

Malignant Struma Ovarii Requiring Emergency Surgery for Acute Abdomen: A Case Report and Literature Review

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Abstract

Malignant struma ovarii is an extremely rare tumor, accounting for $\leq 0.1\%$ of all mature cystic teratomas and 0.01% of all ovarian tumors. We herein describe a case involving a patient who underwent emergency surgery for suspected torsion of a mature cystic teratoma that was later diagnosed as malignant struma ovarii. A 23-year-old woman was brought to our hospital with the main complaint of acute lower abdominal pain. Computed tomography revealed a 10-cm-diameter right ovarian tumor with findings suggestive of a mature cystic teratoma. Based on the computed tomography and clinical findings, torsion of the ovarian tumor was suspected; therefore, emergency laparoscopic-assisted surgery was performed. On histopathological examination, the tumor was composed of cells with clear basophilic cytoplasm and a round nucleus. The cells were organized in thyroid follicle-like structures or funicular and solid honeycomb structures, and they exhibited slight nuclear atypia, proliferation, and vascular invasion. The tumor was diagnosed as malignant struma ovarii, and additional surgical resection of the right adnexa with partial omentectomy by laparotomy was performed on a later date. No malignant cells were found in the subsequently resected tissues, and cytologic examination of the ascitic fluid was negative. Because no residual tumor was found, the patient was followed up at the outpatient clinic without additional treatment. No signs of recurrence had been detected at the time of this writing. We herein present this case along with a literature review.

Keywords: Malignant struma ovarii; Emergency operation; Diagnosis; Preservation of fertility

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Introduction

Malignant struma ovarii is an ovarian tumor histologically composed of thyroid tissue that occupies $\geq 50\%$ of the tumor, with nuclear atypia of the constituent cells and evidence of vascular invasion. It is a very rare ovarian tumor, accounting for $\leq 0.1\%$ of all mature cystic teratomas and 0.01% of all ovarian tumors. Most signs and symptoms of this tumor are nonspecific and include lower abdominal pain and a lower abdominal mass. Thus, struma ovarii is often found incidentally during surgery or as a cause of acute abdomen. Sufficient evidence regarding the optimal treatment of malignant struma ovarii has not been obtained because of the scarcity of cases. In particular, only a few reports have addressed the treatment policy that must be

adopted to preserve fertility while reducing the risk of recurrence in patients with this tumor. Given this paucity of data, the impact of malignant struma ovarii on life expectancy remains controversial, and its optimal management is currently debated [1-4]. Most authors advocate for aggressive treatment involving local surgery followed by total thyroidectomy, radioactive iodine ablation, and thyroid hormone-suppressive therapy regardless of the presence of distant metastases at the time of diagnosis [5-9]. We encountered a patient who underwent emergency surgery (laparotomic tumorectomy) for suspected torsion of an ovarian tumor that was later histopathologically diagnosed as malignant struma ovarii. We herein present this case along with a literature review.

Case Report

A 23-year-old woman (nullipara, nulligravida) was brought to our hospital by ambulance because of acute lower abdominal pain that had developed several days previously. Although she had been diagnosed with an ovarian tumor by a local doctor, she had received no specific treatment. She had no remarkable medical or family history.

On admission, pelvic examination revealed an increase in the size of the right adnexa, with marked tenderness on pressure. No abnormalities were found in the uterus or left adnexa. Ultrasonography showed a right ovarian mass measuring 10 cm in diameter. Laboratory examinations, including blood counts and biochemical tests, revealed no significant abnormalities with the exception of an elevated serum C-reactive protein concentration of 8.71 mg/dl. Urgent contrast-enhanced computed tomography showed a tumor measuring 10 cm in diameter in the right ovary. The tumor consisted of a cystic component containing fatty material coexisting with a solid component, and it showed strong contrast enhancement suggestive of bleeding. Based on these findings, torsion of a mature cystic teratoma was suspected (**Figure 1**), and emergency laparoscopic-assisted tumorectomy was carried out.

