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Laparoscopic Valve-Preserving Cecectomy for Fibrous Obliteration of the Appendix Mimicking an Appendiceal Mucocele: A Case Report

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A B S T R A C T

Fibrous obliteration of the appendix is an under-recognized, benign process in which the normal appendiceal mucosa, lymphoid follicles, and submucosa are progressively replaced by fibroblastic and neurogenic tissue. When the obliterated lumen dilates and accumulates low-attenuation material, it can closely imitate an appendiceal mucocele or a low-grade appendiceal mucinous neoplasm on computed tomography (CT), creating a therapeutic dilemma: the surgeon must avoid both under-treatment, which risks a neoplastic margin or pseudomyxoma peritonei, and over-treatment with an unnecessary colectomy. We report a 59-year-old woman with six months of recurrent epigastric and right-lower-quadrant pain and a soft, non-peritonitic abdomen, in whom contrast-enhanced CT showed a well-defined, tubular, fluid-density appendiceal lesion measuring 4.5 × 2.4 × 6 cm extending toward the cecum, with a basal calcific focus and no post-contrast enhancement, interpreted as a probable mucocele. Given its size, basal location, and indeterminate nature, a laparoscopic cecectomy was performed: the mesoappendix and ligament of Treves were sealed and divided, the right colon was mobilized, and the cecum was transected with a linear stapler oriented to preserve the ileocecal valve, with intact en-bloc retrieval in an endobag. Histopathology revealed fibrous obliteration—luminal replacement by spindle cells in a loose fibromyxoid stroma with chronic inflammation and absent normal mucosa—rather than a mucinous neoplasm. Recovery was uneventful, with a one-day stay and resolution of the right-sided pain. Valve-preserving laparoscopic cecectomy is a safe, function-sparing alternative to segmental colectomy for selected benign appendiceal and cecal disease when the base is involved or the diagnosis is indeterminate.

1. Introduction

The vermiform appendix is conventionally regarded as a simple appendage of the cecum, and acute appendicitis dominates clinical thinking about appendiceal disease. Yet the appendix and the cecum together host a surprisingly broad spectrum of benign and neoplastic conditions that may present with indistinguishable right-lower-quadrant symptoms.[1] Pathological processes affecting this region range from infective and inflammatory disorders to congenital and neoplastic lesions, including cecal diverticulitis, appendiceal duplication, appendiceal mucocele, neurogenic tumors such as schwannoma and paraganglioma, neuroendocrine tumors, polyps, mucinous neoplasms, and carcinoma.[2,3] Because several of these entities converge on a similar clinical and radiological picture—a dilated, thick-walled, or fluid-filled appendix—the operating surgeon is frequently forced to make intraoperative decisions under diagnostic uncertainty, balancing the morbidity of an inadequate resection against that of an unnecessarily extensive one.[4]

Among the least familiar of these entities is fibrous obliteration of the appendix, sometimes termed

obliterative appendicitis or, when a neurogenic component predominates, neurogenic appendicopathy or axial neuroma. In this process, considered by many authors to be partly age-related, the normal appendiceal architecture—mucosa, lymphoid follicles (Peyer's patches), and submucosa—is gradually effaced and replaced by fibroblastic proliferation, fatty infiltration, and bland spindle-cell tissue within a loose fibromyxoid stroma. Although the lesion is overwhelmingly benign and is encountered relatively often by pathologists examining incidentally removed appendices, it remains poorly recognized by radiologists and clinicians. Critically, when the obliterated lumen distends and retains low-attenuation, mucoid, or fatty material, cross-sectional imaging can render an appearance that is essentially identical to that of an appendiceal mucocele or a low-grade appendiceal mucinous neoplasm (LAMN).[4] The clinical consequence of this radiology–pathology mismatch is substantial, because the preoperative suspicion of a mucinous neoplasm legitimately changes the operation: a mucinous lesion demands intact, no-touch, margin-negative removal to avoid spillage and the dreaded sequela of pseudomyxoma peritonei.[5]

The surgical response to a suspected mucinous or base-involving appendiceal lesion is not uniform. Simple appendectomy is adequate—and curative—when disease is confined to the appendix with a clearly negative base, whereas more extensive resection is warranted when the appendiceal base or cecal cuff is involved, when margins cannot be assured, or when malignancy is suspected.[6] Between these poles lies cecectomy (partial cecal resection), an operation that removes the appendiceal base together with a cuff of cecum while preserving the bulk of the right colon and, when technically feasible, the ileocecal valve.[4] Preservation of the ileocecal valve is not a trivial detail: its loss after ileocecal resection or right hemicolectomy is associated with accelerated transit and altered bowel habit in a proportion of patients, so that an operation able to spare it offers a functional advantage in benign disease. Laparoscopic cecectomy, in particular, carries the well-established minimally invasive benefits of reduced blood loss, lower septic and bowel-obstruction risk, shorter hospital stay, and faster recovery relative to open surgery.[7,8]

Despite these advantages, the literature on cecectomy for benign appendiceal disease is dominated by small reports of mucinous neoplasms and incidental tumors; the specific scenario in which a benign fibrous obliteration masquerading as a mucocele drives a decision to perform cecectomy is rarely documented in a structured, image-and-technique–rich format. The novelty of the present report lies in this intersection: it documents a radiologically convincing "appendiceal mucocele" that proved, on definitive histopathology, to be fibrous obliteration of the appendix, and it details a complete laparoscopic, ileocecal-valve–preserving cecectomy from imaging through pathology with intraoperative and specimen photography. The aim of this study is therefore twofold—first, to alert clinicians and radiologists to fibrous obliteration as a benign mimic of appendiceal mucocele/LAMN that should enter the differential diagnosis of a dilated, non-enhancing appendix; and second, to demonstrate that valve-preserving laparoscopic cecectomy is a safe, oncologically prudent, and function-sparing operation that occupies the rational middle ground between appendectomy and segmental colectomy when the appendiceal base is involved or the diagnosis remains indeterminate.

