

Chemical Peritonitis Due to Ruptured Ovarian Teratoma: A Case Report and Literature Review

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Abstract

Introduction: Mature cystic teratomas (MCT) are the most common ovarian tumors in pediatric patients, often asymptomatic due to slow growth, when symptomatic, they can lead to abdominal pain. Spontaneous rupture can result in acute chemical peritonitis (CP), a rare but life-threatening complication. This study presents a clinical case of a patient with spontaneous rupture of an ovarian teratoma and associated acute CP.

Clinical Case: 13-year-old female presented with acute abdominal pain, fever, distended and painful abdomen with peritoneal reaction in the right iliac fossa and hypogastrium. Abdominal ultrasound showed a hypoechoic rounded image with an anechoic center in the right adnexal region. Laparoscopic exploration revealed a cystic teratoma of the right ovary with torsion, but no compromise of vitality. Purulent fluid indicated CP due to ruptured and twisted ovarian teratoma. Right ovarian cystectomy was performed, drainage was offered in the Douglas pouch. The patient's condition improved, and she was discharged after recovery.

Discussion: Rupture and CP are rare but require emergency surgery. Preoperative diagnosis can be challenging due to their non-specific clinical presentation and the need to rule out malignant complications.

Conclusion: Early and appropriate management of MCT is essential to prevent serious complications. Sebum spillage can cause CP, the treatment of choice is teratoma removal, combined with extensive lavage to avoid chronic peritonitis. Laparoscopic surgery stands out as a safe and effective option. A high index of suspicion and comprehensive approach are emphasized in managing this uncommon condition in the pediatric population.

Keywords: Mature cystic teratomas (MCT), Ovarian teratoma, Chemical peritonitis.

Level of Evidence: Grade IV.

Abbreviations

Alpha-fetoprotein (AFP)

Beta-human chorionic gonadotropin (B-Hcg)

Cancer antigen 125 (CA-125)

Germ cell tumors (GCTs)

Chemical peritonitis (CP)

Mature cystic teratoma (MCT)

Ovarian germ cell tumors (OGCTs)

Highlights

- Mature cystic teratomas are the most common ovarian tumors in children, with recognized complications such as acute chemical peritonitis.
- This case report highlights the significance of accurate diagnosis and surgical management in a unique pediatric patient presentation. No prior cases in pediatric patients have been reported.

Introduction

Germ cell tumors (GCTs) are the most frequent ovarian tumors in the pediatric age group. Mature cystic teratoma (MCT), also known as dermoid cyst, accounts for approximately 95% of all ovarian GCTs [1-5]. It is composed of well-differentiated derivatives of at least two of the three germ cell layers [6]. While they may be asymptomatic due to their slow growth, abdominal pain is the most common symptom when they present. Their clinical presentation varies and can manifest as mass effect compression or complications such as torsion, infection, or malignant transformation. Rupture of the tumor leads to the release of irritating chemical substances into the abdominal cavity, resulting in severe inflammation of the peritoneum, known as chemical peritonitis (CP). This is a potentially life-threatening complication that requires urgent medical attention. This study reports the case of a 13-year-old patient with spontaneous rupture of a GCT and associated acute CP. No previous cases have been reported in pediatric patients.

Clinical Case

A 13-year-old female patient presented with sudden-onset severe abdominal pain rated 8/10, accompanied by fever for 36 hours. Upon inquiry, she reported dysuria and foul-smelling vaginal discharge. Her gynecological history included menarche at 12 years, irregular cycles, dysmenorrhea, and menstruation two days before the consultation. Physical examination revealed afebrile, tachycardic with a distressed facies, distended and painful abdomen, defense predominant in the right iliac fossa and hypogastrium, and peritoneal reaction. Complementary studies showed irregular air distribution and hydroaerial levels in the right iliac fossa on abdominal X-ray (Fig. 1.), and abdominal ultrasound revealed a 7x6 cm hypoechoic rounded image with an anechoic center in the right adnexal region, associated with particulate-free fluid in the right iliac fossa. Laboratory tests showed a white blood cell count of $12,300 \times 10^3 / \mu\text{L}$, CRP of 16 mg/dL, and tumor markers: B-Hcg: 4.5 mIU/mL, Alpha-fetoprotein (AFP): 1.4 ng/mL, CA-125: 46 U/mL (reference range: 0 to 35). Exploratory laparoscopy was performed, revealing purulent fluid with scattered debris consistent with sebaceous material, omentum adhered to the small intestine and parietal peritoneum in the hypogastrium. Blunt maneuvers unblocked the mentioned abscess, revealing a cystic tumor measuring 9x7 cm originating from the right ovary, with torsion but no compromise of vitality (Fig. 2.).

