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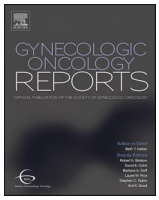

Case report

When it's not ovarian cancer: A case of a massive leiomyoma with hydropic change

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ABSTRACT

Background: Uterine leiomyomas are benign tumors characterized by pelvic pain and abnormal bleeding. Their evolution can lead to degenerative changes, occasionally mimicking malignancies on imaging, presenting diagnostic challenges.

Case presentation: A 31-year-old nulliparous woman presented with symptoms of bloating, cramping, and abdominal distension. Imaging suggested an advanced ovarian malignancy, showing a complex adnexal mass and elevated CA-125 levels. During exploratory laparotomy, what was suspected to be ovarian cancer was instead identified as a large uterine mass on pathologic evaluation revealing a benign leiomyoma with extensive hydropic change.

Conclusion: This case highlights the diagnostic intricacies associated with large complex adnexal masses and illustrates how benign conditions like leiomyomas with hydropic degeneration can mimic ovarian cancer. This emphasizes the importance of comprehensive preoperative and intraoperative assessments to tailor management and avoid unindicated radical procedures.

1. Introduction

Pelvic masses encompass a wide range of benign and malignant conditions that can arise from various structures within the pelvic region. They are often detected incidentally during routine examinations or investigated due to symptomatology such as pelvic pain or abnormal bleeding. The differential diagnosis for pelvic masses is broad and includes ovarian cysts, ectopic pregnancies, pelvic inflammatory disease, and neoplasms such as ovarian cancer and uterine fibroids. Correctly diagnosing these masses is critical, as the treatment strategies and prognoses differ significantly between benign and malignant conditions (Bennett and Oliva, xxxx; the role of the obstetrician-gynecologist in the early detection of epithelial ovarian cancer,xxxx).

Uterine leiomyomas are common, benign tumors that are diagnosed based on patient symptomatology and confirmed with pelvic exam and imaging. Leiomyomas, commonly characterized by pelvic pain, pressure, and abnormal uterine bleeding, can undergo changes over time, including myxoid changes, hyaline degeneration, cystic changes, calcification, fatty metamorphosis, and less often, hydropic changes. These degenerative changes as seen on imaging can result in diagnostic confusion, often raising concern for malignancy (Rosai, 2011; Blaustein's, 2013; Willmott et al., 2012). Degenerative leiomyomas, when confined to the uterus, can be confused with leiomyosarcoma on imaging. Although transvaginal ultrasound and computational tomography (CT) are commonly used in the assessment of pelvic masses, magnetic resonance imaging (MRI) is superior in characterizing the soft tissue and provides more information for distinguishing between benign and malignant changes (Bura et al., 2021). Lahkman et al. introduced four qualitative imaging features on MRI with the strongest statistical association to distinguish malignant from benign lesions: nodular borders, hemorrhage, "T2 dark" areas, and central unenhanced areas (Lakhman et al., 2017). Cases in which the tumors are particularly large or have adnexal involvement can further complicate the differential diagnosis and management. Although an elevated cancer antigen 125 (CA-125) marker can be helpful in narrowing the differential diagnosis in postmenopausal women, elevation of this marker can also be seen

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with endometriosis, pregnancy, and inflammatory conditions such as pelvic inflammatory disease (Bast et al, xxxx). There is no evidence-based threshold of CA-125 considered clinically significant in premenopausal women; therefore, the integration of this tumor marker with other clinical factors is strongly recommended in this population (the role of the obstetrician-gynecologist in the early detection of epithelial ovarian cancer, xxxx).

Here, we report a case of a young woman who presented with abdominal distension and CT findings concerning for advanced ovarian malignancy who was ultimately found to have a large uterine leiomyoma with hydropic degeneration. For perspective, we also conducted a brief literature review in this area.

