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Low-grade mucinous appendiceal neoplasm mimicking an ovarian lesion: A case report and review of literature

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Abstract

BACKGROUND

Appendiceal tumors are rare lesions that may not be easily differentiated from primary ovarian lesions preoperatively, despite the use of advanced diagnostic methods by experienced clinicians.

CASE SUMMARY

A 59-year-old G2P2 woman, with chronic pelvic pain, underwent a pelvic ultrasound that revealed an adnexal mass measuring 58 mm × 34 mm × 36 mm, with irregular borders, heterogeneous echogenicity, no color Doppler vascularization and without acoustic shadowing. Normal ovarian tissue was visualized in contact with the lesion, and it was impossible to separate the lesion from the ovary by applying pressure with the ultrasound probe. Ascites, peritoneal metastases or other alterations were not observed. With the international ovarian tumor analysis ADNEX model, the lesion was classified as a malignant tumor (the risk of malignancy was 27.1%, corresponding to Ovarian-

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Adnexal Reporting Data System category 4). Magnetic resonance imaging confirmed the presence of a right adnexal mass, apparently an ovarian tumor measuring 65 mm × 35 mm, without signs of invasive or metastatic disease. During explorative laparotomy, normal morphology of the internal reproductive organs was noted. A solid mobile lesion involved the entire appendix. Appendectomy was performed. Inspection of the abdominal cavity revealed no signs of malignant dissemination. Histopathologically, the appendiceal lesion corresponded to a completely resected low-grade mucinous appendiceal neoplasm (LAMN).

CONCLUSION

The appropriate treatment and team of specialists who should provide health care to patients with seemingly adnexal lesions depend on the nature (benign *vs* malignant) and origin (gynecological *vs* nongynecological) of the lesion. Radiologists, gynecologists and other pelvic surgeons should be familiar with the imaging signs of LAMN whose clinical presentation is silent or nonspecific. The assistance of a consultant specializing in intestinal tumors is important support that gynecological surgeons can receive during the operation to offer the patient with intestinal pathology an optimal intervention.

Key Words: Adnexal mass; Appendiceal neoplasm; Diagnostic imaging; Pelvic neoplasm; Adnexal diseases; Pelvic neoplasm; Case report

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Core Tip: Low-grade mucinous appendiceal neoplasm is one of the rarest intestinal tumors. Our case highlights how this neoplasm can mimic the behavior of a gynecological (adnexal) lesion in terms of clinical and imaging presentation, while the management and teams of professionals offering treatment significantly differ from those appropriate in the case of adnexal pathology.

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INTRODUCTION

A pelvic mass with adnexal topography may be a primary adnexal lesion or an ovarian metastasis, but also a primary tumor arising from the uterus, bladder or intestine^[1]. Meticulous diagnostic procedures should provide a reliable estimate of the lesion's nature (benign *vs* malignant) and its origin (gynecological *vs* nongynecological), to offer the patient adequate treatment without delay, avoiding unnecessary interventions and reducing the risk of iatrogenic morbidity. Appendiceal tumors are infrequent and, in certain cases, such as the one that we are presenting here, may not be differentiated from primary adnexal lesions despite the use of advanced diagnostic methods and preoperative assessment procedures^[2].

CASE PRESENTATION

Chief complaints

A postmenopausal 59-year-old woman, G2P2, was admitted to our Gynecology Department due to ultrasound evidence of an adnexal mass of uncertain behavior in the context of chronic pelvic pain.

History of present illness

Over the past 2-3 mo, the patient experienced mild-to-moderate and persistent pain in the right lower quadrant, without irradiation, which worsened with somatic movements. There was no reference to any specific gastrointestinal, gynecological, urological or other symptom. A right adnexal solid lesion of 5 cm was found on transvaginal ultrasound, which was requested by the general practitioner who referred the patient to our tertiary referral hospital.

History of past illness

The patient's past medical history was unremarkable.

Personal and family history

The patient's personal and family history was also unremarkable.

Physical examination

Pelvic examination revealed that the external genitalia, vagina and cervix were normal. During bimanual palpation, a 5-6 cm, hard, painful and mobile mass was detected in the right ovarian fossa.

Laboratory examinations

There was no hematological or biochemical alteration. The levels of tumor biomarkers, including CA-125 (6.7 U/mL), were normal.

Imaging examinations

Transvaginal ultrasound revealed a solid lesion measuring 58 mm × 34 mm × 36 mm, in close contact with the normal tissue of the right ovary, with irregular borders, heterogeneous echogenicity, no vascularization visualized by the use of color Doppler (color score 1) and without acoustic shadowing (Figure 1). Ascites, peritoneal metastases or other alterations were not observed. Using the international ovarian tumor analysis (IOTA) ADNEX model^[3] and the recommended cutoff of 10%, the lesion was classified as a malignant tumor (Figure 2). The determined risk of malignancy was 27.1%, which corresponded to the Ovarian-Adnexal Reporting Data System 4 risk category (*i.e.*, intermediate risk)^[4]. Pelvic magnetic resonance imaging (MRI) showed a tumor apparently originating from the right ovary and measuring 65 mm × 35 mm, while no signs of invasive disease were noted (Figure 3). In both imaging techniques, continuity between the tumor and gastrointestinal tract was not observed or documented.

