Cureus
Part of SPRINGER NATURE

Open Access Case Report

Intact Resection and Surgical Staging of a Giant Right Ovarian Mucinous Borderline Tumor in a Patient With a Complex Surgical History: A Case Report

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Review began 10/26/2026
Review ended 11/03/2026
Published 11/05/2026

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DOI: 10.7759/cureus.119168

Abstract

Giant ovarian tumors present significant diagnostic and surgical challenges, particularly in patients with extensive prior abdominal and pelvic surgery. We report the surgical management of a giant right ovarian mucinous borderline tumor in a 44-year-old woman, gravida 3 para 3, who presented with a 2-year history of chronic pelvic pain that progressed to severe stabbing pain over 2 weeks. Her surgical history included three cesarean deliveries, open cholecystectomy, laparoscopically assisted vaginal hysterectomy with left ovarian cystectomy and bilateral salpingectomy with preservation of both ovaries, laparoscopic leiomyoma excision, and open abdominoplasty. Contrast-enhanced computed tomography demonstrated a 26 × 21 × 22 cm multiloculated right ovarian mass with cystic and solid components extending from the pelvis into the right upper quadrant. The available tumor markers, including CA-125, lactate dehydrogenase, inhibin A, and inhibin B, were within normal limits. Results for carcinoembryonic antigen (CEA) and carbohydrate antigen 19-9 (CA 19-9) were not documented in the available records. The patient underwent exploratory laparotomy requiring extensive adhesiolysis lasting more than 60 minutes and bilateral ureterolysis. The mass was successfully excised intact without rupture or spillage, followed by surgical staging procedures involving omental and peritoneal biopsies, pelvic and para-aortic tissue sampling, and peritoneal washings. Intraoperative cystoscopy confirmed bilateral ureteral patency, and estimated blood loss was less than 50 mL. Gross pathological examination revealed a 4.96-kg ovarian mass measuring 28.5 × 21 × 18.5 cm, with final histopathology confirming a mucinous borderline tumor. Omental and peritoneal biopsies demonstrated no malignancy. The postoperative course was uneventful, and the patient was discharged home in stable condition on postoperative day two. This case highlights the importance of careful operative planning, meticulous adhesiolysis, ureteral identification and protection, and intact specimen extraction when managing giant ovarian tumors in patients with complex surgical histories.

Categories: Obstetrics/Gynecology, General Surgery, Oncology
Keywords: adhesiolysis, adnexal mass, exploratory laparotomy, giant ovarian mass, mucinous borderline ovarian tumor, oncologic staging, ovarian neoplasm, pelvic adhesions, salpingo-oophorectomy, ureterolysis

Introduction

Adnexal masses are frequently encountered in gynecologic practice, but ovarian tumors reaching giant proportions remain relatively uncommon with the widespread use of pelvic imaging. Although no universally accepted size threshold defines a giant ovarian tumor, cutoffs of 10 cm and 15 cm have been reported in the literature [1-5]. Symptoms often develop gradually and may initially be attributed to weight gain, gastrointestinal disturbances, or chronic pelvic discomfort.

Mucinous ovarian neoplasms account for approximately 10-15% of ovarian tumors and characteristically present as large, unilateral, multiloculated cystic masses. Approximately 80% are benign, while 16-17% are classified as borderline tumors [6]. Mucinous borderline ovarian tumors (MBOTs) are characterized by atypical epithelial proliferation without destructive stromal invasion and account for approximately 35-45% of borderline ovarian tumors [7,8]. These neoplasms are typically unilateral, frequently present at an early stage, and have an excellent prognosis. However, their substantial size and histological heterogeneity, including the potential coexistence of benign, borderline, and invasive components, complicate accurate preoperative and intraoperative characterization [8]. Serum tumor markers and radiologic findings may not reliably distinguish borderline tumors from benign or invasive mucinous neoplasms, while frozen-section examination is susceptible to underdiagnosis, particularly in large, heterogeneous tumors [9-12].

As ovarian tumors enlarge, they may produce compressive symptoms, including abdominal distension, urinary frequency, constipation, and respiratory compromise secondary to diaphragmatic elevation [13,14]. Their size also introduces anesthetic and operative challenges, including potential venous compression, altered respiratory mechanics, and hemodynamic changes associated with tumor removal [13,15,16]. Surgical management becomes particularly challenging in patients with extensive prior abdominal or pelvic

surgery, as dense adhesions can distort normal anatomical planes, limit exposure, and increase the risk of injury to adjacent structures [17]. Careful adhesiolysis, retroperitoneal dissection, and ureteral identification may therefore be necessary to facilitate safe tumor removal [18-20].