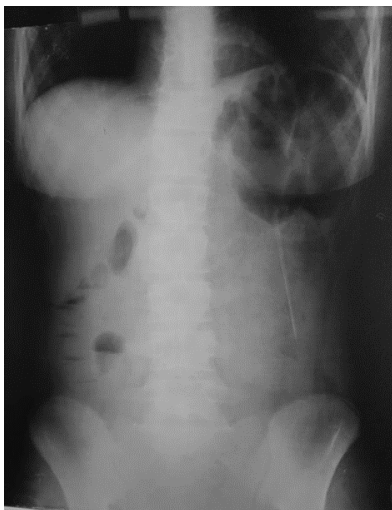


Figure 1. Abdominal X-ray: irregular air distribution and hydroaerial levels in the right iliac fossa.



Figure 2. Cystic tumor measuring 9x7 cm originating from the right ovary, with torsion but no compromise of vitality.

The left ovary showed no macroscopic alterations. Laparoscopic approach involved unraveling the small intestine to the Treitz angle, revealing loose adhesions, fibrin, parietal edema, and interasal abscesses. Puncture of the right ovarian cyst resulted in the evacuation of abundant sebaceous purulent fluid and pilose material. (Fig. 3) The diagnostic presumption of an ovarian teratoma led to performing right ovarian cystectomy, which revealed a firmly adhered ovarian capsule without a cleavage plane with ovarian parenchyma, necessitating a partial right oophorectomy that included the entire described lesion. Concurrently, exploration revealed a retrocecal appendix with a phlegmonous distal end, leading to an appendectomy. The procedure concluded with extensive abdominal lavage and the placement of drainage in the Douglas pouch. The patient maintained the drainage for 7 days, regained intestinal transit after 3 days, and experienced fever spikes with isolation of Methicillin-sensitive *Staphylococcus aureus* in the peritoneal fluid culture, resulting in two weeks of treatment with Piperacillin-tazobactam and vancomycin. The patient was discharged after completion of antibiotic treatment. In the distant postoperative period, she remained clinically asymptomatic, and an ultrasound at four months postoperatively showed no pathological findings. The histopathological report revealed: "Mature solid-cystic ovarian teratoma, with identification of mature neural tissue, muscle, cartilage, respiratory tissue, and skin. (fig. 4) Acute inflammatory involvement of the appendicular wall. Peritoneal fluid cytology showed no atypical squamous epithelial cells.

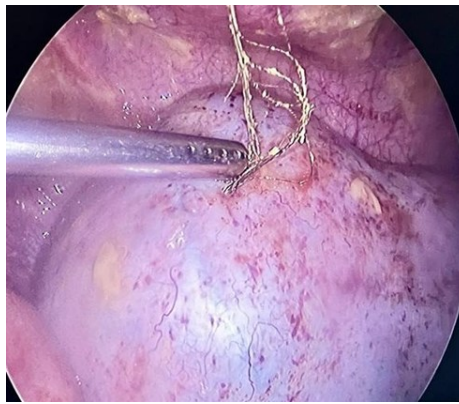


Figure 3. Puncture abundant sebaceous purulent fluid and pilose material.

