Primary cecal pathologies presenting as acute abdomen and critical appraisal of their current management strategies in emergency settings with review of literature

Singh Mathuria Kaushal-Deep, Afzal Anees, Shehtaj Khan, Mohammad Amanullah Khan, Me hershree Lodhi

ABSTRACT

Background: The importance of cecal pathologies lie in the fact that being the first part of the large intestine, any disease involving the cecum affects the overall functioning of the large bowel. Primary cecal pathologies presenting as acute abdomen have not been described in any previous study in terms of presentation, management, and outcome.

Objectives: The objective of this study was to identify the reported causes of primary cecal pathologies presenting as acute abdomen and the various causes presenting in our setting, the to discuss morbidity and mortality associated with cecal pathologies, and to critically analyze the various management modalities employed in an emergency setting.

Materials and Methods: This is a retrospective analysis of a prospectively collected data of all adult patients admitted to our unit in the last 10 years for acute abdomen, in whom cecal pathology was identified as the primary offending agent.

Results: Our analysis of 43 patients revealed cecal perforation secondary to amebic colitis along with the simultaneous presence of liver abscess to be the most common primary cecal entity met in practice as acute abdomen. Other pathologies that were encountered included volvulus, diverticulitis, and idiopathic typhlitis. Primary acute cecal pathologies are associated with high mortality rates (≈42%). Delay in diagnosis seems to be the most important factor contributing to high mortality as these conditions are commonly misdiagnosed as appendicular pathology. Most of our patients were managed by conservative colonic resection with proximal diversion. This seems to be a more plausible option in current practice in an emergency setting (mortality rate ≈ 36%) as hemicolectomy is associated with proportionately higher mortality rates (67%).

Conclusion: A high index of suspicion, timely and adequate pre-operative workup, optimal resuscitation, and surgical conservatism with proximal diversion might help in early accurate identification of these conditions and possibly improved outcome.

Key Words: Amebic typhlitis, cecal diverticulitis, conservative colonic resection, emergency laparotomy, fulminant amebic colitis, idiopathic typhlitis, ileoascending anastomosis, ileocecal resection, ileotransverse anastomosis, primary cecal pathology, right hemicolecotomy, ruptured liver abscess

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INTRODUCTION

The importance of cecal pathologies lies in the fact that being the first part of large intestine, any disease involving the cecum affects the overall functioning of the large bowel. Primary cecal pathologies presenting as acute abdomen often pose a challenge to their optimal management due to the requirement of urgent intervention in most cases and being a common source of misdiagnosis.[1,2] These pathologies are commonly misdiagnosed as they often mimic acute appendicitis. This misdiagnosis can lead to under-treatment of the actual pathology, and it results in high morbidity and mortality associated with these conditions. Hence, accurate identification of a primary cecal pathology is required so that it can be optimally managed and patient outcome can be improved. Cecal perforation in association with amebic colitis with or without a ruptured or intact liver abscess presenting with acute abdomen is reported as a rare entity in the Western literature. In fact, it is often reported as a case report. However, it is a relatively common entity in developing countries like India and we have similar experiences.

Aims and objectives
The objective of this study was to identify the reported causes of cecal pathology presenting as acute abdomen in medical literature and the various causes presenting in our setting, to identify the pattern of common pathologies in our setup, to discuss morbidity and mortality associated with cecal pathologies, and to critically analyze the various management modalities commonly employed for cecal pathologies presenting as acute abdomen in emergency settings.

MATERIALS AND METHODS

This is a retrospective analysis of prospectively collected data of patients admitted to our unit in last 10 years for acute abdomen, in whom cecal pathology was identified as the prime culprit. Ethical approval was provided by the Ethical Committee of the University and was conducted in accordance with guidelines of Good Clinical Practice and the Declaration of Helsinki.

Inclusion criteria
All adult patients presenting in the emergency department with acute abdomen were included in the study, in whom cecal pathology as the cause of acute abdomen was suspected clinically and/or on imaging and further confirmed intra-operatively and/or on histopathological examination (HPE) or on imaging. Patients identified with primarily a cecal pathology who had acute abdominal pain the initial symptom but who did not present immediately were also included in the study. This inclusion criteria had to be taken up to address the fallacy that patients in developing countries like ours, especially those who live in rural areas or who are illiterate, often resort to indigenous methods of treatment or take symptomatic treatment from local practitioners before presenting to a tertiary center like ours for definitive treatment.[3] Finally, only those patients who were operated within 24 h of index admission in the emergency operation theater by a registrar or faculty member after initial resuscitation were included in the study.