When the malignant potential of a large mucinous ovarian mass cannot be established preoperatively, preservation of capsular integrity becomes an important surgical consideration. Intraoperative rupture may result in intraperitoneal spillage and alter International Federation of Gynecology and Obstetrics (FIGO) staging [21-24]. Additionally, retrospective studies have associated tumor rupture with an increased risk of recurrence in borderline ovarian tumors [25]. Although controlled cyst decompression may facilitate the removal of selected benign-appearing ovarian masses, the presence of solid components and uncertain malignant potential favors intact extraction to minimize the risk of intraperitoneal spillage. Surgical staging of ovarian neoplasms involves assessing the extent of disease through procedures such as peritoneal washings, omental and peritoneal evaluation with appropriate biopsies, and retroperitoneal lymph node assessment when clinically indicated. Intact specimen extraction and appropriate surgical staging are therefore important considerations in managing large, complex adnexal masses.

We present the case of a 44-year-old woman with an extensive gynecologic and abdominal surgical history who underwent intact resection and surgical staging of a giant right ovarian mass measuring 28.5 × 21 × 18.5 cm and weighing 4.96 kg. Final histopathological examination confirmed a mucinous borderline ovarian tumor, with operative and pathological findings suggesting disease confined to the ovary (presumed FIGO stage IA). This case highlights the importance of careful operative planning, extensive adhesiolysis, bilateral ureterolysis, and preservation of tumor integrity when managing giant ovarian neoplasms in patients with complex surgical histories.

Case Presentation

Clinical presentation

A 44-year-old woman, gravida 3 para 3, with a body mass index (BMI) of 37.12 kg/m², presented with severe, progressively worsening abdominal, flank, and pelvic pain. She reported chronic mild discomfort over the preceding one to two years, with a marked increase in severity during the previous two weeks. The pain had become constant, sharp, and stabbing, reaching an intensity of 10/10 on the day of presentation. It was exacerbated by movement and partially relieved by drawing her knees toward her chest. Associated symptoms included intermittent fever, with patient-reported temperatures ranging from 101°F to 103°F at her workplace, chills, fatigue, and nausea and vomiting over the preceding week. She also reported severe chronic constipation and increased urinary frequency but denied vaginal bleeding, abnormal vaginal discharge, or dysuria.

Past medical, surgical, and family history

The patient's history was notable for multiple prior abdominal, pelvic, and gynecologic surgical procedures. She underwent three cesarean deliveries, including one primary and two repeat cesarean sections (2001, 2002, and 2008), followed by an open cholecystectomy in 2011. In 2016, she underwent a laparoscopically assisted vaginal hysterectomy with left ovarian cystectomy for a benign left ovarian mass and bilateral salpingectomy, with preservation of both ovaries. Additional procedures included laparoscopic excision of a pedunculated leiomyoma in 2018 and open abdominoplasty in 2024. She also underwent a benign left breast lumpectomy in 2018, with a normal screening mammogram approximately one month before presentation.

The patient was a former cigarette smoker who had quit three years before presentation and denied alcohol or recreational drug use. Her family history was significant for ovarian cancer in a maternal great-aunt, leukemia and lung cancer in her maternal grandmother, and gastric cancer in her paternal grandmother. Her mother had undergone removal of multiple benign masses and reportedly had negative germline genetic testing. The patient had not previously undergone genetic counseling or testing.

Physical examination

On examination, the patient was alert but appeared to be in acute distress secondary to pain. She was afebrile, with a blood pressure of 138/82 mmHg, heart rate of 88 beats/min, respiratory rate of 16 breaths/min, and oral temperature of 97.2 °F (36.2 °C). Abdominal examination revealed a soft abdomen with marked tenderness in the right lower quadrant and right flank. A large, firm, nonmobile mass was palpable, extending from the pelvis into the upper abdomen. No rebound tenderness or involuntary guarding was noted. Pelvic examination confirmed the surgical absence of the uterus and cervix, with displacement of the upper vaginal vault by the large abdominal mass.

Diagnostic workup

Preoperative laboratory evaluation included a complete blood count, comprehensive metabolic panel, coagulation studies, urinalysis, urine culture, and serum tumor markers. Most laboratory parameters were within their respective reference ranges, with no evidence of leukocytosis, anemia, or significant electrolyte abnormalities. The estimated glomerular filtration rate (eGFR) was mildly below the laboratory reference

threshold, while the activated partial thromboplastin time (aPTT) was marginally shortened. Tumor markers, including cancer antigen 125 (CA-125), lactate dehydrogenase (LDH), inhibin A, and inhibin B, were within normal limits. Detailed laboratory findings are summarized in Table *1*. A baseline preoperative electrocardiogram (ECG) was normal.