FINAL DIAGNOSIS

The patient underwent an exploratory laparotomy. Normal uterus, fallopian tubes and ovaries were visualized. We found a solid and mobile lesion originating in the appendix (Figure 4). Inspection of the abdominal cavity revealed no signs of malignant dissemination. The lesion histological diagnosis was low-grade mucinous appendiceal neoplasm (LAMN) (Figure 5).

TREATMENT

Appendectomy was performed. In accordance with the orientation provided by the general surgery consultant, who was invited to the operative theatre, no other intervention was performed.

OUTCOME AND FOLLOW-UP

The patient had an uneventful postoperative clinical course and was discharged from the hospital on the third postoperative day. Currently, six months after surgery, the patient remains asymptomatic.

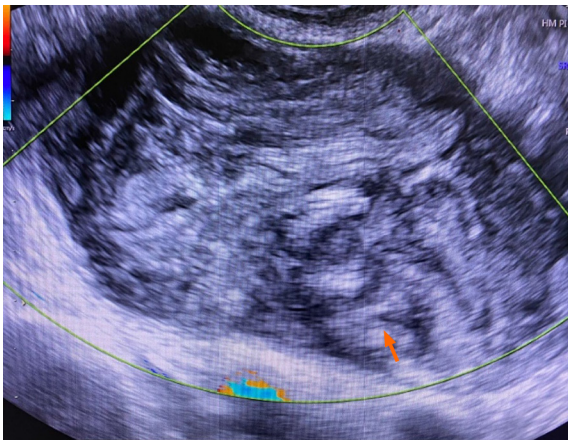


Figure 1 Low-grade mucinous appendiceal neoplasm presenting as a right adnexal mass (transvaginal ultrasound).

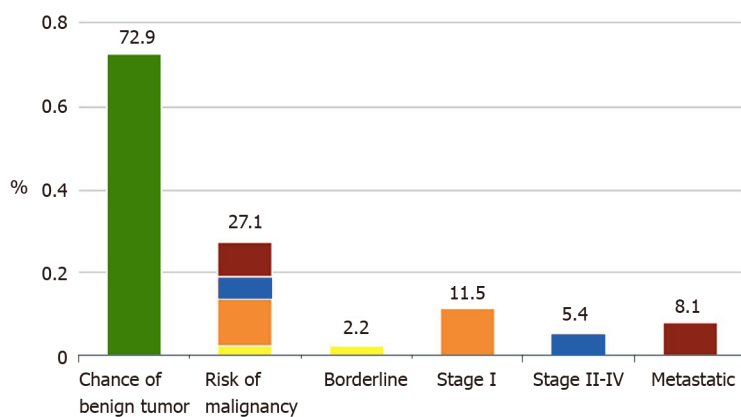


Figure 2 Low-grade mucinous appendiceal neoplasm assumed as an adnexal neoplasm: Results of the tumor assessment using the international ovarian tumor analysis ADNEX prediction model.

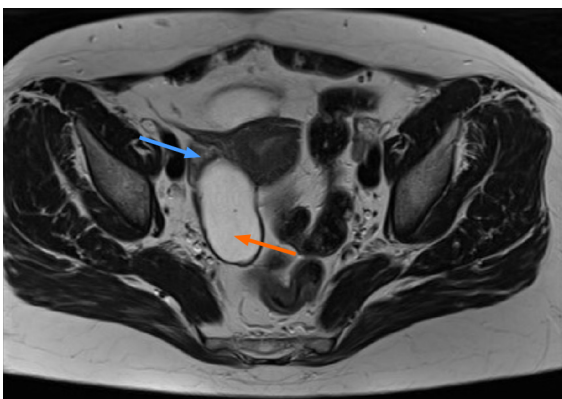


Figure 3 Low-grade mucinous appendiceal neoplasm mimicking an ovarian tumor (magnetic resonance imaging presentation). The blue arrow indicates the right ovary; the orange arrow indicates the tumor apparently originating from the right ovary.

DISCUSSION

Pelvic tumors represent one of the most frequent reasons for referral to gynecology departments. The management strategies are guided by the degree of clinical imaging-based suspicion of malignancy, as well as symptoms; the patient's age; and her desire for fertility preservation. To promote survival and/or quality of life, an adequate characterization and clinical contextualization of the observed lesions must be carried out in order to refer the patients with a malignant neoplasm for treatment by



Figure 4 Low-grade mucinous appendiceal neoplasm macroscopic features (appendectomy with tumorectomy specimen).

