Sigmoid Cancer Mimicking Ovarian Echotexture on Transvaginal Ultrasound: Case Report with Literature Review

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ABSTRACT

Ultrasound is a first line imaging modality for the evaluation of female pelvic pain. Pelvic pain constitutes one of the most common reasons for presentation to the emergency department with increasing use of point of care ultrasound. Infrequently, point of care or formal ultrasound evaluation may lead to misdiagnosis of extraovarian disease. This can have serious consequences, especially if an extraovarian malignancy is mistaken for a normal ovary or an ovary with a benign process. We present a case of a 41-year-old female who presented to the emergency department for a chief complaint of pelvic pain and vaginal bleeding. Transvaginal ultrasound demonstrated a left adnexal mass, later characterized as a sigmoid colon cancer on MRI and pathology, simulating ovarian echotexture with peripheral hypoechoic components resembling follicles. This article will review the literature of various cases of extraovarian pathology misidentified as ovarian processes and highlight the importance of considering these extraovarian mimickers to prevent potential morbidity and mortality of a missed diagnosis.

Keyword: Ovarian mimics, transvaginal ultrasound, ovarian malignancy

INTRODUCTION

Gynecologic and obstetric (OB/GYN) applications of ultrasound originated in the 1950s and 1960s with further advances in sonographic techniques and clinical use evolving by the 1970s. [1] The 1958 seminal paper by Donald et al. explored the earliest application of ultrasound in the field of OB/GYN and included the first images of pelvic masses. [2] Early indications for pelvic sonograms included evaluation of cystic and solid masses with subsequent incorporation of sonography for the evaluation of early pregnancy, ovarian malignancy, ascites, and nonpalpable pelvic masses. [1] The first transvaginal ultrasound probe was developed in the 1960s with the practical use of endovaginal sonographic techniques gaining ground with the development of real-time imaging in the 1970s. [3-6] The early 1990s saw the gradual introduction of endovaginal sonographic techniques into the general ultrasound pelvic exam with further studies in the 2000s exploring various pelvic pathologies through the use of transvaginal technique. [3, 7-8] The clinical applications of transvaginal ultrasound have transformed the evaluation and management of acute and chronic pelvic pain in the primary care and subspecialty settings, including the emergency department (ED). Studies in the past 20 years evaluating the application of transvaginal ultrasound for pelvic pain have expanded the uses of sonographic exams while acknowledging its limitations. [9-16]

The prevalence of chronic pelvic pain has been extensively studied. [17-24] One early study demonstrated a 3-month prevalence of 15% amongst women aged 18-50 and with other literature reporting prevalence as high as 27%. [17] Common non-neoplastic causes of chronic pelvic pain include ovarian cysts, endometriosis, pelvic inflammatory disease, pelvic congestion syndrome, and interstitial cystitis. [25-31] Non-gynecologic causes include gastrointestinal and genitourinary disorders while sometimes psychosomatic factors are contributory. [32-34] Acute pelvic pain differs in time course, but may have similar physical exam findings to chronic pelvic

pain. Acute causes also include ectopic pregnancy, ovarian torsion, ruptured ovarian cyst, and appendicitis. [35-36]

Due to the high volume of patients presenting for pelvic pain, transvaginal point of care ultrasound for ED physicians has been a source of ongoing discussion and research. [37-38] Non-radiologists performing ultrasound may be more focused on the uterus and ovaries as typical sources of pelvic pain and may incorrectly assign abnormal pelvic ultrasound findings to the reproductive organs. Recent studies have highlighted non-ovarian pathology can be misassigned to the ovary on transvaginal ultrasound. [39-41] We present a case of a colon cancer simulating ovarian echotexture, which could have been misinterpreted as a normal ovary and was correctly characterized on magnetic resonance imaging (MRI). Through literature review, the authors will discuss various pelvic pathologies arising within and outside the genital tract which can mimic a normal or abnormal ovary. Given the increasing prevalence of point of care transvaginal ultrasound among ED providers, we present this case as a teaching opportunity and also discuss the non-ovarian differential considerations when evaluating an adnexal mass.

CASE PRESENTATION

Presentation

A 41-year-old female presented to the ED for the evaluation of 10 days of sharp right lower quadrant and right hip pain radiating to her right lower extremity. She reported a gradual onset of pain without trauma or other known inciting events. The patient noted irregular menstrual bleeding for several months prior to presentation, endorsing dysmenorrhea and metromenorrhagia. Physical exam was significant for tenderness on palpation of the right lower quadrant without rebound tenderness or guarding. The patient's past medical and surgical history was significant for obesity, ruptured ectopic pregnancy status post bilateral salpingectomy,

cesarean section, and appendectomy. She denied personal history of prior malignancy or a family history of gynecologic or gastrointestinal malignancy.

Imaging

Pelvic ultrasound performed at the radiology department during the ED visit showed an oval, heterogeneous hypoechoic and isoechoic, oval, solid mass in the left adnexa measuring 2.5 x 3.1 x 2.1 cm (Figure 1). This mass demonstrated a frond-like internal architecture with a resultant artifactual appearance of hypoechoic ovarian follicles. Internal Doppler vascular flow was present in a branch-like pattern (Figure 2). The sonographer presented the mass to the interpreting radiologist as a normal left ovary. The uterus and a 1.9 cm right ovary had a normal sonographic appearance. After a second review of the images, the radiologist identified a normal 3 cm left ovary separate from the mass originally identified as the left ovary. There was no free fluid in the pelvis.