Exclusion criteria
Patients with subacute, intermittent, or chronic pain; when predominant symptom like acute onset of pain was attributable to some other cause even in the presence of a cecal pathology; when predominant pathology was not cecal; and patients with cecal pathology operated as an elective case were excluded from our study. Thus, patients diagnosed to be having appendiceal stump blowout, perforation of base of appendix, ileocecal tuberculosis, or intussusception were not included in the study.

We analyzed this data of patients admitted to our unit for acute abdomen, in whom cecal pathology was the primary cause for the various management options employed and the final outcome of these patients. No control groups were available for comparison.

Statistical analysis
Data analysis was done with Microsoft Excel® 2016 (Microsoft Corp., Redmond, Washington, USA). Mean and standard deviation were observed for continuous forms of data like age. Data was expressed as percentages. Continuous data, when required, were also evaluated for significance by Student’s t-test (for comparing two groups), analysis of variance (for comparing more than two groups), and post hoc analysis in the form of Tukey’s honest significance difference test. For categorical data, significance testing was done by Fisher’s exact test. P < 0.05 was considered statistically significant for all practical applications.

RESULTS

A total of 43 patients met the inclusion criteria. The average age of patients that were included in the study was 37.9 ± 10.3 (range 19–70) years. From the 43 patients, there were 35 male and 8 female thus giving a male-to-female ratio of ≈ 4:1. Figure 1 shows the flowchart depicting the outcome of patients by procedures performed and the final diagnosis of patients. Table 1 shows the outcome characteristics of all patients by final diagnosis and procedure performed. Figures 2 and 3 are intra-operative images of two patients that are included in the current study.
Figure 4 shows the distribution of patients by pre-operative provisional diagnosis. The provisional diagnosis of 20/43 (47%) patients was completely different from their final diagnosis. The initially suspected diagnoses in these cases included acute appendicitis, appendicular perforation, and pyoperitoneum; however, the final diagnosis was found to be a primarily cecal pathology. Most of these patients were suspected of having either acute appendicitis or an appendicular perforation after clinical examination and initial investigations of X-ray and ultrasonography. Three patients were operated on, aspiration of pus from the peritoneal cavity on pre-operative ultrasonography (USG)-guided aspiration. Some patients presenting with right iliac fossa pain and/or features of generalized peritonitis with a dubious diagnosis on initial investigations and not responding to medical management, underwent operation operated based on the clinical parameters. In the remaining patients, those who had a ruptured or intact liver abscess with features of peritonitis, they were assumed to be having a cecal pathology secondary to amebic colitis that led to the perforation. This was further verified intra-operatively and on final HPE reporting. In most of the cases, amebae or their cysts/trophozoites could not be demonstrated in HPE specimen. In such patients, the diagnosis of Entamoeba infection was confirmed by serology and stool examination; and in one patient endoscopic biopsy of the sigmoid colon could only demonstrate the infection, so even in these patients, the provisional diagnosis of cecal pathology was on the assumption basis. Six of these patients with intra-operatively detected cecal perforation with liver abscess were operated on clinical
| Diagnosis                                      | Patient number | Age | Sex   | Presentation after how many days of initial acute-onset pain abdomen | Procedure                                                                 | Outcome    |
|-----------------------------------------------|----------------|-----|-------|-----------------------------------------------------------------------|---------------------------------------------------------------------------|------------|
| Amebic cecal perforation with ruptured liver abscess | 1              | 35  | Male  | 1                                                                      | Ileocecal resection with ileoascending anastomosis                        | Survived   |
|                                               | 2              | 29  | Male  | 3                                                                      | Ileocecal resection with ileoascending anastomosis                        | Expired    |
|                                               | 3              | 37  | Male  | 1                                                                      | Right hemicolectomy with ileotransverse anastomosis                       | Survived   |
|                                               | 4              | 34  | Male  | 2                                                                      | Ileocecal resection with ileoascending anastomosis with mucous fistula    | Survived   |
|                                               | 5              | 28  | Male  | 5                                                                      | Ileocecal resection with ileoascending anastomosis with proximal loop ileostomy | Expired    |
|                                               | 6              | 40  | Male  | 2                                                                      | Ileocecal resection with ileoascending anastomosis with mucous fistula    | Survived   |
|                                               | 7              | 43  | Male  | 1                                                                      | Ileocecal resection with ileoascending anastomosis                        | Expired    |
|                                               | 8              | 26  | Female| 1                                                                      | Ileocecal resection with ileoascending anastomosis with mucous fistula    | Survived   |
|                                               | 9              | 39  | Male  | 2                                                                      | Ileocecal resection with ileoascending anastomosis with mucous fistula    | Survived   |
