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A rare case of malignant transformation: squamous cell carcinoma arising on the basis of an ovarian mature cystic teratoma

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Abstract

Background Ovarian mature cystic teratomas (MCTs) are the most prevalent benign ovarian tumors, with rare potential for malignant transformation, most commonly into squamous cell carcinoma. Accurate diagnosis is crucial for optimal management and prognosis.

Case presentation A 27-year-old woman presented with a year-long history of intermittent abdominal and groin pain. Imaging studies, including contrast-enhanced computed tomography (CT) and magnetic resonance imaging (MRI), revealed a mixed solid-cystic lesion in the left adnexal region, consistent with an MCT exhibiting radiologic signs of malignancy. The patient underwent unilateral salpingo-oophorectomy, and intraoperative frozen section analysis suggested a mature cystic teratoma. However, definitive histopathological examination confirmed squamous cell carcinoma arising from the MCT. This case highlights the limitations of frozen section analysis in detecting malignancy.

Conclusion Malignant transformation of MCTs, though rare, poses significant diagnostic and therapeutic challenges. Comprehensive preoperative imaging and meticulous postoperative histopathological evaluation are essential for accurate diagnosis and effective management. This case underscores the importance of interdisciplinary collaboration in addressing complex gynecologic pathologies.

Keywords Ovarian mature cystic teratoma, Squamous cell carcinoma, Malignant conversion, Ovarian tumours

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Introduction

Ovarian mature cystic teratomas (MCTs), colloquially known as ovarian dermoid cysts, are the most frequent benign ovarian tumours occurring in women in their second and third decades. MCTs constitute approximately 20% of benign ovarian neoplasms diagnosed during the postmenopausal period [1]. They represent 95% of all teratomas, approximately 70% of all germ cell tumours, and 10% of neoplasms originating from the ovaries [2]. Synchronous bilateral ovarian involvement is documented in about 10–15% of cases [3].

MCTs generally remain asymptomatic until they attain substantial size. The most common clinical manifestations are abdominal and groin pain, which result from the mass effect on adjacent tissues and organs. Potential

Fig. 1 The axial slice of the contrast-enhanced abdominopelvic CT (0.625 mm slice thickness) scan illustrates a significant lesion emanating from the left adnexal region extending to the abdominal midline. The lesion features an oval-shaped component characteristic of a mature cystic teratoma, evident by its fat-fluid levels (highlighted by the white arrow). Directly anterior to this, there is a lobulated and heterogeneous solid component (indicated by the white star), which is suggestive of malignant transformation

Fig. 2 The coronal plane of the contrast-enhanced abdominopelvic CT (0.625 mm slice thickness) scan reveals a complex lesion located in the abdominal cavity. An oval-shaped, fat-rich mature cystic teratoma is identifiable, marked with a white triangle. Notably, the teratoma contains calcifications, highlighted by a white arrow. Positioned superiorly, a component suggestive of malignant transformation is visible, indicated by a white star

complications include ovarian torsion, rupture, peritonitis, or infection [4].

Although rare, malignant transformations such as squamous cell carcinoma can emerge from the foundation of mature cystic teratomas (MCTs), often indicating a poor prognosis [1]. Early diagnosis of such malignant transformations is crucial to pre-empt complications like invasion and metastasis, utilizing diagnostic modalities including ultrasound (US), computed tomography (CT), and magnetic resonance imaging (MRI) [4, 5].

This study details a case involving squamous cell carcinoma that developed on the rare substrate of an ovarian mature cystic teratoma.