2. Case

A 31-year-old woman, gravida 0, with no past medical history, presented with a large pelvic mass and symptoms of bloating, cramping, increasing abdominal distension, and discomfort. The patient indicated she had been evaluated 3 years earlier for similar symptoms. At that time, she underwent a transvaginal ultrasound, which showed a normal-sized uterus and right ovary, with 8.5 cm left ovary containing simple-appearing 5 cm and 3 cm cysts. The transvaginal ultrasound also revealed an elongated complex structure in the posterior cul-de-sac measuring 10 cm, likely representing dilated thick-walled fallopian tube. Further imaging with CT of the abdomen and pelvis revealed a 6-cm thin-walled cystic structure in the left adnexa, causing mass effect on the uterus, consistent with a possible ovarian or paraovarian cyst. At that time, a large amount of complex fluid was present within the pelvis. Based on these findings, she was offered diagnostic laparoscopy for further evaluation but was lost to follow-up. Three years later, the patient presented with worsening abdominal bloating and discomfort. She reported rapidly increasing abdominal distension over the last few weeks, with early satiety and difficulty laying flat. CT of the abdomen and pelvis revealed a 28 x 21 x 34 cm (TR x AP x CC) complex solid and cystic mass in the adnexa, which extended superoirly into the abdomen, to the level of the stomach, with small volume ascites, possibly representing an ovarian or primary peritoneal malignancy (Fig. 1). Additional findings included low-attentuation hepatic lesions < 1 cm and prominent bilateral supradiaphragmatic nodes. On evaluation of serum tumor markers, her CA-125 was 135 U/mL (the upper limit of normal for premenopausal women is 62 U/mL (Nguyen et al, xxxx), and her carcinoembryonic antigen (CEA), alpha-fetoprotein (AFP), inhibin A, and beta human chorionic gonadotropin (β-hCG) were 1.4 ng/mL, 3.8 ng/mL, 11 pg/mL, and < 5 miU/mL, respectively.

Given the patient's desire for fertility preservation, she was counseled on and consented for exploratory laparotomy, removal of the mass, unilateral salpingo-oophorectomy, and possible surgical staging. Upon entry into the abdomen via a large midline vertical skin incision, ~200 cc of non-hemorrhagic ascites and a large, 35-cm, complex multiloculated mass with solid and thin-walled cystic components extending from the posterior uterus to the level of the liver, with extensive adhesions to the rectosigmoid colon, were noted (Fig. 2). Both ovaries and fallopian tubes and upper abdominal survey were unremarkable. The mass was spontaneously draining serous fluid and was resected completely from the uterus. Moderate endometriosis was noted in the posterior cul-de-sac, and multiple biopsies were sent for pathologic evaluation. Frozen section revealed benign leiomyoma with extensive hydropic change; therefore, surgery was concluded after resection of the mass. Final histologic evaluation confirmed the diagnosis of leiomyoma with extensive hydropic change. Endometriosis was found in the adhesions to the pelvic sidewall and retroperitoneum.

3. Discussion

Leiomyomas with degenerative changes can mimic ovarian malignancies, presenting a diagnostic conundrum. Uterine leiomyomas are among the most common gynecologic neoplasms. Typical cases of leiomyoma are easy to diagnose by various imaging methods when symptoms of abnormal uterine bleeding or bulk symptoms, including pelvic pain or pressure, are present. Degenerative changes are common in uterine leiomyomas, corresponding to approximately 10 % of histopathological variants, the most common of which are myxoid, hyaline, cystic, and hydropic degenerations (Rosai, 2011). Although some degree of hydropic degeneration (watery edema within the tumor) is seen in up to 50 % of cases, extreme hydropic changes are uncommon (diffuse hydropic cystic or perinodular hydropic degeneration) (Blaustein's, 2013). These extreme and uncommon forms can pose a clinical and diagnostic challenge by obscuring the primary involved organ, and therefore, altering clinical and imaging pictures.

