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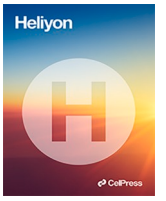

Case report

Giant ovarian solid and cystic masses mixed with three types of tumors: A rare case report and literature review

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ABSTRACT

Background: Most ovarian tumors exhibit a pure histological characteristic. Nevertheless, a combination of tumors with the same histogenetic origin but different histologic subtypes is relatively common. Additionally, co-occurrence of tumors with different histogenetic origins is very rare. Typically, these mixed tumors include mixed epithelial tumors, mixed epithelial-stromal tumors, mixed germ cell-sex cord-stromal tumors, and mixed germ cell tumors. However, mixed epithelial-sex cord stromal-lymphohematopoietic system tumors are rare. Currently, clinicians have limited knowledge of this type of tumor, and the epidemiology, diagnosis, and treatment of this disease are yet to be established.

Case presentation: We report a case of a 73-year-old woman with abdominal distension and pain for three months. Imaging evaluation revealed a large pelvic mass, with ultrasound suggesting a benign ovarian cyst along with leiomyoma. Furthermore, computed tomography (CT) and magnetic resonance imaging (MRI) revealed a malignant tumor. Blood tests showed significant increases in CA125 and CA199 levels. The patient underwent a total abdominal hysterectomy and bilateral salpingo-oophorectomy. During the surgery, a large multinodular cystic solid mass was observed in the right ovary, and the maximum nodular diameter was 14.2 cm. The solid areas of the mass appeared gray-white and taupe, whereas the cystic areas contained clear liquid with smooth walls 0.2 cm thick and no intracystic solid areas. The left ovary had solitary nodules, the largest being 4 cm in diameter. Microscopic examination of the right ovary revealed three different cell types. The first type of cell area was analogous, round, fusiform, and staggered mixed cells with unclear boundaries and rare nucleolus or mitosis. The second type of cell area was the cystic dilatation area. The cyst wall was covered with a single layer of flat epithelium, rich eosinophilic cytoplasm, uniform nuclear chromatin, and no papillary structures. The third type was a diffuse lymphoid region with uniform medium-sized cells, rough nuclear chromatin and evident nucleoli and mitosis. The morphology of the left ovarian cell was single, which was consistent with the first type of cell area in the right ovary. Immunohistochemistry of the right ovary indicated that the first region expressed vimentin, inhibin-α, calretinin, SF-1, WT-1 and CD56, with Ki-67 at 5 %, and no CKpan expression. The second region expressed CKpan, with Ki-67 at 1 %. The third region expressed CD20, Pax-5, Bcl-6, Bcl-2, MUM1, CD45, and C-myc, with Ki-67 at 70 %, and positive IGH clonal gene rearrangement. Lastly, the pathological diagnosis was

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a mixed ovarian tumor in the right ovary, comprising thecoma-fibroma, serous cystadenoma, diffuse large B-cell lymphoma, and a thecoma-fibroma in the left ovary. A follow-up examination of the patient after 15 months showed no mass or lymph node enlargement in other parts of the body, and no recurrence or metastasis was observed.

Conclusions: We present a case of a postmenopausal woman with a rare combination of thecoma-fibroma, serous cystadenoma and diffuse large B-cell lymphoma in the ovary. To the best of our knowledge, this is the first reported case of such a combination. Typical pathological morphology and immunohistochemistry are crucial for the diagnosis of this disease. Owing to the limited knowledge of the disease, its pathogenesis and tissue origin are unknown. Clinicians should be careful about such patients. We believe this case report may provide some novel insights into the diagnosis and therapy of patients with this type of tumor.

1. Background

Although mixed tumors of the ovary are gradually garnering attention, their incidence remains very low [1,2]. The most prevalent combinations include mucinous cystadenoma associated with Brenner tumor, mature cystic teratoma, Sertoli-Leydig cell tumor, and serous cystadenoma [3,4]. Most of these tumors originate from the ovarian epithelium and stroma, with very rare cases involving lymphoma. The first report of ovarian tumors mixed with fibroma and serous cystadenoma was by Copland et al., in 1946 [5]. Subsequent reports have documented combinations of thecoma and/or fibroma with other tumors [6,7]. Thecoma-fibroma is a common benign ovarian sex cord-stromal neoplasm, has documented combinations in postmenopausal women [8,9], and accounts for 1.0%–4.0 % of all ovarian tumors [10,11]. Clinical manifestations are nonspecific and associated with estrogen secretion and tumor size [12,13], potentially presenting with ascites, abdominal pain, and vaginal discharge [14]. The mass often has a clear boundary and large volume, which can lead to misdiagnosis as a malignant tumor [15]. Thecoma-fibroma is commonly associated with conditions such as uterine leiomyoma, endometrial cancer, and ovarian cyst and rarely with diffuse large B-cell lymphoma (DLBCL) [16]. Therefore, we reported a rare case of ovarian lymphoma where the primary component was ovarian thecoma-fibroma, with serous cystadenoma and DLBCL as secondary components. We retrospectively analyzed the clinicopathological characteristics, immunophenotype, diagnosis, differential diagnosis, prognosis, and follow-up of this case and reviewed related literature to improve the

