Low-Grade Appendiceal Mucinous Neoplasms Mimicking Ovarian Adnexal Masses: A Case Report

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Writer's Comment: I underwent appendix surgery as a child after one-year intake of medicines prescribed by multiple physicians, and all these medications were regarded as unnecessary at the time of diagnosis. I can still recall those hospital visits as a child in India, and during each visit, I heard new stories from the other patients complaining about their critical health conditions due to previous treatments following the wrong diagnosis. The observance of misdiagnosis in treatments shaped my goal of becoming a physician and a medical researcher. So, when Dr. Herring gave us this challenging assignment of writing a formal case report centric around the real person, I perceived it as an opportunity to present a report that might help in avoiding the misdiagnosis and started to look for someone who had a health problem prone to misdiagnosis. To my surprise, I found a lot of health problems that are prone to misdiagnosis, but I chose to write about my aunt, who suffered from rare misleading cancerous tumors originating from her appendix that were misdiagnosed preoperatively and only accurately diagnosed during her surgery. This writing assignment allowed me to delve deep and understand the correct diagnosis of her rare health problem through a collection of her records, her family's description of her real-life experience, and my research. I consider myself very fortunate to be able to present this case report that might help in making the correct diagnosis of these misleading mucinous neoplasms of appendiceal origin.

Instructor's Comment: In my Writing in the Professions: Health course, one assignment is a formal case report. The students find someone who is sick or hurt, and write a detailed account of the problem. The report must be thorough to the point that nothing important—or even anything unimportant—is left out. Further, the language must be ruthlessly technical. "The patient had things on his face, so he went to the doctor," becomes, "A 36-year-old male presented with bilateral facial lesions, and when blood work revealed a CD4+ count of ~100, the PCP suspected Kaposi's sarcoma." Oh, and the report has to be written about a real person, known to the writer. Ravinder had his hands full just doing the basics, but he takes it a step further. He describes, step by step, a case in which the root of the problem is a disorder so rare that it requires a long and complex ordeal to get at that root. The result is a case report which is different in no really important way from the real thing, in a real medical journal—except that the author is not yet a physician.

—Scott Herring, University Writing Program

Introduction

Low-grade appendiceal mucinous neoplasms, also known as LAMN, are rare malignant tumors of appendiceal origin that often lead to pseudomyxoma peritonei following the rupture of the excessively occluded lumen of the appendix. The incidence of this malignancy is very rare, with only 2.8 cases per million persons as of 2011 (Shaib et al., 2017). These neoplasms are easily misdiagnosed due to their rare occurrence, thus causing a delay in treatment which sometimes leads to sepsis. Here, I report the case of a fifty-six-year-old female who suffered from pseudomyxoma peritonei caused by rare malignant tumors of appendiceal origin, which was accurately diagnosed only during surgery due to the misleading nature of these tumors.

Case Presentation

A fifty-six-year-old postmenopausal female presented to the emergency department of the medical center with a four-month history of abdominal pain in the right lower quadrant and a recent pain occurrence in the hypogastric region. The patient, with chief complaints of recurrent

nausea, emesis, and abdominal distension, reported that she had observed progressive abdominal expansion from the last two years but had not experienced any chronic abdominal pain episodes or any gastrointestinal problems. Upon physical examination, the persistent abdominal pain at a steady level eight on the Wong-Baker pain scale was noted, along with tenderness in the right iliac fossa with a rebound tenderness extending to the pelvic region. The vital signs were normal with temperature 39˚C, blood pressure 133/82 mm Hg, pulse rate 89/min, and respiratory rate 18/min. Upon admission, the abdominopelvic CT scan revealed peritoneal effusion along with massive ascites and a hard, lobulated pelvic cystic mass. The blood work revealed a mild leukocytosis with an increase in the percentage of segmented neutrophils. Suspecting the pelvic mass to be a malignant ovarian adnexal mass, the emergency physician referred her to a gynecologic oncologist.

