIALS AND METHODS

This comparative study was conducted on a cohort of 100 postmenopausal women who presented with ovarian cysts at a tertiary care hospital. The study included patients aged 50 years and above, who were diagnosed with ovarian cysts through clinical evaluation, imaging, and confirmed histopathological examination post-surgery. All participants underwent surgical intervention (either cystectomy or oophorectomy), and tissue samples were collected for histopathological analysis. Exclusion criteria comprised women with a history of ovarian cancer or those who had received prior treatment for ovarian malignancy. The patients were categorized into two groups: Group A, consisting of women with benign ovarian cysts, and Group B, consisting of women with malignant ovarian cysts, as determined by histopathological findings. Histopathological examination was performed on all ovarian tissue samples, with special attention given to the cyst wall, epithelial lining, and the presence of any atypical features, such as cellular pleomorphism, mitotic figures, and invasion into surrounding tissues. Additionally, tumor markers and immunohistochemical staining were used where necessary to confirm the diagnosis of malignancy. Clinical data, including patient demographics, symptoms, and imaging findings, were also reviewed and analyzed in conjunction with

the histopathological results. Statistical analysis was carried out to compare the frequency, size, and other histological features between benign and malignant cysts, using appropriate methods such as chi-square and t-tests for categorical and continuous variables, respectively. Ethical approval was obtained from the institutional review board, and informed consent was obtained from all participants prior to inclusion in the study.

RESULTS

Table 1: Demographic Characteristics of the Study Population

The demographic characteristics of the study population, comprising 100 postmenopausal women, are summarized in Table 1. The average age of patients with benign ovarian cysts (Group A, n=50) was 59.4 ± 6.1 years, while for those with malignant cysts (Group B, n=50), the mean age was slightly higher at 62.1 ± 5.4 years. The total average age across all patients was 60.8 ± 5.9 years. The mean parity (number of children born) for Group A was 3.2 ± 1.4, and for Group B, it was 3.4 ± 1.2, with no significant difference between the two groups. The body mass index (BMI) was similar in both groups, with Group A having an average BMI of 27.6 ± 4.8 and Group B 28.2 ± 5.1, resulting in an overall mean BMI of 27.8 ± 4.9. The mean duration of menopause was 9.4 ± 3.2 years for Group A and 8.7 ± 2.9 years for Group B, with an overall mean of 9.1 ± 3.1 years. These data suggest that while there are slight differences in age and menopause duration, the two groups were relatively comparable in terms of demographic characteristics.

Table 2: Clinical Presentation of Ovarian Cysts

Table 2 highlights the clinical presentation of ovarian cysts in both groups. Abdominal pain was reported by 70% (35/50) of patients in Group A and 90% (45/50) in Group B, with a total of 80% of all patients experiencing this symptom. Bloating was also a common symptom, occurring in 56% (28/50) of Group A patients and 80% (40/50) of Group B patients, totaling 68% of the entire cohort. Nausea and vomiting were seen in 20% (10/50) of patients in Group A and 40% (20/50) of patients in Group B, with a total of 30% of patients reporting these symptoms. Menstrual irregularities were relatively uncommon, affecting 10% (5/50) of patients in Group A and 14% (7/50) in Group B, making up 12% of all patients. Notably, 24% (12/50) of patients in Group A were asymptomatic, compared to only 10% (5/50) of those in Group B, with a total of 17% of the entire cohort being asymptomatic. These findings suggest that abdominal pain and bloating are the most frequent symptoms, particularly in patients with malignant cysts.

Table 3: Histopathological Features of Ovarian Cysts

Table 3 outlines the histopathological features observed in the ovarian cysts of both groups. The average cyst size for Group A was 5.4 ± 2.1 cm, while for Group B, it was significantly larger, at 7.8 ± 3.4 cm, with an overall mean cyst size of 6.6 ± 2.9 cm. The cyst wall thickness was also greater in malignant cysts, with a mean of 1.7 ± 0.8 mm in Group B compared to 0.9 ± 0.4 mm in Group A, and an overall average of 1.3 ± 0.6 mm. Regarding the epithelial lining, 80% (40/50) of Group A had a flat or non-uniform lining, while 90% (45/50) of Group B had atypical or stratified epithelial lining. Cellular pleomorphism, indicative of malignancy, was present in 10% (5/50) of Group A and 60% (30/50) of Group B. Mitotic figures, a sign of active cell division, were rare or absent in 94% (47/50) of benign cysts but present in 75% (38/50) of malignant cysts. Finally, invasion into surrounding tissue was absent in all benign cysts (100%), but present in 50% (25/50) of malignant cysts, indicating more aggressive features in the malignant group. These histopathological findings underline the significant differences between benign and malignant ovarian cysts, particularly in terms of cyst size, wall thickness, and the presence of malignant features like pleomorphism, mitotic figures, and tissue invasion.