Laboratory Parameter	Patient Result	Reference Range	Clinical Significance
White blood cells	9.2 × 10^3/μL	4.8–10.8 × 10^3/μL	No leukocytosis
Red blood cells	4.81 × 10^6/μL	4.2–5.4 × 10^6/μL	Within normal limits
Hemoglobin	13.5 g/dL	12.0–16.0 g/dL	No anemia
Hematocrit	40.0%	37.0–47.0%	Within normal limits
Platelets	395 × 10^3/μL	130–400 × 10^3/μL	Within reference range
Creatinine	0.9 mg/dL	0.6–1.3 mg/dL	Within reference range
eGFR (2021 CKD-EPI)	80.84 mL/min/1.73 m^2	≥90 mL/min/1.73 m^2	Mildly below reference threshold
Sodium/Potassium	141 / 4.1 mmol/L	135–145 / 3.5–5.1 mmol/L	Within normal limits
AST/ALT	30 / 49 U/L	15–37 / 30–65 U/L	Within reference ranges
Alkaline phosphatase	90 U/L	50–136 U/L	Within normal limits
Prothrombin time	10.3 s	9.5–12.1 s	Within normal limits
INR	1.01	0.93–1.20	Within normal limits
Activated PTT	24.2 s	24.5–31.5 s	Marginally below reference range
Urinalysis and culture	Hazy urine, trace mucus; culture reported less than 100,000 CFU of gram-positive cocci	Clear urine, absent mucus	Findings require clinical correlation
CA-125	Reported within normal limits	Not available	Normal results do not exclude ovarian neoplasia
LDH	Reported within normal limits	Not available	Within reported normal range
Inhibin A, ultrasensitive	10.9 pg/mL	Not available	Within reported normal range
Inhibin B	10.9 pg/mL	Not available	Within reported normal range

TABLE 1: Preoperative laboratory findings

eGFR, estimated glomerular filtration rate; CKD-EPI, Chronic Kidney Disease Epidemiology Collaboration; AST, aspartate aminotransferase; ALT, alanine aminotransferase; INR, international normalized ratio; PTT, partial thromboplastin time; CFU, colony-forming units; CA-125, cancer antigen 125; LDH, lactate dehydrogenase

Radiological assessment

Contrast-enhanced computed tomography (CT) of the abdomen and pelvis demonstrated a giant, well-defined, multiloculated mass with mixed cystic and solid components measuring 26 × 21 × 22 cm, arising from the right adnexal region and extending from the pelvis into the right upper quadrant. Pelvic ultrasonography further confirmed the presence of the large complex adnexal mass. Moderate omental stranding was observed in the right upper quadrant without discrete metastatic nodules or omental caking. Trace pelvic free fluid was present, without significant ascites. The left ovary appeared structurally normal, and a small fat-containing umbilical hernia was incidentally identified. Posteroanterior and lateral chest radiographs demonstrated no acute abnormalities. The available radiological documentation did not establish whether hydroureteronephrosis was present or absent on preoperative CT imaging. Additional

imaging characteristics, including O-RADS (Ovarian-Adnexal Reporting and Data System) classification, Doppler vascularity, septal thickness, and specific contrast-enhancement patterns of the solid components, were not documented in the available reports.

Surgical intervention

Given the substantial size, multiloculated appearance, and solid components of the right ovarian mass, malignancy could not be excluded preoperatively. Referral to a gynecologic oncologist was recommended and discussed with the patient. However, she declined referral and elected to undergo surgical management locally. Extensive preoperative counseling addressed the proposed procedure, available alternatives, anticipated benefits, and potential complications, including injury to the bowel, bladder, ureters, or major vessels due to adhesions, hemorrhage, and the possibility of an underlying malignancy requiring additional treatment. Written informed consent was obtained for surgical intervention, including staging procedures and removal of the contralateral ovary.

On hospital day one, the patient underwent exploratory laparotomy under general endotracheal anesthesia. Bilateral lower-extremity sequential compression devices were applied for venous thromboembolism prophylaxis, and intravenous cefazolin was administered before skin incision. The patient was positioned supine, a Foley catheter was inserted, and the abdomen was prepared and draped in a sterile fashion.