|                                               | 10             | 31  | Male  | 3                                                                      | Ileocecal resection with ileoascending anastomosis with mucous fistula    | Expired    |
|                                               | 11             | 41  | Male  | 1                                                                      | Ileocecal resection with ileoascending anastomosis with mucous fistula    | Survived   |
|                                               | 12             | 58  | Male  | 1                                                                      | Ileocecal resection with ileoascending anastomosis with mucous fistula    | Survived   |
|                                               | 13             | 46  | Male  | 2                                                                      | Ileocecal resection with ileoascending anastomosis with mucous fistula    | Expired    |
|                                               | 14             | 35  | Male  | 4                                                                      | Right hemicolectomy with ileotransverse anastomosis                       | Expired    |
|                                               | 15             | 30  | Male  | 1                                                                      | Ileocecal resection with ileoascending anastomosis with mucous fistula    | Survived   |
|                                               | 16             | 29  | Male  | 1                                                                      | Ileocecal resection with ileoascending anastomosis with mucous fistula    | Survived   |
|                                               | 17             | 37  | Male  | 2                                                                      | Ileocecal resection with ileoascending anastomosis with mucous fistula    | Survived   |
|                                               | 18             | 40  | Male  | 1                                                                      | Ileocecal resection with ileoascending anastomosis with mucous fistula    | Survived   |
|                                               | 19             | 33  | Male  | 1                                                                      | Ileocecal resection with ileoascending anastomosis with mucous fistula    | Expired    |
|                                               | 20             | 21  | Male  | 2                                                                      | Ileocecal resection with ileoascending anastomosis with mucous fistula    | Survived   |
|                                               | 21             | 46  | Male  | 1                                                                      | Ileocecal resection with ileoascending anastomosis with mucous fistula    | Survived   |
|                                               | 22             | 50  | Male  | 3                                                                      | Right hemicolectomy with ileoascending anastomosis with mucous fistula    | Expired    |
|                                               | 23             | 41  | Male  | 1                                                                      | Ileocecal resection with ileoascending anastomosis with mucous fistula    | Expired    |
|                                               | 24             | 27  | Male  | 1                                                                      | Ileocecal resection with ileoascending anastomosis with ileoascending anastomosis | Survived   |
|                                               | 25             | 30  | Female| 2                                                                      | Right hemicolectomy with ileotransverse anastomosis                       | Expired    |
|                                               | 26             | 36  | Male  | 1                                                                      | Ileocecal resection with ileoascending anastomosis with mucous fistula    | Survived   |
|                                               | 27             | 25  | Male  | 1                                                                      | Right hemicolectomy with ileotransverse anastomosis                       | Survived   |
|                                               | 28             | 43  | Male  | 4                                                                      | Ileocecal resection with ileoascending anastomosis with mucous fistula    | Expired    |
|                                               | 29             | 56  | Male  | 1                                                                      | Ileocecal resection with ileoascending anastomosis                        | Survived   |
|                                               | 30             | 40  | Female| 1                                                                      | Ileocecal resection with ileoascending anastomosis with colopexy           | Survived   |
|                                               | 31             | 29  | Male  | 2                                                                      | Right hemicolectomy with ileoascending anastomosis                        | Survived   |
|                                               | 32             | 36  | Female| 1                                                                      | Ileocecal resection with ileoascending anastomosis with mucous fistula    | Expired    |
|                                               |                |     |       | Contd...                                                               |                                                                           |            |
judgment as pre-operative radiological investigations were inconclusive. Some patients with liver abscess might have concomitant active amebic typhlitis, but they usually present with history of fever and diarrhea. Such patients were not included in our study. However, two patients were identified who presented with acute right iliac fossa pain and found to be having liver abscess on USG. A diagnosis of amebic typhlitis was established in these patients on lower gastrointestinal endoscopy, stool microscopic examination, and endoscopic biopsy specimen taken from the cecum. Contrast-enhanced computed tomographic (CECT) scan was not employed as a diagnostic modality in those patients who were operated in emergency due to its nonavailability at our center in emergency settings before the year 2016.