The patient was referred for a follow-up contrast-enhanced MRI of the pelvis, which demonstrated a 3 cm mass arising from the wall of the sigmoid colon in the left lower abdomen (Figure 3). The mass had isointense T1 signal to the adjacent bowel wall and slight T2 hyperintensity without abnormal enhancement. The ovaries had a normal appearance on MRI.

Colonoscopy and pathology

Subsequent colonoscopy demonstrated a 3 cm, pedunculated polyp within the sigmoid colon, as well as additional 2-6 mm polyps in the sigmoid and transverse colon (Figure 4). All visualized polyps were removed during the colonoscopy via hot snare polypectomy. There were no complications.

On histologic analysis, the 3 cm sigmoid polyp revealed a villous morphology with extensive low-grade dysplasia and a focal mucin lake. The mucin lake contained free-floating strips and fragments of epithelium, yielding a diagnosis of adenocarcinoma arising in a villous adenoma (Figures 5, 6). The malignant epithelial fragments had a cribriform architecture, but were

otherwise deceptively bland (Figure 7). The remaining polyps were all tubular adenomas. The patient's young age and the presence of multiple tubular adenomas prompted consideration for an inherited condition such as Lynch syndrome. Microsatellite instability (MSI) testing via immunohistochemistry of the malignant polyp revealed retained protein expression of MLH1, PMS2, MSH2, and MSH6 (Figure 8). Genetic testing was subsequently performed, and was negative for the *MLH1*, *PMS2*, *MSH2, MSH6,* and *EPCAM* mutations of Lynch syndrome. Additionally, no *MUTYH* mutations were found, excluding the possibility of MutYH-associated polyposis.

CT chest/abdomen/pelvis was negative for metastatic disease. Subsequent sigmoidoscopies, including biopsies at the site of prior disease, have all been negative for dysplasia or malignancy. The patient is now 4 years out from her initial diagnosis without evidence of recurrent or metastatic disease.

DISCUSSION

Transvaginal sonography has evolved over the past three decades from a subspecialty modality to an examination now performed with varying proficiency by sonographers, midwives, clinicians, and radiologists alike. [3] ED transvaginal point of care ultrasound is being used with increased frequency with multiple studies examining its accuracy and ability to decrease ED patient length of stay. [37-38, 42] Pelvic pain and vaginal bleeding amongst women is one of the most common reasons for presentation to the ED. [35-36] The accuracy and limitations of pelvic ultrasound differ amongst pelvic pain etiologies. For example, ultrasound is helpful in evaluation of ovarian torsion, but more limited in diagnosing conditions such as endometriosis. [43-47] Nonovarian pathologies or atypical ovarian conditions can mimic normal ovarian anatomy or benign ovarian processes and are a potential cause of perceptual error for clinicians and radiologists. [48] The intrinsic poor contrast and limited field of view of transvaginal ultrasound when compared to CT and MRI further subject ultrasound to adnexal evaluation pitfalls. [49]

Pelvic MRI with contrast and sometimes CT are necessary adjuncts to characterize adnexal masses.

Infections, inflammatory processes, or iatrogenic materials located in the peritoneum or the ovary itself may result in misdiagnosis during adnexal ultrasound evaluation. Numerous case series and case reports have described components of infection that appear similar to ovarian cysts or malignancies. Peritoneal and genital tuberculosis remains one of the most common mimickers of ovarian malignancy amongst infectious etiologies in endemic countries (Table 1). A single retrospective study evaluating 113 patients with extraovarian disease mimicking ovarian cancer showed peritoneal tuberculosis to represent the most common etiology overall. [74] Nonabsorbable suture and surgicel granulomas have also been reported to mimic ovarian cancer. [66-67] Extraovarian genital tract pathologies constitute the most common mimics of the ovaries. Fallopian tube pathology, paraovarian/peritoneal inclusion cysts, and pedunculated uterine fibroids may all be mistaken for ovaries on ultrasound. [75] Other infrequent genital tract processes include infected or malignant degeneration of pedunculated fibroids involving the broad ligament (Table 2).

Non-gynecologic processes to include malignancies have also been shown to mimic ovarian masses (Table 3). There is now considerable literature detailing various non-gynecologic findings incidentally found on transvaginal ultrasound (Table 4). Amongst non-gynecologic neoplasms, appendiceal mucoceles have been frequently discovered on transvaginal ultrasound due to their close location to the right adnexa. Jansen et al. described typical mucocele appearance as para-ovarian unilocular tubular masses with internal contents resembling "whipped cream." [85] Visualization of small intestine and colon neoplasms is uncommon with transvaginal ultrasound, however depending on location, tumor size, and paucity of bowel gas, these neoplasms may be discovered by a trained operator. [98] Transvaginal ultrasound also has an important role in the evaluation of rectovaginal space infiltration in the evaluation of rectal cancer. [99, 103-104] Peritoneal mesothelioma can be a masquerader of ovarian carcinomatosis as well as other peritoneal processes which can simulate primary ovarian disease.

A flowchart to arrive at a reasonable differential diagnosis for an extraovarian adnexal mass is shown in Figure 9. One should first consider whether genital tract or non-gential tract etiologies are more likely. Then, a further division can occur in categories such as infectious versus non-infectious and malignant versus non-malignant etiologies based on clinical presentation and patient risk factors. Considering this simple schema when evaluating an adnexal mass on transvaginal ultrasound can assist in identifying the need for further imaging, tissue sampling, and treatment.