During surgery, a 10-cm-diameter right ovarian tumor with a smooth surface was observed; however, there no torsion, adhesion, or ascites was present. A well-developed atypical vessel inside the tumor was damaged during the surgery, resulting in heavy bleeding. Therefore, the surgical procedure was converted to laparotomy and the tumor was resected. The intraoperative blood loss volume was 640 ml. The tumor contained some fatty material and hair, but for the most part, it was solid with some atypical vessels (**Figure 2**). The patient's postoperative course was favorable, and she was discharged 7 days after the surgery.

On histopathological examination, the resected tumor was lined by epidermoid stratified squamous epithelium and contained glial and cartilage tissues in the cystic part. The solid part was mostly composed of proliferative cells with clear basophilic cytoplasm that were organized into thyroid follicle-like structures (**Figure 3**). In some areas, the cells formed funicular and solid honeycomb structures. The cells were relatively uniform in size and shape, but they showed an increased nuclear/cytoplasmic ratio; nuclear atypia and evidence of vascular invasion were also found (**Figure 4**). Immunohistochemical tests showed positive results for anti-thyroid transcription factor 1 antibody and anti-thyroglobulin antibody, which are thyroid follicle epithelium markers (**Figure 5**). Based on these histopathological findings, the tumor was diagnosed as malignant struma ovarii containing a poorly differentiated carcinoma component.

Considering the patient's age, preservation of fertility was attempted. Resection of the adnexa only on the affected side and partial omentectomy were performed at a later date as an additional surgery. At the time of the additional surgery, cytologic examination of the peritoneal washings showed negative results, and the resected tissues showed no evidence of malignancy. The patient showed a favorable postoperative

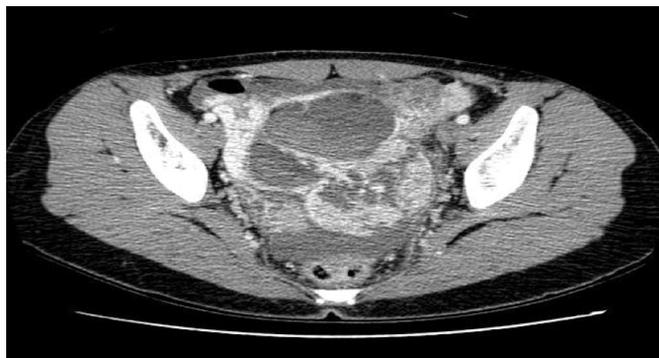


Figure 1 Transverse computed tomography section. The section shows a 10-cm well-defined complex lesion with solid and cystic components in the pelvis, extending on either side of the midline and reaching to both sides of the adnexa. No obvious lymph nodes or signs of metastasis are present.



Figure 2 Macroscopic findings. A 7-cm nodule of malignant struma ovarii in the wall of a 10-cm dermoid cyst.

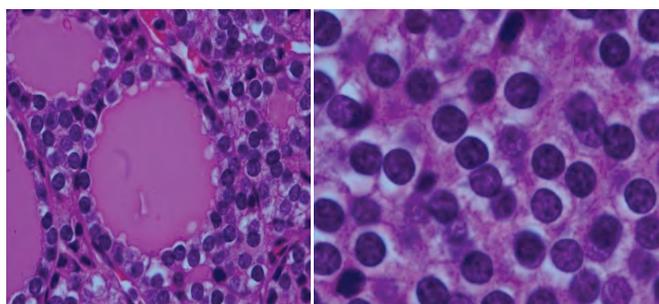


Figure 3 Low-power (200x) and high-power (400x) hematoxylin- and eosin-stained sections. (A) Low-power hematoxylin- and eosin-stained section demonstrates a thyroid follicle pattern. (B) High-power hematoxylin- and eosin-stained section demonstrates nuclear features including nuclear grooves, clear overlapping, and enlargement.

