


CASE REPORT

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Coexistence of tubo-ovarian abscess and carcinoid tumor of the appendix in a sexually inactive girl: a case report

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Abstract

Background: Tubo-ovarian abscess (TOA) is mostly a sequela of pelvic inflammatory disease (PID) which is seen in sexually active women. Although very rare, TOA could be seen in virgin adolescent girls. Fifteen cases of TOA were reported in virgin girls in English literature. Only one of these cases was suspected to be due to appendicitis. Herein, we present the first case of coexistence of tubo-ovarian abscess and carcinoid tumor of the appendix in a sexually inactive girl.

Case presentation: A 13-year-old girl presented with abdominal pain and fever. Ultrasonography reported that there was a 63×48 mm sized, heterogeneous, thick-walled, dense-content complicated cyst in the right ovary which was thought to be a hemorrhagic cyst and a tubular structure, measuring 12 mm in its thickest part which was thought to be the appendix. During the operation, a TOA was observed in the right adnexal region. The thick, edematous appendix which was lying separately was excised. The TOA was evacuated; a drain was placed. The appendix pathology was reported as “carcinoid tumor.”

Conclusion: We present the first case of TAO with carcinoid tumor of appendix and the second case of TAO that was suspected to be due to appendicitis. When the sexually inactive TOA cases including our case were reviewed, we found that the median age was 15 years (12–47 years) and 11 of 16 cases (69%) were under 18 years of age. The presenting symptoms were abdominal or pelvic pain in all cases, fever in 11 cases (69%), vomiting in 6 cases (38%), dysuria in 5 cases (31%), and diarrhea in 3 cases (19%). Both perforated appendicitis and TOA patients have the same clinic presentation such as fever, abdominal tenderness, increased leukocyte count, increased inflammatory markers. The differential diagnosis can be achieved by radiological examinations such as ultrasonography, computerized tomography or magnetic resonance imaging.

Keywords: Abscess, Adolescent, Appendicitis, Carcinoid tumor, Case report

Background

Tubo-ovarian abscess is mostly a complication of PID and is less commonly caused by pelvic or abdominal surgery, malignancy or intra-abdominal infections such as appendicitis [1–3]. Even so in the sexually inactive TOA

cases that were published (15 cases), the reported possible etiological factors were ascending genital tract infection due to chronic pooling of urine at vagina and poor hygiene in 2 cases [4, 5], concomitant urinary tract infection in 1 case [6], imperforate hymen, labial agglutination or vaginal septum in 3 cases [7–9], cat-related trauma in 1 case [10], hematogenous seeding due to Crohn’s disease in 1 case [4], disruption in the balance of vaginal flora due to recent antibiotic usage in 1 case [11], suspected bacterial bowel translocation in 1 case [12], and unknown but according to bacteria cultured, suspected ascending

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infection from lower genital tract in 4 cases [2, 3, 13, 14]. Only one case was reported with a previously drained intraabdominal abscess due to suspected perforated appendicitis [15] (Table 1).

When the sexually inactive TOA cases including our case were reviewed, we found that the median age was 15 years (12–47 years) and 11 of 16 cases (69%) were under 18 years of age. The presenting symptoms were abdominal or pelvic pain in all cases, fever in 11 cases (69%), vomiting in 6 cases (38%), dysuria in 5 cases (31%), and diarrhea in 3 cases (19%). Only one case reported to have vaginal discharge. Most of the radiological examinations revealed complex, multilocular cystic mass at adnexal region or in the pelvis with inflammation findings on some. When culture results were examined, *E. coli* was reported in 5 cases (31%), *Streptococcus* subspecies in 6 cases (38%), *Peptostreptococcus* in 2 cases (12%), *Abiotrophia/Granulicetella*, *Bacteroides/Stahylococcus/Streptococcus*, and *Pasteurella multocida* each in 1 case. Six cases have had salpingo-oophorectomy, and 6 cases have had abscess drainage (3 of them by laparoscopy, 3 of them by laparotomy). At one case, the abscess was drained by interventional radiology without operation. In 4 cases appendectomy was also added to the procedure. At one case, due to dense adhesions, small bowel resection and enteroenterostomy were needed. At one case, the operation was reported as “removal of mass,” and in another case, the operation was reported as “explanatory laparotomy” only (Table 1).