Regarding the present case with a mass arising from the enteric tract, differential considerations include adenocarcinoma, lymphoma, and metastasis. On transvaginal ultrasound, bowel wall tumors are often solid, localized, and round. [98] Malignant lesions can be hypoechoic or heterogeneous in echogenicity. Colonic adenocarcinoma can also demonstrate a pseudokidney or targetoid appearance, although these features are often noted in the annular configuration of carcinomatous tumors. [98, 104] Compared to appendiceal mucoceles and rectal cancer, transvaginal ultrasound appearance of colonic malignancies has been underreported in literature.

Our case demonstrates concordant radiological-pathological correlation with sonographic features reflective of the primary tubulovillous morphology of colon cancer. Tubulovillous structure was demonstrated by the frond-like internal echotexture on transvaginal ultrasound secondary to papillary projections of the mass. These papillary projections extended to the unaffected adjacent bowel wall mucosa giving the appearance of an ovarian follicular pattern. Application of pressure with a transvaginal probe and resultant collapse of the surrounding bowel walls likely contributes to this ovarian echotexture (Figure 10). In discussion with the interpreting radiologist, the central branching hypervascular component corresponding to the tubular stalk was a significant reason for raising the suspicion for a non-ovarian mass and subsequent MRI recommendation. Our literature search revealed that many of the masqueraders of ovarian cancer, whether infectious, inflammatory, or malignant, demonstrated imaging features that were nonspecific yet concerning for ovarian malignancy. Our case demonstrated a malignancy masquerading as a potentially normal left ovary. We believe that a tubulovillous

colon cancer when evaluated with transvaginal ultrasound can mimic ovarian echotexture due to potential similar size, oval or round shape due to surrounding collapsed bowel wall, and a peripheral frond-like morphology simulating ovarian follicles.

CONCLUSION

This case report discusses a unique instance of non-ovarian malignancy masquerading as a normal ovary on pelvic ultrasound. Previous literature has shown extraovarian diseases, including infections, inflammatory processes, and extraovarian malignancy can mimic ovarian pathology but not specifically normal ovarian anatomy. This case should be a reminder that non-gynecologic pathologies should be considered in the ultrasound evaluation of pelvic pain. Pelvic pain is one of the most common ED presentations and is being increasingly evaluated with point of care transvaginal ultrasound. It is important for clinicians who perform pelvic ultrasound and radiologists to consider these extraovarian mimickers to prevent potential morbidity and mortality of a missed diagnosis.

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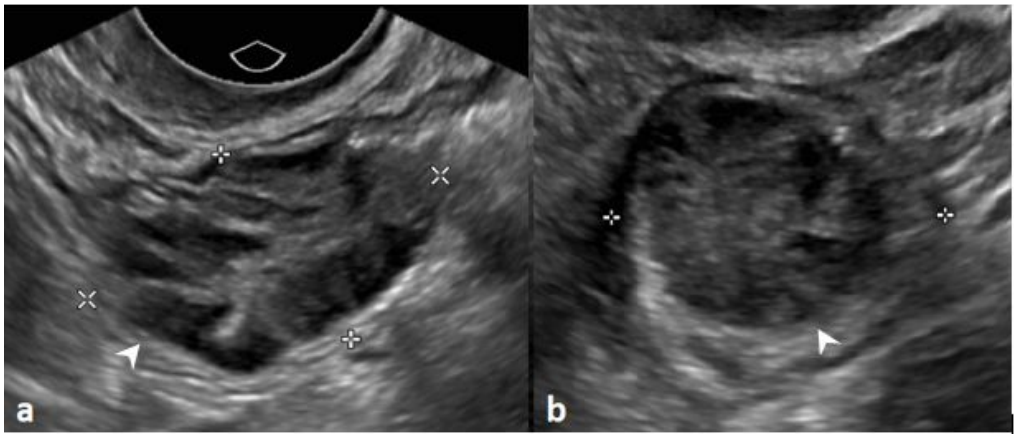

Fig. 1 41-year-old-woman undergoing evaluation of pelvic pain and vaginal bleeding. **a, b** Transvaginal ultrasound images demonstrate a left adnexal mass measuring up to 3.1 cm in greatest dimension. Peripheral hypoechoic components (arrowheads), left adnexal location, and oval shape overall could be misconstrued to represent a normal ovary. This mass was later proven to be a sigmoid colon adenocarcinoma.

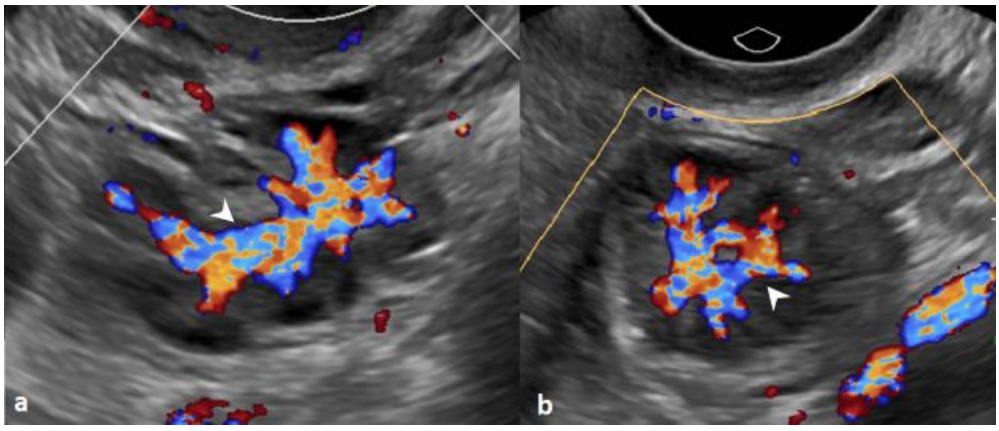

Fig. 2 41-year-old-woman undergoing evaluation of pelvic pain and vaginal bleeding. **a, b** Transvaginal Doppler sonographic images demonstrate a left adnexal mass with branching vascularity(arrowheads). This mass was later proven to be a sigmoid colon adenocarcinoma.