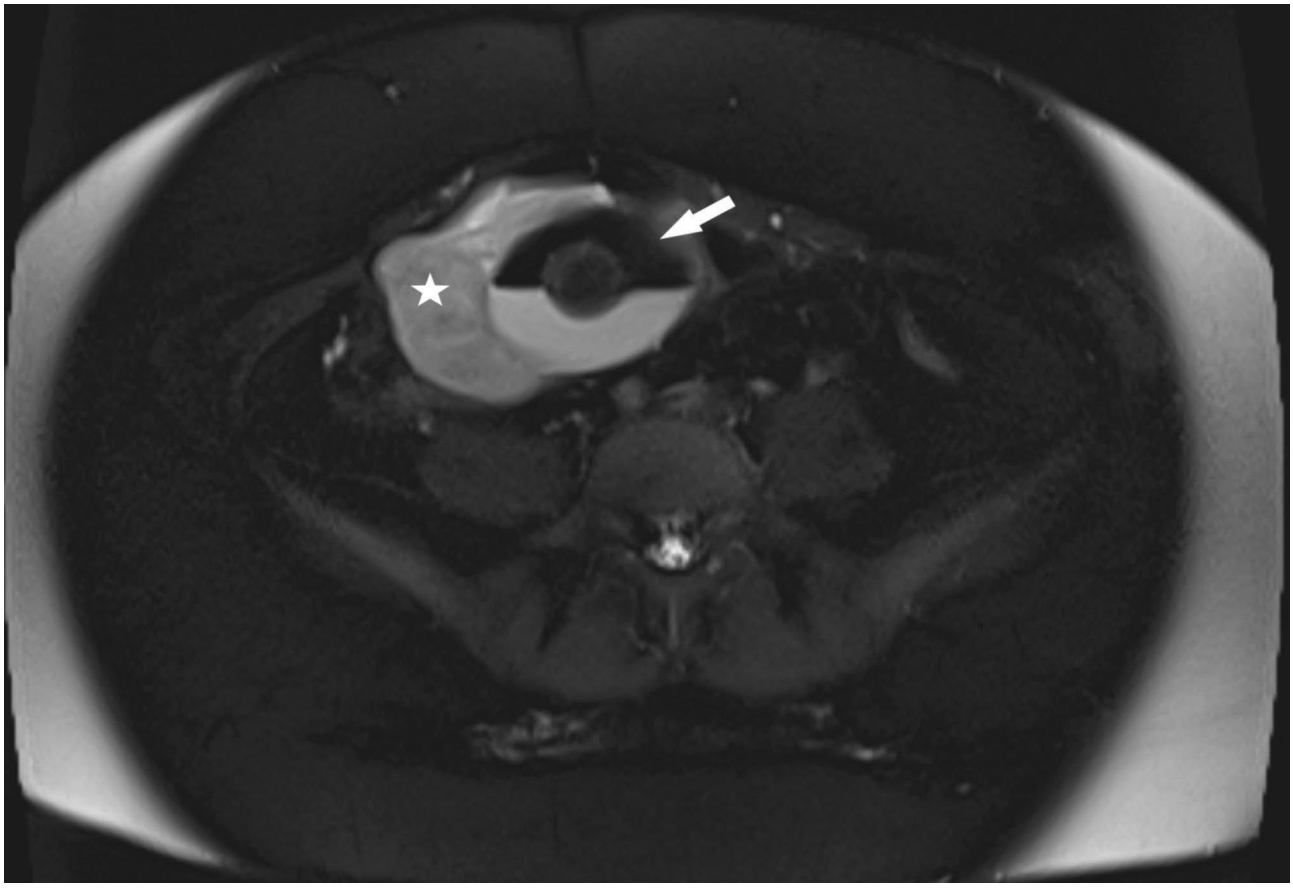

Fig. 3 T2-weighted fat-suppressed MRI image in the axial plane showcases a clearly defined, oval-shaped lesion consistent with a mature cystic teratoma, evident by the fat-fluid levels marked with a white arrow. Adjacent to this, on the right anterolateral aspect, lies a heterogeneous, hyperintense soft tissue component, indicated by a white star, suggestive of malignant transformation

Case report

A 27-year-old woman presented to our clinic reporting intermittent abdominal and groin pain persisting for a year. Patient had no known additional medical conditions and was not on any medication. Surgical history included a caesarean section. Laboratory evaluations revealed a mildly increased white blood cell count of 10,650 cells/mL. Hematocrit level and other biochemical parameters were within normal limits. Notably, tumor markers were elevated: carcinoembryonic antigen (CEA) at 7.04 µg/L, cancer antigen 19 – 9 (CA19-9) at 82.6 U/mL, and cancer antigen 125 (CA125) at 106 U/mL.

A contrast-enhanced abdominopelvic CT examination conducted on the patient showed a predominantly mixed solid-cystic lesion, approximately 13 × 11 × 9 cm in size, arising from the left adnexal loge and extending to the midline at the umbilical level. The lesion displayed fat-fluid levels and calcifications. Its anterosuperior part contained a solid component about 5.5 cm thick at its widest, with lobulated margins and a heterogeneous internal texture. This component blurred the interface with adjacent intestinal attachments and extended into the surrounding peritoneal fat (Figs. 1 and 2).

The patient underwent pelvic magnetic resonance imaging (MRI) to evaluate possible invasion into neighbouring tissues and organs. The MRI revealed a solid component with heterogeneous contrast enhancement and diffusion restriction, alongside areas demonstrating signal loss compatible with fat content and fat-fluid levels in T2 fat-suppressed sequences (Fig. 3). The lesion showed no clear evidence of invasive behaviour. Given the CT and MRI results, which were radiologically indicative of a mature cystic teratoma with malignant transformation, surgical intervention was scheduled.