Most of the primary appendix tumors are diagnosed through the pathological examination of the appendix in patients who were operated on for appendicitis [16]. In 0.3% of the pathology materials of children undergoing appendectomy, a carcinoid tumor of the appendix is detected [16]. The carcinoid tumor is the most common primary neoplasm of the appendix (25–40%) [17]. The carcinoid tumor originates from enterochromaffin cells that can be seen all over the body, but are primarily found in the main bronchus and submucosa of the gastrointestinal tract [17]. In the carcinoid tumor series of 13,715 cases of Modlin et al., 70% of the cases were reported to be located in the gastrointestinal tract and 24% were in the appendix [17].

While appendectomy is sufficient in cases with a tumor size less than 2 cm, right hemicolectomy is recommended in cases with a tumor size larger than 2 cm in adult cases [16]. Indications for right hemicolectomy in cases with <2 cm tumor size are positive or unclear surgical margin (tumors located at appendix-base), incompletely resected tumor, deep mesoappendix invasion, lymphovascular invasion, cecal spread, high mitotic index and high Ki-67 proliferation index [16]. The mitotic index examined and reported in the pathological examinations is usually

below 1 in 10 large magnifications; if the mitotic index happens to be 2 or 3, it indicates poor prognosis [18]. The pathological examination of the Ki-67 proliferation index is also helpful in predicting metastasis development; in which an index value below 2% shows a good prognosis [19].

Herein, we present the first case having both tubo-ovarian abscess and carcinoid tumor of the appendix at the same time.

Case presentation

A 13-year-old girl presented with abdominal pain, which had been intense for 5 days, and was located in the right lower quadrant for the last 2 days. While constipation and fever had accompanied the symptoms, there were no complaints of vomiting and dysuria. As the abdominal pain started on the first day of her menstruation, the patient thought that the pain was related to menstruation. The medical and family histories of the patient were unremarkable. She had no sexual relationship before. In the physical examination, all system examinations were natural except for 38°C fever and tenderness in the lower right quadrant of the abdomen. Serum Leukocyte count was 18,400/ μ L, serum CRP level was 67.44 mg/L and serum β -hcg and AFP levels were normal. Urinalysis was normal. Ultrasonography (USG) reported that there was a 63×48 mm sized, heterogeneous, thick-walled, dense-content complicated cyst in the right ovary which was thought to be a hemorrhagic cyst and a tubular structure, measuring 12 mm in its thickest part which was thought to be the appendix (Figs. 1 and 2).

The patient was operated on with a pre-diagnosis of perforated appendicitis. During the operation, while looking for the appendix, a well-circumscribed mass was observed in the right adnexal region, on the posterior wall of the abdomen, covered with peritoneum. During palpation, the mass ruptured, purulent fluid drained from it, and a sample was taken for culture examination. The mass was an abscess located superolateral to the right ovary, in the posterior of the right uterine tube, adhered and conglomerated to the ovary and uterine tube but outside of them both. Ovary, tube, and the abscess were all together forming a conglomerated mass that had become covered by the peritoneum. The uterus was seen separately. We explored the Douglas pouch, and no pathology was detected. We reached the caecum, and, by palpation, the appendix which was extending towards the Douglas pouch was found. The appendix was lying medial to the conglomerated mass, separately, and the appendix was very thick, inflamed, and edematous. The meso-appendix was thickened. There was no gross perforation on the appendix. The appendix was excised. The abscess was evacuated, and the surgery was

Table 1 Review of the literature (14 case reports/case series, a total of 16 cases including our case presentation)