The patient was transferred to the Department of Obstetrics and Gynecology on the same day. The gynecologic oncologist performed a pelvic examination, which revealed positive adnexal tenderness and negative cervical motion tenderness. The following day, a clinical examination including abdominopelvic sonography and trans-vaginal ultrasonography confirmed a multi-cystic mass of about 14 cm in diameter, filled with fluid, below the uterus in the right adnexa. The transvaginal ultrasonography also showed a complex unilateral cystic ovarian mass originating from the right ovary, suggestive of ovarian cancer. The patient denied experiencing any past reproductive issues. The blood tests showed CRP level elevated to 38.5 mg/dL and the expression levels tumor markers CEA, CA19-9 and CA125 elevated to 5 ng/ml, 52 U/ml, and 36 U/ml respectively. Magnetic resonance imaging showed a cystic mass of diameter 8.2 cm in contact with the right ovary and the uterus in the right iliac fossa extending to the hypogastric region. MRI also showed small tumorous implants causing lesions on the anterior peripheral surface of the liver and spleen, suggesting the dissemination of the mucin from the tumors in the abdominal cavity as a result of metastasis. The ascitic fluid cytology examination revealed the malignancy of mucinous cells. Based on the clinical presentation, the patient, diagnosed preoperatively with suspected pseudomyxoma peritonei induced by mucinous malignant ovarian tumors, was scheduled for the exploratory laparotomy.

On the third day after admission, the patient reported high abdominal distension; therefore, an interventional radiologist performed paracentesis and drained 300 mL of ascites mucinous fluid. Following

the procedure, the patient reported relief and remained stable for the remainder of the day. On the fourth day, the blood pressure of the patient suddenly dropped to 103/62 mm Hg with a respiratory rate of 14 bpm and her temperature rose to 38°C. An electrocardiogram showed atrial fibrillation with a rapid ventricular rate. Her blood results showed a raised CRP level to 52.5 mg/L. Based on the clinical examination, the patient was suspected to have intraperitoneal sepsis due to infected pseudomyxoma peritonei secondary to suspected malignant ovarian neoplasia. An emergency exploratory laparotomy was performed jointly by the oncologist and gynecologic oncologist, which revealed the ruptured appendiceal mucocele with omental caking, scalloping of some anterior surface of the liver, intraperitoneal metastasis to the ovary, and the invasive peritoneal mucinous implants. Thus, cytoreductive surgery along with appendectomy, right hemicolectomy, peritonectomy, unilateral oophorectomy, and omentectomy was performed. Another laparotomy was performed twenty-four hours later for peritoneal washout and further debulking of tumors. Following the second laparotomy, hyperthermic intraperitoneal chemotherapy, also known as HIPEC, with 40 mg of mitomycin-C at a target temperature of 42–43°C was performed for ninety minutes. The intra-abdominal infection was treated with intravenous ceftriaxone 1 g Q24H and cefepime 2 g IV Q8H extended infusion plus metronidazole 500 mg IV Q8H.

Swab tests of the fluid taken from the appendix showed moderately growing Enterococcus faecalis, Bacteroides fragilis. Histological examination demonstrated that the mass was a low-grade mucinous neoplasm of appendiceal origin associated with mucocele-like lining epithelium and acellular mucus. Pathology results revealed pT4b N0 M1a invasive mucinous of appendiceal origin with the invasion of the ovary and anterior surface of the liver. These findings showed the perforated low-grade appendiceal mucinous neoplasms as the leading cause of pseudomyxoma peritonei with the appendix as the primary site, and the coexisting mucinous ovarian tumors and peritoneal deposits represented metastasis from the appendiceal mucinous neoplasm. The patient was discharged after three weeks' surveillance with no imaging evidence of intra-abdominal infection or any malignant tumors with no further therapy. A six-month follow-up showed that the patient was asymptomatic with no pathological imaging findings of dissemination or any malignant mucinous neoplasms.