A vertical midline incision was made from the pubic symphysis to approximately 2.5 cm below the umbilicus and extended through the subcutaneous tissue and rectus fascia. Upon entering the peritoneal cavity, the substantial size of the mass and its extensive adhesions became apparent. To facilitate safe mobilization and minimize the risk of capsular rupture, the incision was extended around the umbilicus to approximately 4 cm above it. Peritoneal washings were obtained immediately upon entry and submitted for cytologic evaluation.

Intraoperative exploration revealed a tense, multiloculated right ovarian mass occupying the pelvis, extending beneath the pubic symphysis, and reaching approximately 10 to 15 cm above the umbilicus. The external surface was smooth and intact, without visible excrescences or capsular defects. Dense, vascular adhesions connected the mass to the anterior abdominal wall, right pelvic sidewall, and multiple loops of small bowel along its posterior surface. Additional adhesions involved the sigmoid colon and left ovary. No gross ascites, peritoneal implants, or omental nodularity were identified. The appendix appeared grossly normal and was preserved.

Extensive adhesiolysis was performed for more than 60 minutes using a combination of blunt and sharp dissection with electrosurgical cautery, while maintaining meticulous hemostasis. Given the substantial distortion of pelvic anatomy and proximity of the mass to retroperitoneal structures, bilateral ureterolysis was performed early in the procedure to identify and protect both ureters. The available preoperative documentation did not establish whether prophylactic ureteral stenting had been considered. Following complete mobilization of the mass, the right infundibulopelvic ligament was skeletonized, clamped using a Heaney clamp, transected with an EnSeal device, and doubly ligated with 0-Vicryl suture. No fallopian tube was attached to the mass, consistent with the patient's prior bilateral salpingectomy. The right ovarian mass was removed intact without capsular rupture, spillage, or leakage and submitted for permanent histopathologic evaluation. Intraoperative frozen-section examination was not performed. The available operative documentation did not specify the reason frozen-section examination was omitted. However, the possibility of malignancy had been addressed during preoperative counseling, and the patient had provided informed consent for surgical staging procedures. The gross appearance of the intact specimen is shown in Figure *1*.



FIGURE 1: Gross appearance of the intact giant right ovarian mucinous borderline tumor

Gross photograph of the excised right ovarian mass on the surgical back table following intact extraction. The specimen weighed 4.96 kg and measured 28.5 × 21 × 18.5 cm on pathological examination. The external surface was smooth, intact, and dark purple, with prominent superficial vascularity and no visible capsular rupture or surface excrescences. No fallopian tube was attached to the specimen. Final histopathological examination confirmed a mucinous borderline ovarian tumor.

Because the malignant potential of the mass remained uncertain intraoperatively, additional surgical staging procedures were performed. A left oophorectomy was completed, with no residual fallopian tube identified. This was consistent with the patient's prior bilateral salpingectomy, and removal of the remaining ovary had been discussed during preoperative counseling. Additional staging procedures included partial omentectomy using electrosurgical transection, peritoneal biopsies from the right and left pelvic sidewalls and posterior cul-de-sac, and sampling of right pelvic, left pelvic, and para-aortic nodal tissue.

Following completion of the surgical procedures, the operative fields were thoroughly inspected, and hemostasis was confirmed. The liver and diaphragmatic surfaces appeared smooth without visible nodules. Examination of the small and large bowel revealed no apparent serosal injury. Sponge, needle, and instrument counts were correct.

Intraoperative cystoscopy was performed before abdominal closure to assess urinary tract integrity. The bladder mucosa appeared normal without evidence of injury, and urine efflux was observed from both

ureteral orifices, supporting bilateral ureteral patency. A new Foley catheter was subsequently inserted. The peritoneum was closed using running 2-0 Vicryl suture, followed by fascial closure with 0-PDS, subcutaneous approximation with 2-0 Vicryl, and skin closure using running subcuticular 4-0 Monocryl. A Mepilex dressing was applied.

The anesthesia team administered a bilateral transversus abdominis plane block for postoperative analgesia. Estimated blood loss was less than 50 mL, and intraoperative urine output was 250 mL. No intraoperative complications were reported.

Histopathological findings

Right Ovarian Mass

Gross pathological examination revealed an intact right ovarian mass weighing 4.96 kg and measuring 28.5 × 21 × 18.5 cm. The external surface was smooth, dark purple, and intact, with no attached fallopian tube. Upon sectioning, the cyst wall measured 0.1 to 1.0 cm in thickness. Approximately 50% of the internal lining was smooth and tan-pink, while the remaining portion consisted of multiloculated cystic compartments containing thick, pink-tan gelatinous material. A 14.5 × 14.5 cm region of irregular, solid, tan-pink tissue was also identified. No papillary excrescences were observed. Representative sections of the solid, cystic, and multiloculated components were submitted for microscopic evaluation in tissue blocks 1A-1L. Final histopathological examination established the diagnosis of a mucinous borderline ovarian tumor.