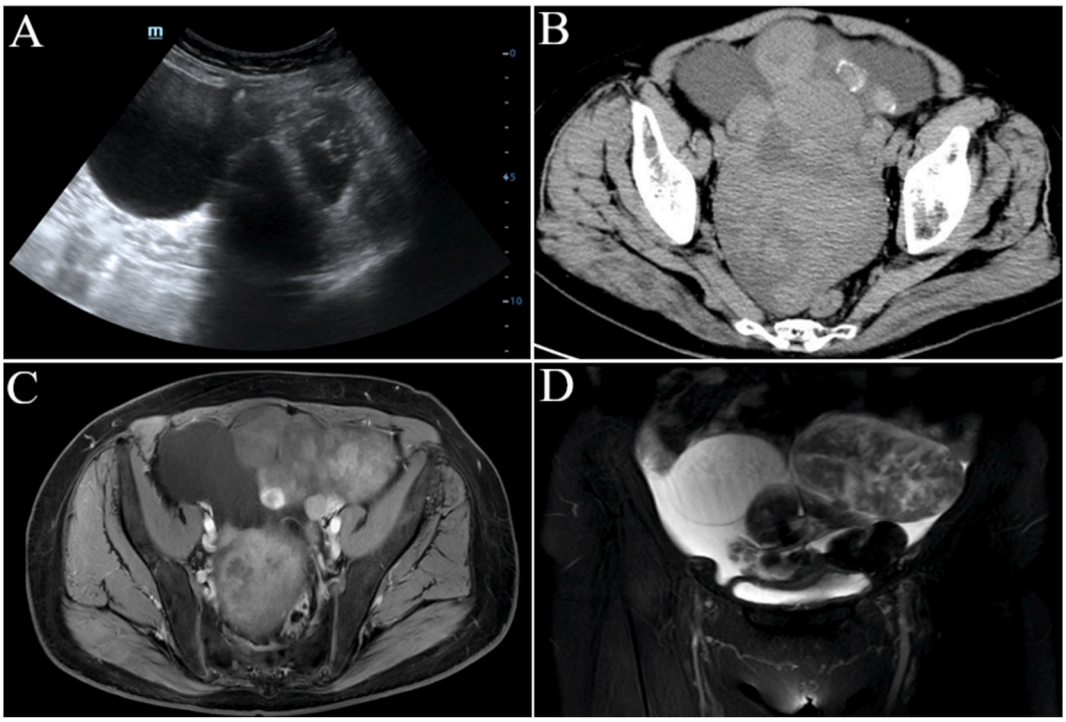

Fig. 1. Imaging. Ultrasound revealed multiple low-echo and cystic solid masses of different sizes in the pelvic cavity, with clear boundaries and uneven internal echo. The largest one was 14.2cm × 8.3cm × 6.9cm (A). CT showed multiple solid masses in the lower abdomen and pelvis, some of which were cystic, with uneven density and clear boundary (B). MRI examination of the uterine adnexa showed equal or slightly longer T1 and low or super long T2 mixed multiple clumps signal shadow, mild uneven delayed enhancement in the solid part and no obvious enhancement in the cystic component (C, D).

understanding of this rare disease.

2. Case presentation

In April 2021, a 73-year-old Asian female was admitted to Yichang Central People's Hospital with a three-month history of abdominal distension and pain. She was postmenopausal for 20 years and had a medical history of hypertension, coronary heart disease, and diabetes. Her surgical history included cardiac stent implantation in 2018. She had no personal or family history of tumors. Her current medications include aspirin, metformin, and nifedipine. Physical examination revealed palpable abdominal masses approximately the size of a child's skull, which were firm, non-tender, and fixed in position. Blood tests showed increased CA199 at 174 U/mL (normal 0–39 U/mL) and CA125 at 198.3 U/mL (normal 0–35 U/mL). Hormone levels were not evaluated. Ultrasound (Fig. 1A) imaging identified multiple low-echo and cystic solid masses of varying sizes in the pelvic cavity, with clear boundaries and uneven internal echoes. The largest mass was 14.2 cm × 8.3 cm × 6.9 cm in size. The masses were considered to be uterine leiomyoma complicated with serous cystadenoma. Computed tomography (CT) revealed (Fig. 1B) multiple solid masses in the lower abdomen and pelvis, some cystic with uneven density and clear boundaries. Magnetic resonance imaging (MRI) of the uterine adnexa showed (Fig. 1C and D) equal or slightly longer T1 and low or super long T2 mixed multiple clumps signal shadow, mild uneven delayed enhancement in the solid parts, and no significant enhancement in the cystic components. A few liquid signal shadows were also noted in the pelvic cavity. Part of the right ovary sent to histopathology during surgery was reported as a benign tumor. The patient underwent total abdominal hysterectomy and bilateral salpingo-oophorectomy after exploratory laparotomy. During the surgery, an isolated mass was found on the left ovary, and multiple large solid and cystic masses were found on the right ovary (Fig. 2A). The right fallopian tube was elongated to 10 cm and attached to the outer tumor envelope. Additionally, approximately 200 mL of clear yellowish fluid was present in the pelvic cavity. The surfaces of the uterus, peritoneum, omentum, bowel, and bladder were smooth.