Discussion

Appendiceal mucinous neoplasms are very rare and only constitute about 1 percent of cancer cases and 0.3 percent of appendectomy cases. Based on the earlier classifications, mucinous neoplasms pertaining to the appendix were considered benign, but based on the recent studies, these are considered malignant and are classified as low-grade tumors with acellular mucin in or beyond the appendiceal wall (Shaib et al., 2017). Certain studies report the predominance of these neoplasms in females with 4:1 (Papoutsis et al., 2011). The appendiceal mucinous tumors such as low-grade mucinous neoplasms can rupture easily and spread into the peritoneum in the gelatinous form, leading to pseudomyxoma peritonei. A pseudomyxoma peritonei is a clinical syndrome that occurs when the peritoneal cavity is filled with mucous beyond the right lower quadrant of the abdomen and the underlying cause of mucous could be ovarian cysts, appendiceal mucinous tumors, or any abdominal mucinous cyst (Ramaswamy, 2016). Since low-grade appendiceal mucinous neoplasms are very rare, pseudomyxoma peritonei due to this condition is an unusual occurrence in which several mucinous peritoneal and omental implants along with mucinous ascites occupy the abdominal cavity resulting in abdominal distension. As the mucinous tumor grows inside the appendix, it occludes the lumen of the appendix. Mucus accumulates within the appendix, perforates it, and seeds the peritoneum with the mucous secreting malignant cells which further produce ascites and tumor implants on other abdominal organs by proliferating. Sometimes in cases of delayed diagnosis, appendiceal perforation is accompanied by bacterial contamination of mucous, further leading to sepsis as presented in the patient (Huang et al, 2015).

The most effective treatment for the pseudomyxoma peritonei is the cytoreductive surgery involving peritonectomy and other surgical incision of invaded organs, followed by hyperthermic intraperitoneal chemotherapy with 40 mg of mitomycin-C at a target temperature of 42–43°C performed for ninety minutes. The timing of cytoreductive surgery usually is based on the peritoneal cancer index, which is determined by the lesion size score and the tumor size in a particular region of the abdomen. The surgeries are preoperatively planned based on the appendiceal tumor size, but in the patient presented in our case, the appendiceal tumor was not detected using radiographic imaging

techniques. Moreover, the peritoneal cancer index was immeasurable due to the adhesions and the unusual location of the tumor, which further contributed to the misdiagnosis of the tumor. If the appendiceal mucinous tumors are detected while they are confined within the lumen of the appendix before the perforation, an appendectomy, in conjunction with right hemicolectomy, eliminates the entire malignancy without the risk of lymphovascular invasion, and no additional therapy is necessary. Although the HIPEC in the patient was performed using mitomycin, other chemoperfusion regimens can be used for HIPEC, such as oxaliplatin, which is mostly used in Europe (Melnitchouk & Meyerhardt, 2020).

Once ruptured, appendiceal mucinous neoplasms often lead to various tumorous implants in the peritoneal cavity and sometimes result in a right adnexal mass with a primary appendiceal origin. So, a differential diagnosis should be made by the gynecologist, considering the possibility of mucinous neoplasms of appendiceal origin if a pelvic mass is found in close proximity to the right ovary (Ozdemir & Usubutun, 2016). Radiographic imaging techniques such as MRI do not show the calcification character present in the layered walls of the cystic mass, thus making it harder to classify the origin of mass preoperatively. The tumors in the peritoneal cavity are very hard to distinguish from right adnexal cysts, especially when the radiographic imaging does not present enough evidence of perforation or dilation of the appendix. Therefore, in order to avoid misdiagnosis, the gynecologic oncologist should consider the possibility of mucocele and the mucinous neoplasms associated with it in the patient, with an additional emphasis on women with unusual ultrasonographic findings in the right adnexal region. Moreover, the unilateral character of the right ovarian cyst should be considered while making the diagnosis, and a laparotomy should be considered to verify the diagnosis (Papoutsis et al., 2011). This case study is intended to make clinicians aware of the likeliness of mucinous neoplasms of appendiceal origin mimicking as an ovarian mucinous cyst in the hypogastric region, which can be often misdiagnosed, resulting in avoidable complications such as sepsis.

The patient passed away in an accident a year ago.

References

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