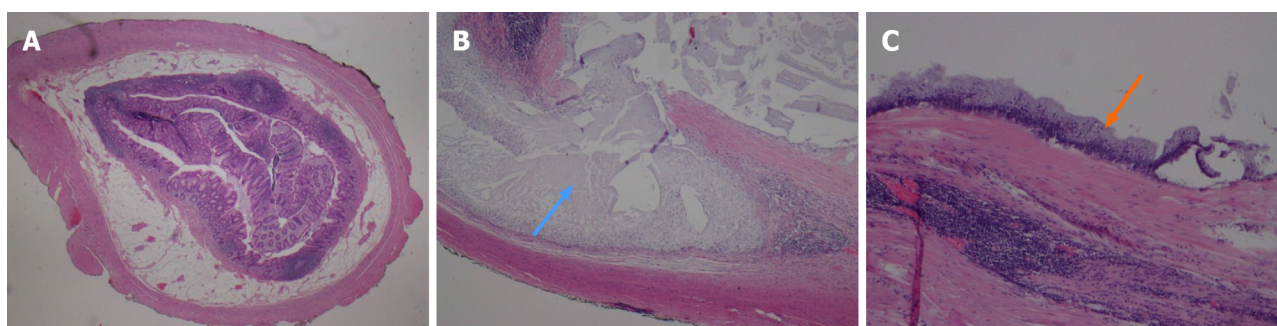


Figure 5 Appendectomy with tumorectomy specimens (histological characteristics). A: Proximal appendiceal stump with normal histological features [Hematoxylin & eosin (H&E) staining, 20 × magnitude]; B: Low-grade mucinous appendiceal neoplasm (LAMN) (H&E staining, 40 × magnitude, blue arrow showing acellular mucin); C: LAMN (H&E staining, 100 × magnitude, orange arrow absence of high-grade epithelial dysplasia).

gynecological oncologists or other specialists in their respective subspecialized units to avoid unnecessary surgery in patients with functional adnexal formations and benign adnexal lesions. The case presented in this study highlights how the preoperative assessment of a patient can be challenging and how gynecologists, despite a detailed and dedicated preoperative evaluation of the patient, can face nongynecological lesions during surgery.

Instead of an expected solid ovarian lesion, our patient had a LAMN, which accounts for 1% of gastrointestinal neoplasms^[5]. It is a low-grade dysplastic epithelial lesion that, by definition, lacks infiltrative invasion, which would be termed mucinous adenocarcinoma^[6]. The PubMed search that we conducted on January 1, 2021, identified 23 reports resembling our case (Table 1). A large case series indicated that the median age at LAMN diagnosis is 61 years, which is close to the age of our patient^[7]. In terms of sex, the literature reports a higher prevalence in females (the female/male ratio varies from 7:1^[8] to 1.4:1^[9]). Similarly, ovarian carcinoma occurs at the median age of 63 years^[10]. Regarding clinical presentation, ovarian cancer typically produces symptoms, including nonspecific pelvic/abdominal pain, bloating, urinary urgency or frequency, in the late and advanced stages^[11,12]. In the same manner, appendiceal mucocoele that mimics an adnexal mass most commonly presents with pelvic/abdominal pain^[13]. The complications of LAMN include intussusception, volvulus, small bowel or ureteral obstruction, rupture and mucinous ascites, namely, pseudomyxoma peritonei. The ovarian etiology assumption by routine and epidemiological/clinical overlap can easily lead to an erroneous diagnosis. Preoperatively, LAMN is commonly misdiagnosed as acute appendicitis or an adnexal mass^[14], as occurred in our patient. Differential diagnosis may also include mucinous adenocarcinoma of the appendix and a high-grade appendiceal mucinous neoplasm, a pelvic foreign body and a subserous uterine fibroid. The literature consistently reinforces the idea that the presence of a right-sided adnexal mass should allow for the possibility of an appendiceal neoplasm^[15,16]. Interestingly, cases of left-sided appendiceal neoplasms mimicking an adnexal mass have recently been reported^[17,18].

Table 1 Appendiceal neoplasms mimicking adnexal lesions (cases identified by the PubMed search, published in English language until January 2021)

