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CASE REPORT

Ruptured Ovarian Mature Cystic Teratoma with Adenocarcinoma Transformation: A Case Report

Liping Xu, Jinxiao Jiang, Qingxia Geng, Yinmin Zhang

Department of Gynecology, Rizhao People's Hospital, Rizhao, Shandong Province, 276800, People's Republic of China

Correspondence: Yinmin Zhang, Department of Gynecology, Rizhao People's Hospital, Rizhao, Shandong Province, 276800, People's Republic of China, Tel +86 13806332079, Email 1158287283@qq.com

Purpose: Ovarian mature cystic teratoma (MCT) is the most common ovarian tumor, and only a small fraction undergoes malignant transformation. The most prevalent malignant type of the ovary is squamous cell carcinoma, followed by adenocarcinoma. However, ruptured ovarian mature cystic teratoma with adenocarcinoma transformation is extremely rare.

Case Presentation: A 75-year-old postmenopausal woman presented to the emergency room with abdominal pain following a CT examination, the patient was diagnosed with a ruptured ovarian MCT. Subsequently, surgery was performed. Finally, she was diagnosed with adenocarcinoma tumor originating from the MCT of the ovary based on histopathology and immunohistochemistry examination. Following six cycles of chemotherapy with carboplatin and paclitaxel, the patient underwent long-term follow-up, during which no recurrence was observed over 10 months of examinations.

Conclusion: The cases of ruptured cystic teratomas are rare, and ruptured cancerous transformation in MCT is infrequently documented in the literature. Therefore, special attention should be paid when encountering such cases in medical practice, as they can easily be misdiagnosed as benign ovarian tumors.

Keywords: mature cystic teratoma, malignant transformation, squamous cell carcinoma, adenocarcinoma

Introduction

Ovarian mature cystic teratoma (MCT) originates from germ cells with differentiation potential.[1] They are benign ovarian tumors that undergo malignant transformation in 1–2% of cases. The most common malignant ovarian tumor type is squamous cell carcinoma, followed by adenocarcinoma.[2] Ovarian MCT can be easily diagnosed using ultrasonography, CT, or MRI in uncomplicated cases. However, owing to nonspecific symptoms, preoperative diagnosis of cancerous transformation in MCTO is challenging. Most patients are diagnosed in advanced stages, where the treatment outcomes are typically poorer than those diagnosed in the middle or early stages. The diagnosis depends on postoperative pathology and immunohistochemistry, and no current unified treatment standard exists. Patients with early malignant transformation of the tumor often remain asymptomatic but may present symptoms such as abdominal pain, abdominal distension, or palpable abdominal masses. Case reports show that the average age of patients with malignant transformation is 51.3 years old. Therefore, for postmenopausal women who have teratoma, vigilance is necessary regarding the possibility of malignant transformation.[3] This study aims to report a case of ruptured ovarian MCT with adenocarcinoma transformation.

Case Presentation

In early 2023, a 75-year-old postmenopausal woman presented to the gynecology department of Rizhao People's Hospital, Shandong, China, with hypogastric pain persisting for the past 15 days. She did not report vaginal bleeding, constipation, urinary frequency, decreased appetite, or weight loss.

Gynecological examination revealed cervical atrophy, and large pelvic cavity mass with clear boundary and poor movement, accompanied by tenderness and rebound pain. Serum tumor marker levels were as follows: CA125, 93.8 U/

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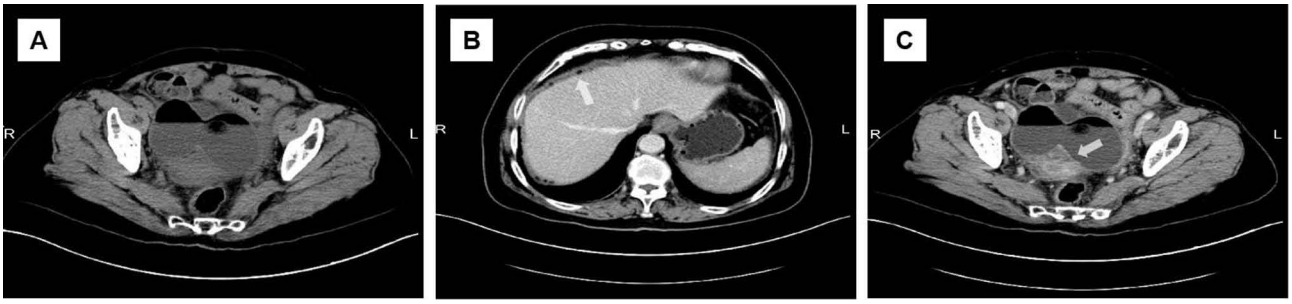

Figure 1 Enhanced abdominal CT examination results. (**A**) An irregular low-density pelvic lesion with visible lipid-fluid levels. (**B**) Unclear surrounding space with soft tissue density around the liver area (indicated by the arrow). (**C**) Contrast-enhanced CT shows obvious enhancement at the edge (indicated by the arrow).