2. Case Presentation

History and examination

A 59-year-old woman presented with a six-month history of recurrent epigastric and right-lower-quadrant abdominal pain prior to admission. The pain was intermittent and dull rather than acute, and was not accompanied by abdominal distension, nausea, vomiting, or any disturbance of bowel habit. She reported no fever, no weight loss, and no urinary symptoms. There was no history of prior abdominal surgery and no relevant family history of gastrointestinal malignancy. On physical examination she was hemodynamically stable and afebrile. The abdomen was soft and non-distended, with no guarding, rigidity, or palpable mass; in particular there was no localized peritonism in the right iliac fossa. The remainder of the systemic examination was unremarkable. The full chronology of presentation, investigation, and treatment is detailed in Table 1.

Table 1. Chronology of presentation, investigation, and management.

Time point	Event/finding
Six months before admission	Onset of recurrent, intermittent epigastric and right-lower-quadrant pain; no distension, nausea, vomiting, or change in bowel habit
Admission	Soft, non-distended, non-peritonitic abdomen; afebrile and hemodynamically stable
Laboratory	Leukocytosis with neutrophilia; remaining baseline studies unremarkable
Imaging (contrast CT)	Dilated, non-enhancing, fluid-density tubular appendiceal lesion 4.5 x 2.4 x 6 cm extending to the cecum, with a basal calcific focus; interpreted as a probable appendiceal mucocele
Operation	Laparoscopic cecectomy with ileocecal-valve preservation; en-bloc intact retrieval in an endobag; minimal blood loss; no conversion
Pathology	Fibrous obliteration of the appendix; no mucinous neoplasm or malignancy
Postoperative	Liquid diet within 4 h, regular diet within 24-48 h; discharge on postoperative day 1; resolution of right-sided pain; no fever or leak

Laboratory and imaging findings

Laboratory investigation showed an elevated leukocyte count with neutrophilia, consistent with a low-grade inflammatory process; the remaining baseline biochemistry and hematology were unremarkable. Because the clinical picture was indolent rather than that of acute appendicitis—there was neither focal right-iliac-fossa peritonism nor a marked acute inflammatory response—the patient proceeded to cross-sectional imaging for characterization rather than to emergency surgery.

Contrast-enhanced abdominal CT demonstrated luminal dilatation of the appendix. The appendiceal lumen was distended and contained low-attenuation material with a fatty component, together with an enhancing linear structure running along its center. A suspicious focal wall defect and adjacent mild fatty stranding were noted in the distal portion of the appendix. The dominant lesion was a well-circumscribed, fluid-density, regularly tubular structure measuring approximately 4.5 × 2.4 × 6 cm, occupying the appendiceal lumen and extending toward the cecum, projected at the level of the fourth lumbar to first sacral vertebra. A focal hyperdensity at the base was felt to represent a probable appendicolith and showed no enhancement on the post-contrast series. The constellation of a dilated, well-defined, non-enhancing, fluid-filled tubular appendiceal lesion was interpreted as most consistent with an appendiceal mucocele. The CT images are presented in Figure 1 (axial, sagittal, and coronal reformats). Because the lesion was large, involved the appendiceal base, and could not be confidently distinguished from a low-grade mucinous neoplasm, the multidisciplinary decision was to proceed with a laparoscopic cecectomy rather than simple appendectomy, in order to obtain an intact specimen with a negative cecal margin. The principal radiological considerations that informed this decision are examined in the discussion that follows.

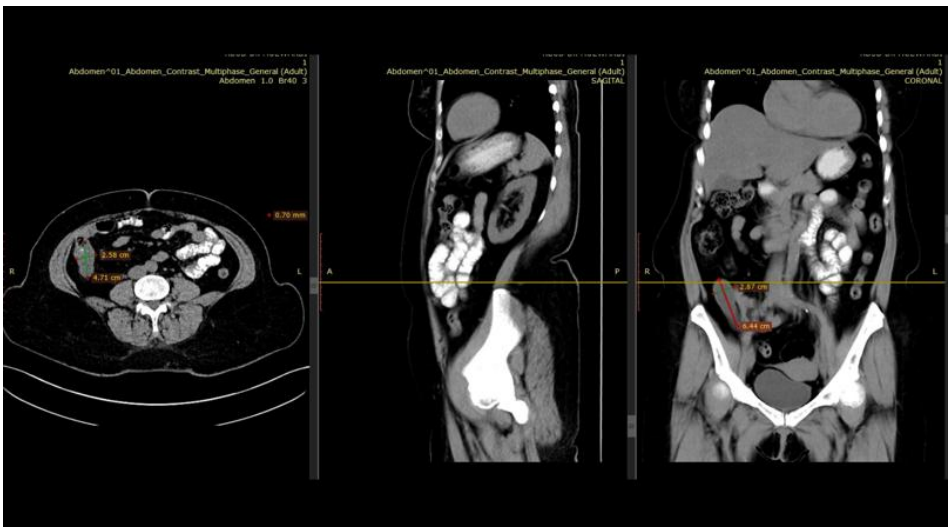

Figure 1. Contrast-enhanced abdominal CT (axial, sagittal, and coronal reformats) showing a dilated, well-defined, non-enhancing fluid-density tubular lesion of the appendix extending toward the cecum, with a basal calcific focus. The central linear structure within the appendiceal lumen corresponded histologically to the fibrous core of the specimen (patient-identifying data redacted).

