



Laparoscopic Cecectomy for Diseases of the Appendix and Cecum

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J Coloproctol 2023;43(4):e256–e260.

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Abstract

Introduction The cecum is the first part of the large bowel. Cecectomy is a sufficient treatment for some patients, avoiding overtreatment by ileocolic resection.

Purpose The goal of this study was to review a surgeon's experience with laparoscopic cecectomy and provide a technical video demonstration of this uncommon operation.

Methods A retrospective chart review was conducted of all consecutive patients treated with laparoscopic cecectomy over a 16-year period. All operations were performed using a 3-trocar technique. The cecum was transected with 1 to 2 firings of a 60 millimeters linear stapler, preserving the ileocecal valve and ascending colon.

Results 19 patients were identified including 12 females (63.2%). Median age was 42 years (range 16-84). Indication for surgery included appendiceal pathology in 12 patients (63.2%) and cecal abnormality in 7 (38.9%). There was no conversion to open surgery. Median intraoperative blood loss was 25 ml (range 0-150 ml) and no patient received a blood transfusion. No intraoperative or postoperative complication was noted. The median length stay was 1 day (range 0-6). Readmission rate was 0%. Final appendiceal histopathology revealed acute/chronic appendicitis in 5 patients, mucinous cystadenoma in 4 patients. Cecal histopathology revealed adenoma in 4 patients. Median follow-up was 16 months (range 4-53).

Conclusions Laparoscopic cecectomy is a sufficient treatment for some patients with benign conditions of the appendix and cecum. It carries minimal morbidity. It should be considered as an alternative to segmental bowel resection in a select group of patients.

Keywords

- ▶ cecum
- ▶ cecectomy
- ▶ appendicitis
- ▶ appendiceal tumors
- ▶ cecal diverticulum
- ▶ cecal polyp

Introduction

The large bowel consists of four anatomical parts which include the cecum, the colon, the rectum, and the anus. The cecum is anatomically defined as the portion of the large bowel confined to the area below a horizontal line drawn medially to laterally from the antimesenteric border of the terminal ileum at the ligament of Treves to the lateral line of Toldt at the ascending colon (▶ **Fig. 1**). The appendix is

considered an appendage of the cecum. The most common disorder of the appendix is appendicitis. However, other benign and malignant conditions can affect both the appendix and cecum. Such pathologic states can range from infectious, inflammatory, congenital, to neoplastic conditions. A variety of disorders affecting the appendix and cecum have been reported including bacterial, viral, fungal, and parasitic infections, diverticulitis of the cecum, appendiceal duplication, appendiceal mucocele, neural derived tumors like

received

June 3, 2023

accepted after revision

October 24, 2023

DOI <https://doi.org/10.1055/s-0043-1776904>.

ISSN 2237-9363.

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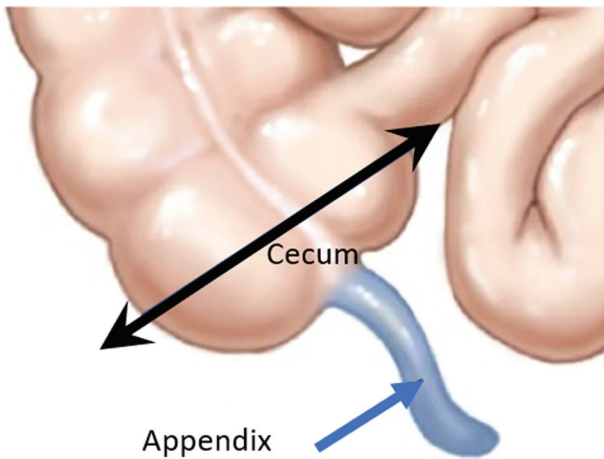


Fig. 1 Anatomic definition of the cecum.

paraganglioma and schwannoma, neuroendocrine tumors, polyps, and carcinoma.¹⁻¹⁰ While most patients with benign disorders of the appendix are treated by appendectomy, a subset of patients such as those with necrosis of the appendiceal base from gangrenous appendicitis or benign tumors extending into the appendiceal orifice require more than the conventional appendectomy. Furthermore, a subset of patients with cecal pathology require complete cecal resection. While an uncommon scenario, some patients have undergone ileocolic resection or segmental colectomy for benign disorders of the appendix and cecum when a cecectomy alone would have been a sufficient treatment.¹⁰

The purpose of this article was to report our experience with laparoscopic cecectomy and to illustrate the technical steps of this operation with a video.

Materials and Methods

Institutional review board and administrative approval was obtained for the study. A retrospective review was performed of all patients who underwent laparoscopic cecectomy over a 16-year period. All operations were conducted by a single board-certified colon and rectal surgeon [MAA]. Data abstracted included patients' demographics, intraoperative, and postoperative data. Long-term follow-up was obtained from the chart review.