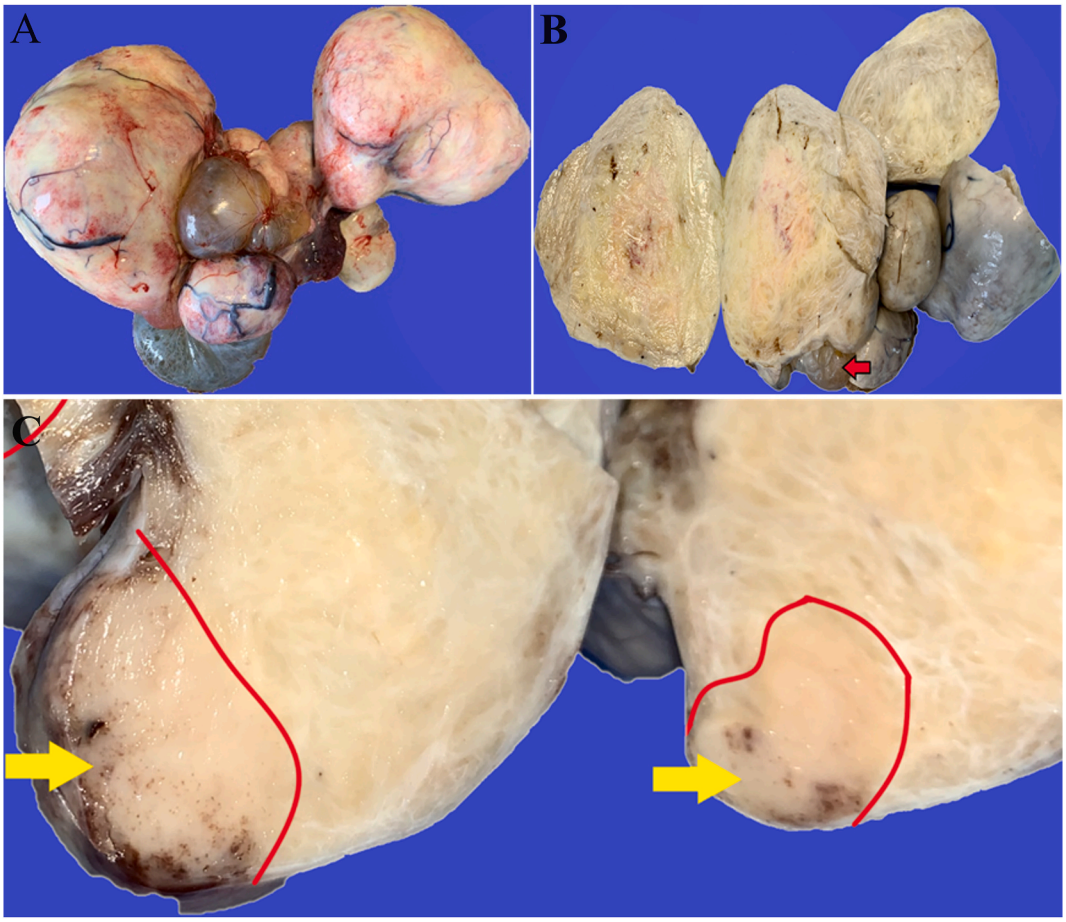

Fig. 2. Gross in pathology. Multiple large solid and cystic masses occupying the right ovary were found intraoperatively (A), and the right adnexal structure was unclear. After extensive sampling, it was found that the tumor solid section was not uniform, and most of the solid sections were gray-white and hard. There are also some cystic areas containing clear fluid, marked with red arrows (B). Close examination of the tumor solid section revealed that the focal area was taupe and not hard, which was markedly different from the surrounding area. Enlarge the image in the taupe area (C).

The tumors were completely excised and sent for pathological evaluations. Extensive sampling revealed that the right ovarian tumor's solid section was not uniform, with most areas gray-white and hard, whereas some cystic areas contained clear fluid (Fig. 2B). Close evaluation of the tumor solid section showed that the focal area was taupe and not hard, which was considerably different from the surrounding hard regions (Fig. 2C). Microscopically, the gray-white hard areas exhibited mixed growth of round-like thecoma cells and spindle-shaped fibrous cells with eosinophilic light-stained cytoplasm, and rare nucleolus or mitosis (Fig. 3A). Immunohistochemical staining revealed that the right tumor expressed vimentin, inhibin-α, calretinin, SF-1, WT-1 and CD56, with Ki-67 at 5 %, and negative CKpan (Fig. 3B–F). The taupe areas contained diffused and evenly distributed lymphoid cells with less cytoplasm, large nuclei, rough chromatin, and visible nucleoli or mitosis (Fig. 4A). Tumor expressed CD20 (Fig. 4B), Pax-5, Bcl-2 (Fig. 4C), Bcl-6 (Fig. 4D), MUM1 (Fig. 4E), CD45, with C-myc at 60 %, and Ki-67 at 70 % (Fig. 4F). They did not express CD3, CD21, CD10, cyclin D1, SOX-11, CD43, CD38, CD5, and EBER-CISH (Epstein-barr encoding region-chromogenic in situ hybridization) was negative. IGH gene rearrangement was found in four detection sites, including FR1-JH (Fig. 5A), FR2-JH (Fig. 5B), FR3-JH (Fig. 5C), and DH-JH (Fig. 5D). The cystic areas had flat epithelium, abundant eosinophilic cytoplasm, small nuclei, uniform chromatin, and no distinct papillary structure. Furthermore, CKpan was positive, with Ki-67 at 1 %. Table 1 summarizes the complete results of immunohistochemistry and molecular pathology.