Operative technique

The operation was performed with the patient supine under general anesthesia. A single 1 g dose of intravenous ceftriaxone was administered as antibiotic prophylaxis following induction. An orogastric tube and a Foley urinary catheter were placed to decompress the stomach and bladder. After a 1 cm infraumbilical skin incision, a pneumoperitoneum was established to 12 mmHg using a Veress needle, and a 10 mm trocar was inserted at the umbilicus to accommodate a 30-degree laparoscope. Under direct vision and following diagnostic exploration, a 15 mm working trocar was placed in the left lower quadrant and a 5 mm trocar in the suprapubic region. The intra-abdominal pressure was then increased to 15 mmHg, and the patient was placed in a Trendelenburg position with the left side down, allowing the small bowel to fall away from the right iliac fossa and exposing the cecum and appendix.

The full intraoperative sequence is illustrated in Figure 2. Exploration confirmed a markedly enlarged, obliterated appendix arising from the cecum (Figure 2A). The ligament of Treves together with the mesoappendix was divided using an advanced bipolar vessel-sealing device (LigaSure; Medtronic, Minneapolis, Minnesota, USA), as shown in Figure 2B. The ascending colon was partially mobilized to its mid portion using a lateral-to-medial approach to release it from its lateral peritoneal and retroperitoneal attachments; this maneuver ensured full mobility of the cecum and permitted safe, tension-free transection. The cecum was then divided with one to two firings of a 60 mm purple-load linear stapler (Medtronic, Minneapolis, Minnesota, USA), as shown in Figure 2C. The stapler was deliberately oriented horizontally along the antimesenteric border just distal to the terminal ileum, so that the entire diseased cecal cuff and appendix were excised en bloc while the ileocecal valve was preserved to avoid stricture or functional compromise; the truncated cecum with the ascending colon left in continuity is shown in Figure 2D. The staple line was inspected for integrity after resection to exclude any defect that might predispose to a postoperative leak.

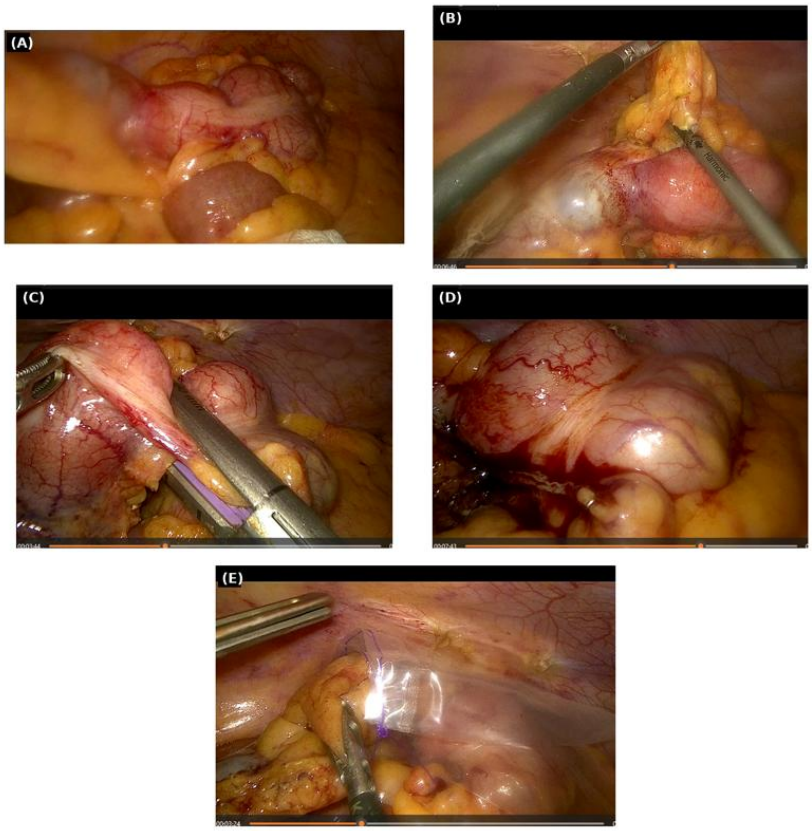

Figure 2. Intraoperative laparoscopic sequence of the valve-preserving cecectomy. (A) Exposure of the enlarged, obliterated appendix arising from the cecum. (B) Division of the mesoappendix and ligament of Treves with an advanced bipolar vessel-sealing device. (C) Transection of the cecum with a 60 mm linear stapler. (D) The truncated cecum after en-bloc excision, with the ascending colon preserved. (E) Intact specimen within an endocatch retrieval bag.