The indication for laparoscopic cecectomy was based on preoperative imaging (Computed tomography of the abdomen and pelvis or ultrasound) (► Fig. 2) and/or colonoscopy (► Fig. 3).

The operation was performed in the supine position under general endotracheal anesthesia. All patients received intravenous antibiotics within 1 hour prior to incision (cephalosporins with metronidazole and for patients with severe penicillin allergy ciprofloxacin with metronidazole). Additional doses of antibiotics were administered selectively in patients with appendicitis. No oral mechanical bowel preparation was given.

The surgeon stood at the left side of the operating table along with the assistant camera holder. The monitor and

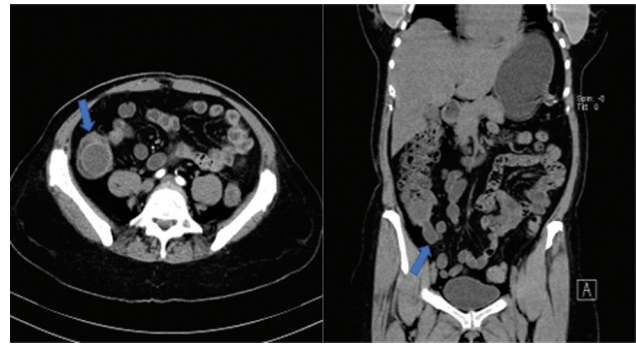


Fig. 2 Computer tomography axial and coronal views of abnormally dilated appendix [arrow].

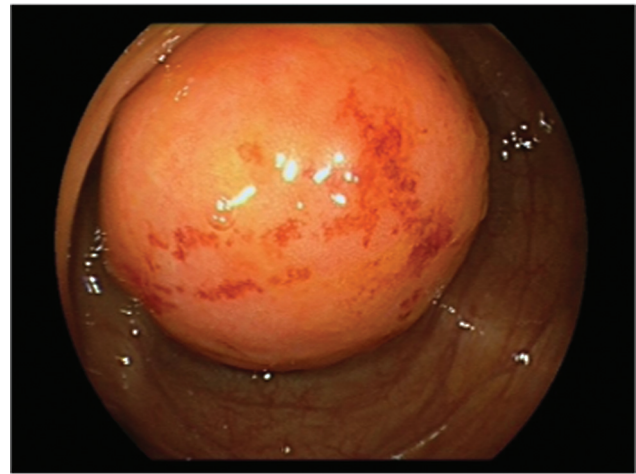


Fig. 3 Colonoscopy view of an abnormal cecum due to extrinsic compression by an appendiceal tumor.

insufflating device were positioned next to the patient right shoulder. All operations were performed laparoscopically using a 3-trocar technique: 5 mm trocars in the left lower quadrant and the lower midline, in addition to a 12 mm supraumbilical trocar (► Fig. 4). After establishing a pneumoperitoneum to 15 mm Hg, the patient was placed in the

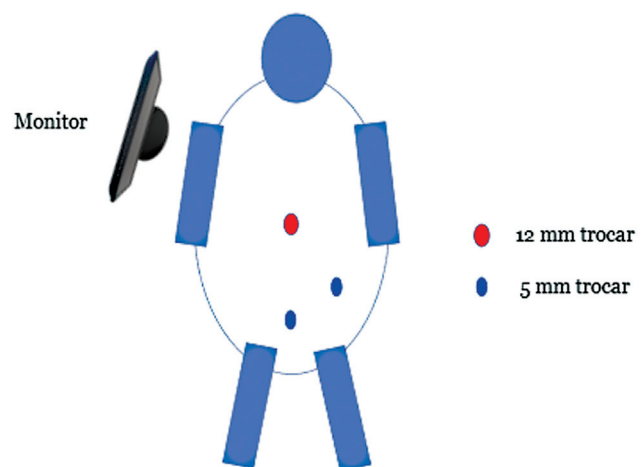


Fig. 4 Trocars placement for laparoscopic cecectomy.