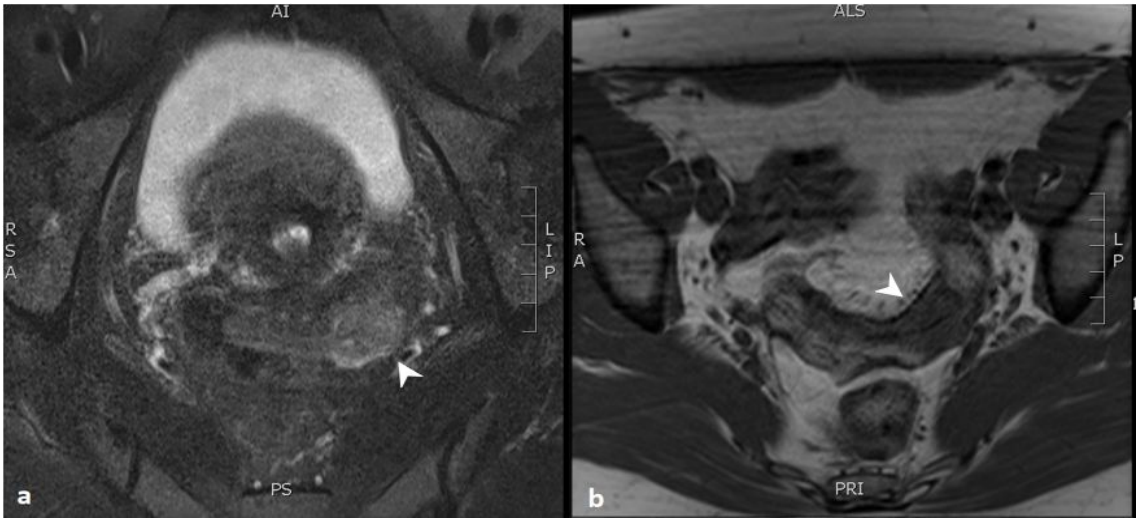

Fig. 3 41-year-old-woman undergoing evaluation of pelvic pain and vaginal bleeding. **a** Axial T2 MR image with fat saturation demonstrates a mildly hyperintense endoluminal sigmoid colon mass (arrowhead). **b** Axial T1 MR image demonstrates an intermediate intensity mass at the same location (arrowhead). This mass was later proven to be a sigmoid colon adenocarcinoma.

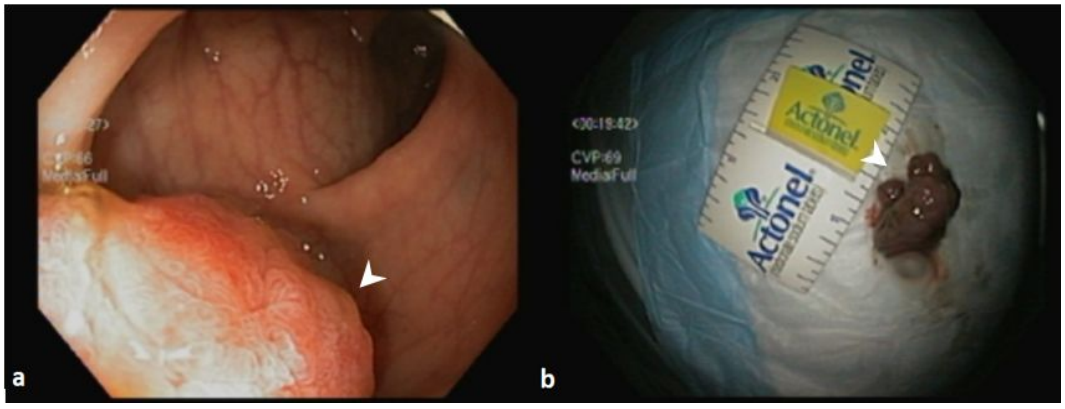

Fig. 4 41-year-old-woman undergoing colonoscopy for a sigmoid colon mass. **a** An endoscopic photo shows a polypoid mass arising from the sigmoid colon wall (arrowhead). **b** A gross specimen photo shows the mass after after snare biopsy and resection (arrowhead).