Staging Specimens

Histopathological examination of the additional surgical specimens revealed no malignancy (Table *2*). The contralateral left ovary was benign, and the omental specimen demonstrated no gross nodularity or microscopic evidence of malignancy. Peritoneal biopsies from the right and left pelvic regions and posterior cul-de-sac were also benign. The posterior cul-de-sac specimen contained benign congested fibrous tissue, while the remaining peritoneal specimens consisted of benign fibroadipose tissue. Specimens submitted for right pelvic, left pelvic, and para-aortic lymph node evaluation showed benign fibroadipose tissue without evidence of malignancy. No identifiable lymphoid tissue was present in the right pelvic and para-aortic specimens. The left pelvic specimen contained a possible lymphoid fragment on gross examination, although the final pathological diagnosis described benign fibroadipose tissue.

Specimen	Gross Findings	Final Diagnosis
Right ovarian mass	4.96 kg; 28.5 × 21 × 18.5 cm; smooth, intact dark purple surface; approximately 50% smooth lining and 50% multiloculated cystic areas with gelatinous contents; 14.5 × 14.5 cm solid area; no papillary excrescences or attached fallopian tube	Mucinous borderline tumor
Omentum	16.5 × 12.5 × 1.0 cm; no gross nodules	Benign omentum; no malignancy identified
Posterior cul-de-sac peritoneum	1.5 cm fragment of hemorrhagic soft tissue	Benign congested fibrous tissue; no malignancy identified
Left ovary	3.0 × 2.3 × 1.5 cm; 5 g; tan-pink, cerebriform appearance	Benign ovary; no malignancy identified
Right pelvic peritoneum	1.8 cm fragment of mildly hemorrhagic membranous tissue	Benign fibroadipose tissue; no malignancy identified
Right inguinal pelvic nodal specimen	3.5 × 3.0 × 0.8 cm aggregate of fragmented adipose tissue; no lymphoid tissue identified grossly	Benign fibroadipose tissue; no lymphoid tissue or malignancy identified
Left pelvic nodal specimen	1.4 cm aggregate containing a possible lymphoid tissue fragment	Benign fibroadipose tissue; no malignancy identified
Left pelvic peritoneum	2.0 cm fragment of hemorrhagic membranous and fatty tissue	Benign fibroadipose tissue; no malignancy identified
Para-aortic nodal specimen	2.0 × 2.0 × 0.5 cm aggregate of fatty tissue; no lymphoid tissue identified grossly	Benign fibroadipose tissue; no lymphoid tissue or malignancy identified
Peritoneal washings	60 mL of red fluid; cell block and cytospin preparations examined	Acute blood; malignant-cell status not explicitly reported

TABLE 2: Surgical pathology and cytology findings

Peritoneal Cytology

The peritoneal fluid specimen consisted of 60 mL of red fluid submitted for cytological examination. Cell block and cytospin preparations were examined, with the final cytological diagnosis reporting acute blood. The report did not explicitly document the presence or absence of malignant cells. The gross and final pathological findings of all submitted specimens are summarized in Table *2*.

Pathological Assessment

The right ovarian tumor was removed intact without intraoperative rupture or spillage. Histopathological examination confirmed a mucinous borderline ovarian tumor, with no malignancy identified in the contralateral ovary, omental specimen, or sampled peritoneal tissues. Although tissue was submitted for regional lymph node evaluation, the available pathological findings did not establish histologically confirmed negative lymph nodes. The operative and pathological findings were consistent with an apparently ovary-confined tumor, although definitive FIGO staging requires confirmation of the relevant surface and cytological findings.

Postoperative course and follow-up

Following surgery, the patient was transferred awake and hemodynamically stable to the post-anesthesia care unit before admission to the surgical floor. Her postoperative recovery was uncomplicated. By postoperative day one, she was ambulating independently, and her severe preoperative abdominal and pelvic pain had completely resolved. She reported only mild incisional and right lower quadrant soreness, which was adequately controlled with scheduled acetaminophen and ibuprofen, supplemented by oral

oxycodone as needed. She tolerated a regular diet without nausea or vomiting, had a bowel movement, and demonstrated appropriate wound healing, with the incision remaining clean, dry, and intact.