The patients with a pre-operative different diagnosis (20/43) were finally diagnosed with idiopathic typhlitis (1 patient), cecal diverticulum/diverticulitis with or without perforation (3 patients), idiopathic typhlitis (1 patient), isolated cecal necrosis (1 patient), cecal malignancy (1 patient), amebic colitis with ruptured liver abscess leading to pyoperitoneum (3 patients) and ten patients of amebic colitis with ruptured/intact liver abscess. Figure 5 shows the distribution of patients by final diagnosis. Nearly 28/43 (65%) of the patient’s had cecal perforation secondary to amebic colitis with a ruptured or intact liver abscess. Other patients had diagnoses such as cecal volvulus, idiopathic typhlitis, cecal diverticulitis with or without perforation, cecal malignancy leading to perforation, Ogilvie’s syndrome involving cecum only, and spontaneous ischemic nonocclusive cecal necrosis as depicted in Figure 5.

Nearly 5/43 (11.6%) patients were managed conservatively and the remaining 38 (88.4%) were operated in the emergency [Figure 1]. Patients who were managed conservatively included one elderly patient presumed to be having idiopathic typhlitis (which was further confirmed on
CECT abdomen) and survived; one frail debilitated elderly patient suspected to be having cecal diverticulitis (further confirmed on CECT) who expired on the 3rd day while being resuscitated for operative planning; two patients of amebic typhlitis with liver abscess who presented with acute right iliac fossa pain and one patient with pseudo-obstruction of large colon involving the cecum (confirmed on CECT).

Among the 38 patients who underwent emergency laparotomy, 9/38 (23.7%) patients were operated on by standard right hemicolectomy (which included patients with diagnosis of amebic cecal perforations with liver abscess, isolated cecal necrosis, cecal volvulus, cecal diverticulitis, and cecal carcinoma), 6/9 (66.7%) of these patients expired. Among the expired patients, there were one patient each with a final diagnosis of isolated cecal necrosis, cecal carcinoma, and perforated cecal diverticulitis; and three patients with amebic cecal perforation with associated liver abscess. 28/38 (73.7%) patients were managed by conservative colonic or ileocolic resection with or without proximal diversion. 11/34 (32.4%) of these patients expired. Seven patients in the conservative resection group underwent ileocolic anastomosis, two of which were proximally diverted. Two of the three patients with cecal volvulus without any gangrenous change underwent conservative resection with primary ileocolic anastomosis and both these patients survived. One patient with cecal volvulus who underwent right hemicolectomy without diversion also survived. One hemodynamically unstable female patient with a diagnosis of cecal diverticulitis without perforation underwent tube cecostomy expired on day 4 post-operation. No operative intervention could be done in this patient. Thus, the total mortality rate in our study of patients with primary cecal pathology presenting as acute abdomen is 41.9% (18/43).