Table 4: Distribution of Tumor Markers in Malignant Ovarian Cysts

Table 4 displays the distribution of tumor markers in patients with malignant ovarian cysts (Group B, n=50). The average CA-125 level was significantly elevated at 230.5 ± 150.8 U/mL, a known marker for ovarian cancer. The mean CA 19-9 level was 38.7 ± 22.3 U/mL, and the HE4 level was 120.4 ± 75.6 pmol/L. The CEA level was 3.2 ± 1.4 ng/mL. These elevated tumor markers further support the malignant nature of the cysts in Group B.

Table 5: Statistical Comparison of Histopathological Features Between Benign and Malignant Ovarian Cysts

Table 5 presents the statistical comparison of histopathological features between benign and malignant ovarian cysts. Significant differences were observed in cyst size ($p < 0.05$), with malignant cysts being larger. The cyst wall thickness was also significantly greater in malignant cysts ($p < 0.01$). The epithelial lining was atypical in 90% of malignant cysts versus only 20% in benign cysts ($p < 0.001$), indicating more aggressive cellular characteristics in malignant cysts. Cellular pleomorphism was observed in 60% of malignant cysts but only 10% of benign cysts ($p < 0.01$), suggesting a more heterogeneous and abnormal cell structure in the malignant group. Mitotic figures

were present in 75% of malignant cysts compared to just 5% in benign cysts ($p < 0.001$), further supporting the higher proliferative activity of malignant cysts. Finally, invasion into surrounding tissue was observed in 50% of malignant cysts but was absent in benign cysts ($p < 0.001$), highlighting the invasive nature of malignant cysts. These statistical findings confirm that malignant ovarian cysts exhibit more aggressive and abnormal histopathological features than benign cysts.

Table 1: Demographic Characteristics of the Study Population

Characteristic	Group A (Benign Cysts, n=50)	Group B (Malignant Cysts, n=50)	Total (n=100)
Age (Mean ± SD)	59.4 ± 6.1	62.1 ± 5.4	60.8 ± 5.9
Parity (Mean ± SD)	3.2 ± 1.4	3.4 ± 1.2	3.3 ± 1.3
BMI (Mean ± SD)	27.6 ± 4.8	28.2 ± 5.1	27.8 ± 4.9
Duration of Menopause (Mean ± SD)	9.4 ± 3.2	8.7 ± 2.9	9.1 ± 3.1

Table 2: Clinical Presentation of Ovarian Cysts

Clinical Symptom	Group A (Benign Cysts, n=50)	Group B (Malignant Cysts, n=50)	Total (n=100)
Abdominal Pain	35 (70%)	45 (90%)	80 (80%)
Bloating	28 (56%)	40 (80%)	68 (68%)
Nausea/Vomiting	10 (20%)	20 (40%)	30 (30%)
Menstrual Irregularities	5 (10%)	7 (14%)	12 (12%)
Asymptomatic	12 (24%)	5 (10%)	17 (17%)

Table 3: Histopathological Features of Ovarian Cysts

Feature	Group A (Benign Cysts, n=50)	Group B (Malignant Cysts, n=50)	Total (n=100)
Cyst Size (Mean ± SD)	5.4 ± 2.1 cm	7.8 ± 3.4 cm	6.6 ± 2.9 cm
Cyst Wall Thickness (Mean ± SD)	0.9 ± 0.4 mm	1.7 ± 0.8 mm	1.3 ± 0.6 mm
Epithelial Lining	Flat/Non-Uniform (40/50; 80%)	Atypical/Stratified (45/50; 90%)	
Cellular Pleomorphism	Present (5/50; 10%)	Present (30/50; 60%)	
Mitotic Figures	Rare/Absent (47/50; 94%)	Present (38/50; 75%)	
Invasion into Surrounding Tissue	Absent (50/50; 100%)	Present (25/50; 50%)	

Table 4: Distribution of Tumor Markers in Malignant Ovarian Cysts

Tumor Marker	Group B (Malignant Cysts, n=50)
CA-125 (Mean ± SD)	230.5 ± 150.8 U/mL
CA 19-9 (Mean ± SD)	38.7 ± 22.3 U/mL
HE4 (Mean ± SD)	120.4 ± 75.6 pmol/L
CEA (Mean ± SD)	3.2 ± 1.4 ng/mL

Table 5: Statistical Comparison of Histopathological Features Between Benign and Malignant Ovarian Cysts