Case	Age	Cardinal symptom	Clinical context	Imaging modality	Tumor marker	Presumed diagnosis	Treatment	Appendix: Histopathology
1 ^[24]	32	Abdominal pain	Acute abdomen (38 wk pregnancy)	US (cystic mass 32 mm × 35 mm × 59 mm)	N/A	Right ovarian torsion	Laparotomy: Appendectomy C-Section	Mucocele (torsion)
2 ^[25]	49	Pelvic pain	Chronic pain (1 yr)	US (heterogenous mass 70 mm × 35 mm × 40 mm). MRI (cystic mass 70 mm × 63 mm × 29 mm)	CEA 10.5 µg/L (↑). CA125 normal	Right adnexal mass of paraovarian origin	Laparoscopy: Appendectomy. Peritoneal washing	LAMN. Peritoneal cytology: Negative
3 ^[2]	81	Abdominal pain	Chronic pain (several months)	US (heterogenous cystic mass 110 mm × 90 mm). MRI (heterogenous cystic mass 120 mm × 100 mm)	CA125 13.18 U/mL. CA19.9 20.8 U/mL. CEA 1.76 ng/mL. CA15.3 6.7 U/mL	Right adnexal mass	Laparotomy: Appendectomy and a right hemicolectomy with ileo-transverse anastomosis. Total abdominal hysterectomy and bilateral salpingo-oophorectomy due to pelvic organ prolapse	Appendiceal mucinous neoplasm with low malignancy potential
4 ^[17]	61	Incidental imaging finding	Preventive gynecological check-up	US (heterogenous solid mass 104 mm × 40 mm)	CA19.9 40 U/mL (↑). CA125 9 U/mL. CA15.3 13 U/mL. AFP 2 ng/mL	Left adnexal mass	Laparotomy: Appendectomy. Excisional biopsy of the omentum	LAMN
5 ^[26]	41	Pelvic pain	Chronic pain	US (cystic mass 60 mm × 28 mm). MRI (70 mm × 40 mm × 30 mm)	CEA and CA19.9 normal	Right adnexal mass	Laparoscopy converted to laparotomy: Right hemicolectomy with side to side ileocolic stapler anastomosis	LAMN
6 ^[27]	15	Abdominal pain	Acute abdomen	US; CT (no precise description reported)	N/A	Right ovarian torsion	Laparoscopy: Appendectomy	Mucocele
7 ^[28]	46	Incidental pelvic examination finding	Preventive gynecological check-up	US (cystic mass 115 mm × 40 mm)	N/A	Right adnexal mass (hydro-pyosalpinx, tubo-ovarian abscess or ovarian cyst)	Laparotomy: Appendectomy	Mucocele
8 ^[15]	71	Pelvic pain	Acute pain	US (cystic mass 50 mm × 70 mm). MRI (cystic mass 40 mm × 80 mm)	CA125 9.1 U/mL. CA19.9 5.09 U/mL. AFP 2.4 ng/mL. β-hCG 0.01 mIU/mL	Right adnexal mass	Laparotomy: Appendectomy. Total abdominal hysterectomy and bilateral salpingo-oophorectomy due to pelvic organ prolapse	Mucocele
9 ^[29]	80	Abdominal pain	Chronic pain (several months)	US (mixed echogenic mass 61 mm × 43 mm × 51 mm). CT (calcified cyst 70 mm × 60 mm × 50 mm)	CA125 normal	Right adnexal mass (ovarian cyst)	Laparotomy: Appendectomy	Mucinous cystadenoma
10 ^[30]	61	Pelvic pain	Chronic pain (several months)	US (cystic mass). CT (homogenous mass 110 mm × 35 mm)	Normal (not specified)	Right adnexal mass (ovarian cyst or hydrosalpinx)	Laparoscopy: Appendectomy	LAMN
11 ^[31]	26	Pelvic pain	Chronic pain	US (cystic mass 30 mm × 30 mm)	N/A	Right adnexal mass (ovarian cyst)	Laparoscopy: Appendectomy	Mucinous cystadenoma with mild-moderate dysplasia
12 ^[16]	70	Incidental pelvic examination finding	Preventive gynecological check-up	US (solid mass 60 mm × 60 mm × 40 mm)	CA125 120 mg/dL (↑). CEA normal	Right adnexal mass	Laparotomy: Appendectomy. Total abdominal hysterectomy and bilateral salpingo-oophorectomy.	Mucinous cystadenoma