The final pathological diagnosis was as follows: right mixed ovarian tumors (thecoma-fibroma, 70 %; serous cystadenoma, 20 %; and DLBCL, 10 %) and left ovarian thecoma-fibroma. Post-surgery, the patient was given symptomatic treatment, including antibiotics (piperacillin and tazobactam), anti-diabetic drugs (insulin), and energy supplementation (vitamin C and potassium supplement). The patient did not undergo chemotherapy due to personal reasons. After 15 months of follow-up, the patient underwent a general physical examination, CT evaluation of important organs and ultrasound examination of the neck, axillary and inguinal region lymph nodes at our hospital. No lymph node enlargement, recurrence or other lesions were found. The patient's symptoms significantly improved after the surgery without discomfort, and she was satisfied with the treatment effect.

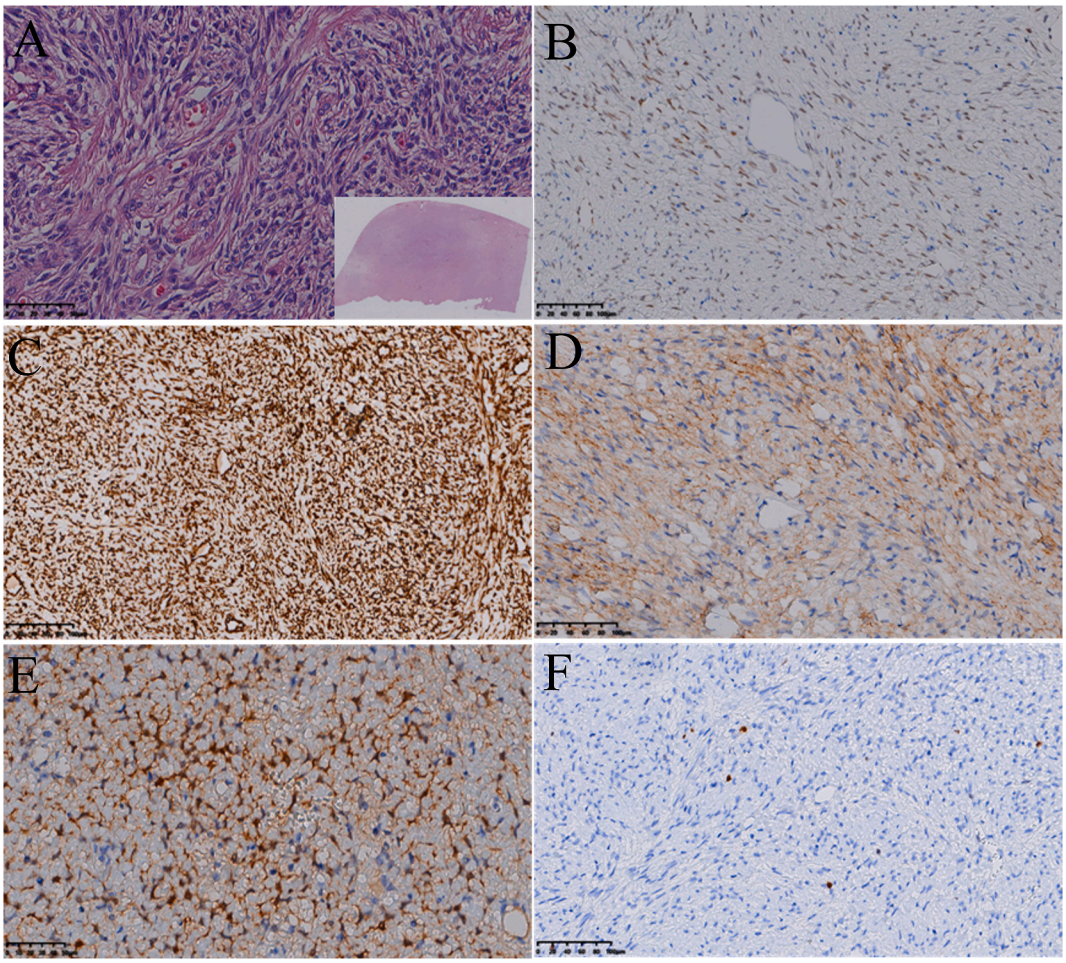

Fig. 3. Pathological characteristics of thecoma-fibroma. Hematoxylin-eosin staining showing the mixed growth of round-like thecoma cells and spindle-shaped fibrous cells with rare nucleolus or mitosis (A); scanning power was displayed in the lower right corner. The tumor cells diffuse strong expression of WT1 (B), vimentin (C), CD56 (D), and calretinin (E). Ki-67 was 5 % (F).