Reference	Patient's age	Symptom (duration)	Radiological examination	Possible cause	Culture results	Operation
1 Gensheimer (2010) [2]	20 years	Abdominal pain (3 weeks)	CT: A complex multilocular cystic mass in the right adnexa measuring 7 x 5 cm. USG: a 7 x 6 x 5 cm. Complex right ovarian cyst suggestive of a complex hemorrhagic cyst.	Uncertain (ascending infection from the lower genital tract ?)	<i>Abiotrophia/Granulicatella</i>	Small bowel resection (adhesions, and deserialization), enteroenterostomy, appendectomy, right salpingo-oophorectomy (necrotic in appearance)
2 Simpson-Camp (2012) [3]	14 years	Pelvic pain, abdominal fullness, and dysuria	CT: a large multiloculated right adnexal mass. USG: a complex right adnexal mass measuring 12.5 x 9.6 x 11 cm with multilocular areas and septations with no normal ovarian parenchyma visible	Unknown (direct ascension)	<i>Streptococcus viridans</i>	Explanatory laparotomy
3 Hartman (2009) [4] – 1	12 years	Abdominal pain, nausea, vomiting, and fever (1 day)	CT: Echogenic debris at the center of the lower pelvis, suggestive of large dominant cyst and inflammation of the left ovary	Chronic vaginal pooling of urine (Obesity, poor hygiene)	<i>E. coli</i>	Laparoscopy, drainage of abscess
4 Hartman (2009) [4] – 2	16 years	Abdominal pain, and fever (3 weeks)	CT: small irregular fluid collections extending into the pelvis, anterior and superior to the uterus with inflammation of the right ovary.	Hematogenous seeding of bacteria (Chron's disease)	<i>B. uniformis</i> , coagulase negative staphylococcus, <i>S. milleri</i>	Laparoscopy, drainage of ovarian and liver abscess
5 Moore (1999) [5]	15 years	Abdominal pain, nausea, vomiting, dysuria, and fever (3 weeks)	USG: (limited) an enlarged heterogeneous uterus MRI: an enlarged heterogeneous uterus, poorly defined soft tissue changes in the pelvis	Vaginal voiding (recessed urethra, chronic pooling of urine in the posterior vagina)	<i>E. coli</i>	Explanatory laparotomy, Left salpingo-oophorectomy (postoperative percutaneous abscess drainages)
6 Arda (2004) [6]	15 years	Abdominal pain, dysuria, and fever (2 days)	USG and CT: 6 x 2.5 x 3 cm abscess originating in the right tubo-ovarian structure.	Concomitant urinary tract infection	<i>E. coli</i>	Laparoscopy, drainage of abscess

Table 1 (continued)

Reference	Patient's age	Symptom (duration)	Radiological examination	Possible cause	Culture results	Operation
7 Tsatsaris (2019) [7]	16 years	Abdominal pain, swollen abdomen, and fever (2 days)	USG: Multilocular adnexal mass with debris, septations, and irregular thick walls of 6 x 8.2 x 9.6 cm in size, located in the left adnexal region. MRI: Hematometrocolpos, thick-walled mass on the left ovary filled with fluid and hypointense signal in T1 and typically heterogeneous in T2 series.	Imperforate hymen		Explanatory laparotomy, removal of mass in left adnexa
8 Stortini (2017) [8]	14 years	Abdominal pain, vomiting and diarrhea (sepsis)	USG: a significant interval increase in size of the volume of the right ovary from 14 mL to 148 mL, markedly edematous with hyperemia in its periphery and preserved central arterial and venous flow. MRI: Severe inflammatory changes of the pelvis with moderate amount of free fluid and TOAs mainly in the right ovary and both fallopian tubes.	Vaginal pooling of urine (Labial agglutination)	<i>Streptococcus anginosus</i> , <i>Peptostreptococcus anaerobius</i>	Drainage of abscesses (interventional radiology)
9 Ashrafganjooei (2011) [9]	24 years	Abdominal pain, diarrhea, fever (2 days) (Mental retardation, primary amenorrhea)	USG: a 7 x 7.5 cm complex mass in right pelvis with irregular borders and multiple septa. Dilatation of right urinary collecting system due to extrinsic compression.	Vaginal septum (lower 1/3)	Positive (mixed bacteria)	Explanatory laparotomy, right salpingo-oophorectomy
10 Teng (1996) [10]	47 years	Abdominal pain, diarrhea, anorexia, and fever (3 weeks)		Transient bacteremia from cat trauma	<i>Pasteurella multocida</i>	Diagnostic laparoscopy, explanatory laparotomy, supracervical hysterectomy, bilateral salpingo-oophorectomy, appendectomy
11 Cheong (2013) [11]	13 years	Abdominal pain, anorexia, vomiting, fever, dysuria, vaginal discharge	USG: a large retrouterine heterogeneous collection measuring 10 x 8 x 11.4 cm that was compatible with an abscess secondary to perforated appendicitis.	Disruption in the balance of the vaginal flora (recent antibiotic usage)	<i>Streptococcus viridians</i> , <i>Peptostreptococcus</i>	Laparoscopy, Laparotomy, Left salpingo-oophorectomy

Table 1 (continued)