13 ^[32]	68	Incidental pelvic examination finding	Abnormal uterine bleeding	US (cystic mass 39 mm)	N/A	Right adnexal mass (ovarian cyst)	Laparoscopy: Appendectomy	Mucocele
14 ^[18]	50	Pelvic pain	-	US (tubular mass 96 mm × 40 mm × 33 mm). MRI (no precise description reported)	N/A	Left adnexal mass (hydrosalpinx)	Robotic: Appendectomy Right hemicolectomy	Low grade mucinous adenocarcinoma
15 ^[33]	42	Incidental imaging finding	1 st trimester bleeding	US (cystic mass 120 mm × 108 mm × 58 mm)	CA125 16 U/mL	Right adnexal mass (ovarian cyst)	Laparotomy: Appendectomy	Mucocele
16 ^[34]	31	Pelvic pain	Fever	US; MRI (no precise description reported)	CA125 12.2 U/mL. CEA 5.2 U/mL. CA19.9 0.8 ng/mL	Right adnexal mass (hydrosalpinx)	Laparotomy: Appendectomy	Mucocele
17 ^[35]	79	Incidental imaging finding	Preventive gynecological check-up	US (uniloculated mass, characterized by dishomogeneous content, distal shadowing 59 mm × 43 mm × 40 mm). MRI (cystic mass 80 mm)	CEA 1.26 ng/mL. CA125 8.1 U/mL. CA19.9 3.44 U/mL. CA15.3 14.1 U/mL	Right adnexal mass (ovarian cyst)	Laparoscopy: Appendectomy	Mucocele
18 ^[36]	80	Pelvic pain	Chronic pain	US (cystic/solid mass 83 mm × 65 mm × 64 mm). CT (cystic mass 100 mm × 80 mm)	CEA 54.2 ng/mL	Right adnexal mass	Laparotomy: Appendectomy. Omentectomy, total abdominal hysterectomy, and bilateral salpingo-oophorectomy	LAMN
19 ^[37]	83	Incidental imaging finding	Preventive gynecological check-up	US (cystic/solid mass 87 mm). MRI (cystic mass 90 mm)	CEA 5.3 ng/mL (↑). CA15.3 31.4 U/mL	Right adnexal mass	Laparotomy: Appendectomy	LAMN
20 ^[38]	78	Asymptomatic	Known adnexal mass on ultrasound follow-up	US (cystic mass 58 mm × 42 mm × 35 mm). MRI (bilocular cystic mass 41 mm × 19 mm)	CEA, CA125 and CA19.9 normal	Right adnexal mass	Laparotomy: Appendectomy. Total abdominal hysterectomy and bilateral salpingo-oophorectomy due to pelvic organ prolapse.	Mucinous cystadenoma
21 ^[39]	28	Pelvic pain	Acute abdomen	CT (cystic mass 33 mm × 50 mm)	N/A	Right adnexal mass (ovarian cyst rupture)	Laparoscopy: Appendectomy	Mucocele (torsion: Hemorrhagic transmural necrosis)
22 ^[40]	36	Pelvic pain	-	US (cystic complex mass)	CEA ↑; CA19.9 ↑	Right adnexal mass	Laparotomy: Appendectomy	Mucinous cystadenoma
23 ^[41]	75	Asymptomatic	Adnexal mass on ultrasound (investigation due to CEA↑)	US. CT (cystic mass 90 mm)	CEA 17.7 ng/mL (↑). CA125 and CA19.9 normal	Right adnexal mass (ovarian malignancy)	Laparotomy: Appendectomy	Mucinous cystadenoma

↑: Above the upper limit of normal; AFP: Alpha-Fetoprotein; C-section: Cesarean section; CA125: Cancer antigen 125; CA15.3: Cancer antigen 15.3; CA19.9: Carbohydrate antigen 19.9; CEA: Carcinoembryonic antigen; CT: Computed Tomography; MRI: Magnetic resonance imaging; N/A: Not available; US: Ultrasound; LAMN: Low-grade mucinous appendiceal neoplasm; β-hCG: β-human chorionic gonadotropin.

Imaging modalities for diagnosis include ultrasound, computed tomography (CT) and MRI. Regarding the ultrasound imaging features, it has been described that an appendiceal mucocele (the LAMN includes lesions that were described previously as mucocèles) should be suspected when a cystic mass with concentric echogenic layers (the “onion skin” sign) and a normal ovary are detected in the right lower quadrant^[19]. In parallel, the possibility of separating a lesion from the ovary by applying pressure with the ultrasound probe (“split” sign) also indicates its nonovarian origin^[20]. In our patient, we observed the “onion skin” sign (Figure 1) but not the “split” sign. The IOTA models have been externally validated and found to be valuable tools for discriminating between benign and malignant ovarian tumors (1); however, they

should not be used if nonadnexal lesions with adnexal topography are suspected. We used the IOTA ADNEX model because it seemed a lesion originating from the ovarian parenchyma. The obtained output could not properly assist us. The literature suggest that CT scan are superior to ultrasound evaluations in diagnosing LAMN^[21], namely, to distinguish LAMN from acute appendicitis. Nevertheless, CT is diagnostic in less than 50% of cases^[22]. We used MRI to complement the ultrasound assessment, and the MRI findings were consistent with a primary ovarian lesion.

Once the appendiceal lesion was confirmed during the explorative intervention, the assistance of a surgeon specializing in intestinal pathology was of fundamental importance to provide an appropriate treatment to the patient. In accordance with the Clinical Practice Guidelines of the American Society of Colon and Rectal Surgeons^[23], LAMNs with negative margins and no evidence of perforation or peritoneal involvement are safely treated with appendectomy alone.

CONCLUSION

The spectrum of lesions that have adnexal topography is wide, and in addition to diverse adnexal lesions, it includes uterine, bladder and intestinal pathology. LAMN should be suspected when a right adnexal mass with concentric echogenic layers separable from normal ovarian tissue is observed. Despite meticulous preoperative examination, when unexpectedly nongynecological lesions are identified, intraoperative cooperation between gynecologists and other specialists is crucial to offer adequate intervention to the patient. Registering such cases and reviewing the preoperative imaging findings may increase preoperative diagnostic sensitivity and specificity and therefore should not be omitted.

