Case Report

Malignant struma ovarii: Case report of an unusual ovarian tumor with CT imaging✩,✩✩,★★

Atrikha Rahma, MDa, Lies Mardiyana, MDa,∗, Dyah Fauziah, MDb

aDepartment of Radiology, Faculty of Medicine Universitas Airlangga, Dr Soetomo General Academic Hospital, Surabaya, Indonesia
bDepartment of Anatomic Pathology, Faculty of Medicine Universitas Airlangga, Dr Soetomo General Academic Hospital, Surabaya, Indonesia

A R T I C L E   I N F O

Article history:
Received 4 February 2022
Revised 21 February 2022
Accepted 22 February 2022

Keywords:
CT Imaging
Malignant Struma Ovarii
Ovarian Teratoma

A B S T R A C T

Struma ovarii is categorised as a monodermal type of mature teratoma and consists primarily of thyroid tissue. It is an uncommon ovarian tumor, with non–specific clinical, and imaging findings. The majority of struma ovarii are benign and are typically associated with mature cystic teratomas. A small proportion of struma ovarii may undergo malignant transformation, with papillary carcinoma the most common type of malignancy. The criteria used to identify a malignant change in struma ovarii are identical to those used to evaluate the thyroid gland. Nevertheless, due to the rarity of struma ovarii, imaging diagnostic criteria, and subsequent management are not clearly defined. This case report describes a 41-year-old female patient who presented with rapid abdominal enlargement over a period of 1 month, accompanied by elevation of the tumor marker CA-125. Based on these clinically findings, ovarian cancer was suspected. The patient underwent a total abdominal hysterectomy with bilateral salpingo-oophorectomy. Histopathology results revealed a malignant struma ovarii.

© 2022 The Authors. Published by Elsevier Inc. on behalf of University of Washington. This is an open access article under the CC BY license (http://creativecommons.org/licenses/by/4.0/)

Introduction

Teratoma comprises 15%-20% of ovarian tumors. Ovarian teratoma is a germinal cell tumor arising from foetal yolk sac germinal cells. Based on the WHO classification, ovarian teratomas can be divided into 3 groups: mature, immature, and monodermal. Because these teratomas are germinal cell tumors, they are typically differentiated from the embryonic germ layer into 3 components: ectoderm, endoderm, and mesoderm. As a result, these tumors demonstrate a wide variety of morphologies. A monodermal teratoma is defined as an ovarian teratoma that contains predominantly or solely one type of tissue [1]. A diagnosis of struma ovarii is made when

✩✩ Acknowledgment: None.
✩✩✩ Competing Interests: The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.
∗ Funding: None.
* Corresponding author.
E-mail address: lies.mardiyana@fk.unair.ac.id (L. Mardiyana).
https://doi.org/10.1016/j.radcr.2022.02.067
1930-0433/© 2022 The Authors. Published by Elsevier Inc. on behalf of University of Washington. This is an open access article under the CC BY license (http://creativecommons.org/licenses/by/4.0/)
thyroid tissue comprises more than 50% of the tumor tissue. Struma ovarii represents 1% of all ovarian tumors and 2.7% of all dermoid tumors [2]. Preoperative diagnosis is difficult, due to a lack of distinctive clinical and imaging features, and the rate of preoperative misdiagnosis is high. Because it is an uncommon type of tumor, there are no specific clinical, radiological, or serum markers that distinguish struma ovarii in the absence of thyroid hormone abnormalities. Thus, a definitive diagnosis is obtained by histopathological examination. In addition, preoperative radiological findings are crucial for determining appropriate management [3]. In this case report, we present a patient with malignant struma ovarii and describe the identification of the tumor’s features with computed tomography (CT) imaging, based on a thorough review of the literature.

Case report

A 41-year-old female patient presented with rapid abdominal enlargement for a period of 1 month. Serum levels of tumor marker CA-125 were elevated at 604.22 U/mL (normal: less than 30-35 U/mL), but serum carcinoembryonic antigen (CEA) levels were considered normal. Ascites was observed in the abdominal and pelvic cavities. The clinician suspected ovarian cancer; however, paracentesis revealed benign peritoneal ascites. CT imaging showed a dominant cystic mass with solid and papillary projection components, calcification, and a fat component, with a multilobulated, smooth margin measuring approximately 10.0 × 15.6 × 22.6 cm from the right ovary (Figs. 1-3), and a dominant fat mass and solid component with calcification, measuring 5.4 × 3.6 × 7.0 cm from the left ovary (Figs. 1-3). Moreover, the mass showed contrast enhancement in the solid component. The patient underwent a total abdominal hysterectomy with bilateral salpingo-oophorectomy. Histopathological examination revealed a malignant struma ovarii of the right ovary (Fig. 4), whereas the left ovary contained a benign teratoma.

Discussion

Struma ovarii is a germ cell tumor of the ovary. It is comprised of more than 50% thyroid tissue and can be differentiated from a mature teratoma, which contains only a small component (less than 50%) of benign thyroid tissue. Despite the high thyroid tissue content of such tumors, thyrotoxicosis occurs in only 5% of all struma ovarii cases [4]. Struma ovarii typically arises unilaterally, with 5% of cases occurring bilaterally [5]. Struma ovarii may mimic the clinical symptoms of ovarian malignancy, presenting with ascites, a complex ovarian cyst, and an elevation of CA-125 [2]. Struma ovarii occurs primarily in women aged 30-50 years and may be accompanied by contralateral mature teratoma ovarii and cystadenoma [6].