The specimen was placed into an endocatch retrieval bag and removed intact through the supraumbilical trocar site (Figure 2E), which was minimally enlarged to accommodate the specimen bulk without fragmentation. The supraumbilical fascial defect was closed with several interrupted Vicryl 2-0 sutures, and the skin was approximated with a Vicryl 2-0 subcuticular stitch. The freshly resected en-bloc specimen is shown in Figure 3, with its anteroposterior and lateral profiles in Figure 3A and Figure 3B and the cut surface in Figure 3C.

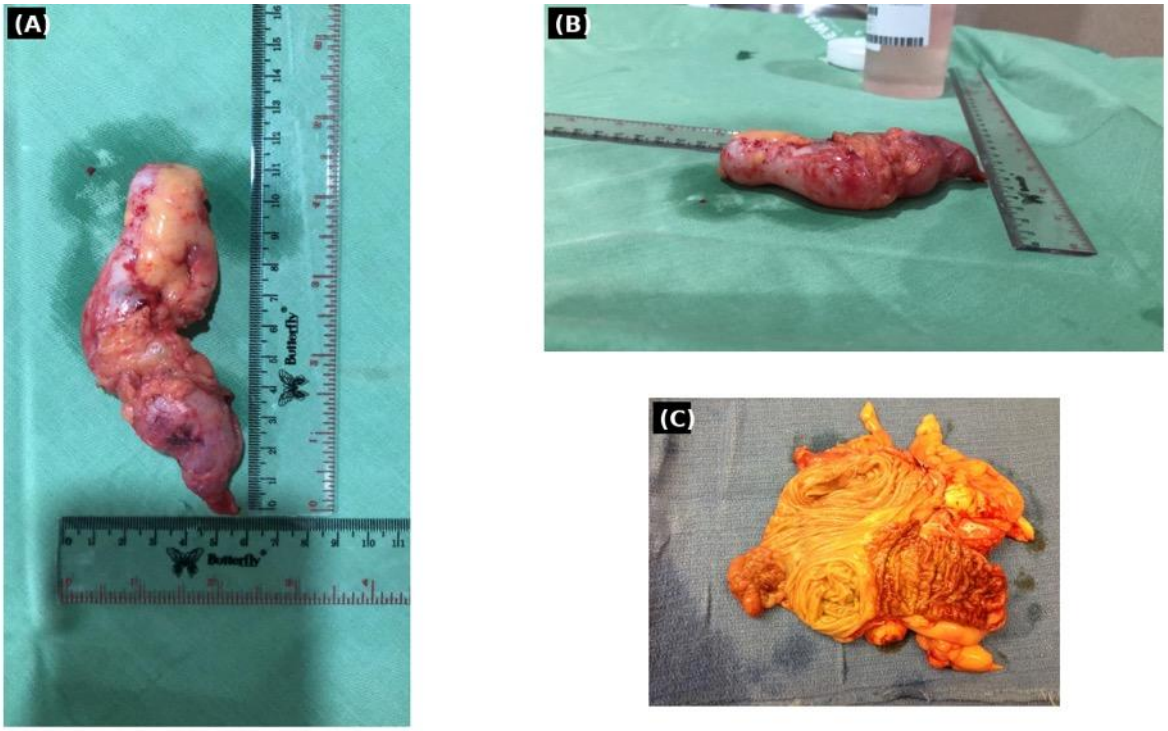

Figure 3. Macroscopic resected specimen. (A) Anteroposterior and (B) lateral views of the resected appendix and cecal cuff alongside a measuring scale (specimen approximately 11 cm long and 2 cm in diameter). (C) Cut surface showing luminal obliteration with mucoid and fibrofatty content.

Postoperative course

Estimated intraoperative blood loss was minimal, and no blood transfusion was required. The procedure was completed laparoscopically without conversion to open surgery. A full liquid diet was commenced within four hours of operation and advanced to a regular diet within 24 to 48 hours. The patient was discharged after a single postoperative day. There was no postoperative fever and no clinical sign of staple-line leak or perforation. The intermittent right-lower-quadrant pain that had prompted presentation resolved after surgery, although the patient's epigastric discomfort—anatomically unrelated to the appendiceal pathology—persisted, underscoring that not all of her symptoms were attributable to the appendiceal lesion.

Pathology

Macroscopic examination of the resected specimen, shown in Figure 3, showed an inflamed appendix measuring approximately 11 cm in length and 2 cm in diameter (Figure 3A and 3B), with obliteration of both the mucosa and the appendiceal lumen evident on the cut surface (Figure 3C). On microscopy at 100× magnification, as detailed in Figure 4, the appendiceal wall showed fibrous tissue with luminal obliteration, mucosal atrophy, and a scattered chronic inflammatory infiltrate of lymphocytes, histiocytes, and plasma cells. The lumen was replaced by bland spindle cells set in a loose fibromyxoid background admixed with chronic inflammatory cells. Notably, the appendix lacked the normal appendiceal mucosa and lymphoid follicles, and the lumen was displaced by fatty infiltration and fibrous proliferation. The linear enhancing structure identified centrally within the appendix on CT corresponded histologically to a fibrous core composed of fibroblastic proliferation and capillary-sized blood vessels. In contrast to the preoperative imaging, no true

appendiceal wall defect was identified on pathological examination, indicating that the focal "wall defect" suggested on CT represented a radiological over-call rather than a genuine perforation. There was no mucinous epithelium, no epithelial atypia, no acellular mucin dissecting the wall, and no evidence of a mucinous neoplasm or malignancy. The cecal transection had been carried out well beyond the lesion to obtain a grossly clear margin, and the examined cecal cuff was free of disease, although a formal margin-distance measurement was not separately recorded. The diagnosis was established on routine histomorphological examination (hematoxylin and eosin); the integrated findings established a diagnosis of fibrous obliteration of the appendix.