Ovarian cancer is the second leading cause of gynecologic cancer death in the United States after uterine cancer (Siegel et al., 2024); known risk factors are advanced age, and more specifically, postmenopausal status, a family history of ovarian cancer, and an increased number of lifetime ovulations (La Vecchia, xxxx). Pregnancy is

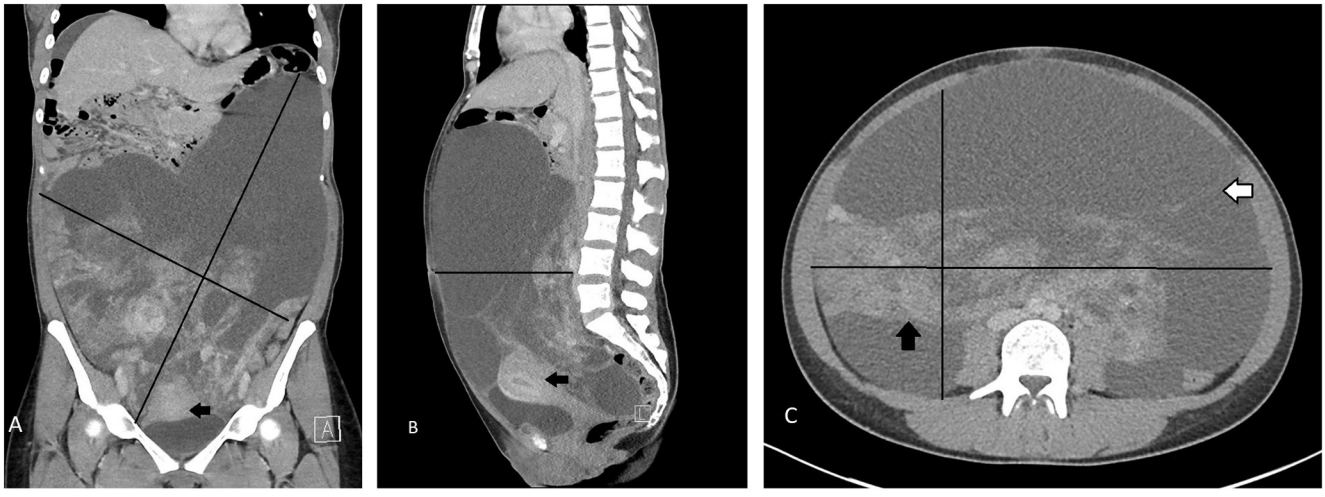

Fig. 1. Abdominopelvic computed tomography (CT) in the portal venous phase. (A) Coronal reconstruction demonstrating a large mixed cystic and solid mass encasing the uterus (black arrow); note the mass effect, with the bowel displaced to the upper abdomen. (B) Sagittal reconstruction, again showing the mass encasing the uterus (black arrow). (C) Axial image at the level of the aortic bifurcation demonstrating both the solid enhancing components (black arrow) and the cystic/multiloculated components (white arrow) of the lesion.