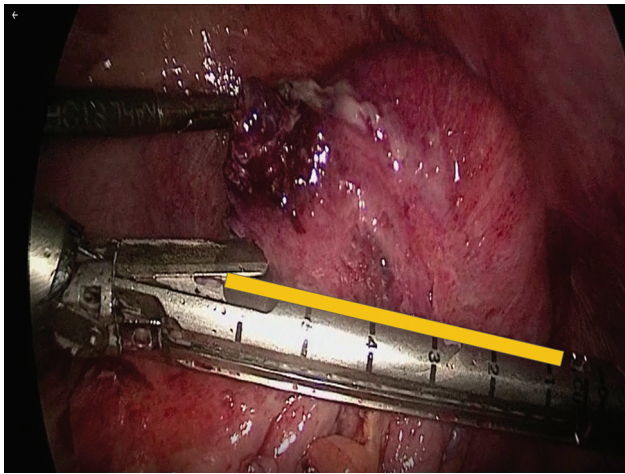


Fig. 5 Stapler position before resection. See the direction of the stapler marked with yellow line preserving of the ileocecal valve by limiting the resection to the cecum to minimize any potential negative functional impact

Trendelenburg position with the left side down in order to keep the small bowel out of the way. The ligament of Treves along with the mesoappendix were divided using the LigaSure™ device (Medtronic, Minneapolis, Minnesota, USA). The ascending colon was partially mobilized to its mid portion from a lateral to medial approach in order to free it from its lateral and retroperitoneal attachments. This maneuver ensured full mobility of the cecum for safe and complete transection. The cecum was transected with 1 to 2 firings of the 60 mm purple load linear stapler (Medtronic, Minneapolis, Minnesota, USA). The stapler was oriented horizontally along the antimesenteric border of the terminal ileum for complete excision of the cecum while preserving the ileocecal valve to avoid any stricture [see ▶ **Supplementary Material Video 1**] (▶ **Fig. 5**). Stapler line should be checked for integrity after the resection to avoid any post operative leak (▶ **Fig. 6**). The specimen was retrieved with an endocatch bag

through the supraumbilical trocar site which was slightly enlarged depending on the specimen bulk (Medtronic, Minneapolis, Minnesota, USA). The supraumbilical trocar site was closed with several single interrupted sutures using Vicryl 2.0 and the skin was approximated with Vicryl 2.0 subcuticular stitch (Ethicon, Somerville, Massachusetts, USA).

Supplementary Material Video 1

Online content including video sequences viewable at: <https://www.thieme-connect.com/products/ejournals/html/10.1055/s-0043-1776904>.



Most patients were admitted for overnight observation. Full liquid diet was administered within 4 hours of operation and advanced to a regular diet within 24 to 48 hours of operation.

Results

During the study period, 19 patients (12 females, 63.2%) underwent laparoscopic cecectomy. Median age was 42 years (range 16-84 years). ▶ **Table 1** represents the intraoperative and postoperative outcomes. Median estimated blood loss was minimal (25 milliliters). No patient required blood transfusion. There were no intraoperative or postoperative complications. No patient was converted to open surgery. Median length of stay was 1 day and only 1 patient required hospitalization for 6 days for psychiatric reasons. Appendiceal pathology was more common than cecal pathology (12 patients, 63.2%). Appendicitis with necrosis and/or involvement of the base was the most common reason for laparoscopic cecectomy, followed by benign appendiceal tumors and cecal polyps (2 tubular adenoma and 2 tubulovillous adenoma). Interval cecectomy for prior localized perforation

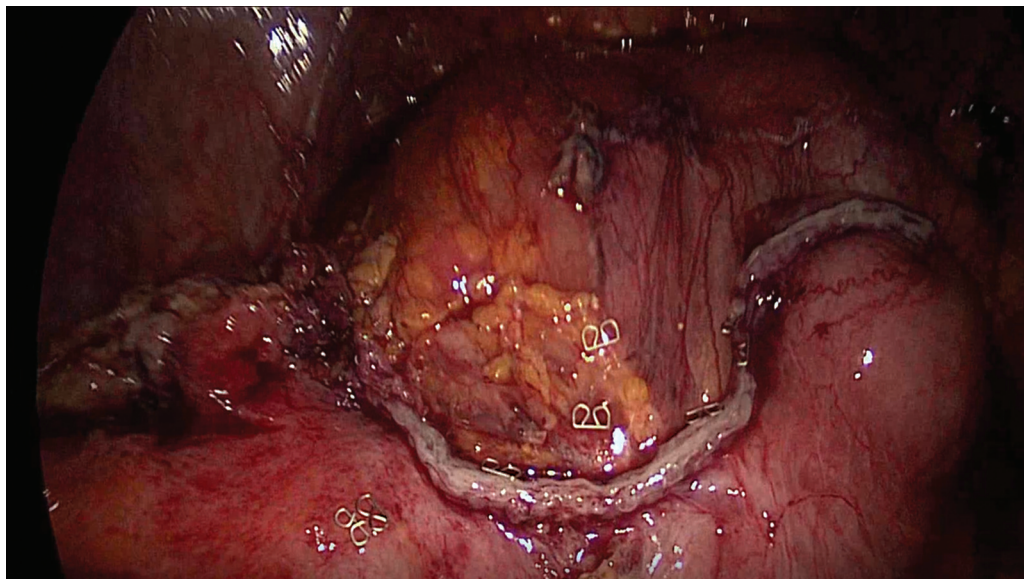


Fig. 6 Stapler line after resection.