The patient was discharged home in stable condition on postoperative day two. At discharge, her blood pressure was 102/55 mmHg, heart rate was 90 beats/min, respiratory rate was 18 breaths/min, temperature was 98.3 °F (36.8°C), and oxygen saturation was 100% on room air. Discharge instructions included pelvic rest, avoidance of heavy lifting, continued ambulation, resumption of a regular diet, and multimodal oral analgesia for postoperative pain management.

At the one-week postoperative follow-up visit, the surgical incision was healing appropriately, without evidence of infection or reported wound complications (Figure *2*). Final histopathological examination had established the diagnosis of a mucinous borderline ovarian tumor. No adjuvant therapy was recommended, and continued clinical surveillance was planned. Serial tumor marker monitoring was not planned because the preoperative tumor markers had been within normal limits. A four-week postoperative follow-up visit was scheduled for further clinical evaluation, review of the final pathological findings, discussion of ongoing surveillance, and consideration of genetic counseling given the patient's family history of ovarian cancer.



FIGURE 2: Abdominal incision at one-week postoperative follow-up

Clinical photograph obtained one week after exploratory laparotomy, demonstrating the vertical midline abdominal incision with extension around the umbilicus. Mild residual superficial crusting and localized postoperative discoloration are visible along the incision, particularly in the periumbilical region. At the follow-up examination, the incision was documented as healing without clinical signs of infection.

Discussion

The presentation of a giant ovarian mass exceeding 25 cm represents a significant diagnostic and surgical challenge in modern gynecologic practice. A central diagnostic consideration is distinguishing a benign or borderline mucinous neoplasm from an invasive primary ovarian epithelial malignancy and, particularly in mucinous tumors, from metastatic gastrointestinal carcinoma. In this patient, the combination of a large, unilateral, multiloculated mass with a smooth external surface favored a primary ovarian mucinous neoplasm, with final histopathology identifying a mucinous borderline ovarian tumor. However, normal preoperative tumor markers alone could not establish the malignant potential of the lesion [8,22]. Gross characteristics favoring primary ovarian origin over metastatic mucinous disease include unilaterality, substantial tumor size, and a smooth external surface. In the widely used size-and-laterality algorithm, unilateral mucinous tumors measuring at least 13 cm are classified as primary ovarian tumors, with approximately 98% accuracy in identifying primary tumors [26]. These characteristics were present in this case.

Nevertheless, gross morphological criteria are supportive rather than definitive. Metastatic gastrointestinal mucinous carcinomas, particularly those originating from the colorectum, may occasionally present as large, unilateral ovarian masses that mimic primary ovarian neoplasms. Therefore, further evaluation should be considered when the clinical or pathological findings raise concern for metastatic disease. In mucinous ovarian neoplasms, gastrointestinal evaluation and additional serum markers, including carcinoembryonic antigen (CEA) and carbohydrate antigen 19-9 (CA 19-9), may assist in the diagnostic assessment when clinically indicated [22]. Importantly, CA-125 is frequently normal in mucinous ovarian tumors, and its normal value in this patient does not independently support or exclude a particular histological diagnosis. When the distinction between primary ovarian and metastatic gastrointestinal disease remains uncertain, immunohistochemical analysis can provide additional diagnostic information. Primary ovarian mucinous tumors frequently demonstrate CK7 expression, with variable PAX8 positivity and generally absent SATB2 expression, whereas lower gastrointestinal primaries more commonly express CK20 and SATB2. Combined CK7 and SATB2 immunohistochemistry has demonstrated greater than 95% diagnostic accuracy in distinguishing primary ovarian mucinous tumors from lower gastrointestinal metastases [27]. Furthermore, a SATB2-negative and PAX8-positive immunohistochemical profile has been reported to demonstrate 100% specificity for primary ovarian mucinous neoplasms within the studied differential diagnostic setting [28]. These findings should be interpreted in conjunction with tumor morphology, clinical history, and radiological evaluation.

Mucinous borderline ovarian tumors are predominantly unilateral and commonly diagnosed at an early stage, with an excellent overall prognosis. Reported five-year overall survival exceeds 95%, with the majority of patients presenting with disease confined to the ovary [29,30]. Despite these favorable outcomes, accurate histopathological classification remains essential because mucinous tumors may exhibit substantial intratumoral heterogeneity, with benign, borderline, and occasionally invasive components coexisting within the same lesion. Thorough pathological sampling, particularly of solid or morphologically suspicious regions, is therefore necessary to minimize the risk of overlooking focal invasive carcinoma. Sampling recommendations commonly emphasize examination proportional to tumor size, including at least one tissue block per centimeter of maximum tumor diameter [8]. Important pathological features requiring evaluation include intraepithelial carcinoma and stromal microinvasion, while higher disease stage and younger age have also been reported as factors associated with recurrence in borderline ovarian tumors [8,30]. The risk of malignant progression following a diagnosis of mucinous borderline ovarian tumor has been estimated at approximately 4%, although distinguishing true progression from an initially undersampled invasive component remains an important consideration [8]. These findings underscore the importance of adequate histological evaluation, particularly in a heterogeneous specimen of this magnitude.