mL (normal range < 35.0). An abdominal ultrasound revealed a heterogeneous mass measuring 12.5 cm * 6.3 cm * 8.6 cm with multiple cystic components and papillary protrusion in the pelvic cavity. Abdominal and pelvic contrast-enhanced CT confirmed a 15×8 cm mass in the right ovary, showing contrast uptake and ascites, along with multiple round intraperitoneal fatty density lesions (Figure 1). The diagnosis of ruptured ovarian teratoma was confirmed, and a emergency exploratory laparotomy was performed. During the surgery, the peritoneal cavity was opened, revealing a moderate amount of peritoneal material and numerous hair follicles. A mass originating from the right ovary, approximately 15×18 cm in size could be seen, and a rupture was visible on the surface. The cyst contained multiple well-defined round lesions with fatty content and matted hair while its surface is smooth. No abnormal lesions were found on the surface of the uterus, the left adnexa, the omentum, the peritoneum abdominalis, and the bowel. The intraoperative frozen section specimen after bilateral adnexectomy showed cystic teratoma with heteroplastic hyperplasia of glandular epithelium and caryokinesis. Based on postoperative histopathological analysis and immunohistochemistry results (Figure 2), surgery revealed a rare occurrence: a malignancy arise within a mature cystic teratoma after colonoscopy did not show any abnormality. Then the patient underwent a total abdominal hysterectomy, omentectomy, and pelvic and paraaortic lymphadenectomy. The uterus, omentum majus, and lymph nodes were found free of

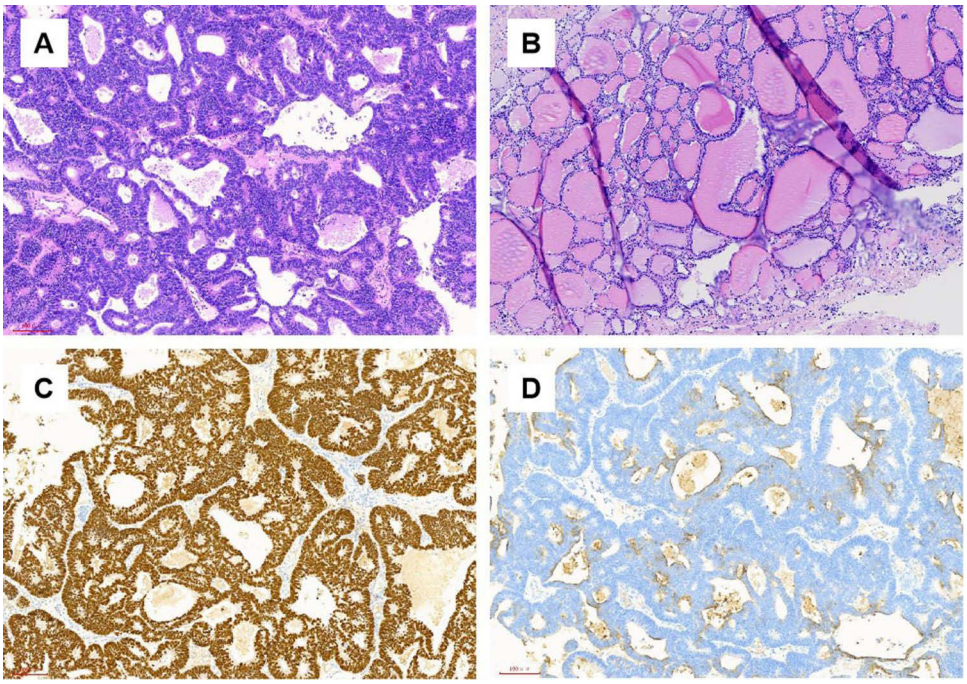

Figure 2 (**A**) The tumor cells arranged in glandular tubes with increased nucleus: cytoplasmic ratio and cellular atypia. (**B**) Cystic teratoma with mature areas showing mature thyroid tissue. (C&D) Positive expression of CDX2 and CK20. (**A**) HE × 100, (**B**) HE × 100, (**C**) IHC × 100, (**D**) IHC × 100).

malignancy. The patient was diagnosed with stage IC according to the 2014 FIGO classification. After second surgery, the patient underwent six cycles of chemotherapy with carboplatin and paclitaxel were performed. Our follow-up plan included physical examination and abdominal ultrasonography every 3 months, along with an abdominal and pelvic CT scan every 6 months. Following these, she experienced an uneventful clinical course, and no abnormalities were observed during 10 months of follow-up examinations.