Table 1 Intraoperative and postoperative outcome of 19 patients who underwent laparoscopic cecectomy

			N = 19
Intraoperative			
		Median estimated blood loss (range) in milliliters	25 (0-150)
		Conversion to open	0%
		Complications	0%
Postoperative			
		Complications	0%
		Median length of stay (range) in days	1 (0-6)
		Readmission	0%
		Long-term need for re-operation	0%
Final pathology			
	Appendix		12 (63.2%)
		Appendicitis [acute or chronic]	5 (26.3%)
		Mucinous cystadenoma	4 (21%)
		Fibrous obliteration	2 (10.5%)
		Carcinoid	1 (5.3%)
	Cecum		7 (36.8%)
		Adenoma	4 (21%)
		Intramucosal carcinoma	1 (5.3%)
		Diverticulitis	1 (5.3%)
		Submucosal lipoma	1 (5.3%)

of the appendix revealed fibrosis and scarring without evidence of neoplasm in 2 patients. In the patients with polyps or neoplastic lesions, none had a positive margin. During a median follow-up of 16 months (range 4-53), no patients required segmental colectomy.

Discussion

This retrospective study reported a surgeon's experience with laparoscopic cecectomy and highlighted the technical steps of the operation. With proper selection of patients with benign pathology of the appendix and cecum, the outcome of laparoscopic cecectomy was very favorable with minimal morbidity while properly addressing the underlying pathology.

The interest in publishing this study stems from the senior author's own encounters with patients who underwent ileocolic resection or segmental colectomy by surgical colleagues for benign disorders of the appendix and cecum. While such resections are indicated in select cases, in most excising more than the cecum is a surgical overtreatment. This more aggressive stance is probably due to a combination of factors, including the uncertainty of diagnosis preoperatively in some patients, an overestimation of the impact of some benign pathology, the concerns about a potential need to reoperate and remove the right colon if unfavorable pathology, and an incomplete understanding of the large bowel anatomy. While most surgeons in practice receive

proper anatomical education in their formative years, it is the senior's author observation that there is at times confusion between the definition of the large bowel and the colon. The large bowel as stated earlier has 4 parts: the cecum, the colon, the rectum, and the anus. Similarly, the colon has 4 parts: the ascending, the transverse, the descending, and the sigmoid. A clear understanding of the difference between these 2 definitions and an appreciation for the cecal anatomy as a separate part of the large bowel provides the surgeon with clarity and the ability to tailor an operation to the patient's need. When indicated, a laparoscopic cecectomy carries several advantages compared to colectomy including shorter operative time, less blood loss, less risk for intraabdominal sepsis, and less risk for small bowel obstruction. Furthermore, the functional outcome following colonic resection can vary from no change in bowel habits to frequent bowel movements and diarrhea in a minority of patients due to the loss of the ileocecal valve. While the function of the appendix and cecum remains poorly understood, a role in regulating the human microbiome has been proposed.¹¹ Further investigation remains essential to understanding the role played by the appendix and cecum. Preservation of the ileocecal valve by limiting the resection to the cecum when clinically indicated can minimize any potential negative functional impact.^{12,13} Avoidance of ileocolic resection or segmental right hemicolectomy, when possible, can hopefully decrease the small, albeit significant risk of diarrhea and its impact on quality of life.^{13,14} Cecectomy has been previously

established as a viable alternative to appendectomy in severe cases of appendicitis when a surgeon is concerned at the quality of the tissue at the base of the appendix.¹⁵ This role has expanded beyond appendicitis to include benign neoplastic conditions. When properly selected, laparoscopic cecectomy can be curative in many patients with benign conditions. However ileocolic resection or right hemicolectomy should be considered for cases where a negative cecal margins cannot be achieved [such as large polyps involving the ileocecal valve] or when there is a high index of suspicion for malignancy based on endoscopic appearance of a cecal lesion or suspicious lymph nodes on cross sectional imaging.

Conclusions

Laparoscopic cecectomy is a safe and effective procedure. Laparoscopic cecectomy should be considered as an alternative to segmental bowel resection in select patients with benign pathology of the appendix and cecum. A clear appreciation of large bowel and cecal anatomy coupled with a good understanding of the various appendiceal and cecal disorders can assist the surgeon in determining the ideal candidates for this operation.

Conflict of Interest

Dr Muharrem Oner and Dr Maher A. Abbas have no conflicts of interest or financial ties to disclose.

The datasets generated during and/or analysed during the current study are available from the corresponding author on reasonable request.

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