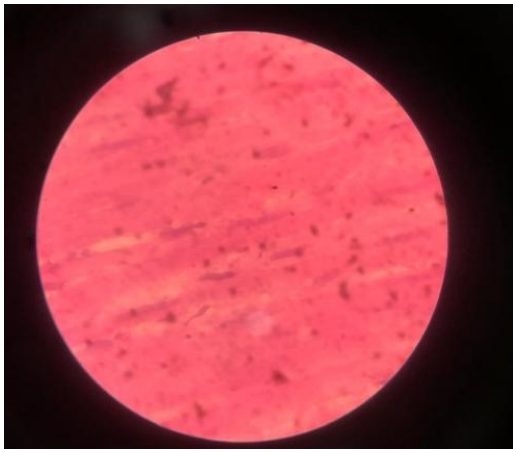

Figure 4. Histopathology (hematoxylin and eosin, original magnification 100x) showing fibrous obliteration of the appendiceal lumen: replacement by bland spindle cells in a loose fibromyxoid stroma with scattered lymphocytes, histiocytes, and plasma cells, and absence of normal mucosa and lymphoid follicles.

3. Discussion

A pathology beyond appendicitis: the appendiceal–cecal spectrum

This case is a reminder that the differential diagnosis of a symptomatic right-lower-quadrant lesion centered on the appendix extends well beyond acute appendicitis. The appendix and cecum can be affected by infective, inflammatory, congenital, and neoplastic processes, and several of these—mucinous neoplasms, neurogenic tumors, neuroendocrine tumors, and carcinoma—can be clinically silent or produce only vague, chronic pain of the type our patient described.[10-12] A practical implication is that any dilated, mass-like, or atypical appendix discovered on imaging or at operation should be approached as a potential neoplasm until proven otherwise, with the operative plan and specimen handling adjusted accordingly.[4] Careful preoperative characterization also reduces the rate of negative or unnecessary appendectomy, reinforcing the value of dedicated imaging before intervention in indolent presentations.[9] In our patient, the indolent six-month history, the soft non-peritonitic abdomen, and a CT lesion that did not behave like phlegmonous appendicitis all signaled that this was not routine appendicitis and that a tailored operation was required.[10]

The clinical presentations of appendiceal and cecal lesions are also protean, which compounds the diagnostic difficulty. Beyond chronic pain, mucinous and other appendiceal masses may present as a palpable right-iliac-fossa mass, as incidental imaging findings, or dramatically as cecal-colic or ileocecal intussusception, with the dilated appendiceal lesion acting as the lead point.[1] In some such cases the underlying lesion ultimately proves to be a high-grade mucinous neoplasm or a mucinous adenocarcinoma requiring formal oncologic resection, a reminder that the apparently benign "mass at the cecal pole" occasionally harbors malignancy and that the surgeon must retain the flexibility to escalate the operation intraoperatively.[1,13] The lesson for the patient before us was that a chronic, non-specific presentation did not lower the index of suspicion; if anything, the chronicity and the atypical CT morphology raised it.

Fibrous obliteration as a benign mimic of mucocele and LAMN

The central teaching point of this report is the radiology–pathology mismatch between fibrous obliteration of the appendix and an appendiceal mucocele or low-grade mucinous neoplasm. Fibrous obliteration replaces the normal mucosa, lymphoid tissue, and submucosa with fibroblastic and neurogenic spindle-cell proliferation and fatty infiltration, exactly the histology seen in our specimen. When this process is accompanied by luminal distension and the accumulation of low-attenuation mucoid or fatty material, the CT appearance—a well-defined, tubular, non-enhancing, fluid-density appendiceal lesion—overlaps almost completely with that of a mucocele or LAMN.[4] Our patient's imaging illustrates the trap precisely: the 4.5 × 2.4 × 6 cm fluid-density tubular lesion with a basal calcific focus and no enhancement, shown in Figure 1, was read as a probable mucocele, yet definitive histology revealed only benign fibrous obliteration with no mucinous epithelium. The principal entities that must be weighed against one another in this setting are set out in Table 2; recognizing fibrous obliteration as a genuine entry in the differential of a dilated, non-enhancing appendix, as detailed in Table 2, does not change the prudent surgical strategy, but it does temper prognostic expectations and reframes postoperative surveillance once the benign diagnosis is confirmed.[12]

Table 2. Differential diagnosis of a dilated, non-enhancing appendix on computed tomography.