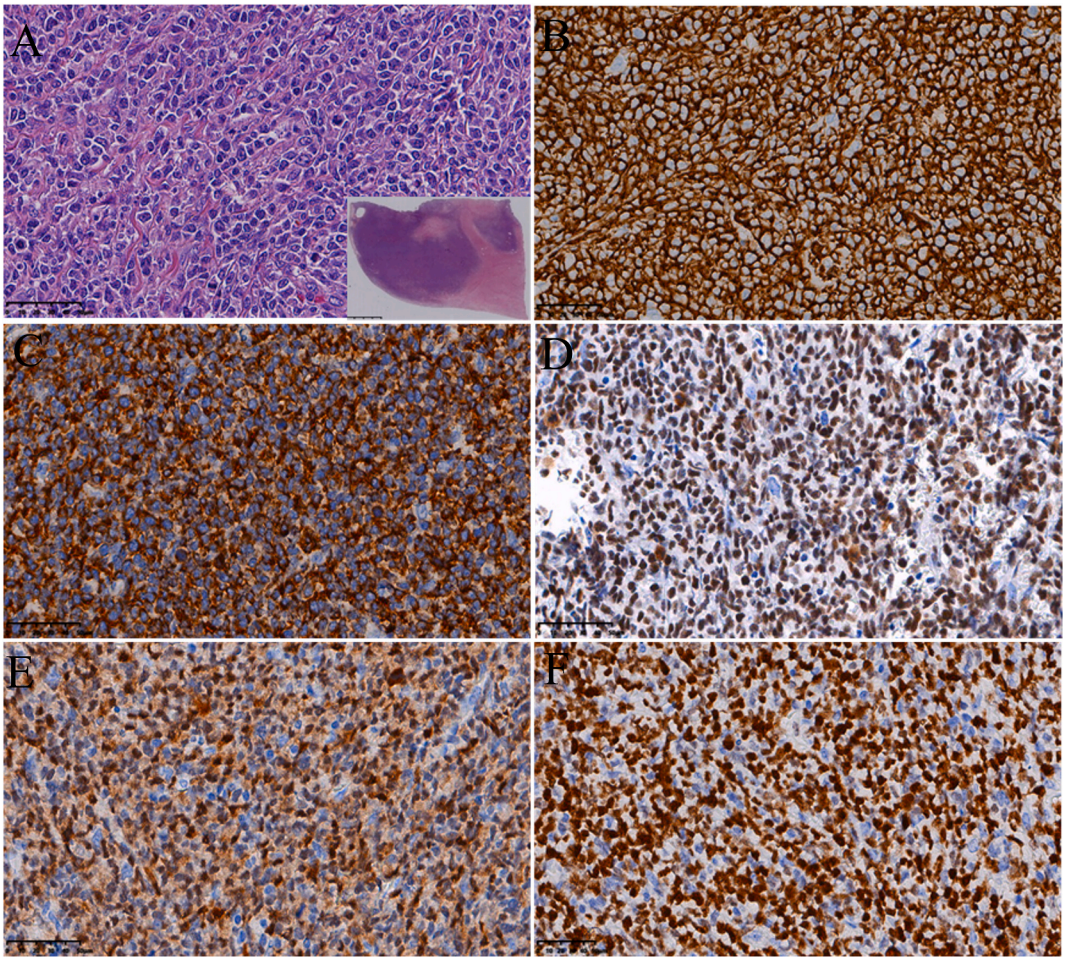

Fig. 4. Pathological characteristics of DLBCL. Low magnification showing a dark blue nodular area of high-density cells, and scanning power was displayed in the lower right corner (A). The lymphoid cells were diffuse and evenly distributed, with little cytoplasm, large nuclei, rough chromatin, and visible nucleoli or mitosis (A). The lymphoid cells diffuse strong expression of CD20 (B), Bcl-2(C), Bcl-6(D), MUM1 (E), and Ki-67 (F).

3. Discussion

Mixed ovarian tumors are a rare type of ovarian neoplasm characterized by a diverse mix of cell types and complex origins. The previously reported mixed types of cases include mucinous cystadenoma and germ cell tumors. Only a few clinical studies have reported this type of case; hence, our understanding is insufficient. Most studies have reported a combination of two tumor types, and reports of three-type mixed tumors are rare. Gaurish et al. reported a tumor with a mix of five germ cell components originating from a single cell type [17]. Similarly, our case involves a mixture of ovarian epithelium and sex cord stroma, such as fibroma combined with serous cystadenoma. Nevertheless, combinations involving different epithelial types, sex cord stroma with germ cells, and various germ cell types can also occur. Our case is particularly rare, featuring a combination of epithelial, sex cord-stromal, and lymphoma characteristics, which have not been previously reported yet. In a large cohort study by Monterroso et al. studying 39 adult patients with non-Hodgkin's lymphoma involving the ovary, found that in 10 % of these cases, the lymphoma originated primarily in the ovary, highlighting the rarity of primary ovarian lymphoma [18]. The complex mixing increases the difficulty of diagnosing ovarian tumors [19]. Until now, the pathogenesis of this mixed tumor is unclear. Some researchers suggest that different tumors with clear boundaries may indicate concurrent occurrence [20]. In the present case, we hypothesize that another type of tumor occurring based on thecoma-fibroma may develop for three reasons: First, thecoma-fibroma still accounts for the main part of the tumor, with the other two types making up relatively low proportions. Second, the patient's disease progressed slowly and exhibited a benign process. Although the size of the tumor was very large, no metastases or malignant transformations occurred in other sites, and the patient's prognosis was excellent post-surgery. Third, DLBCL appears within the thecoma-fibroma envelope, possibly due to gene mutations in B lymphocytes due to long-term inflammatory stimulation leading to tumor formation. No lymph node enlargement or internal organ occupying lesion was found, indicating that the lymphoma is a primary ovarian lesion. However, because lymphoma in the female reproductive system is extremely rare, diagnosing primary ovarian lymphoma requires caution, as it accounts for less than 0.1 % of all

