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Ovarian Teratoma – Pathological Study at a Tertiary Care Centre

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Abstract:

Ovarian teratomas constitute a significant proportion of **germ cell tumors** and represent a diverse category of neoplasms comprising tissues derived from all three germ layers. They are most frequently encountered in women of reproductive age and present with a wide range of clinical and pathological features (1). This retrospective study was conducted at a tertiary care centre to analyze the incidence, clinical presentation, gross morphology, histopathological patterns, and associated complications of ovarian teratomas over a one-year period. A total of 64 cases were included, ranging from benign mature cystic teratomas to rare immature and monodermal variants. Most cases presented with abdominal pain, mass effect, or were detected incidentally during imaging. Mature cystic teratomas accounted for 89% of cases, consistent with global trends (2). Gross examination revealed cystic structures filled with sebaceous material, hair, and ossified components, while histology demonstrated well-differentiated tissues such as squamous epithelium, adipose tissue, respiratory epithelium, cartilage and neural tissue (3). Immature teratomas represented 6% of cases and showed primitive neuroectodermal tissue, aligning with WHO classification criteria (4). Monodermal teratomas, including struma ovarii, were identified in 5% of cases and displayed characteristic thyroid follicles (5). Complications such as torsion were seen in 14% of cases, while malignant transformation into squamous cell carcinoma occurred in 1.5%, comparable with published studies (6). The study highlights the importance of meticulous gross sampling because immature elements may be focal and easily missed (7). Histopathological evaluation remains the gold standard for classification and grading, as imaging alone is insufficient for identifying immature or malignant changes (8). The findings emphasize the diagnostic significance of teratoma subtype differentiation for appropriate clinical management (9). This study concludes that ovarian teratomas are predominantly benign, but meticulous evaluation is essential due to the possibility of immature components and rare malignant transformation (10).

Keywords: Ovarian teratoma, Mature cystic teratoma, Immature teratoma, Germ cell tumor, Pathology

Introduction:

Ovarian teratomas are among the most common **germ cell neoplasms** encountered in gynecologic pathology and are characterized by the presence of tissues derived from ectoderm, mesoderm, and endoderm (1). Their incidence is highest in women of reproductive age, although they may occur at any age, including childhood and postmenopausal years (2).

Teratomas are broadly classified into mature, immature, and monodermal variants based on histopathological characteristics, with mature cystic teratoma being by far the most frequently diagnosed subtype (3). Mature cystic teratomas, also known as dermoid cysts, typically present as cystic lesions containing sebaceous secretions, hair, bone, cartilage, or even teeth (4). They are often asymptomatic and identified incidentally, although some patients may present with abdominal pain, fullness, or complications such as torsion, rupture, or infection (5). Immature teratomas, in contrast, contain immature neuroectodermal tissue and are associated with a more aggressive clinical course requiring accurate grading for optimal management (6). Monodermal teratomas, including struma ovarii, carcinoid tumors, or neural-type lesions, are rare but clinically significant due to their potential hormonal activity (7). The pathogenesis of ovarian teratomas is widely accepted to arise from parthenogenetic activation of germ cells, although molecular studies indicate heterogeneous genetic patterns (8). Diagnosis relies on a combination of clinical findings, radiological imaging, and primarily histopathological evaluation, especially for immature or malignant variants (9). Imaging modalities such as ultrasound and MRI can suggest characteristic features like the Rokitansky protuberance, calcification, or fat–fluid levels, but cannot reliably differentiate benign from immature elements (10). Histopathological examination remains essential for accurate classification and detecting rare malignant transformations (11). Malignant transformation, although uncommon, is most often into squamous cell carcinoma and necessitates prompt recognition due to its poor prognosis (12). This study aims to analyze the spectrum of ovarian teratomas encountered at a tertiary care centre in North India, emphasizing the importance of detailed pathological study for correct diagnosis and management. The objectives of this study include classifying ovarian teratomas, documenting their gross and microscopic characteristics, evaluating associated complications, and identifying rare variants and malignant transformations (13). By correlating clinical data with pathological features, this study provides insights into the diagnostic challenges and management implications of ovarian teratomas in a resource-limited setting (14,15).