The most instructive surgical aspect of this case was the successful intact removal of a giant ovarian mass in the setting of extensive prior abdominal and pelvic surgery. The patient's surgical history included three cesarean deliveries, open cholecystectomy, laparoscopically assisted vaginal hysterectomy with left ovarian cystectomy and bilateral salpingectomy, subsequent laparoscopic leiomyoma excision, and recent open abdominoplasty. The prior open abdominoplasty also represented an important consideration during abdominal entry and closure, as previous abdominal wall dissection may alter subcutaneous tissue planes and increase the technical difficulty of midline access. Although rectus plication can further increase abdominal wall tension and complicate fascial closure, the available records did not establish whether this procedure had been performed. These procedures contributed to a complex operative environment characterized by dense, vascular adhesions involving the anterior abdominal wall, pelvic sidewall, and multiple loops of small bowel along the posterior surface of the mass. Additional adhesions involved the sigmoid colon and contralateral ovary. These findings increased the technical difficulty of dissection and the potential risk of bowel, vascular, and urinary tract injury. Extension of the vertical midline incision approximately 4 cm above the umbilicus improved surgical exposure, while meticulous adhesiolysis lasting more than 60 minutes allowed controlled mobilization of the mass. Bilateral ureterolysis was performed early to identify and protect the ureters within the distorted pelvic anatomy. Intraoperative cystoscopy subsequently demonstrated bilateral ureteral efflux, supporting ureteral patency at the conclusion of the procedure.

Preservation of capsular integrity during surgical mobilization is another important consideration in the management of giant ovarian neoplasms. Intraoperative rupture may result in intraperitoneal spillage and, when the remaining staging criteria are satisfied, can change the classification of an otherwise FIGO stage IA ovarian tumor to stage IC1. Tumor rupture has also been associated with an increased risk of recurrence in borderline ovarian neoplasms [8,25]. However, the clinical implications of capsular rupture differ between invasive ovarian carcinoma and borderline tumors and should not be overstated. For borderline ovarian tumors, adjuvant chemotherapy has not demonstrated a consistent therapeutic benefit, meaning that surgical upstaging alone would not necessarily warrant additional systemic treatment. Nevertheless, FIGO stage IC has been identified as an adverse prognostic factor in a nationwide cohort, with a reported hazard ratio of approximately 2.7, although five-year overall survival for mucinous borderline ovarian tumors remains above 95% [29]. The principal benefit of intact specimen extraction in this patient was therefore preservation of capsular integrity, avoidance of surgical spillage, and reduction of uncertainty in subsequent staging and surveillance decisions. Meticulous, hemostatic dissection permitted intact extraction of the 4.96-kg mass without rupture or leakage, with estimated blood loss below 50 mL and early postoperative

return of bowel function. Although peritoneal washings were obtained at the beginning of the procedure, the final cytology report documented acute blood without explicitly reporting the absence of malignant cells. Consequently, the available cytological documentation alone does not definitively establish all criteria required for FIGO stage IA [31].

The extent of surgical staging in borderline ovarian tumors remains an important consideration. Omental assessment and peritoneal biopsies may identify otherwise unrecognized extraovarian disease and contribute to accurate staging, although reported rates of surgical upstaging vary according to tumor histology, initial stage, and the extent of evaluation [22]. By contrast, routine systematic lymphadenectomy is generally not recommended for borderline ovarian tumors because neither nodal involvement nor lymphadenectomy has demonstrated a clear overall survival benefit. Nodal evaluation is therefore generally reserved for clinically or radiologically suspicious lymph nodes [30,32]. In this patient, tissue submitted from the right pelvic, left pelvic, and para-aortic regions demonstrated benign fibroadipose tissue without histologically confirmed lymph nodes. Accordingly, regional nodal status could not be definitively established (pNX). This finding highlights the importance of distinguishing attempted nodal sampling from successful histopathological lymph node evaluation. Historically, appendectomy was frequently performed during staging of mucinous ovarian tumors because of concern for appendiceal primary malignancy. However, current recommendations generally do not support routine appendectomy when the appendix is grossly normal, as was observed in this patient [22].