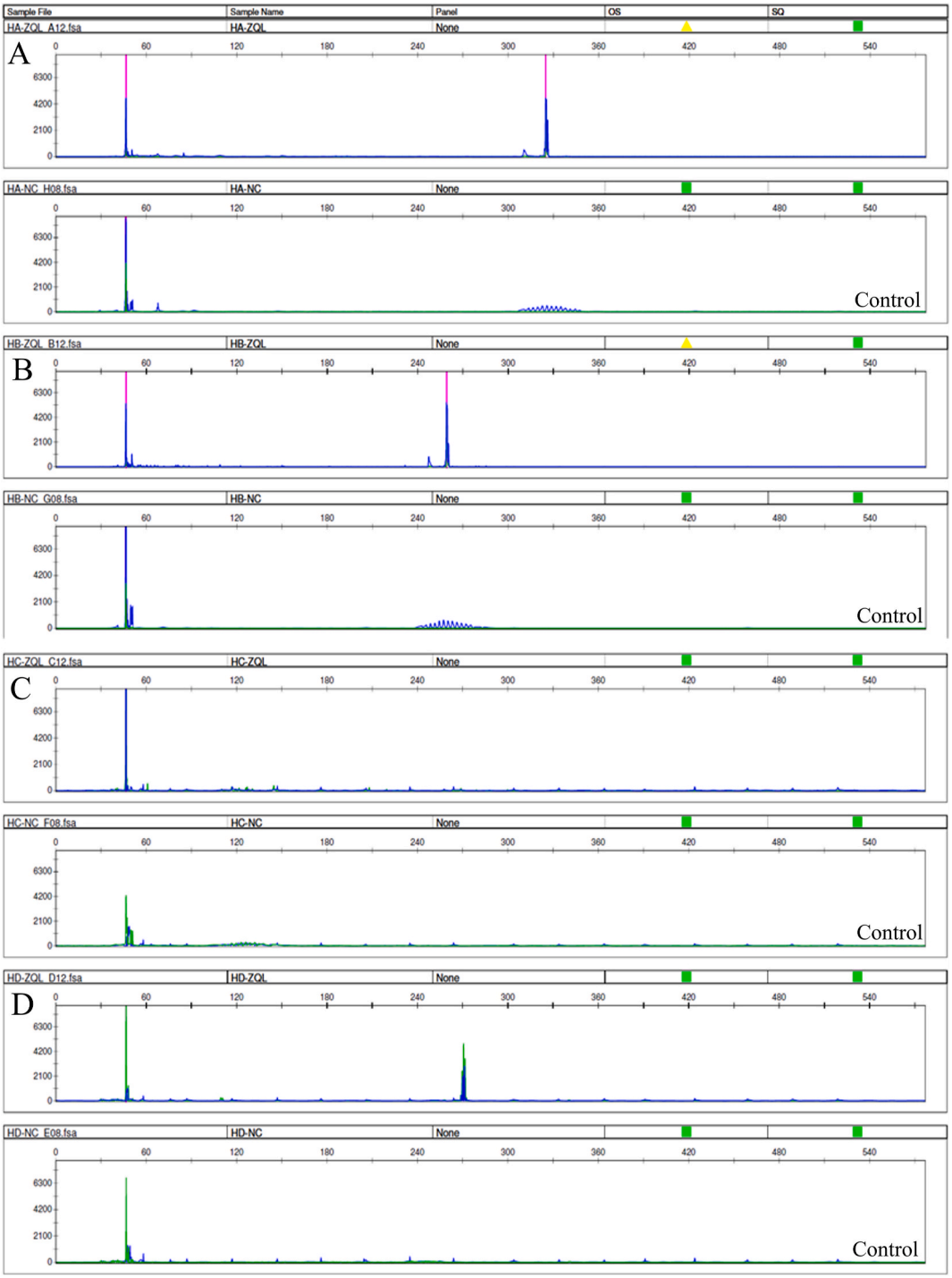

Fig. 5. IGH clonal gene rearrangement (PCR). Four IGH detection sites showing clonal gene rearrangement, including FR1-JH (A), FR2-JH (B), FR3-JH (C), and DH-JH (D). Each detection site was accompanied by a control.

ovarian tumors. The clinical criteria for diagnosing primary ovarian lymphoma include elderly patients with a definitive ovarian mass and no lymph node enlargement or other site lesions. Additionally, common pathological morphology, immunohistochemical phenotype, and gene rearrangement are crucial for diagnosis. Our case is consistent with the aforementioned characteristics; however, it is unique due to the association of DLBCL with thecoma-fibroma.

Compared with patients with similar pathological types such as fibroma with serous cystadenoma, thecoma with serous

Table 1
Summary of immunohistochemical and molecular pathological results.

IHC Markers	Thecoma-fibroma	Serous cystadenoma	DLBCL
vimentin	+	–	+
CKpan	–	+	–
inhibin-α	+	–	–
calretinin	+	–	–
SF-1	+	–	–
WT-1	+	–	–
CD56	+	–	–
CD20	–	–	+
CD3	–	–	–
CD5	–	–	–
CD21	–	–	–
Pax-5	–	–	+
Bcl-6	–	–	+
Bcl-2	–	–	+
CD43	–	–	–
CD38	–	–	–
SOX-11	–	–	–
cyclin D1	–	–	–
CD45	–	–	+
CD10	–	–	–
MUM1	–	–	+
C-myc	–	–	60 %
Ki-67	5 %	1 %	70 %
EBER-CISH	–	–	–

IHC = immunohistochemistry, - = negative, + = positive, DLBCL = diffuse large B-cell lymphoma, EBER-CISH = epstein-barr encoding region-chromogenic in situ hybridization.