Reference	Patient's age	Symptom (duration)	Radiological examination	Possible cause	Culture results	Operation
12 Goodwin (2013) [12]	13 years	Abdominal pain, vomiting (1 day)	USG: a closed loop of small bowel in keeping with obstruction with bowel compromise and potential perforation. The ovaries were normal.	Suspected bacterial bowel translocation	<i>E. coli</i>	Explanatory laparotomy, drainage of TOA and pyosalpinx
13 Dogan (2004) [13]	19 years	Abdominal pain, nausea, vomiting and low grade fever (3 days)	USG: a cystic mass with hyperechoic semisolid areas measuring 57 x 76 x 91 mm on the right adnexal area. CT: cystic masses measuring 70 x 80 mm and 60 x 50 mm, a mural nodule containing 10 mm of calcification in its inner structure, resembling dermoid cyst.	Ascending microorganisms from the lower genital tract	<i>E. coli</i> , α -hemolytic streptococci	Abscess drainage, wedge resection of infected ovarian tissue
14 Leong (2001) [14]	23 years		USG: an 8 x 8 cm polycystic right ovary Transvaginal USG: a complex right pelvic mass with a large septum. The mass contained several fluid filled locules and fluid and debris layering occurring in the two largest locules.	Unknown		Laparoscopic right salpingo-oophorectomy
15 Mills (2018) [15]	13 years	Abdominal pain, dysuria, and fever	CT: 5.2 x 5.8 x 5.3 cm multiloculated cystic mass with surrounding inflammation and adjacent peripherally enhancing fluid. USG: Left ovarian abscess and a concern of torsion.	Chronic appendicitis	<i>Streptococcus constellatus</i>	Explanatory laparotomy, appendectomy, release of omentum

Table 1 (continued)

Reference	Patient's age	Symptom (duration)	Radiological examination	Possible cause	Culture results	Operation
16	Our case 13 years	Abdominal pain, constipation, and fever	USG: In the right ovary, 63 x48 mm sized, heterogeneous, thick-walled, dense-content complicated cyst was observed. It is thought to be a hemorrhagic cyst. In the neighborhood of the cyst described, the tubular structure, measuring 12 mm in its thickest part, was observed and it is thought to be the appendix due to its extension to the pericecal region.	Appendicitis	None	Laparotomy, appendectomy, drainage of abscess

CT computed tomography, USG ultrasonography, MRI magnetic resonance imaging

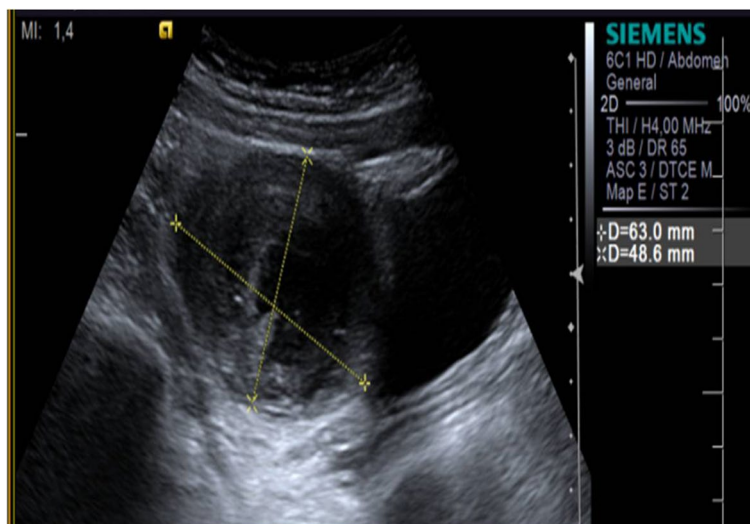


Fig. 1 USG image: 63×48 mm cyst in the right ovary

terminated by placing a drain in the abscess and without additional intervention in order not to damage the ovary and the tube.

The patient did not develop any complications. The culture of the abscess was negative for infection. The drain was removed on the 2nd day and the patient was discharged on the 4th day. Antibiotic treatment was initiated with intravenous ceftriaxone, amikacin, and ornidazole preoperatively and was continued postoperatively for 5 days and changed into oral cefixime and metronidazole for 5 more days. The appendix pathology was reported as “well-differentiated neuroendocrine tumor (carcinoid tumor), tumor size is 0.7 cm, the tumor arises from the mucosa and infiltrates into the submucosa and muscularis propria” (Figs. 3 and 4). Carcinoid syndrome findings such as flushing, diarrhea and bronchoconstriction were not observed in the patient. The patient was referred to the Pediatric Oncology clinic and was followed without any additional treatment because of the small tumor size. Control pelvic USG at the third month was normal.