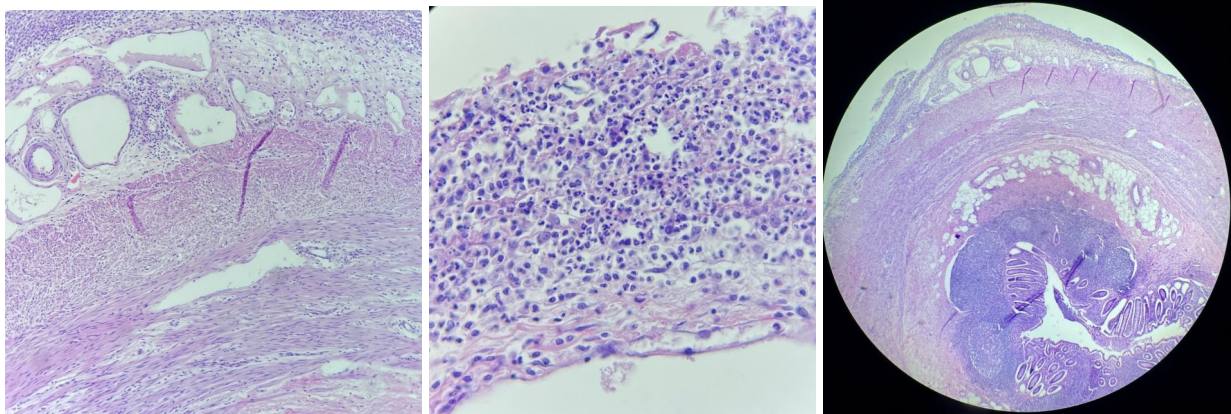


Figure 4. Mature solid-cystic ovarian teratoma, with identification of mature neural tissue, muscle, cartilage, respiratory tissue, and skin. (A) (B) (C)

Discussion

GCTs represent the most frequent ovarian tumors in the pediatric age group. MCT comprises approximately 95% of all ovarian GCTs and 30 to 40% of all ovarian tumors [7-8]. Benign ovarian teratomas are bilateral in 10% to 15% of cases [9]. They are composed of well-differentiated derivatives of at least two of the three germ cell layers, with the constant presence of ectodermal tissue [10]. Macroscopically, they present a thin wall composed of stratified squamous epithelium with underlying sebaceous glands, hair shafts, and other structures from cutaneous appendages. In most cases, structures from other germ cell layers are identified, such as cartilage, bone, and thyroid tissue [9].

Due to their slow growth, they can be asymptomatic and incidentally found, but they can reach considerable size before clinical manifestation. The most frequent symptom is abdominal pain due to mass effect or associated complications [11-12]. Acute presentation accounts for 10% of cases and is caused by complications such as torsion, infection, bleeding, or malignant transformation. Approximately 1% undergo malignant transformation of any of the components [13-14]. Spontaneous rupture is a rare complication, with an estimated incidence of 0.3% to 2.5%. The extravasation of sebaceous content into the abdominal cavity irritates the peritoneum and may lead to CP, reported in less than 1% of cases in the adult population [15,16].

From an imaging perspective, a simple abdominal X-ray may show calcifications, which, although frequent, can also be observed in other ovarian neoplasms. Pathognomonic ultrasound findings of ovarian teratoma include the presence of intratumoral fat, which is present in 90% of cases. It is common to visualize a cystic mass with a densely echogenic protuberance, known as a Rokitansky nodule, which often contains teeth, hair, bone, or sebaceous components. Other sonographic signs include the "tip of the iceberg sign," where only a part of the lesion is visible due to posterior acoustic shadowing, and the "dot-and-dash sign," where multiple thin echogenic bands are observed due to pilosebaceous material.

Nuclear magnetic resonance (MRI) is considered the choice for in-depth study of ovarian tumor masses because it can evaluate both tumor characteristics and extension. In MRI, the fatty component appears as a hyperintense signal in T1-weighted and fat-suppression sequences. On the other hand, teratomas may contain cystic areas, which are visualized as regions of low signal intensity in T1 and high intensity in T2 sequences. Solid areas containing tissues such as bone, cartilage, or nervous tissue are visualized with different signal intensities. A characteristic finding of ovarian teratomas is the presence of teeth or bone, which appear as hypointense areas in T1 and T2 sequences [10,17].

AFP is a tumor marker that is usually elevated in immature teratomas. Its utility has been demonstrated in the preoperative stage, as it allows differentiating between mature and immature teratomas, and also in subsequent follow-up to assess the possibility of recurrence. However, it is important to note that the presence of these tumor markers is not exclusive to ovarian teratomas and can also be elevated in other types of tumors. In most cases, ovarian teratomas are benign and not associated with elevated levels of tumor markers in the blood. Therefore, the determination of AFP is mainly performed in situations suspicious of malignancy and is part of the comprehensive evaluation of the patient, along with imaging and histopathological evaluation.