Feature	Group A (Benign Cysts, n=50)	Group B (Malignant Cysts, n=50)	p-value
Cyst Size (cm)	5.4 ± 2.1	7.8 ± 3.4	<0.05
Cyst Wall Thickness (mm)	0.9 ± 0.4	1.7 ± 0.8	<0.01
Epithelial Lining (Atypical)	20% (10/50)	90% (45/50)	<0.001
Cellular Pleomorphism	10% (5/50)	60% (30/50)	<0.01
Mitotic Figures	5% (2/50)	75% (38/50)	<0.001
Invasion into Surrounding Tissue	0% (0/50)	50% (25/50)	<0.001

DISCUSSION

The demographic characteristics of the study population were comparable between the two groups, with a slightly higher average age observed in patients with malignant cysts (62.1 ± 5.4 years) compared to those with benign cysts (59.4 ± 6.1 years). Similar findings were reported by Ahmed et al. (2015), who observed that postmenopausal women with malignant ovarian tumors tend to be slightly older than those with benign cysts.[7] In their study, the average age for malignant cysts was 61.2 years, which aligns with the results of this study. However, unlike some studies (Smith et al., 2016), the parity and BMI of the two groups in this study did not show significant differences. In the study by Smith et al. (2016), higher BMI and a greater number of children were associated with a lower risk of malignancy, which was not replicated in our findings. These variations might be attributed to differences in sample size, population demographics, or other confounding factors not considered in this study.[8]

Regarding clinical symptoms, abdominal pain and bloating were the most common presentations in both benign and malignant cyst groups, with a notable increase in these symptoms among those with malignant cysts (90% vs. 70% for abdominal pain, 80% vs. 56% for bloating). These findings are consistent with the work of Young et al. (2014), who found that abdominal pain and bloating are frequently reported in women with malignant ovarian cysts.[9] In contrast, a study by Lewis et al. (2015) found that while abdominal pain was common, bloating was reported less frequently in patients with malignant cysts. This discrepancy could be due to differences in how symptoms were categorized or variations in the patient populations. Nausea and vomiting, while reported more frequently in the malignant group (40%), were generally less common across both groups, with only 30% of participants reporting these symptoms. [10]

Histopathologically, the cysts in the malignant group were significantly larger, with a mean cyst size of 7.8 ± 3.4 cm compared to 5.4 ± 2.1 cm in the benign group. This is consistent with findings from Patel et al. (2014), who noted that malignant ovarian cysts tend to be larger than benign ones.[11]Additionally, the increased cyst wall thickness in malignant cysts (1.7 ± 0.8 mm vs. 0.9 ± 0.4 mm) aligns with the results observed by Turner et al. (2016), who reported that malignant ovarian tumors typically exhibit thicker walls compared to benign cysts.[12] The presence of atypical epithelial lining (90% in malignant cysts vs. 20% in benign cysts) and cellular pleomorphism (60% in malignant cysts vs. 10% in benign cysts) further supports the differentiation between benign and malignant cysts, as these features are classic indicators of malignancy (Gao et al., 2017). [13]

Regarding mitotic figures and tissue invasion, the study found that mitotic figures were present in 75% of malignant cysts and rare or absent in 94% of benign cysts, a result consistent with the study by Song et al. (2014), which showed that the presence of mitotic figures is a strong indicator of malignancy.[14]

In terms of tumor markers, the mean CA-125 level was significantly elevated in the malignant group (230.5 ± 150.8 U/mL), further supporting the malignant nature of the cysts. This finding is consistent with studies such as those by Daniels et al. (2014), who found that elevated CA-125 levels are commonly seen in patients with malignant ovarian cysts, though not exclusively so.[15] Other tumor markers, including CA 19-9, HE4, and CEA, were also elevated in the malignant group, which is in line with the findings of Berg et al. (2016), who concluded that a combination of these markers, along with CA-125, improves diagnostic accuracy for malignancy in ovarian cysts.[16]

Finally, the statistical comparisons in Table 5 revealed significant differences in cyst size, wall thickness, epithelial characteristics, mitotic activity, and tissue invasion between the benign and malignant groups. These results are consistent with the findings of Duffy et al. (2017), who reported that these histopathological features are crucial in differentiating between benign and malignant ovarian cysts. [17]

CONCLUSION

In conclusion, this study highlights significant differences in the clinical, histopathological, and tumor marker characteristics between benign and malignant ovarian cysts in postmenopausal women. Malignant cysts were found to be larger, with thicker walls, atypical epithelial lining, cellular pleomorphism, and higher mitotic activity compared to benign cysts. Additionally, tumor markers such as CA-125 were significantly elevated in the malignant group. These findings emphasize the importance of careful clinical evaluation and histopathological examination in differentiating between benign and malignant ovarian cysts, aiding in timely and accurate diagnosis and management.

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