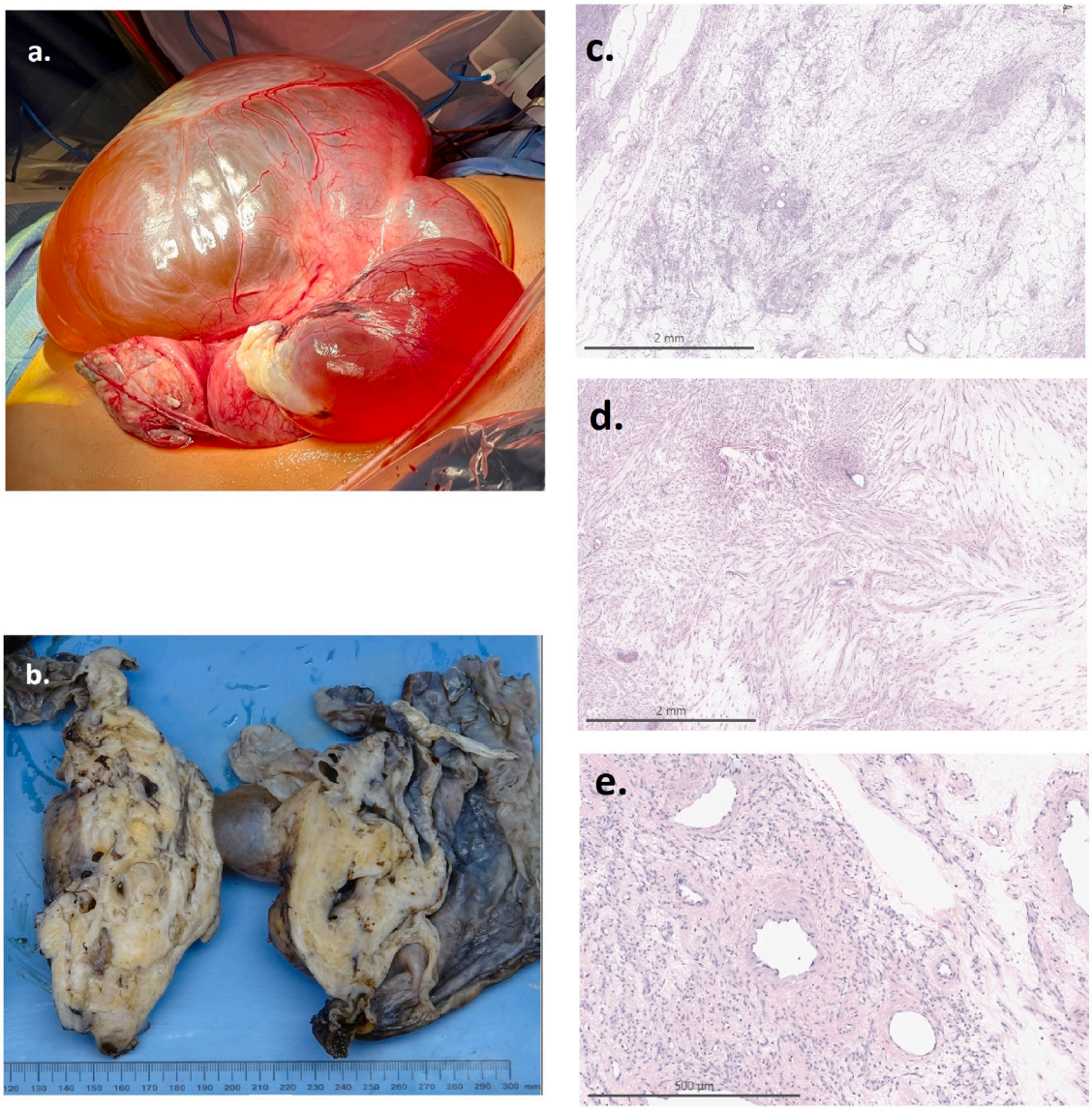

Fig. 2. Uterine pedunculated subserosal solid and cystic leiomyoma with extensive hydropic change. (a) intraoperative finding of a large mass. (b) large solid and cystic mass after formalin fixation and sectioning. Microscopic examination with H&E staining showing massive hydropic degeneration (c and d), and bland spindle cells associated with thick-walled vasculature typical of leiomyoma (e).

a protective factor (La Vecchia, xxxx). Preoperative evaluation of a patient with suspected ovarian cancer includes an assessment of symptoms, a full medical history, including family history evaluation, abdominal and pelvic exams, ultrasound and/or abdominal/pelvic CT scans, chest imaging, and assessment of CA-125 or other tumor markers, as clinically indicated. In this case, the patient was young, premenopausal, and nulliparous, presenting with symptoms typical of ovarian malignancy, including new onset bloating, abdominal distension, and abdominal-pelvic discomfort. These symptoms, in conjunction with imaging findings of a very large complex solid and cystic adnexal mass, prominent supradiaphragmatic nodes, and elevated CA-125, increased the suspicion for ovarian malignancy (La Vecchia, xxxx).