Entity	Typical CT features	Discriminating clue/implication
Appendiceal mucocele	Well-defined, thin-walled, low-attenuation cystic dilatation; possible mural calcification	Benign; cannot be reliably separated from LAMN;* manage as neoplasm if uncertain
Low-grade appendiceal mucinous neoplasm (LAMN)*	Dilated, encapsulated, low-density appendix; mural calcification; layered mucin	Risk of perforation and PMP;† requires intact, margin-negative resection
Mucinous adenocarcinoma	Irregular wall thickening, soft-tissue enhancement, nodes, peritoneal mucin	Oncologic resection (right hemicolectomy) and surveillance
Fibrous obliteration / neurogenic appendicopathy	Dilated, non-enhancing tubular appendix; central fibrous/fatty core; possible basal calcification	Benign mimic; diagnosed only on histology; excellent prognosis
Acute or chronic appendicitis with appendicolith	Wall thickening, peri-appendiceal stranding, appendicolith	Inflammatory; correlate clinically
Pseudomyxoma peritonei (advanced)	Loculated peritoneal mucin, scalloping of liver/spleen surfaces	Indicates established peritoneal spread; consider CRS/HIPEC‡

*Notes: * LAMN = low-grade appendiceal mucinous neoplasm; † PMP = pseudomyxoma peritonei; ‡ CRS/HIPEC = cytoreductive surgery with hyperthermic intraperitoneal chemotherapy.*

The corollary is equally important: the inability to exclude a mucinous neoplasm preoperatively means the operation must be planned as though a neoplasm were present. Even an experienced radiologist cannot reliably separate fibrous obliteration from LAMN on CT alone, and surgical series of appendiceal mucinous lesions document repeated instances in which the final histology diverged from the preoperative impression.[4] The safe course, therefore, is to let the worst plausible diagnosis dictate technique—intact, margin-negative removal—while allowing the benign possibilities to inform counseling and follow-up.

A closer look at the imaging features helps explain both the diagnostic overlap and the residual clues that may aid characterization. The cardinal CT finding shared by mucocele, LAMN, and fibrous obliteration is a dilated, well-encapsulated, low-attenuation tubular appendiceal structure, frequently with a thin or imperceptible wall and, in many cases, mural or basal calcification.[4] Features that should heighten concern for a frankly neoplastic or higher-risk lesion include a large transverse diameter, irregular or nodular wall thickening, soft-tissue enhancement within the lesion, peri-appendiceal stranding out of proportion to symptoms, free or loculated peritoneal mucin, and the "scalloping" of adjacent organ surfaces that signals established pseudomyxoma peritonei.[13] In our patient, the lesion was large and basally located but lacked nodal enlargement, solid enhancing components, and peritoneal mucin, a profile compatible with either a low-risk mucinous lesion or a benign mimic. Cross-sectional

imaging in suspected appendiceal mucinous disease also serves a second, often underappreciated function—mapping the extent of any peritoneal involvement and estimating the peritoneal cancer index—so that the surgeon enters the operation with a realistic expectation of what may be found and what additional procedures might be required.[13] The careful pre-operative review of these features, summarized in Table 2, allowed the team to plan a contained cecectomy with a low but acknowledged probability of needing to escalate.

Choosing the operation: appendectomy, cecectomy, or colectomy

For appendiceal lesions, the operative decision is fundamentally a question of margin and base involvement. When a lesion is confined to the appendix with a clearly uninvolved base, simple appendectomy is both adequate and curative.[6] When the appendiceal base, the cecal cuff, or the ileocecal valve is involved, or when the base tissue is of poor quality, an operation that captures a cuff of cecum is required to secure a negative margin; this is the indication for cecectomy.[4,6] Right hemicolectomy or formal ileocecal resection is reserved for situations in which negative margins cannot be achieved by cecectomy, where there is a large lesion straddling the ileocecal valve, where nodal disease is suspected on cross-sectional imaging, or where there is a high index of suspicion for malignancy or high-grade histology.[2,11] These thresholds, distilled from recent surgical cohorts and series of appendiceal mucinous neoplasms, are detailed in Table 3.

Table 3. Surgical options for benign or indeterminate appendiceal-base and cecal disease.

Procedure	Principal indication	Extent/margin	Key consideration
Appendectomy	Lesion confined to the appendix with a clearly negative base	Appendix only	Inadequate when the base is involved; risk of a positive margin
Cecectomy (partial cecal/cuff resection)	Base or cecal-cuff involvement; indeterminate lesion requiring an intact specimen	Appendix plus cecal cuff; ileocecal valve preserved	Function-sparing middle ground; valve preservation avoids diarrhea/malabsorption
Ileocecal resection / right hemicolectomy	Margins not achievable by cecectomy, valve involvement, nodal/oncologic suspicion, or malignancy	En-bloc ileocecum with nodal basin	Removes the valve; greater functional impact; for higher-risk disease
Cytoreductive surgery + HIPEC‡	Established pseudomyxoma peritonei	Peritonectomy plus intraperitoneal chemotherapy	For peritoneal dissemination; specialist centers

Notes: ‡ HIPEC = hyperthermic intraperitoneal chemotherapy.

In the present case, the dominant lesion was large (approximately 6 cm), abutted the appendiceal base, and projected toward the cecum, so simple appendectomy would have risked a positive or compromised base margin. At the same time, there was no imaging evidence of nodal disease, transmural invasion, or peritoneal spread to justify a formal right hemicolectomy. Cecectomy therefore represented the rational middle ground—wide enough to guarantee a clear cecal margin and intact specimen, yet conservative enough to preserve the right colon and ileocecal valve. This graded, lesion-adapted approach mirrors that reported across contemporary cohorts and series of appendiceal mucinous neoplasms, in which margin-negative limited resection is curative for confined low-grade disease while more extensive resection is reserved for higher-risk lesions.[1,4,6]