course and was discharged 7 days postoperatively. We explained to the patient and her family that she had a very rare tumor for which there was no established treatment and that a favorable prognosis could be expectable with I131 radiation therapy even if the disease recurred. In deference to the wishes of the patient

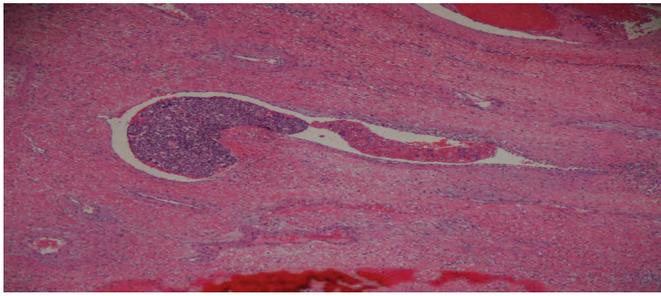


Figure 4 Vascular invasion in follicular adenocarcinoma (100x).

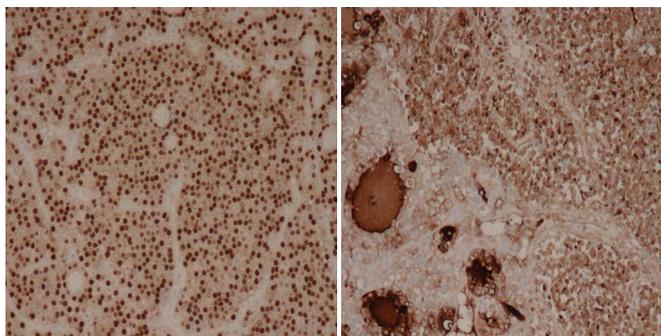


Figure 5 Immunohistochemical sections. Immunohistochemical tests showed positive results for (A) anti-thyroid transcription factor 1 antibody (250x) and (B) anti-thyroglobulin antibody (250x).

and her family, the patient was followed at our outpatient clinic without radiation therapy because of concerns regarding the risk of infertility with such therapy. At the time of this writing (12 months after the initial emergency surgery), the patient was still being followed up and had shown no signs of tumor recurrence.

Discussion

Malignant struma ovarii is an ovarian germ cell tumor classified as a teratoma. It is a very rare tumor, accounting for $\leq 0.1\%$ of all mature cystic teratomas and 0.01% of all ovarian tumors [9-13]. The diagnostic criteria are in accordance with those of thyroid cancer. Malignant struma ovarii is defined as an ovarian tumor histologically composed of thyroid tissue accounting for $\geq 50\%$ of the solid part of the tumor and showing evidence of malignancy, such as vascular invasion. Morphologically, this tumor contains thyroid follicle-like structures and papillary structures and may exhibit proliferation of undifferentiated cells. To confirm the presence of thyroid tissue, immunohistochemical assays with anti-triiodothyronine, anti-thyroxine, anti-thyroid transcription factor 1, and anti-thyroglobulin antibodies are useful. Findings suggestive of malignancy include distant metastasis, nuclear atypia, nuclear enlargement, and vascular invasion. In particular, papillary cancer is characterized by the presence of "ground glass" nuclei [9,12-14]. Pathological examination in our case showed relatively uniform-looking tumor cells with slight nuclear atypia, evidence of vascular invasion, and proliferation of poorly differentiated cells. A diagnosis of malignant struma ovarii was made based on these findings (**Figures 3 and 5**).

The clinical manifestations of malignant struma ovarii are nonspecific and include abdominal pain, an abdominal mass, irregular genital bleeding, and ascites. This disease is often found incidentally during abdominal surgery or imaging studies. Differentiation from a teratoma is difficult by diagnostic imaging. Blood thyroid hormone levels are usually within normal limits, and symptoms of hyperthyroidism are relatively rare, occurring in only 5% to 8% of patients with this disease [9,12]. However, elevated blood thyroglobulin levels have been reported; therefore, blood thyroglobulin has been used as a tumor marker for malignant struma ovarii [9,12].