Discussion

Malignant transformation in ovarian MCT is rare. Currently, the mechanism of malignant transformation in teratoma remains unclear. Some studies indicate that high-risk HPV infection may contribute to the malignant transformation of mature teratomas into squamous cell carcinoma.[4] Mutations in KRAS and wild-type BRAF genes can cause teratoma to undergo malignant transformation into adenocarcinoma.[5] Adenocarcinomas within MCT often originate from gastrointestinal or respiratory epithelium and commonly exhibit TP53 mutations.[6] After the first surgery, we performed a colonoscopy to rule out metastatic cancer. Risk factors for malignant transformation also include a family history of ovarian cancer and a history of smoking.[7] However, clinical symptoms in patients at the early stage often remain asymptomatic. Here, our patient indicated abdominal pain. While typically asymptomatic, benign tumors may cause pelvic pain if complicated by torsion or rupture. According to previous study findings, the average age of patients with malignant transformation is 55.0 ± 14.4 years old,[8] and the mean tumor volume was 14.8 cm.[9] Older age and larger tumor volume indicate a higher risk of malignancy. The patient was also a postmenopausal woman with a large mass size. The preoperative examination makes it challenging to evaluate tumor malignancy. However, when tumors rupture, especially with abdominal fluid accumulation and fatty density nodules visible on CT or MRI, they are often mistaken for mature cystic teratoma. To examine the utility of CA125, CA199, or neutrophil-to-lymphocyte ratio as effective diagnostic makers for mature cystic teratoma with malignant transformation, elevation in serum Ca125 and scc Ag levels can serve as indicators to predict transformation into squamous cell carcinoma. Among patients exhibiting elevated tumor markers, the 5-year survival rate was 13.9%, compared to 100 among those within the normal range.[8] According to Huijun Chen, 44.44% of patients with malignant MCTs experienced abdominal pain.[10] However, in cases of twisted or ruptured MCTs, abdominal pain is the primary symptom, and there is concern regarding CA125 and CA199 levels. Particularly when ultrasound or CT reveals ascites, ruptured MCTs are typically considered, even with slight elevations in CA125 or CA199. In this case study, the patient with abdominal pain exhibited an elevated CA125 level, and ascites were observed. The clinical use of CT for preoperative diagnosis of malignancy, especially adenocarcinoma arising from an MCT in the ovary, remains unclear.

No comprehensive treatment plan exists for patients with malignancy of MCT. For patients desiring pregnancy and diagnosed with stage IA disease, comprehensive surgical staging, and examination of the contralateral ovary are recommended. Due to the rarity of such neoplasms, the ideal plan of action for their management is still unclear.

After comprehensive surgical staging, patients with stage IA disease can undergo conservative treatment, while those with advanced-stage disease should undergo optimal cytoreductive surgery to improve survival outcomes.[2,6] Cytoreductive debulking surgery with adjuvant chemotherapy is the main stay of treatment. Hackethal et al discovered that the survival rate of patients with stage IA disease is higher than that of patients in the advanced stage. For patients in the advanced stage who undergo optimal cytoreductive surgery, postoperative alkylating drugs can improve survival rates. However, no correlation is observed with radiotherapy. The overall survival time for operations combined with chemotherapy is 57.1 months, and that of noncombined chemotherapy is 25.2 months.[6] Chen et al analyzed 188 cases with surgical staging and reported an overall 5-year survival rate of 48.4% for all stages. The 5-year survival rates for each stage were as follows: stage I: 75.7%, stage II: 33.8%, stage III: 20.6%, and stage IV: 0%.[7] The prognosis of patients correlates with tumor type, volume, tumor marker level, and pathological stage. Predictors of poor prognosis include age > 45 years, tumor progression, increased size, high-grade tumor type, absence of total hysterectomy, residual tumor lesion, and lack of chemotherapy.[2] Systematic studies show that platinum-based chemotherapy following surgery can enhance the survival rate of patients with malignant transformation.[8] Currently, the optimal adjuvant chemotherapy for advanced-stage disease remains unestablished. Commonly used adjuvant chemotherapy regimens include taxane and platinum-based treatments.[11] Patients with malignant adenocarcinoma and peritoneal dissemination may undergo

treatment with hyperthermic intraperitoneal chemotherapy.[12] Furthermore, Shimada suggests that early administration of bevacizumab post-surgery may delay disease progression.[13] In recent years, tumor immune checkpoint inhibitors such as Pembrolizumab,[14] Nivolumab,[15] Sintilimab,[16] and Camrelizumab[17] have been utilized in clinical practice, proving effective for patients with malignant recurrence. In our case report, the patient with IC-stage disease underwent six cycles of chemotherapy with carboplatin and paclitaxel after surgery. Currently, complete remission has been achieved. However, owing to the short follow-up time, there is insufficient evidence to predict the prognosis.

Conclusion

In conclusion, ovarian MCTs with adenocarcinoma transformation is a rare condition associated with a poor prognosis. Due to the low incidence of malignant transformation of MCT and the absence of clinical diagnostic criteria, symptoms such as abdominal pain and ascites can lead to confusion with benign ovarian tumor twists or ruptures. Currently, no reports exist regarding transforming MCT into adenocarcinoma rupture. Therefore, awareness of this possibility is crucial, and further exploration is warranted in clinical practice.

Abbreviation

MCT, mature cystic teratoma.

Ethical Statement

All procedures of the research conformed to the Declaration of Helsinki and the Institutional and/or National Research Council ethical standards. Written informed consent was obtained from the patient for publication of this case report and the accompanying images. Writing and publishing this case report was approved by Rizhao People's Hospital.

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Author Contributions

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

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Disclosure

The author(s) report no conflicts of interest in this work.

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