Avoiding spillage and pseudomyxoma peritonei

A decisive reason to favor an intact, no-touch resection in any suspected mucinous appendiceal lesion is the prevention of pseudomyxoma peritonei (PMP). Rupture or piecemeal removal of a mucin-producing appendiceal neoplasm can disseminate epithelial cells throughout the peritoneal cavity, seeding a slowly progressive, difficult-to-eradicate mucinous peritoneal disease whose treatment may ultimately require major cytoreductive surgery and intraperitoneal chemotherapy with substantial morbidity.[5] Even when imaging cannot prove that a lesion is neoplastic, the consequences of spillage are severe enough that the operative principle is

uniform: remove the lesion en bloc, without rupture, and retrieve it within a protective bag.[13] In our patient this principle was fully honored—the mesoappendix and ligament of Treves were sealed and divided, the cecum was transected with a linear stapler beyond the lesion, and the specimen was extracted intact in an endocatch bag through a protected, minimally enlarged port site, as shown in Figure 2E. That the final pathology proved benign does not diminish the soundness of the strategy; it validates a discipline that would have been protective had the lesion been a LAMN.

It is also worth recognizing that the prognosis of established peritoneal mucinous disease is strongly grade- and cytoreduction-dependent. The great majority of cases arise from a ruptured appendiceal mucinous neoplasm, and large registry experience shows that long-term outcome after cytoreductive surgery is governed by tumor grade, cellularity, and the completeness of cytoreduction.[5] This reinforces, rather than dilutes, the intraoperative imperative in an indeterminate appendiceal lesion: because a benign-appearing mucocele and a low-grade mucinous neoplasm capable of seeding the peritoneum cannot be separated with certainty before histology, the safest default is intact, contained extraction in every case.

Technical considerations: staple-line integrity and valve preservation

Two technical elements of this operation merit emphasis. The first is the security of the cecal transection line. Although the evidence base for closure technique is largest in the context of routine appendectomy—where comparative cohorts and a meta-analysis have examined stapler, endoloop, polymeric clip, and energy-device closure of the appendiceal stump—the underlying principle generalizes: a secure, well-vascularized mechanical closure minimizes the risk of leak and of subsequent intra-abdominal collection or bowel obstruction.[14-18] Stapler-based closure has been associated with low complication rates and, in large database analyses, with favorable bowel-obstruction outcomes, while clip-, loop-, and invagination-based methods remain safe and economical alternatives in appropriately selected cases.[16-18] In our patient, a 60 mm linear stapler provided a reliable cecal transection, and the staple line was deliberately inspected after firing to confirm integrity before specimen retrieval. The accumulated evidence on closure technique is consistent in its central message even where individual methods differ: leak and stump-related complications are driven less by the specific device than by the security and vascularity of the closure and by avoidance of tissue ischemia or tension, so that a meticulous, well-perfused mechanical line is the goal regardless of whether a stapler, loop, clip, or energy device is chosen.[15,19,20] Translating this principle to a cecal cuff resection, the larger lumen and thicker wall of the cecum make a linear stapler the most ergonomic and reliable choice, and the deliberate post-firing inspection performed here is a simple, reproducible safeguard against the most feared early complication.

Equally important is the controlled division of the mesoappendix and the vascular pedicle. The use of an advanced bipolar vessel-sealing device allowed hemostatic division of the ligament of Treves and the mesoappendiceal vessels with minimal thermal spread and negligible blood loss, contributing to the clear operative field that is itself a prerequisite for accurate, spillage-free dissection around a fragile, distended appendix.[2,14] Maintaining a bloodless plane is not merely cosmetic: in a lesion that might rupture and seed the peritoneum, every avoidable manipulation and every episode of bleeding that obscures the field increases the risk of inadvertent breach, so that efficient energy-based sealing indirectly serves the oncologic goal of intact removal.

The second element is preservation of the ileocecal valve. By orienting the stapler horizontally along the antimesenteric border just distal to the terminal ileum, the operation removed the entire diseased cecal cuff while leaving the valve intact. This matters functionally: ileocecal resection and right hemicolectomy remove the valve and are associated, in a proportion of patients, with diarrhea, accelerated transit, and bile-salt malabsorption, whereas valve preservation maintains the physiological brake between ileum and colon. For benign disease, an operation that achieves an adequate margin without sacrificing the valve offers the best balance of oncologic safety and long-term function, and this is one of the principal arguments for cecectomy over colectomy in the appropriate patient.[6]

The minimally invasive advantage and functional recovery

The laparoscopic approach contributed directly to the favorable course in this case. Across comparative cohorts and meta-analyses, the laparoscopic approach to appendiceal and right-colonic surgery is associated with less blood loss, fewer wound and septic complications, shorter length of stay, and faster return of bowel function than open surgery, with the added intraoperative advantage of panoramic assessment of the entire peritoneal cavity for any unexpected mucinous or metastatic deposits.[7,8] Minimally invasive and image-guided platforms continue to expand the precision of lesion localization and the breadth of conditions treated through small incisions, illustrating how a minimally invasive route can enhance, rather than compromise, operative precision.[21,22] In our patient, the benefits were tangible: blood loss was minimal, there was no conversion to open surgery, oral intake resumed within hours, and discharge occurred on the first postoperative day. These outcomes are concordant with the broader experience that, in selected benign appendiceal and cecal disease, a minimally invasive cuff resection delivers oncologic adequacy together with the rapid convalescence characteristic of laparoscopic surgery.[2,3,7]

Pathogenesis of fibrous obliteration and its symptomatic correlate

The histology in this case—bland spindle cells in a loose fibromyxoid stroma, fibroblastic proliferation with capillary-sized vessels, fatty infiltration, and the conspicuous absence of normal mucosa and lymphoid follicles—is the recognizable signature of fibrous obliteration of the appendix. Several mechanisms have been proposed for this luminal effacement. Some cases are thought to follow post-inflammatory scarring after subclinical or repeated appendiceal inflammation, while many, perhaps most, are attributed to a neurogenic occlusive proliferation variously termed neurogenic hyperplasia, neurogenic appendicopathy, or, when it fills the lumen axially, an axial neuroma. Whatever the initiating event, the end state is a fibrotic, neuralized cord that obliterates the lumen and is consistently associated with loss of the normal mucosa and lymphoid architecture—exactly the picture documented in our specimen, shown in Figure 4.