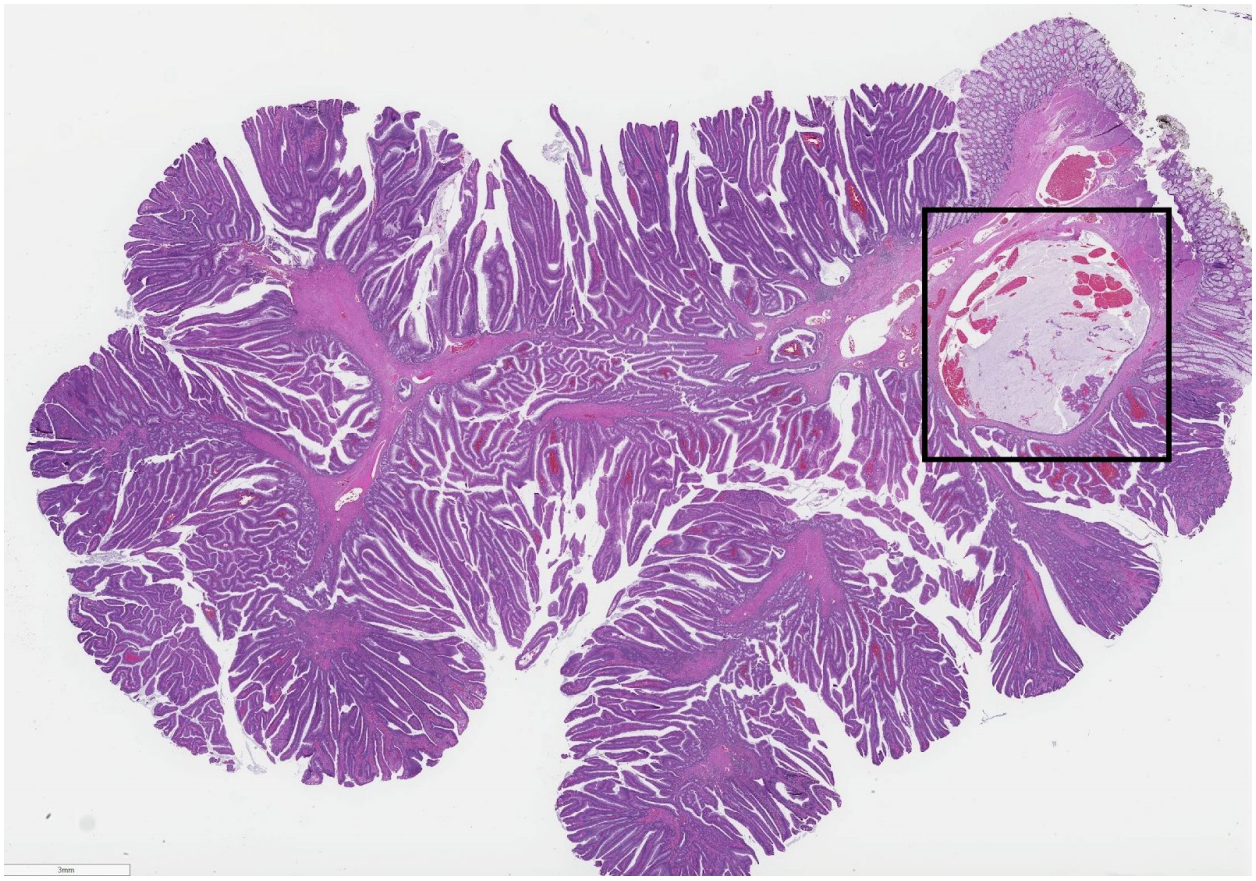

Fig 5. Low power view of pedunculated polyp demonstrating its overall villous architecture and mucin lake (within box).