Discussion

Tubo-ovarian abscess (TOA) is mostly a sequela of pelvic inflammatory disease (PID) which is seen in sexually active women. Less commonly, tubo-ovarian abscess can occur because of an infected adjacent organ such as the appendix [1]. Fifteen cases of tubo-ovarian abscess were reported in virgin girls in English literature. The etiology of TOA in most of these patients was uncertain [2–14] and only one was suspected to be due to appendicitis [15]. Although we assumed that the TOA in our patient is older than the appendicitis, as there was a well-organized

abscess with peritoneal covering and without any acute inflammatory findings, appendicitis still remains the only pathology present in our case to explain the etiology of the TOA.

The differential diagnosis of TOA included ovarian cyst, hydrosalpinx, ectopic pregnancy, tumors, pelvic inflammatory disease, and other abscesses of gastrointestinal system such as abscess due to perforated appendicitis [6]. Clinically, symptoms of a tubo-ovarian abscess are identical to appendicitis, especially perforated appendicitis [11]. Both perforated appendicitis and TOA patients have the same clinic presentation such as fever, abdominal tenderness, increased leukocyte count, and increased inflammatory markers. In these patients differential diagnosis can only be achieved by radiological examinations such as USG, computerized tomography (CT) or magnetic resonance imaging (MRI) [1]. With USG, the TOA is presented as a multilocular, thick-walled, dense-content cystic mass with a thick septa in the adnexal region [9], similar to our patient’s radiological findings. In our patient, USG imaging reported a complicated cyst in the right ovary that was presumed as a hemorrhagic cyst of the ovary, but it did not refer to the pathology as TOA. The differential diagnosis in our case was a hemorrhagic cyst of the ovary and laparotomy was done with a prediagnosis of appendicitis as the appendix diameter was measured as 12 mm with USG. As TOA is rare in sexually inactive girls and as the appendix was reported to be thicker than normal in our patient, our diagnosis was in favor of appendicitis. Our patient was considered as a perforated appendicitis and surgical treatment was planned accordingly. In light of our experience, in this

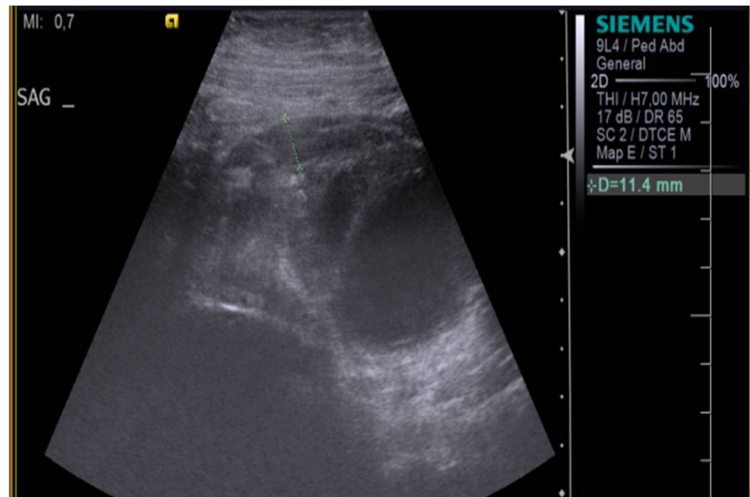


Fig. 2 USG image: in this image, the diameter of the appendix was measured as 11.4 mm

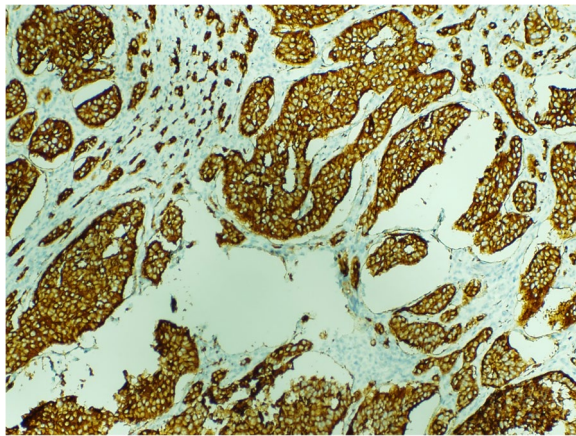


Fig. 3 Synaptophysin stain (magnification: $\times 10$): tumor cells are strongly positive with synaptophysin antibody diffusely