Materials and Methods:

This retrospective observational study was conducted in the Department of Pathology at Rama Medical College, Hospital and Research Centre, Hapur, India, covering the period from July 2024 to June 2025. A total of 64 cases of ovarian teratomas received in the pathology department were examined. All cases were included irrespective of age, clinical findings, laterality, or associated complications. Ethical approval was obtained prior to commencement of the study. Clinical details including age, presenting symptoms, ultrasound findings, and surgical procedure were collected from medical records. The specimens were received in 10% neutral buffered formalin and fixed for 24 hours. Gross examination included assessment of side, size, external surface, cystic or solid nature, presence of hair, sebaceous material, calcification, cartilage, bone, or teeth. The number of locules and presence of Rokitansky protuberance were also documented. Standard grossing protocols were followed, ensuring representative sampling from cyst wall, solid areas, and any suspicious nodules because immature or malignant components may be focal and easily overlooked (7). Tissue sections

were processed routinely and stained with hematoxylin and eosin (H&E). Additional special stains were used when required. Microscopic examination focused on identifying mature tissues such as squamous epithelium, adipose tissue, cartilage, bone, thyroid tissue, respiratory epithelium, and neural tissue (3). Immature teratomas were graded based on the quantity of immature neuroepithelium present in each slide, following WHO classification (4). Monodermal teratomas such as struma ovarii were identified when thyroid follicles composed the majority of tissue (5). For cases where malignant transformation was suspected, careful re-evaluation and additional sampling were performed. Squamous cell carcinoma arising within a mature teratoma was diagnosed based on atypical squamous epithelium infiltrating stroma (6). Clinical correlation was carried out using patient records. Patients ranged in age from 11 to 58 years. Presenting symptoms included abdominal pain, distension, palpable mass, menstrual irregularity, and in some cases, acute abdominal pain due to torsion. Ultrasound findings were reviewed for evidence of dermoid mesh, echogenic nodules, or solid areas. Although imaging is helpful, definitive diagnosis was based on pathological examination (10). All findings were documented in structured proformas. Data was analyzed descriptively. Frequencies and percentages were calculated. The primary outcomes assessed were distribution of teratoma subtypes, histopathological findings, complications, and incidence of malignant transformation. Secondary outcomes included correlation of clinical features with pathological types and identification of rare variants.

Results :

A total of 64 ovarian teratoma cases were analyzed. Mature cystic teratomas were the most common subtype, accounting for 89% of cases. Patients with mature cystic teratomas ranged from 14 to 52 years, with the highest incidence in the 20–40-year age group. Grossly, these tumors showed cystic cavities filled with sebaceous material and hair, with calcification or ossified structures present in 36% of cases. Histopathology confirmed the presence of squamous epithelium, adipose tissue, bone, cartilage, respiratory epithelium, and neural tissue in varying combinations. Immature teratomas accounted for 6% of cases and occurred predominantly in patients younger than 25 years. These tumors showed immature neuroepithelial rosettes and were graded accordingly. Monodermal teratomas, including struma ovarii, constituted 5% of the cases. Struma ovarii showed thyroid follicles filled with colloid, consistent with monodermal differentiation. Complications were identified in several cases. Ovarian torsion was the most frequent complication, occurring in 14% of cases, and was associated primarily with large cystic teratomas. Rupture was documented in 2 cases and led to chemical peritonitis. Malignant transformation was rare and reported in 1.5% of cases, presenting as squamous cell carcinoma arising within a mature cystic teratoma.

Discussion

This study confirms that ovarian teratomas are predominantly benign tumors, with mature cystic teratomas forming the majority, consistent with previous literature (1,3). Immature teratomas and monodermal variants were less common but clinically important due to their

diagnostic and therapeutic implications (5,6). Complications such as torsion were frequent because of the cystic and mobile nature of these tumors (4). Although malignant transformation is rare, its presence highlights the need for thorough sampling and histopathological assessment (12).

Conclusion:

This study provides a comprehensive pathological evaluation of ovarian teratomas at a tertiary care centre. Mature cystic teratomas were the most common subtype, while immature and monodermal variants were less frequently encountered. Complications such as torsion and rare malignant transformation underscore the need for accurate diagnosis. The study demonstrates that histopathology remains essential for identifying immature elements and malignancy. Improved grossing techniques, awareness of rare variants, and correlation with clinical findings can enhance diagnostic accuracy and patient outcomes.

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