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Minimally invasive appendectomy for resection of appendiceal mucocele: Case series and review of the literature

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ABSTRACT

INTRODUCTION: Appendiceal mucoceles encompass neoplastic and non-neoplastic causes of a distended Appendix filled with mucus. Appendectomy is recommended when an appendiceal mucocele is identified, incidentally or otherwise, in the event it is secondary to a malignancy. For an intact mucocele, it is critically important to avoid rupturing the mucocele during resection, as rupture of a neoplastic mucocele can result in pseudomyxoma peritonei, or mucin deposits in the peritoneum, which is associated with long-term morbidity and mortality. For this reason, laparotomy is the traditionally recommended surgical approach for treatment.

PRESENTATION OF CASES: In our case series, we describe two patients, a 49-year-old woman and a 79-year-old man, with incidentally identified appendiceal mucoceles. These patients were successfully treated with minimally invasive approaches to appendectomy, one with a robotic approach and one with a hand-assisted laparoscopic approach. The mucoceles were removed without rupture, and both patients recovered well postoperatively without complication.

DISCUSSION: While laparotomy is the traditionally recommended surgical approach for resection of appendiceal mucoceles, certain minimally invasive techniques allow for safe removal of the mucoceles while minimizing the morbidity of laparotomy.

CONCLUSION: Minimally invasive approaches to appendenctomy, specifically the robotic-assisted approach and the hand-assisted laparoscopic approach, can be considered for safe resection of appendiceal mucoceles.

1. Introduction

Appendiceal mucocele is a rare diagnosis, accounting for less than 1% of appendiceal pathologies [1]. The term "mucocele" is nonspecific and describes a distended Appendix whose lumen is filled with mucus but does not represent a pathological description. Mucoceles of the Appendix are diagnosed incidentally about 50% of the time [1], often as a result of imaging for synchronous malignancies or benign conditions. Symptoms of mucoceles can include abdominal pain or mass, weight loss, nausea, or a change in bowel habits [2]. In addition, patients with a mucocele may present with appendicitis, intussusception, appendiceal torsion, gastrointestinal bleeding, or increasing abdominal girth from rupture of a neoplastic mucocele [1]. Traditionally, resection is recommended for mucoceles, as it can be unclear from imaging which mucoceles harbor malignancy. However, resection must be done with caution, as the rupture of a neoplastic mucocele can give rise to pseudomyxoma peritonei, or the deposition of mucin throughout the peritoneal cavity, which can result in significant morbidity from mucinous ascites and bowel obstruction [1]. Due to this concern for rupture, open resection through laparotomy has been advocated [2].

There have been case reports and case series describing the use of standard laparoscopy for appendiceal mucoceles [3–7], although there is reticence to adopt this technique due to the technical difficulty of performing a laparoscopic appendectomy without causing iatrogenic rupture. We present two patients with appendiceal mucoceles who were successfully resected using minimally invasive approaches other than standard laparoscopy at a tertiary cancer center by surgical oncologists with significant experience with these approaches. One was resected with a hand-assisted laparoscopic technique and the other with a robotic-assisted technique. Both methods allowed for safe removal of the mucoceles without rupture, while minimizing hospital stays and morbidity from laparotomies. This case series is compliant with the SCARE and PROCESS guidelines [8,9].

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Fig. 1. Computed tomography of the abdomen demonstrating a cystic mass in the right lower quadrant.

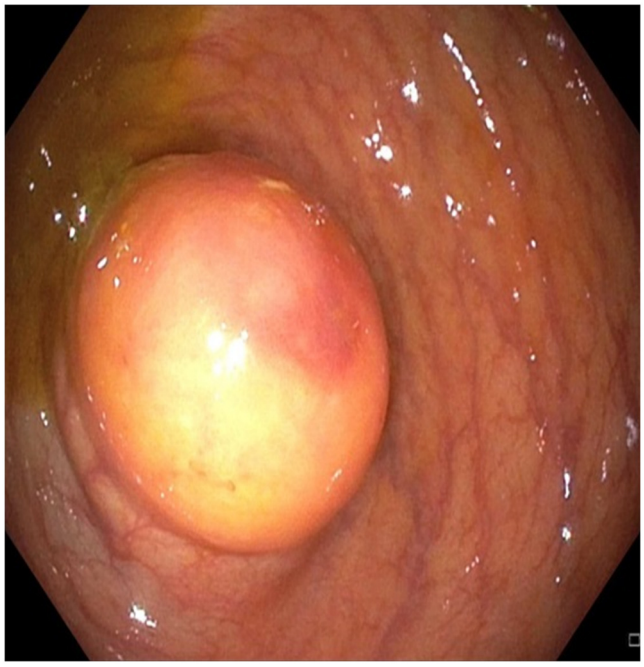

Fig. 2. Colonoscopic findings of the appendiceal mass protruding through the appendiceal orifice into the cecum.

2. Presentation of cases

2.1. Case 1

An otherwise healthy 49-year-old woman presented to her primary care physician with low-grade fevers and elevated liver function tests. She underwent abdominal ultrasonography to assess for a biliary etiology of her symptoms and was found to have an incidental pelvic cystic mass. After her liver function tests had returned to normal levels, she saw a gynecologic oncologist for further workup. Transvaginal ultrasonography demonstrated a large right ovary at 8.3 cm in maximum dimension, with a complex cystic mass measuring 7.2 cm. Due to a concern for malignancy, her gynecologist ordered a computed tomography scan, which identified an appendiceal mass (9.5 × 3.7 cm) with no other abnormalities (Fig. 1). CEA and CA 125 were within normal limits. She was then referred to surgical oncology. A colonoscopy identified a tumor at the appendiceal orifice, which was found upon biopsy to contain intestinal mucosa with hyperplastic changes, without evidence of dysplasia or carcinoma (Fig. 2). With the diagnosis of appendiceal mucocele, she was offered a laparoscopic appendectomy. At the time of the operation, there was some difficulty visualizing the base of the Appendix clearly, and given the size and somewhat tenuous tissue harboring the mucocele, a hand port was placed. This allowed the cecum to be mobilized and the base of the Appendix to be clearly identified during careful manipulation of the Appendix and mucocele. The cecum was divided just distal to the appendiceal base, to ensure removal of the entire mass. The Appendix was maintained intact, and there was no spillage of mucin during the operation. There was also no evidence of mucin deposits on exploration. The patient was discharged in good condition and experienced no complications. Final pathology demonstrated a low-grade mucinous neoplasm with copious mucin production, negative margins, and no invasive component.

Fig. 3. Computed tomography of the abdomen demonstrating a cystic mass in the right lower quadrant.

2.2. Case 2

A 79 year-old man, with a history of intraductal papillary mucinous neoplasm of the pancreas, melanoma, and prostate cancer, was undergoing surveillance for his previous cancers when he was identified on computed tomography to have a 2.2 × 2 cm lesion abutting his appendix (Fig. 3). He was asymptomatic. He had undergone a colonoscopy in 2014, which had not identified any malignancy. CEA and CA 19-9 were within normal limits. He was offered a robotic appendectomy. There was no evidence of intraperitoneal mucin deposits. The robotic approach allowed the Appendix to be meticulously dissected and the base of the Appendix to be clearly identified without manipulating the appendiceal mucocele itself. The cecum was divided just distal to the appendiceal base, again to ensure removal of the entire mass. The specimen was intact and not ruptured (Fig. 4). The patient was discharged in good condition without complications. Final pathology