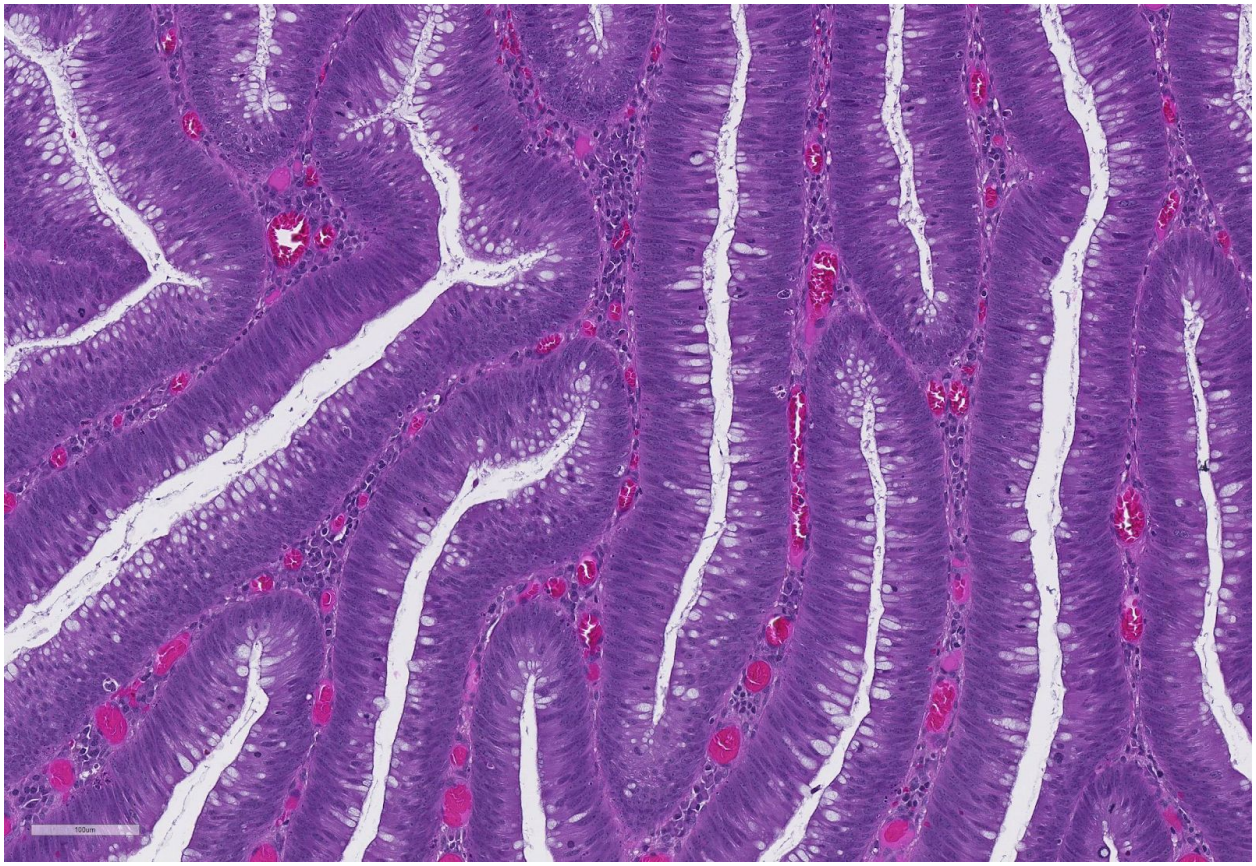

Fig 6. Representative image of the villous adenoma with diffuse, low-grade dysplasia characterized by hyperchromatic, elongated nuclei in a pseudostratified arrangement.

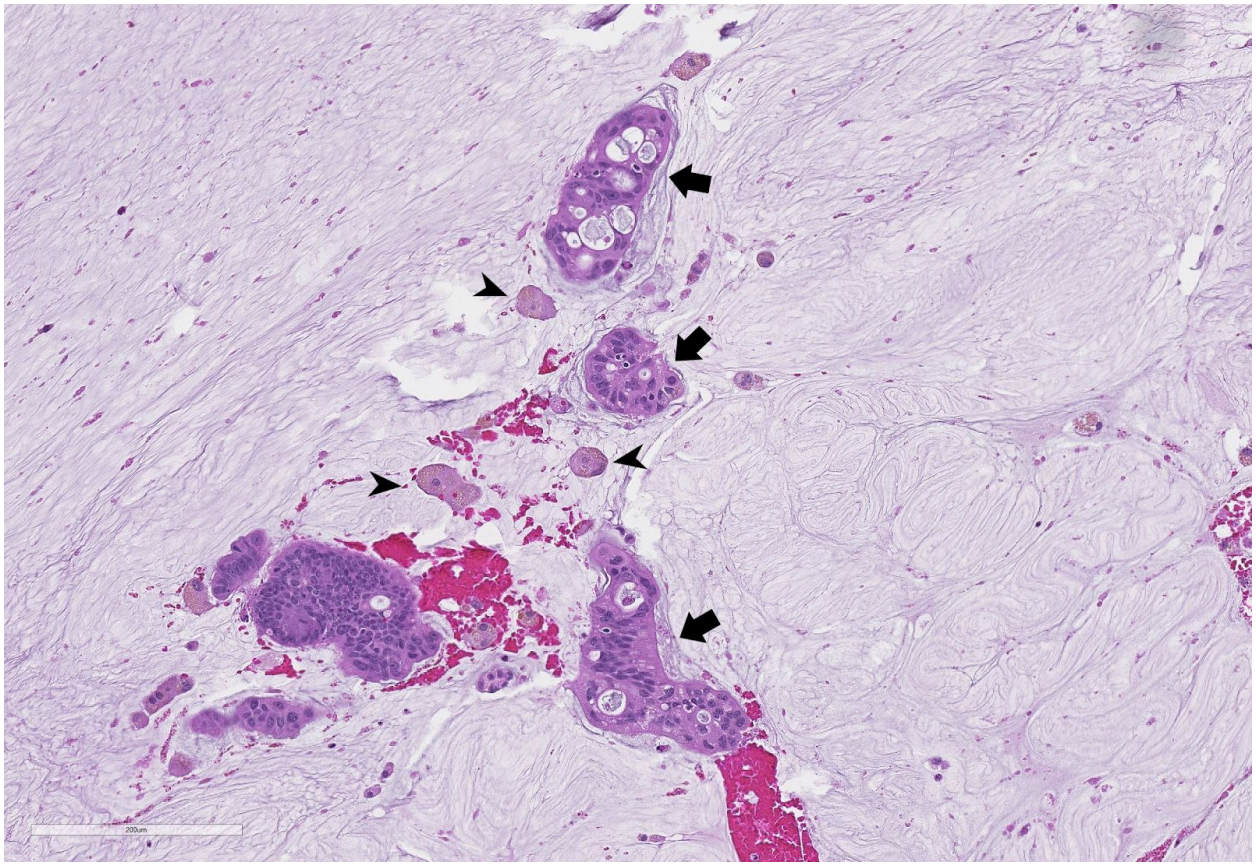

Fig 7. High power view of mucin lake with floating malignant epithelium (arrows) and macrophages (arrowheads). The epithelial fragments demonstrate cribriform architecture and minimal cytologic atypia.