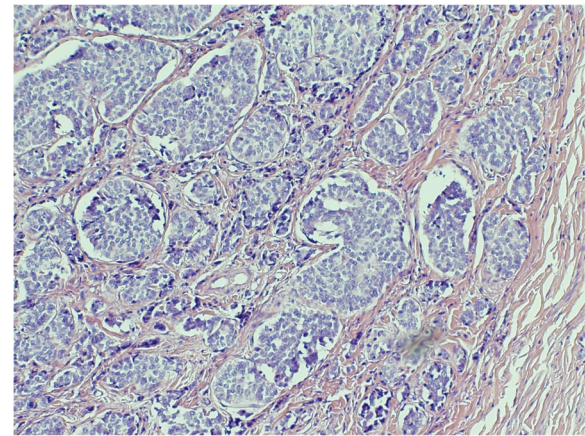


Fig. 4 Hematoxylin and eosin (H&E) stain (magnification: $\times 10$): tumor infiltration in clusters and layers that fills the appendix lumen, mild to moderate atypia in the nuclei, and salt-pepper chromatin pattern in the nuclei

case, we came to the conclusion that TOA should also be considered in the differential diagnosis of perforated appendicitis in patients with radiological findings similar to this case, although the patient is not sexually active.

Management of TOA is antibiotic treatment with drainage of the abscess in selected cases [1]. Some cases may need salpingo-oophorectomy [2, 5, 9, 11, 14]. Anaerobic bacterial coverage is recommended for all TOA cases with gram-negative antibacterial treatment [1]. Our broad-spectrum antibiotic treatment and drainage of the abscess during operation were sufficient for both appendicitis and TOA treatment, and 3 months later, the control pelvic USG was normal.

The prognosis of an incidental carcinoid tumor of the appendix is excellent in children [16]. For adults, five-year survival is 92% in patients with a tumor localized only in the appendix, 82% in patients with a tumor with local metastases, and 31% in those with distant metastasis [18]. Some authors reported that in children, the carcinoid tumor of the appendix did not behave aggressively, and an appendectomy alone was sufficient even with tumors >2 cm in size [16]. In our patient, additional surgical treatment was not required since the tumor was less than 2 cm, the mitotic activity was less than 1/10 and the Ki-67 proliferation index was 2%.

Carcinoid tumor of the appendix with tubo-ovarian abscess has not been previously reported. In our patient the TOA was covered with the peritoneum, was conglomerated with the ovary and uterine tube, and was devoid of acute inflammation, suggesting that it may be an older pathology. Due to these findings, we are not sure that appendicitis was the cause of the TOA. The etiology of the TOA also could be previously perforated and healed appendicitis, chronic appendicitis or bacterial translocation via blood to that region. Since the patient was not sexually active, and there was no previous history of pelvic inflammation, the cause of TOA was not considered to be PID. However, the presence of acute appendicitis was the only pathology present in our case to explain the etiology of the TOA.

The limitations of this case report is that we could not be sure about the etiology of the abscess and when it occurred. As we discussed in our findings, the abscess seemed to be present for a long period, but there was no clear history for such an etiology of the abscess, and the only possible etiological pathology was appendicitis. Although we reviewed the possible etiological factors by asking questions to the patient's family, there could be missing information as the family could have had forgotten. We defined the case as acute appendicitis as the gross appearance of the appendix was very thick, inflamed, and edematous. But at the pathological examination, the pathologists reported only about the carcinoid tumor, and added the detail as 'Appendectomy material has a length of 4 cm and a diameter of 1 cm. Fibrin and regions of hemorrhage are seen at serosa. Fecaloid was present at lumen.'

Conclusion and recommendations

Although very rare, TOA which is mostly seen as a sequela of PID which is seen in sexually active women, could be seen in virgin adolescent girls. As both perforated appendicitis and TOA patients have the same clinical presentation, the differential diagnosis can only be achieved by radiological examinations such as USG, CT, or MRI. Additionally, the pathological examination results of appendectomy should be followed up in the postoperative period, and patients whose pathological examination results are reported as carcinoid tumors should not be overlooked.

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Authors' contributions

MSA and EEA reviewed the patients' records; TAD, MSG, and EEFA reviewed the literature; TAD, LHG, and EF analyzed and interpreted data; TAD, MSG, and EEFA wrote the article; and LHG and EF revised the article. All authors read and approved the final manuscript.

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Competing interests

The authors declare that they have no competing interests

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