Various pathologies can mimic ovarian cancer on imaging, making the distinction between ovarian and primarily non-ovarian pathologies challenging. Mimics include *para*-ovarian cysts, fallopian tube diseases, peritoneal inclusion cysts, pathologies of the appendix, spinal meningeal cysts, lymphoceles, endometriomas, fibrothecomas, gastrointestinal stromal tumors, and broad ligament or pedunculated leiomyoma, especially those with degenerative changes (Bennett and Oliva, xxxx). Furthermore, of all confirmed ovarian malignancies, 17–30 % are secondary ovarian masses, of which 9–15 % are non-gynecologic. The most common malignancies of non-ovarian primaries are gastrointestinal metastases (colon, gastric, and appendiceal), breast cancer metastases, and non-ovarian gynecologic metastases (cervical and endometrial carcinomas) (Willmott et al., 2012). MRI offers multiplanar imaging and superior contrast resolution, which can assist with identifying a normal-appearing ovary, and therefore, distinguishing a pelvic mass from an ovarian neoplasm (Shetty, 2019). In the absence of solid nodules that can be safely biopsied preoperatively, preoperative biopsies of cystic masses presumed to be adnexal in origin are often contraindicated. In this case, MRI evaluation was not performed prior to the procedure given the patient's significant symptoms and CT findings, which indicated a need for urgent surgical management without further work-up.

We used the MEDLINE database to find and review cases of uterine leiomyomata misdiagnosed as ovarian tumors. We found 25 case reports of ovarian tumor-like leiomyomas with different characteristics between 1980 and 2022 (Togashi et al., 1986; Carabias et al., 1995; Domingo et al., 1998; Brown et al., 1998; Dunn et al., 1998; Yarwood and Arroyo, 1999; Migishima et al., 2000; Amant et al., 2001; Weise et al., 2002;

Kulshrestha et al., 2003; Low and Chong, 2004; Jao et al., 2007; Dancz and Macdonald, 2008; Takai et al., 2013; Aydin et al., 2013; Gajewska et al., 2013; Hacivelioglu and Erkanli, 2014; Bansal and Garg, 2014; Naz Masood et al., 2014; Yip et al., 2014; Dong et al., 2015; Karaman et al., 2015; Sharma et al., 2016; Yorita et al., 2016) (Table 1). Among a total of 26 studied cases, all were found to have benign tumor on final pathology. The median age was 45 years (range, 21–58). Menopausal status was reported in 24 subjects, 7 of whom were postmenopausal (29.2 %). The median tumor size (largest dimension) was 20 cm [5, 40]. Twenty-two (85 %) of 26 cases reported on gross morphological

Table 1
Details of reported cases of uterine leiomyoma clinically diagnosed as ovarian malignancy.