The relationship between this benign histology and the patient's symptoms is genuine but incompletely understood. Because the obliterating tissue is rich in nerve fibers, neuropeptide-mediated dysmotility has been proposed as a source of the chronic, ill-defined right-iliac-fossa pain that some of these patients report, and resolution of pain after removal of the obliterated appendix—as occurred here—is frequently described. This symptomatic benefit, together with the diagnostic uncertainty that precedes pathology, provides a coherent rationale for resection even when imaging cannot confirm a neoplasm: the operation both excludes a mucinous tumor and relieves the symptom that brought the patient to attention. It is precisely this convergence of diagnostic and therapeutic benefit that justifies a definitive, margin-secure operation rather than expectant management of a dilated, indeterminate appendix.

Clinical relevance, surveillance, and limitations

For the clinician, this case yields several transferable lessons. A chronic, indolent right-lower-quadrant pain with a dilated non-enhancing appendix on CT should prompt a deliberate, neoplasm-conscious workup rather than reflex emergency appendectomy, and fibrous obliteration should be added to the radiological differential alongside mucocele and LAMN. When the base is involved or the diagnosis is indeterminate, valve-preserving cecectomy provides a margin-secure, function-sparing operation. Once benign fibrous obliteration is confirmed histologically, the prognosis is excellent and intensive oncologic surveillance is unnecessary; by contrast, had the lesion proved to be a mucinous neoplasm, follow-up and, in higher-risk lesions, structured surveillance for peritoneal recurrence would have been indicated.[12,23,24] Cohort data linking the adequacy of resection and the histological grade to the risk of recurrence support coupling the operative decision to the follow-up plan, with cytoreductive surgery and intraperitoneal chemotherapy reserved for patients who develop established peritoneal disease.[5,24] The persistence of this patient's epigastric pain after resolution of her right-sided pain is itself instructive: it reminds the surgeon to attribute only the anatomically congruent symptoms to the appendiceal lesion and to continue evaluating unexplained upper-abdominal complaints separately.

This report has limitations inherent to a single case. It describes one patient with a benign final diagnosis, and the favorable outcome cannot be generalized to lesions that prove malignant or that involve the ileocecal valve, for which more extensive resection is required. Available follow-up is limited to the early postoperative period, during which the patient remained well with resolution of her right-sided pain and no readmission, staple-line leak, or bowel obstruction; longer-term functional data on valve preservation in this individual are not yet available. Finally, the diagnostic ambiguity between fibrous obliteration and mucinous neoplasia was resolved only by definitive histopathology, reinforcing that imaging cannot substitute for pathological confirmation and that operative strategy must be built around the most serious plausible diagnosis rather than the most likely one.

4. Conclusion

Laparoscopic cecectomy is a safe and effective operation that should be considered as an alternative to segmental bowel resection in selected patients with benign pathology of the appendix and cecum. This case demonstrates two points of practical value. First, fibrous obliteration of the appendix is a benign but under-recognized entity that can closely mimic an appendiceal mucocele or low-grade mucinous neoplasm on computed tomography; it deserves a place in the differential diagnosis of a dilated, non-enhancing, fluid-filled appendix, even though its preoperative recognition does not alter the prudent surgical plan. Second, when a lesion involves the appendiceal base or cannot be confidently distinguished from a mucinous neoplasm, valve-preserving laparoscopic cecectomy occupies the rational middle ground between appendectomy and colectomy—wide enough to guarantee an intact, margin-negative specimen and to avoid the catastrophe of pseudomyxoma peritonei, yet conservative enough to spare the right colon and the ileocecal valve and thereby protect long-term bowel function. It must be emphasized, however, that valve-preserving cecectomy is advocated for selected benign or indeterminate disease and is not a substitute for formal oncologic resection where malignancy is confirmed. A clear appreciation of cecal anatomy, a disciplined no-touch retrieval technique, and an understanding of the full spectrum of appendiceal and cecal disorders allow the surgeon to select the ideal candidate for this operation and to deliver oncologic safety and rapid recovery in equal measure.

Declarations

Ethics approval and consent to participate

The study was conducted in accordance with the Declaration of Helsinki. Institutional case-report reporting requirements were observed.

Consent for publication

Written informed consent was obtained from the patient for publication of this case report and the accompanying anonymized clinical, radiological, intraoperative, and histopathological images. All identifying information has been removed.

Availability of data and materials

The data supporting the findings of this case are included within the article.

Competing interests

The authors declare that they have no competing interests.

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Authors' contributions

Both authors contributed to the clinical management, data acquisition, drafting, and critical revision of the manuscript and approved the final version.

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