Ovarian mass removed by unilateral salpingoophrectomy (Fig. 4). The ovarian mass evaluated by an experienced gynecopathologist during the operation, was reported as a mature cystic teratoma. The final histopathological examination revealed squamous cell carcinoma derived from the mature cystic teratoma. This unexpected outcome underscores the limitations of frozen section analysis in certain cases and the necessity for comprehensive tissue examination.

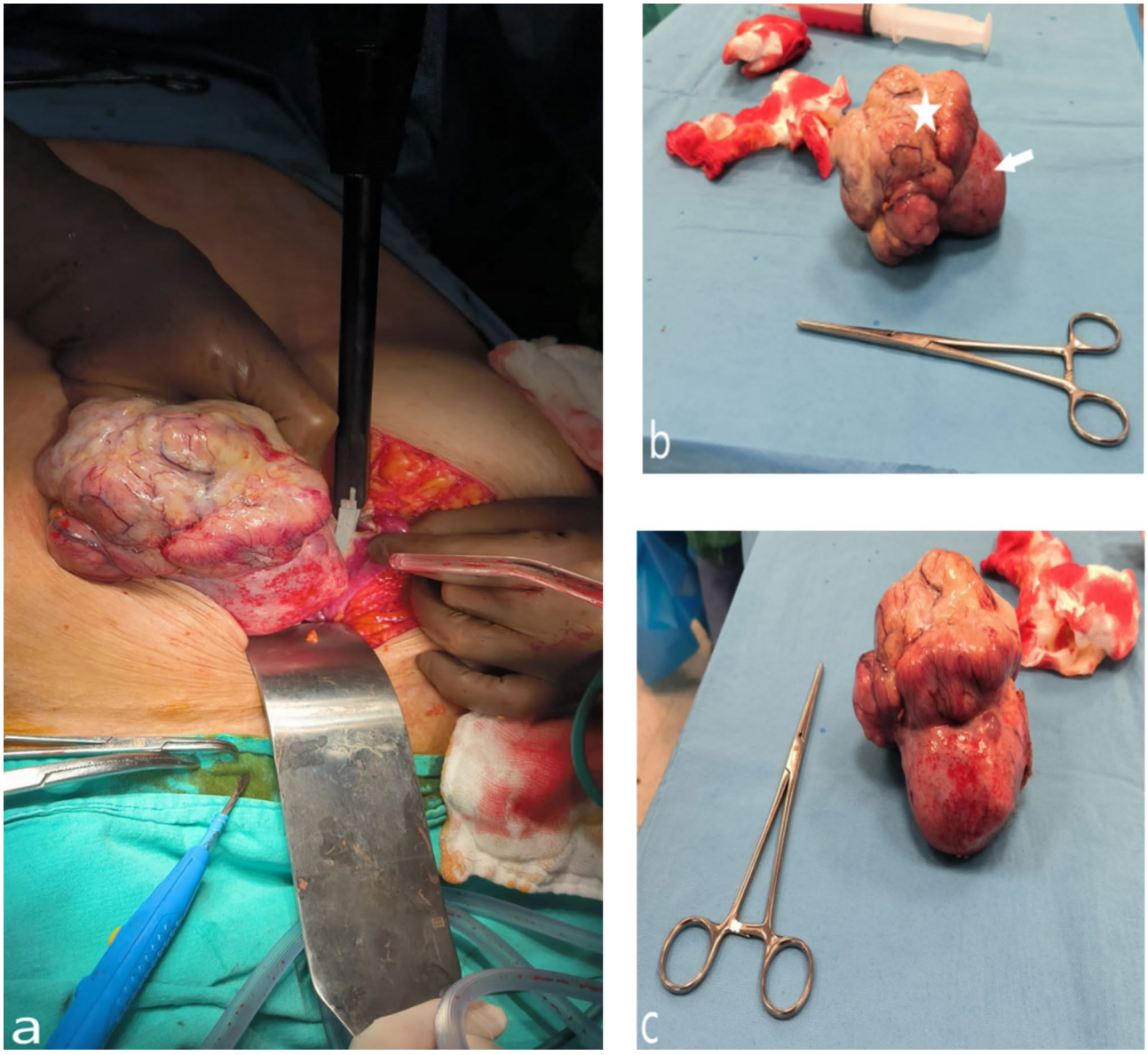

Fig. 4 Postoperative imaging of the lesion. The lesion features an oval-shaped component characteristic of a mature cystic teratoma (highlighted by the white arrow in figure **b**). Directly anterior to this, there is a lobulated and heterogeneous solid component (indicated by the white star in figure **b**), which is suggestive of malignant transformation

Discussion

Ovarian germ cell tumours (GCTs) are uncommon malignancies that derive from ovarian germ cells [4]. Among these, teratomas represent the most frequent germ cell tumour type, predominantly seen in younger women. Teratomas are classified into three histological variants: mature, immature, and monodermal teratomas (struma ovarii). The MCT subtype is the most common, accounting for 95% of teratomas and 10% of all ovarian germ cell tumours [3, 4].