Study	Patient age (years)	CA-125 (U/mL)	Tumor's largest dimension (cm)	Gross morphology of the tumor	Postmenopausal	Ascites	Hydrothorax	Treatment	Histology
Togashi, et al. (1986) (7)	21	–	10	Cystic, pedunculated	No	–	–	Surgical excision	Subserosal leiomyoma
Togashi, et al. (1986) (7)	35	–	–	Cystic, pedunculated	No	–	–	Surgical excision	Subserosal leiomyoma
Carabias, et al. (1995) (8)	54	–	10	Solid and cystic	Yes	–	–	TAH, BSO	Intramural and subserosal leiomyoma
Domingo, et al. (1998) (9)	46	317	20	Large solid uterus-dependent mass	No	Present	Bilateral pleural effusion	TAH, BSO	Leiomyoma
Brown, et al. (1998) (10)	31	83	17	Solid and cystic	No	Present	Right pleural effusion	Surgical excision	Broad ligament leiomyoma
Dunn, et al. (1998) (11)	46	254	30	Pedunculated solid mass	–	Large	Right pleural effusion	TAH, BSO	Leiomyoma
Yarwood, et al. (1999) (12)	51	–	10	Cystic	Yes	–	–	Surgical excision	Subserosal leiomyoma
Migishima, et al. (2000) (13)	51	820	20.5	Solid	Yes	Large	Left pleural effusion	TAH, BSO	Leiomyoma
Amant, et al. (2001) (14)	39	785	30	Solid with cystic degeneration	No	Large	Left pleural effusion	Hysterectomy	Leiomyoma
Weise, et al. (2002) (15)	27	1854	–	–	No	Clinically noticeable ascites	Small right pleural effusion	Surgical excision	Leiomyoma
Kulshreshta, et al. (2003) (16)	40	NA	21	Cystic and solid, pedunculated	No	–	–	–	Subserosal leiomyoma
Low, et al. (2004) (17)	56	Normal	19	Cystic and solid, pedunculated	Yes	–	–	TAH, BSO	Subserosal leiomyoma
Jao, et al. (2007) (18)	55	120 –> 16.3 (8 mo)	32	Cystic and solid, pedunculated	Yes	–	–	TAH, BSO	Subserosal leiomyoma
Dancz, et al. (2008) (19)	51	Normal	40	Cystic (multiloculated), pedunculated	–	–	–	–	Subserosal leiomyoma
Takai, et al. (2013) (20)	46	–	13	Cystic and solid, pedunculated	–	–	–	–	Subserosal leiomyoma
Aydin, et al. (2013) (21)	58	Normal	33	Cystic and solid, pedunculated	Yes	–	–	TAH, BSO	Subserosal leiomyoma
Gajewska, et al. (2013) (22)	40	389 –> 27 (4 wk)	25	Cystic and solid, pedunculated	No	–	–	Surgical excision	Subserosal leiomyoma
Hacivelioglu, et al. (2014) (23)	32	–	20	Cystic and solid, pedunculated	No	–	–	Surgical excision	Subserosal leiomyoma
Bansal, et al. (2014) (24)	45	16	12	Cystic and solid, pedunculated	No	–	–	TAH, BSO	Broad ligament leiomyoma
Naz Masood, et al. (2014) (25)	43	Normal	19.5	Cystic and solid, pedunculated	–	–	–	TAH, BSO	Broad ligament leiomyoma
Yip, et al. (2014) (26)	41	939	12	Cystic and solid, pedunculated	No	Large	None	Surgical excision	Subserosal leiomyoma
Dong, et al. (2015) (27)	37	920	20	Cystic and solid, pedunculated	No	Large	Bilateral pleural effusion	Surgical excision	Necrotic uterine leiomyoma
Karaman, et al. (2015) (28)	45	210	30	Cystic and solid, pedunculated	No	–	–	TAH, BSO	Subserosal lipoleiomyoma
Sharma, et al. (2016) (29)	50	155	29	Solid and cystic	Yes	–	–	TAH, BSO	Broad ligament cellular leiomyoma
Yorita, et al. (2016) (30)	47	Normal	5	Cystic and solid, pedunculated	No	–	–	Surgical excision	Subserosal leiomyoma
Current	31	135	34	Cystic and solid	No	Small	None	Surgical excision	Leiomyoma with hydropic change

TAH = total abdominal hysterectomy; BSO = bilateral salpingo-oophorectomy.

assessment as heterogenous tumors described as 'solid and cystic', 'pedunculated solid and cystic', or 'solid with cystic degeneration'. Aside from our case, CA-125 was reported in 13 other studies (median, 285 U/mL [range, 16–1854]). All patients underwent surgical intervention for possible ovarian malignancy; 12 underwent total abdominal hysterectomy with bilateral salpingo-oophorectomy and 11 underwent only surgical excision of the tumor (the details of the surgical procedure was not reported in 3 studies). Table 1 shows the details of the included cases.

In conclusion, the differential diagnosis of large complex adnexal and pelvic masses should include degenerating leiomyomas with hydropic degeneration, especially when neoplastic preoperative features are present. These patients should undergo careful preoperative and intraoperative evaluation to ensure appropriate management strategy and to prevent unnecessary radical procedures.

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CRediT authorship contribution statement

Hadi Erfani: Writing – review & editing, Writing – original draft, Investigation, Data curation. **Sarah Chiang:** Writing – review & editing, Writing – original draft. **Shannan Dickinson:** Writing – review & editing, Writing – original draft. **Dennis S. Chi:** Writing – review & editing, Writing – original draft, Conceptualization. **Sarah H. Kim:** Writing – review & editing, Writing – original draft.

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