On CT imaging, struma ovarii generally reveals a complex cystic appearance with non-specific findings. The presence of invasive mass growth, a large solid component, and an irregular border on the mass wall or within the mass are typical
CT findings in ovarian teratoma with malignant transformation. It is difficult to differentiate between benign and malignant struma ovarii without extracapsular extension, however, due to the presence of ascites, which is common in malignant masses and can also occur in benign struma ovarii [7]. The overall appearance of the struma consists of multiple cystic and solid areas. Moreover, the gross pathologic appearance of the struma is characterised by a solid area [3]. The high attenuation and calcification observed in the solid areas of these tumors are characteristics of struma ovarii that are detectable with CT imaging. Struma ovarii can also be identified by the presence of a high-density cyst, and CT imaging may show solid, cystic, or cystic-solid components. In the present case, cystic-solid components were found to be the most frequent type; however, the least frequent type also occurs in solid components through CT scan examination. Unlike the most common types of teratoma, struma ovarii does not display lipid material on CT imaging. However, the presence of lipid material and fatty tissue could be indicative of the presence of a dermoid cyst, which is associated with struma ovarii. Understanding these findings is essential for a reliable diagnosis of this type of tumor [3]. Marked enhancement of locally thickened walls and thick septations are indicative of struma ovarii when imaging is carried out after administration of an intravenous contrast agent. The solid components that microscopically correspond to thyroid tissue show strong enhancement as well. This is likely due to the increased vasculature and fibrous content of the thyroid tissue and stroma in the solid part of the struma ovarii tumor. Some experts have suggested that these findings are due to thyroglobulin and thyroid hormones in the follicular thyroid tissue that significantly attenuates X-rays. Additionally, struma ovarii in the presence
of ascites is considered complicated [3]. Ascites occurs in 17% of cases; however, the ascitic fluid rarely contains tumor cells [8]. Malignant struma ovarii typically has a tumor size ranging from 3-20 cm [4].

When an ovarian tumor has both solid and cystic components, further investigation is needed, prior to surgery, to determine whether it is likely benign or malignant. Other useful criteria for evaluating malignant ovarii are mass size (greater than 4 cm), the thickness of septa and wall (greater than 3 mm), and the presence of an internal structure. The latter includes various degrees of solid components, papillary projections, nodularity, necrosis, and haemorrhage. The imaging findings of benign and malignant ovarian lesions may overlap significantly. As the imaging of enhancement patterns improves, however, it will increase the accuracy of differentiating malignant, and benign lesions [9].

**Conclusion**

Struma ovarii is an uncommon and generally benign tumor. Nevertheless, a small proportion of struma ovarii may undergo malignant transformation. CT scan with contrast administration can determine whether a struma ovarii is likely benign or malignant by a thorough examination of the character of the mass, enhancement pattern, the thickness of septa and wall, and presence of an internal structure. Pathology examination of the surgical specimen is mandatory to determine malignancy in struma ovarii.

**Patient consent**

Informed consent obtained for publication of a case report. Written informed consent was obtained from the patient for the publication of this case report.

**REFERENCES**

[1] Kurman Robert J, C Maria Luisa, Simon Herrington C, Young Robert H. Tumors of the ovary: germ cell tumors. In: WHO classification of tumors of female reproductive organs. Lyon: International Agency for Research on Cancer; 2014. p. 57.
[2] Singh Pratibha, Lath Nitisha, Shekar Shashank, Goyal Manu, Gothwal Meenakshi, Yadav Garima, Khera Pushpinder. Struma ovarii: a report of three cases and literature review. J Midlife Health 2018;9(4):225–9.
[3] Zhang Ting, Chen Pingping, Gao Yuping. Struma ovarii: a mini review. Int J Clin Exp Med 2018;11(10):10364–71. www.ijcem.com Accessed: December 30, 2021.
[4] Yasutake NA, Noguchi HB, Ibayashi YC, Nakamura HD, Tateishi KD, Yuki KA, et al. The smallest reported malignant struma ovarii: a case report. Case Rep Oncol 2018;11:693–698.
[5] Cui Y, Yao J, Wang S, Zhao J, Dong J, Liao L. The clinical and pathological characteristics of malignant struma ovarii: an analysis of 144 published patients. Front. Oncol. 2021;11:645156.
[6] Qiao Peng-Fei, Gao Yang, Niu Guang-Ming. Struma ovarii accompanied by mature cystic teratoma of the ovary: a case report and literature review. Oncol Lett 2015;9:2053–2055.
[7] Dujardin Matine I, Sekhri Priti, Turnbull Lindsay W. Struma ovarii: role of imaging. Insight Imaging 2013. doi: 10.1007/s13244-013-0303-3.
[8] Salman WD, Singh Mayuri, Twaij Z. A case of papillary thyroid carcinoma in struma ovarii and review of the literature. Hindawi: Pathology Research International; 2010. p. 5.
[9] Kim Kyeong Ah, Park Cheol Min, Lee Jean Hwa, Kim Hee Kyung, Cho Song Mee, Kim Bohyun, et al. Benign ovarian tumors with solid and cystic components that mimic malignancy. Am J Roentgenol 2004;182:1259–65. doi:10.2214/ajr.182.5.1821259.