Finally, adjuvant chemotherapy and radiotherapy have not demonstrated an established clinical benefit for appropriately classified borderline ovarian tumors following surgical management. Consequently, postoperative care generally consists of surveillance rather than additional antineoplastic treatment [22,33]. Recommended surveillance strategies may include clinical evaluations every two to four months during the first two years, every three to six months during the subsequent three years, and annually thereafter. Physical and pelvic examinations, imaging when clinically indicated, and selective tumor marker monitoring may be incorporated according to the patient's initial findings and clinical course. Serial tumor marker assessment may have limited utility when markers were not elevated preoperatively. Genetic risk evaluation should also be considered when indicated by personal or family cancer history [22]. In this case, no adjuvant therapy was recommended, and continued surveillance was planned following an uncomplicated postoperative recovery.

Limitations

This report has several limitations. First, although the patient demonstrated satisfactory recovery at the one-week postoperative visit, longer-term follow-up information was unavailable. Consequently, subsequent surveillance findings and recurrence-free status could not be established, which is particularly relevant because borderline ovarian tumors may recur several years after initial treatment. Second, although pelvic and para-aortic nodal tissue was submitted for examination, no lymph nodes were definitively identified histologically. Regional nodal status therefore remained indeterminate (pNX), rather than confirmed node-negative. Third, the peritoneal cytology report documented acute blood without explicitly establishing negative malignant cytology. The available pathological documentation also did not specifically confirm the absence of microscopic ovarian surface involvement, limiting independent verification of the proposed FIGO stage IA classification. Fourth, differentiation of a primary ovarian mucinous neoplasm from a metastatic gastrointestinal tumor relied primarily on clinical and morphological features, as the available records did not establish whether additional gastrointestinal evaluation, CEA and CA 19-9 measurements, or confirmatory immunohistochemistry had been performed. Fifth, the available pathology report did not explicitly characterize the presence or absence of intraepithelial carcinoma or microinvasion. Given the substantial tumor size and heterogeneous morphology, additional information regarding the extent of histopathological sampling would strengthen diagnostic confidence and assessment of recurrence risk.

The original contrast-enhanced CT images and representative microscopic histopathology images were unavailable for inclusion in this report. Accordingly, the radiological and histopathological findings were described using the available clinical reports. The case is further documented by an original gross specimen photograph and a comprehensive table summarizing the surgical pathology and cytology findings.

Additional perioperative information, including total operative duration, intravenous fluid administration, and detailed intraoperative hemodynamic and ventilatory measurements, was not available in the records reviewed.

Conclusions

Giant ovarian mucinous tumors present significant diagnostic and surgical challenges, particularly in patients with extensive prior abdominal and pelvic surgery. In this case, adequate surgical exposure, meticulous adhesiolysis, and early bilateral ureterolysis facilitated the intact removal of a 4.96-kg ovarian mass despite dense adhesions and distorted pelvic anatomy. The procedure was completed without rupture or spillage, with minimal blood loss and an uncomplicated early postoperative recovery. Final histopathological examination confirmed a mucinous borderline ovarian tumor, highlighting the limitations of preoperative imaging and tumor markers in determining malignant potential. Preservation of capsular

integrity, appropriate surgical staging procedures, and thorough pathological evaluation remain important for guiding subsequent management. This case demonstrates the value of individualized operative planning and meticulous surgical technique in the safe management of giant ovarian neoplasms in patients with complex surgical histories.

Additional Information

Author Contributions

All authors have reviewed the final version to be published and agreed to be accountable for all aspects of the work.

Concept and design: Sara Almaradweh, Emad Mousa

Acquisition, analysis, or interpretation of data: Sara Almaradweh, Emad Mousa

Drafting of the manuscript: Sara Almaradweh, Emad Mousa

Critical review of the manuscript for important intellectual content: Sara Almaradweh, Emad Mousa

Supervision: Emad Mousa

Disclosures

Human subjects: Informed consent for treatment and open access publication was obtained or waived by all participants in this study. **Conflicts of interest:** In compliance with the ICMJE uniform disclosure form, all authors declare the following: **Payment/services info:** All authors have declared that no financial support was received from any organization for the submitted work. **Financial relationships:** All authors have declared that they have no financial relationships at present or within the previous three years with any organizations that might have an interest in the submitted work. **Other relationships:** All authors have declared that there are no other relationships or activities that could appear to have influenced the submitted work.

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