CA-125 can provide clues to the etiological diagnosis since it is a tumor marker commonly associated with epithelial ovarian tumors, and in the case of germ cell tumors, it is associated with malignant components such as embryonic carcinoma or choriocarcinoma. However, its levels can also be elevated in other benign conditions, such as endometriosis, pelvic inflammatory diseases, or even during the menstrual cycle. As such, it is not used as a single test for the diagnosis of ovarian cancer.

The definitive diagnosis is given by biopsy or surgery. The treatment of mature teratoma consists of complete surgical resection with low risk of recurrence [18]. Conservative surgery is a safe and effective option in the treatment of mature ovarian teratomas in children, as it allows preserving the uninvolved ovarian parenchyma and future fertility. Although laparoscopic approach may present a higher risk of rupture and spillage of teratoma contents, these events do not entail risks of postoperative complications in the hands of trained surgeons [19]. Currently, it is the most accepted approach due to its cosmetic benefits, better visualization, shorter hospital stay, and improved postoperative pain tolerance [20,21]. CP resulting from the spillage of sebum into the peritoneal cavity is a rare complication with an incidence of 1% reported in the adult population if the cyst content is carefully and completely removed [16]. However, with incomplete removal, the incidence of CP is likely much higher [22]. In a literature review combining reports of 470 laparoscopic cystectomies, spillage occurred in 310 cases (66%), and major postoperative complications were observed in only 1 case, with chronic granulomatous peritonitis.

Spontaneous rupture of a mature teratoma with spillage of sebaceous material into the abdominal cavity is uncommon, with an incidence of 0.3% to 0.7% due to the presence of a thick capsule [23]. There is a direct correlation between the size of the ovarian cyst and the risk of rupture, as 80% of the ruptured ovarian cysts had a size above 6 cm [24]. The rupture may lead to shock and bleeding as immediate consequences. A marked granulomatous reaction (CP) may develop subsequently, leading to the formation of dense adhesions and chronic pain.

For these reasons, emergency surgery is suggested if teratoma rupture is suspected [25]. The surgical intervention includes cystectomy and aspiration of the spilled ovarian cyst contents. Instillation of abundant warm saline solution and changes in the patient's position (alternating between Trendelenburg and the inverted position) mobilize the fatty material toward the surface, allowing aspiration to remove any residual debris [26].

When the release of sebum occurs insidiously and progressively, it causes an inflammatory response, leading to the formation of granulomas in the peritoneal cavity, which may resemble peritoneal carcinomatosis, known as chronic CP [27]. In pediatric patients with an unexpected finding of peritoneal implants, histological diagnosis is recommended before proceeding with complete oncological ovarian resection [28]. The management of granulomatous CP generally involves pain and inflammation control with medications. The preoperative diagnosis may be challenging, and among complementary studies, a suggestive finding is the presence of ascitic fluid with a fatty component and fatty implants on CT [29-32]. However, a high index of suspicion is required to make an accurate preoperative diagnosis.

Conclusions

Mature cystic teratomas (MCTs) are a frequent entity among ovarian tumors in the pediatric population. The preoperative diagnosis of ovarian teratoma is complex since a large majority of cases are asymptomatic, and ultrasound is the complementary study of choice. Despite their generally benign nature, spontaneous rupture of these tumors can lead to acute CP, an infrequent but potentially fatal complication. The release of sebaceous content into the abdominal cavity causes a severe inflammatory reaction of the peritoneum, leading to acute clinical manifestations that require urgent surgical intervention.

This clinical case presentation highlights the importance of accurate diagnosis and appropriate treatment to provide effective patient recovery and avoid long-term complications. Timely and careful surgical management, with emphasis on the complete removal of spilled ovarian cyst content, is essential to prevent chronic CP and its adverse consequences. A high index of suspicion is fundamental to establishing an accurate preoperative diagnosis and guiding the therapeutic approach. Laparoscopic surgery is positioned as a safe and effective option in the treatment of these tumors.

The presentation of this clinical case and the literature review highlight the importance of a comprehensive approach to MCTs and their potential associated complications, providing a basis for future research and improvements in the clinical management of this condition. The knowledge of this uncommon yet significant pathology contributes to advancements in surgical approaches, leading to improved clinical outcomes for pediatric patients affected by these ovarian tumors.

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Conflict of Interest

The authors have indicated they have no potential conflicts of interest to disclose.

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