cystadenoma, and thecoma-fibroma with serous cystadenoma reported in the literature, we found that most mixed tumors occur in elderly individuals, involving one or both ovaries [1,5,21]. Clinical manifestations may include abdominal pain, abdominal distension, ascites and vaginal discharge. Muronda et al. reported a case with additional symptoms of urinary incontinence [22]. Most patients lack a genetic history or other diseases, although some have hypertension and diabetes. The patient in the present report also has coronary heart disease. These comorbidities are common in the elderly and are not considered to be directly related to ovarian tumors. Imaging findings typically reveal solid pelvic and cystic masses that appear multinodular with low or uneven density and clear boundaries. Blood tests often show increased levels of CA199 and CA125 [16,20]. A subset of patients may exhibit abnormal hormone levels, which may be related to theca cells. For instance, Fleming et al. reported a case of a young patient with a combination of granulosa cell tumor and thecoma-fibroma who had significantly increased hormone levels [23]. Hormone levels were not assessed in our case. Therefore, subsequent research is warranted to determine the relationship between hormone levels and these tumors. Mixed tumors are generally large, with the smallest diameter reported by Shopov et al. being 5 cm, which required surgical intervention [20]. Typically, these tumors are nodular with well-defined boundaries, a smooth surface, and a mixture of solid and transparent cystic areas. The absence of rupture and extensive adhesion suggests a lack of active biological behavior [24,25]. The cystic area contains clear fluid, and the inner walls of the cysts are smooth. When borderline or malignant lesions are present, the inner cyst wall may show thickened or papillary areas. Specimens should be collected from each differently colored area. Most of the areas of our mixed bilateral ovarian tumor areas were grayish-white and solid. Careful specimen collection showed a very focal grayish-brown area; therefore, there was no omission. Additionally, a mixture of two types of tumors was present, making it easy for us to ease our vigilance and neglect some focal areas. This is a major mistake in the work of pathologists, which should be avoided. Nickel et al. presented as a tumor with interconnecting black and white nodules; additionally, extensive tumor sampling was required to definitively diagnose ovarian melanoma combined with thecoma-fibroma [26].

Under the microscope, we found the following three characteristic pathological images: 1. Diffused theca cells, fibrocyte and fibroblast (gray-white areas); the tumor nuclei were fusiform and oval mixed distribution; the nuclei were located in the center, and the cytoplasm was shallow and eosinophilic. Often distinct collagen fibers were found between cells, which may be accompanied by hyaline degeneration or calcification. The tumors had a distinct envelope. 2. A serous flat epithelium was attached to the cystic areas, and the surface epithelium did not appear to be papillary hyperplasia. 3. Diffuse uniform lymphoid cell areas (taupe areas). The cells in this region were enlarged, the cytoplasmic and fibrotic components were scarce, the nuclei were large and deeply stained, and the nucleolar and mitotic images were easy to view. The proportion of this mixed tumor was diversified; however, it was mainly thecoma-fibroma. In the present case, right thecoma-fibroma accounted for 70 %, serous cystadenoma accounted for 20 %, and DLBCL accounted for 10 %. In the left ovary, only thecoma-fibroma was found, and no other tumor component was found. The causes of the bilateral ovarian tumors inconsistency were unknown. We assumed that they were both primary lesions. Additionally, there was no relationship between them. However, whether germ-line gene mutations are present is unknown. Some scholars believe that there may be FOXL2 gene mutation in thecoma-fibroma, but for similar mixed tumors, there are no relevant studies on molecular reports. In the present case, IGH gene rearrangement was performed only on the lymphoma region, without Sanger sequencing or further study.

Immunohistochemistry helps in diagnosis. Theca cells, fibrocytes and fibroblasts mainly express vimentin, inhibin-α, and

calretinin. Lymphoid cell area diffuses express CD20, Bcl-6, Bcl-2, MUM1, and C-myc, with a high Ki-67 index. Most of the reported cases can be diagnosed by morphology without immunohistochemistry; however, our case is quite special, and immunohistochemistry can improve diagnostic accuracy.

The main differential diagnosis of this disease is as follows: 1. smooth muscle tumors can appear as fusiform, oval or round cells; however, the cell cytoplasm is sparse and light red. Leiomyosarcoma can appear as distinct cell atypia, mitotic image and necrosis. Immunohistochemical expressions of SMA, desmin, and H-caldesmon are helpful for differentiation. 2. Endometrial stromal tumors are dense. Their morphology is relatively consistent, the cells are small, the cytoplasm is sparse, and the number of mitosis differs. The immunohistochemical expression of CD10, ER and PR helps to differentiate. Some cases can be associated with sex cord-like differentiation and the expression of inhibin-α, calretinin, CD99, and WT-1. 3. High-grade serous carcinoma of the ovary is usually solid, papillary, labyrinthine, adenoid and cribriform, with a large nucleus, obvious atypia, visible nucleolus and mitosis. The immunohistochemical expression of P53, WT-1, Pax-8 and CK7 helps in differentiation. 4. Exuberant lymphoid hyperplasia/tumor-like lesions of the ovary mainly occur in fertile women and rarely occur in elderly patients. No lymphoma or tumor is found in other parts of the body, and no significant enlargement of the ovary is observed. The complex large cell components mixed in the lesion are present, such as B-cell differentiation lineages, including plasmoblast, activated lymphoid blast or immune blast. Furthermore, it can also be accompanied by other mature cells, such as lymphocytes, plasma cells, neutrophils, and histiocytes. The large cell CD20 can be diffuse or abundantly positive, but Bcl-6 and MUM1 are generally not positive simultaneously. Plasma cells are polyclonal and monoclonal in a few cases; however, it cannot be considered as tumor evidence. The symptoms of most patients disappear completely without treatment.