REFERENCES

- 1 **Sørensen SS**, Mosgaard BJ. Combination of cancer antigen 125 and carcinoembryonic antigen can improve ovarian cancer diagnosis. *Dan Med Bull* 2011; **58**: A4331 [PMID: [22047929](#)]
- 2 **Akman L**, Hursitoglu BS, Hortu İ, Sezer T, Oztekin K, Avsargil BD. Large mucinous neoplasm of the appendix mimicking adnexal mass in a postmenopausal woman. *Int J Surg Case Rep* 2014; **5**: 1265-1267 [PMID: [25498566](#) DOI: [10.1016/j.ijscr.2014.11.050](#)]
- 3 **Van Calster B**, Van Hoorde K, Valentin L, Testa AC, Fischerova D, Van Holsbeke C, Savelli L, Franchi D, Epstein E, Kaijser J, Van Belle V, Czekierdowski A, Guerriero S, Fruscio R, Lanzani C, Scala F, Bourne T, Timmerman D; International Ovarian Tumour Analysis Group. Evaluating the risk of ovarian cancer before surgery using the ADNEX model to differentiate between benign, borderline, early and advanced stage invasive, and secondary metastatic tumours: prospective multicentre diagnostic study. *BMJ* 2014; **349**: g5920 [PMID: [25320247](#) DOI: [10.1136/bmj.g5920](#)]
- 4 **Andreotti RF**, Timmerman D, Strachowski LM, Froyman W, Benacerraf BR, Bennett GL, Bourne T, Brown DL, Coleman BG, Frates MC, Goldstein SR, Hamper UM, Horrow MM, Hernanz-Schulman M, Reinhold C, Rose SL, Whitcomb BP, Wolfman WL, Glanc P. O-RADS US risk stratification and management system: A consensus guideline from the ACR ovarian-adnexal reporting and data system committee. *Radiology* 2020; **294**: 168-185 [PMID: [31687921](#) DOI: [10.1148/radiol.2019191150](#)]
- 5 **Ramaswamy V**. Pathology of mucinous appendiceal tumors and pseudomyxoma peritonei. *Indian J Surg Oncol* 2016; **7**: 258-267 [PMID: [27065718](#) DOI: [10.1007/s13193-016-0516-2](#)]
- 6 **Carr NJ**, Cecil TD, Mohamed F, Sobin LH, Sugarbaker PH, González-Moreno S, Taflampas P, Chapman S, Moran BJ; Peritoneal Surface Oncology Group International. A consensus for classification and pathologic reporting of pseudomyxoma peritonei and associated appendiceal neoplasia: The results of the peritoneal surface oncology group international (PSOGI) modified Delphi process. *Am J Surg Pathol* 2016; **40**: 14-26 [PMID: [26492181](#) DOI: [10.1097/PAS.0000000000000535](#)]
- 7 **Zhang W**, Tan C, Xu M, Wu X. Appendiceal mucinous neoplasm mimics ovarian tumors: Challenges for preoperative and intraoperative diagnosis and clinical implication. *Eur J Surg Oncol* 2019; **45**: 2120-2125 [PMID: [31462390](#) DOI: [10.1016/j.ejso.2019.08.004](#)]
- 8 **Landen S**, Bertrand C, Madder GJ, Herman D, Pourbaix A, de Neve A, Schmitz A. Appendiceal mucocoeles and pseudomyxoma peritonei. *Surg Gynecol Obstet* 1992; **175**: 401-404 [PMID: [1440166](#)]
- 9 **Yu XR**, Mao J, Tang W, Meng XY, Tian Y, Du ZL. Low-grade appendiceal mucinous neoplasms confined to the appendix: clinical manifestations and CT findings. *J Investig Med* 2020; **68**: 75-81 [PMID: [31300469](#) DOI: [10.1136/jim-2018-000975](#)]
- 10 **Jayson GC**, Kohn EC, Kitchener HC, Ledermann JA. Ovarian cancer. *Lancet* 2014; **384**: 1376-1388 [PMID: [24767708](#) DOI: [10.1016/S0140-6736\(13\)62146-7](#)]
- 11 **Goff BA**, Mandel LS, Melancon CH, Muntz HG. Frequency of symptoms of ovarian cancer in women presenting to primary care clinics. *JAMA* 2004; **291**: 2705-2712 [PMID: [15187051](#) DOI: [10.1001/jama.291.21.2705](#)]