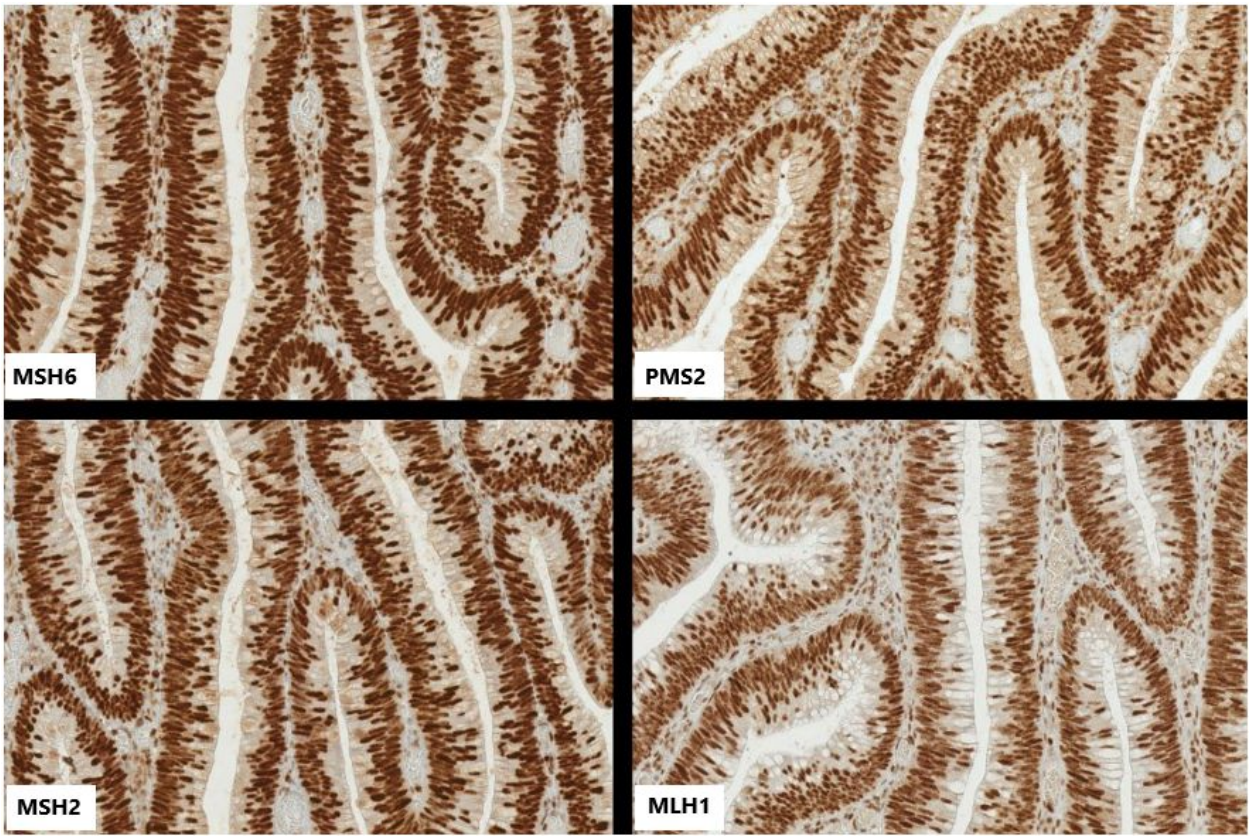

Fig 8. Composite image exhibiting nuclear positivity for each tested protein (MSH6, PMS2, MLH2, and MSH1) of mismatch repair via immunohistochemistry.

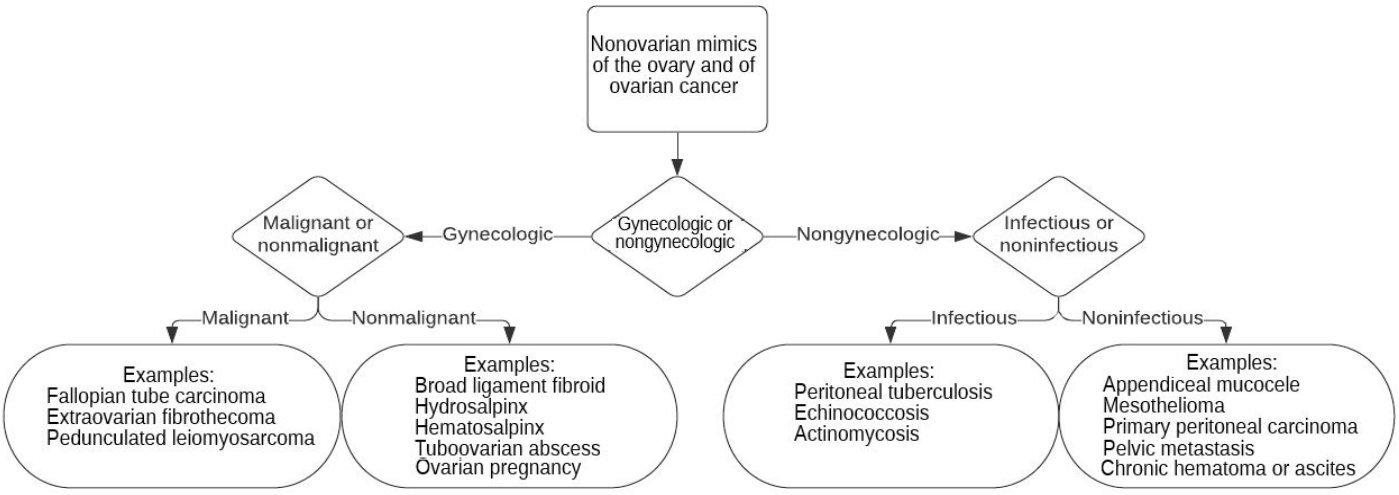

Fig 9. A flowchart illustrating differential considerations for extraovarian adnexal mass