MCTs are distinctly bounded, encapsulated cystic tumours that encompass components from at least two germinal layers—ectoderm, mesoderm, and endoderm—featuring diverse tissue and organ components like hair, skin, neural structures, fat, sebaceous glands, and teeth [4].

MCTs rarely demonstrate malignant transformation, with an incidence rate ranging from 1.5 to 2% [5, 6]. The predominant malignancy arising from such transformations is squamous cell carcinoma, comprising 80% of these cases, with other variations including adenocarcinoma, small cell carcinoma, malignant melanoma, and sarcoma [5, 6]. Studies have shown that these transformations typically occur in postmenopausal women, and the mean age at diagnosis is reported to be 53.5 years [5]. The most frequent manifestations in squamous cell

carcinoma cases originating from MCTs are abdominal pain (47.3%) and the presence of an abdominal mass (26.0%) [7].

In suspicious cases, preoperative radiologic evaluation plays a crucial role in anticipating malignant transformation and guiding surgical decision-making. Şahin et al. emphasized that tumor markers are not always correlated with tumor size [8]. This suggests that malignancy risk is not solely size-dependent but also related to specific imaging features. In our case, radiological findings were key to raising suspicion for malignant transformation and directing the surgical approach. These tumours may exhibit a complex architecture featuring both cystic and solid components, reflecting their diverse tissue and organ content. This variability appearance can sometimes pose diagnostic challenges. In line with this, Pelayo et al. emphasized that although most mature cystic teratomas and serous cystadenomas are correctly classified by ultrasound, certain features—especially the presence of solid components or acoustic shadows—may lead to misclassification, underlining the importance of expert interpretation in radiological evaluation [9]. Typically identified as fatty, hyperechoic lesions during routine ultrasound (US) screenings, MCTs may show characteristic but not definitive signs such as the dot-dash sign, indicative of internal hair, and the tip of the iceberg sign, related to posterior acoustic attenuation. Often, their similar appearance to complex haemorrhagic cysts necessitates further evaluation using cross-sectional imaging modalities like computed tomography (CT) and magnetic resonance imaging (MRI) [4]. These imaging techniques effectively visualize characteristics like fat-fluid levels, calcifications, and structural thickening. In cases like ours, CT findings of well-defined tumour margins, sizes over 10 cm, and cauliflower-like appearances might prompt concerns for malignant transformation. Moreover, MRI can accurately delineate the extent of a tumour's malignant component, invasion, and metastasis with high sensitivity [4].

The primary treatment for MCTs with malignant changes is surgical intervention. Research has demonstrated that combining total hysterectomy and bilateral salpingo-oophorectomy with neoadjuvant chemotherapy markedly enhances survival. Moreover, the study highlighted that lymphadenectomy and omentectomy lack verified effectiveness in decreasing mortality. Additionally, the research reported no observable difference in outcomes between fertility-preserving and radical surgical approaches, and there was no established efficacy for postoperative radiotherapy in enhancing treatment results [10].

Conclusion

Ovarian mature cystic teratomas are frequently occurring benign tumours that mainly impact young women. On occasion, these teratomas can malignantly transform, most commonly into squamous cell carcinoma, thereby elevating the risks of morbidity and mortality. Consequently, prompt diagnosis, diligent follow-up after treatment, and a comprehensive, interdisciplinary approach are essential in the management of these complications.

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Author contributions
Author Contributions: Furkan Özdem was responsible for the conception and design of the study, conducted the literature review, wrote the manuscript, and performed the critical review. Sümeyya Duran Kaymak contributed to the conception of the study, supervised the work, and participated in manuscript writing. Berna Turhan also contributed to the conception of the study, supervision, and manuscript writing. Similarly, Candost Hanedan played a role in the conception of the study, supervision, and manuscript writing. Sezgi Barlas and Özge Demirsoy contributed to the conception of the study and provided supervision. Rasime Pelin Kavak also contributed to the conception of the study and supervision.

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Data availability
No datasets were generated or analysed during the current study.

Declarations

Ethics approval and consent to participate
All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Consent for publication
The written informed consent was obtained from subjects and/or their legal guardians for publication.

Competing interests
The authors declare no competing interests.

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