Although the proportion of DLBCL in this mixed ovarian tumor is minimal, its malignant biological behavior poses a risk of recurrence. Conversely, thecoma-fibroma, being a benign tumor, rarely metastasizes or recurs and can often be treated conservatively [27]. Ideally, a combination of treatments such as surgery, radiation, and chemotherapy should be considered. Currently, there is no standardized treatment protocol, and surgery remains the primary approach for treating this mixed tumor. We have compiled clinicopathological characteristics and treatment approaches from similar cases (Table 2), all of which underwent open surgical procedures. Laparoscopic surgery offers advantages such as decreased trauma, improved cosmetic outcomes, and quicker recovery; its use for cystic and solid tumors with uncertain characteristics may increase surgical risks and compromise the completeness of tumor resection, thereby increasing recurrence rates. In this case, laparotomy was chosen over laparoscopic surgery due to the tumor's substantial size, predominantly solid composition, inability to shrink, adhesion to surrounding organs, and unclear tumor root exposure, all of which precluded laparoscopic surgeries. The patient did not undergo chemotherapy due to her older age and economic conditions. Close follow-up revealed no recurrence or metastasis. The absence of disease progression may be attributed to the low proportion of lymphomas within thecoma-fibroma and the absence of lesions in other body parts. We cannot draw a definite conclusion on whether additional chemotherapy is required for this treatment. Regular ultrasound examinations are a simple and practical means of detecting ovarian tumors, but by the time symptoms manifest, the tumor may have already reached a significant size. Pathological analysis is crucial for determining the tumor's specific nature, especially in large tumors, necessitating careful observation and sampling by pathologists, which is vital for identifying mixed ovarian tumors. Simultaneously, the treatment plan is developed based on tumor type, size, grade, and the patient's overall health status of the patient. Surgery remains the primary treatment modality for most patients. In cases involving borderline or malignant tumor components, radiotherapy, chemotherapy, and targeted immunotherapy may be required. For some special patients requiring fertility preservation, tumor invasiveness and pathological types must be carefully assessed before making personalized treatment strategies. Early detection and diagnosis are crucial for clinical management and prognosis. Regular follow-up is essential to address tumor recurrence and metastasis. Support from family, friends, and professional psychological counseling can help patients in coping with mood swings effectively.

In conclusion, we present a clinically rare occurrence of a mixed ovarian tumor comprising three distinct pathological types. This novel hybrid approach can improve our knowledge of traditional ovarian tumors. Pathology is crucial for diagnosing this type of tumor. Clinicians should pay close attention to this type of tumor. Further investigation into the clinicopathological characteristics of this disease through large sample data and molecular mechanisms is warranted to improve the prognosis of patients.

Ethics statement

Written informed consent was obtained from the individual for the publication of any potentially identifiable images or data included in this article. And this study was approved by the Ethics Committee of Yichang Central People's Hospital.

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Data availability statement

Data included in article/supp. material/referenced in article.

CRediT authorship contribution statement

Xu Liu: Writing – review & editing, Writing – original draft. **Jiao Liu:** Writing – original draft. **Lu Chen:** Writing – review & editing.

Table 2
Clinical and histopathological analysis of previously reported cases of ovarian fibroma (and/or thecoma) with serous cystadenoma.

Author (Year)	Case	Age (years)	Clinical presentation	Reported comorbidities	Gross findings	Pathological type	Therapy	Follow-up
Copland et al. (1946) [5]	1	70	Abdominal distension	Hypertension	Solid and cystic mass, 26 × 19 × 10 cm	Fibroma and serous cystadenoma	BSO	–
Jayalakshmy et al. (2012) [1]	1	56	Abdominal distension	None	Solid and cystic mass, 15 × 8 × 6 cm	Fibroma and serous cystadenoma	TAH + BSO	–
Muronda et al. (2018) [22]	1	68	Urinary incontinence	None	Solid and cystic mass, 8.5 × 8 × 3.5 cm	Thecoma and serous cystadenoma	TAH + BSO	–
Singh et al. (2019) [10]	1	64	Abdominal distension and ascitis	Hypertension and diabetes	Solid and cystic mass, 15 × 10 × 7 cm	Fibroma and serous cystadenoma	BO	–
Shopov et al. (2019) [20]	1	63	Vaginal bleeding	None	Solid and cystic mass, 5 cm in diameter	Fibroma and serous cystadenoma	TAH + BSO + Omen	–
Balhara et al. (2023) [16]	1	56	Abdominal pain	None	Solid and cystic mass, 15 × 11 × 9 cm	Fibroma and serous cystadenoma	USO	–
Halder et al. (2023) [21]	1	55	Abdominal pain and heaviness	Hypertension and diabetes	Solid and cystic mass, 11.8 × 9.9 × 9.5 cm	Fibroma and serous cystadenoma	BSO	–
Present	1	73	Abdominal distension and pain	Hypertension, diabetes and coronary heart disease	Solid and cystic mass, maximum nodular 14.2 cm in diameter	Thecoma-fibroma, serous cystadenoma and DLBCL	TAH + BSO	NED, 15 months

- = unknown, NED = no evidence of disease, BSO = bilateral salpingo-oophorectomy, TAH = total abdominal hysterectomy, BO = bilateral oophorectomy, Omen = omentectomy, USO = unilateral salpingo-oophorectomy, DLBCL = diffuse large B-cell lymphoma.

Chunrong Yang: Writing – review & editing. **Yuchang Hu:** Writing – review & editing. **Yufei Liu:** Writing – review & editing, Writing – original draft.

Declaration of competing interest

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.

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