- 10.1001/jama.291.22.2705]
- 12 **Goff BA**, Mandel LS, Drescher CW, Urban N, Gough S, Schurman KM, Patras J, Mahony BS, Andersen MR. Development of an ovarian cancer symptom index: possibilities for earlier detection. *Cancer* 2007; **109**: 221-227 [PMID: [17154394](#) DOI: [10.1002/cncr.22371](#)]
- 13 **Cubro H**, Cengic V, Burina N, Kravic Z, Beciragic E, Vranic S. Mucocoele of the appendix presenting as an exacerbated chronic tubo-ovarian abscess: A case report and comprehensive review of the literature. *Medicine (Baltimore)* 2019; **98**: e17149 [PMID: [31574819](#) DOI: [10.1097/MD.00000000000017149](#)]
- 14 **Padmanaban V**, Morano WF, Gleeson E, Aggarwal A, Mapow BL, Stein DE, Bowne WB. Incidentally discovered low-grade appendiceal mucinous neoplasm: a precursor to pseudomyxoma peritonei. *Clin Case Rep* 2016; **4**: 1112-1116 [PMID: [27980743](#) DOI: [10.1002/ccr3.694](#)]
- 15 **Balci O**, Ozdemir S, Mahmoud AS. Appendiceal mucocoele mimicking a cystic right adnexal mass. *Taiwan J Obstet Gynecol* 2009; **48**: 412-414 [PMID: [20045765](#) DOI: [10.1016/S1028-4559\(09\)60333-8](#)]
- 16 **Dragoumis K**, Mikos T, Zafrakas M, Assimakopoulos E, Venizelos I, Demertzidis H, Bontis J. Mucocoele of the vermiform appendix with sonographic appearance of an adnexal mass. *Gynecol Obstet Invest* 2005; **59**: 162-164 [PMID: [15687730](#) DOI: [10.1159/000083680](#)]
- 17 **Aleter A**, El Ansari W. Incidental appendiceal mucinous neoplasm mimicking a left adnexal mass: A case report. *Int J Surg Case Rep* 2020; **74**: 132-135 [PMID: [32836208](#) DOI: [10.1016/j.ijscr.2020.07.081](#)]
- 18 **Hajiran A**, Baker K, Jain P, Hashmi M. Case of an appendiceal mucinous adenocarcinoma presenting as a left adnexal mass. *Int J Surg Case Rep* 2014; **5**: 172-174 [PMID: [24568943](#) DOI: [10.1016/j.ijscr.2013.12.008](#)]
- 19 **Caspi B**, Cassif E, Auslender R, Herman A, Hagay Z, Appelman Z. The onion skin sign: a specific sonographic marker of appendiceal mucocoele. *J Ultrasound Med* 2004; **23**: 117-21; quiz 122 [PMID: [14756359](#) DOI: [10.7863/jum.2004.23.1.117](#)]
- 20 **Testa AC**, Van Holsbeke C, Mascilini F, Timmerman D. Dynamic and interactive gynecological ultrasound examination. *Ultrasound Obstet Gynecol* 2009; **34**: 225-229 [PMID: [19644933](#) DOI: [10.1002/uog.7309](#)]
- 21 **Xiao J**, Li P, Liu W. Analysis of Clinical characteristics of low-grade appendiceal mucinous neoplasm (LAMN): A retrospective cohort study of 51 LAMN patients. *J Invest Surg* 2020; 1-7 [PMID: [31906733](#) DOI: [10.1080/08941939.2019.1695986](#)]
- 22 **Nutu OA**, Marcacuzco Quinto AA, Manrique Municio A, Justo Alonso I, Calvo Pulido J, García-Conde M, Cambra Molero F, Jiménez Romero LC. Mucinous appendiceal neoplasms: Incidence, diagnosis and surgical treatment. *Cir Esp* 2017; **95**: 321-327 [PMID: [28655402](#) DOI: [10.1016/j.ciresp.2017.05.008](#)]
- 23 **Glasgow SC**, Gaertner W, Stewart D, Davids J, Alavi K, Paquette IM, Steele SR, Feingold DL. The American society of colon and rectal surgeons, clinical practice guidelines for the management of appendiceal neoplasms. *Dis Colon Rectum* 2019; **62**: 1425-1438 [PMID: [31725580](#) DOI: [10.1097/DCR.0000000000001530](#)]
- 24 **Abu Zidan FM**, al-Hilaly MA, al-Atrabi N. Torsion of a mucocoele of the appendix in a pregnant woman. *Acta Obstet Gynecol Scand* 1992; **71**: 140-142 [PMID: [1316043](#) DOI: [10.3109/00016349209007972](#)]
- 25 **Ahmed N**, Vimplis S, Deo N. A mucocoele of the appendix seen as an adnexal mass on ultrasound scan. *J Obstet Gynaecol* 2017; **37**: 116-117 [PMID: [27868468](#) DOI: [10.1080/01443615.2016.1209172](#)]
- 26 **Alghamdi AO**, Aldossary MY, Alsawidan M, AlBahar S. Low grade appendiceal mucinous neoplasm mimicking an ovarian cyst: A case report. *Int J Surg Case Rep* 2020; **70**: 145-148 [PMID: [32422578](#) DOI: [10.1016/j.ijscr.2020.04.074](#)]
- 27 **Arrington D**, Jewett B, Sterner S, Caplan M, Thacker P. Incidental mucocoele of the appendix in a 15-year-old girl. *Pediatr Emerg Care* 2014; **30**: 555-557 [PMID: [25098799](#) DOI: [10.1097/PEC.0000000000000187](#)]
- 28 **Bahia JO**, Wilson MH. Mucocoele of the appendix presenting as an adnexal mass. *J Clin Ultrasound* 1989; **17**: 62-66 [PMID: [2492555](#) DOI: [10.1002/jcu.1870170114](#)]
- 29 **Bartlett C**, Manoharan M, Jackson A. Mucocoele of the appendix - a diagnostic dilemma: a case report. *J Med Case Rep* 2007; **1**: 183 [PMID: [18093329](#) DOI: [10.1186/1752-1947-1-183](#)]
- 30 **Cristian DA**, Grama FA, Becheanu G, Pop A, Popa I, Şurlin V, Stănilescu S, Bratu AM, Burcoş T. Low-grade appendiceal mucinous neoplasm mimicking an adnexal mass. *Rom J Morphol Embryol* 2015; **56**: 837-842 [PMID: [26429182](#)]
- 31 **Demirci RK**, Habibi M, Karakaş BR, Buluş H, Akkoca M, Öner OZ. Appendix mucocoele mimicking a complex ovarian cyst. *Ulus Cerrahi Derg* 2015; **31**: 58-60 [PMID: [25931937](#) DOI: [10.5152/UCD.2013.17](#)]
- 32 **Gortchev G**, Tomov S, Dimitrov D, Naney V, Betova T. Appendiceal mucocoele presenting as a right adnexal mass: a case report. *Obstet Gynecol Int* 2010; **2010** [PMID: [20871809](#) DOI: [10.1155/2010/281053](#)]
- 33 **Kalu E**, Croucher C. Appendiceal mucocoele: a rare differential diagnosis of a cystic right adnexal mass. *Arch Gynecol Obstet* 2005; **271**: 86-88 [PMID: [15316825](#) DOI: [10.1007/s00404-004-0663-5](#)]
- 34 **Kanasugi T**, Kikuchi A, Omi H, Ikeda M, Fukushima A, Sugiyama T. Appendiceal mucocoele and peritoneal inclusion cyst mimicking right adnexal masses: a diagnostic challenge in gynecologic practice. *J Med Ultrason* (2001) 2013; **40**: 51-55 [PMID: [27276925](#) DOI: [10.1007/s00113-013-0511-1](#)]