Because of the limited number of patients with malignant struma ovarii seen in routine clinical practice, no standard treatment has been established. Malignant struma ovarii is classified as a germ cell tumor in the General Rules for Clinical Management of Ovarian Tumours, and surgical treatment followed by chemotherapy is recommended by the NCCN Guidelines Version 4, 2017. To the best of our knowledge, however, the only report of postoperative chemotherapy following surgical treatment was by Robboy et al. [14] in 2009 that used phenylalanine mustard, adriamycin, and vincristine. Thus, the efficacy of chemotherapy for malignant struma ovarii remains unclear. Several patients have reportedly undergone the same surgical treatment as for ovarian cancer (hysterectomy, bilateral adnexectomy, and retroperitoneal node dissection) with subsequent I131 radiation therapy. Thyroidectomy should precede I131 radiation therapy to allow adequate accumulation of the radionuclide in the lesion. Following surgical treatment combined with I131 radiation therapy, the 10-year survival rate is reportedly 89% and the 25-year survival rate is 84% [15]. Research has also shown that the recurrence rate after treatment is 38% among all patients with malignant struma ovarii and that the recurrence rate after initial surgical treatment not followed by radiation therapy is 50% [9].

Adnexectomy only on the affected side and omentectomy are performed when preservation of fertility is desired [9-11]. Although the influence of I131 radiation therapy itself on infertility is regarded as minimal, radiation therapy following surgical resection is often avoided in patients desiring preservation of fertility, especially considering the potential need for thyroid hormone replacement after thyroidectomy. However, when only adnexectomy on the affected side is performed for fertility preservation, subsequent recurrence is relatively frequent. Among 24 patients with malignant struma ovarii reported from 1970 to 2003, 9 patients underwent adnexectomy only on the affected side. Three of these nine patients received I131 radiation therapy immediately after the surgery, and none developed recurrence [9,11,15-18]. The remaining six patients were followed up without radiation therapy after the adnexectomy, and five of these patients developed recurrence (**Table 1**). There were variations in the lesion stage at the time of the initial surgery, and the time to recurrence varied from 4 to 108 months. The mode of recurrence was peritoneal dissemination in four of the five patients. No patients died of recurrence because all patients with recurrence responded to treatment, including I131 radiation therapy. The longest reported survival period is 432

Table 1 Summary of cases of malignant struma ovarii without radiation therapy.

Patient No.	Initial therapy	Additional treatment	Recurrence (months) Therapy for recurrence	Overall survival (months)
1	LSO	None	None	36
2	LSO	None	4 TAH+RSO+Thyroidectomy+I ¹³¹	7
3	RSO	None	8 Thyroidectomy+I ¹³¹	15
4	RSO	None	24 TAH+LSO+Thyroidectomy+I ¹³¹	29
5	RSO	None	14 TAH+LSO+Thyroidectomy+I ¹³¹	62
6	LSO	None	108 TAH+RSO+Thyroidectomy+I ¹³¹	432

months; thus, a relatively good prognosis can be expected with appropriate treatment [11,14,16-18].

Risk factors for recurrence and metastasis include adhesions observed during surgery, an ascitic fluid volume of >1000 ml, destruction of the ovarian serosa, the presence of papillary tissue, and a tumor diameter of ≥ 12 cm [9]. Our patient has a substantial risk of recurrence in light of these factors and therefore requires close follow-up observation.

Conclusion

In conclusion, patients with malignant struma ovarii may exhibit clinical signs and symptoms and imaging findings similar to those in patients with a benign ovarian tumor. Careful clinical attention is needed to distinguish between mature cystic teratoma and

rare tumors such as malignant struma ovarii. Efforts should be pursued to standardize the care of patients with malignant struma ovarii, perhaps with practice guidelines. We hope that population-level data such as these will be the first step in this process.

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Conflict of Interest

No potential conflict of interest relevant of this article was reported.

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