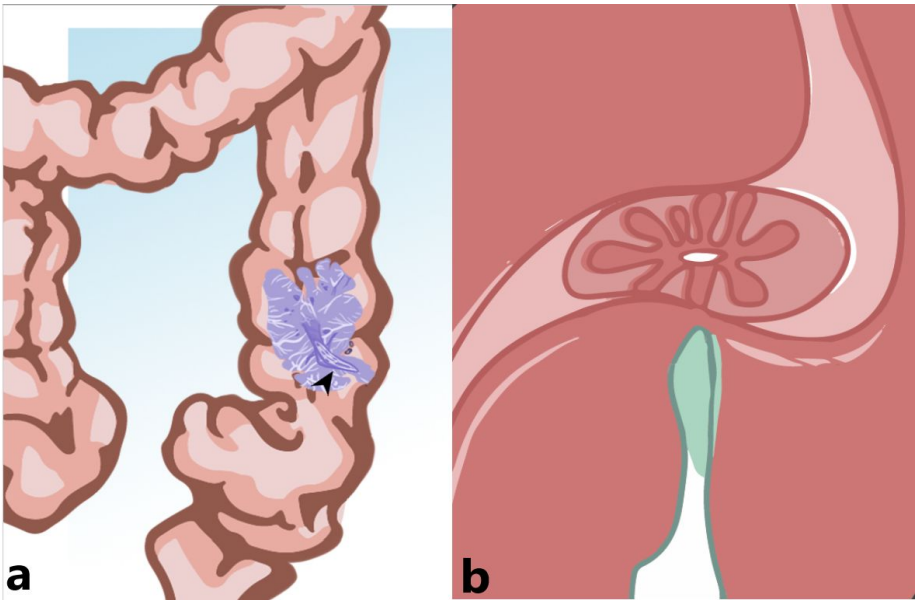

Fig 10. a An illustration demonstrating a colon mass with a tubulovillous morphology and a stalk (black arrowhead). **b** A simplified illustration demonstrating a tubulovillous malignancy of the colon collapsing during application of pressure with a transvaginal probe.

	Number of cases	***Diagnosis***
Ertas et al. [50]	26	Tuberculosis (15), echinococcosis (6), or actinomycosis (5)
Rabesalam et al. [70]	1	Ovarian tuberculosis
Akhtar et al. [50]	1	Genital tuberculosis
Ellis et al. [51]	1	Coccidiomycosis
Drayer et al. [55]	2	Peritoneal tuberculosis(1) and schistosomiasis(1)
Paun et al. [56]	3	Peritoneal tuberculosis(1)

Barroso et al [59]	1	Dovanosis
Stout et al. [61]	1	Mycobacterium bovis peritonitis
Gojayev et al. [62]	1	Chlamydia peritonitis
Yazici et al. [72]	1	Liver fluke

Table 1. Cases of ovarian mimics secondary to infectious etiologies.

	Cases(n)	***Diagnosis***
Su et al. [57]	1	Ovarian pregnancy
Chen et al. [60]	1	Pyomyoma
Salman et al. [63]	1	Broad ligament lipoleiomyoma
Yadav et al. [64]	2	Broad ligament lipoleiomyoma
Agarwal et al. [65]	1	Broad ligament lipomyosarcoma

Table 2. Gynecologic mimics of ovarian malignancy.

	Number of cases	***Diagnosis***
Gehrig et al. [53]	5	Appendiceal adenocarcinoma
Merino et al. [54]	7	Malignant mesothelioma
Paun et al. [56]	3	Primary peritoneal carcinoma(1) and benign

		adnexal mass (1)
Mani et al. [57]	7	Multicystic mesothelioma(4), malignant mesothelioma(3)
Pietzner et al. [58]	1	Melanoma
Eulitt et al. [68]	1	Waldenstrom's macroglobulinemia
Struver et al. [69]	1	Multiple myeloma
Bland et al. [73]	1	Desmoplastic small round blue cell

Table 3. Cases of ovarian mimics secondary to various non-gynecologic malignant etiologies.

Diagnosis	***Source***
Appendiceal mucocele	Malave et al. [76], Ferdinand Sanchez et al. [77], Gehrig et al. [53], Pitiakoudis et al. [78], Kalu et al. [79], Papoutsis et al. [80], Balci et al. [81], Kanasugi et al. [82], Soueï-Mhiri et al. [83]
Other neoplasms(rectal, bladder, colon, lymphoma)	Damani et al. [98], Dhamanaskar et al. [89], Berdov et al. [99], Bennacerraf et al. [100]
Appendicitis	Ohngemach et al. [41], Al-Roubaie et al. [93], Caspi et al. [94], Scinaeux et al. [95], Pelsang et al. [96], Whitford et al. [97]
Diverticulitis	Ohngemach et al. [41], Pradel et al. [88], Zielke et al. [90], Wilson et al. [92]
Obstructing ureteral stone	Ohngemach et al. [41], Laing et al. [86], Damani et al. [98]
Pelvic kidney	Ohngemach et al. [41], Sherer et al. [87]
Enteritis	Ohngemach et al. [41]
Small bowel obstruction	Ohngemach et al. [41]
Thrombosis(Common femoral vein and uterine vein)	Ohngemach et al. [41], Mavrelos et al. [101]
Epiploic appendagitis	Savage et al. [92]
Crohn disease	Damani et al. [98]

Table 4. Non-gynecologic findings on transvaginal ultrasound described in the literature.