- 10.1007/s10396-012-0379-2]
- 35 **Paladino E**, Bellantone M, Conway F, Sesti F, Piccione E, Pietropolli A. Large mucocele of the appendix at laparoscopy presenting as an adnexal mass in a postmenopausal woman: a case report. *Case Rep Obstet Gynecol* 2014; **2014**: 486078 [PMID: [24804128](#) DOI: [10.1155/2014/486078](#)]
- 36 **Panagopoulos P**, Tsokaki T, Misiakos E, Domi V, Christodoulaki C, Sioutis D, Papantoniou N. Low-Grade appendiceal mucinous neoplasm presenting as an adnexal mass. *Case Rep Obstet Gynecol* 2017; **2017**: 7165321 [PMID: [28286683](#) DOI: [10.1155/2017/7165321](#)]
- 37 **Pantiora EV**, Massaras D, Koutalas J, Bagiasta A, Kontis EA, Fragulidis GP. Low-grade appendiceal mucinous neoplasm presenting as adnexal mass: A case report. *Cureus* 2018; **10**: e3568 [PMID: [30648100](#) DOI: [10.7759/cureus.3568](#)]
- 38 **Papoutsis D**, Protopappas A, Belitsos P, Sotiropoulou M, Antonakou A, Loutradis D, Antsaklis A. Mucocele of the vermiform appendix misdiagnosed as an adnexal mass on transvaginal sonography. *J Clin Ultrasound* 2012; **40**: 522-525 [PMID: [21739436](#) DOI: [10.1002/jcu.20858](#)]
- 39 **Rudloff U**, Malhotra S. Volvulus of an appendiceal mucocele: report of a case. *Surg Today* 2007; **37**: 514-517 [PMID: [17522774](#) DOI: [10.1007/s00595-006-3435-y](#)]
- 40 **Scaffa C**, Di Bella O, Tartaglia E, Rotondi M, Lup F, Messalli EM. Surgical approach to appendiceal mucocele mimicking an adnexal complex mass: case report. *Eur J Gynaecol Oncol* 2007; **28**: 503-505 [PMID: [18179147](#)]
- 41 **Shimizu T**, Shimizu M, Kawaguchi K, Yomura W, Ihara Y, Matsumoto T. Mucinous cystadenoma of the appendix with raised serum carcinoembryonic antigen concentration: clinical and pathological features. *J Clin Pathol* 1997; **50**: 613-614 [PMID: [9306947](#) DOI: [10.1136/jcp.50.7.613](#)]



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