**DISCUSSION**

Different primary cecal pathologies as causes of acute abdomen

There are several causes of cecal pathology presenting with acute abdomen which have been described in literature as sporadic case studies. Albers et al. proposed a classification of cecal perforation which is even relevant today give or take a few clinical entities. He divided the various causes into four categories, namely – trauma, obstruction, inflammatory, and tumors. Many of the primary cecal entities described in his classification can present as acute abdomen such as cecal volvulus, vascular accident (leading to cecal gangrene), idiopathic typhlitis, cecal diverticulitis, malignancy, and so on. He also included perforation of base of appendix and blowout of the appendiceal stump as causes of cecal perforation. In the current discussion, we have not included these two diagnoses as well as ileocecals intussusception and tuberculosis as causes of acute primary cecal pathology. Various cecal pathologies can present as acute abdomen either as standalone entities involving the cecum or in the form of cecal perforation. These potentially incriminating pathologies that can present as acute cecal pathology have been tabulated in Table 2. But only some of these conditions are commonly encountered in the clinical practice, and they deserve special attention owing to their dismal outcome. It may be noted that in most of the above-mentioned causes of acute primary cecal pathology, patients were initially suspected to be having acute appendicitis or appendicular perforation and the cecal pathology was appreciated only intra-operatively or on post-operative HPE reporting.
**Entamoeba histolytica and amebic typhilitis as cause of acute abdomen**

In our setup, amebic colitis leading to cecal perforation with or without a ruptured liver abscess (fulminant amebic colitis) is the most common primary cecal entity presenting with acute abdomen. Amebiasis occurs worldwide, but is mostly seen in tropical and developing countries, which have bad sanitary and hygienic practices. Spread is mostly through feco-oral route, by ingestion of cysts and also through contaminated vegetables fertilized by feces, and foods and water handled by unclean hands. Fomites and flies also have a role in the transmission. Autoinfection through improper cleaning of hands is also reported. While amebiasis affects the cecum and ascending colon most often, the sigmoid colon, rectum, and appendix can also be involved. Dysentery develops when the amebae attach to the colonic epithelium, induce apoptosis, invade crypts, and burrow laterally into the lamina propria. This recruits neutrophils, causes tissue damage, and creates a flask-shaped ulcer with a narrow neck and broad base. Histologic diagnosis can be difficult since amebae are similar to macrophages in size and general appearance. Parasites may penetrate splanchnic vessels and embolize to the liver to produce abscesses in about 40% of patients with amebic dysentery. High degree of suspicion in endemic areas is a prerequisite for diagnosis. Fresh liquid stool examination showing hematomorphic trophozoites with Charcot–Leyden crystals is characteristic. Stool examination, preferably for three consecutive days is advocated. Presence of only cysts in asymptomatic individuals is not diagnostic since the cysts of *Entamoeba dispar*, which is noninvasive and harmless are indistinguishable from those of invasive *Entamoeba histolytica*. *Sigmoidoscopic scrapings of ulcers showing hematomorphic trophozoites are diagnostic,* so also is the finding of amebae from the walls of hepatic abscesses. Ultrasound (USG) scan of the abdomen helps in the delineation of hepatic abscesses. X-ray of the chest helps in the detection of spread to the pleura, lung, or pericardium. X-ray of the abdomen is useful for the diagnosis of peritonitis and toxic megacolon. Computed tomography/magnetic resonance imaging help in the diagnosis of intracranial spread of amebiasis. Histological demonstration of amebae in tissue specimens is difficult and it was also difficult in our patients. In only one of the patients, the amebae could be demonstrated conclusively in the histopathological specimen of the cecum. In seven patients, the diagnosis was speculated on the basis of demonstration of trophozoites (with or without Charcot–Leyden crystals) and with or without cysts in stools. The presence of cysts only was not taken to be diagnostic for amebiasis.

**Management of cecal pathologies: Our perspective and what the literature says!**

Certain common cecal pathologies have a very poor outcome in emergency settings such as fulminant amebic colitis and neutropenic enterocolitis. Surgical protocols for management of cecal pathologies have evolved over time. Various treatment options have been described for management of such patients and can be broadly divided into the following four categories – conservative management, tube cecostomy, right hemicolectomy with or without proximal diversion, and primary repair or limited colonic resection with or without proximal diversion.

**Conservative management**

Only certain group of patients with cecal acute abdomen can be managed conservatively. These include certain patients with localized retrocecal abscess which can be aspirated using imaging studies, pylori typhilitis responding to medications, amebic colitis with or without liver abscess, certain cases of cecal diverticulitis, and old debilitated patients in whom surgical outcome is expected to be very poor. We also managed five patients conservatively. One of the patients expired who was an old debilitated vitally unstable male diagnosed as a case of nonperforated cecal diverticulitis who expired, while he was being prepared for operative intervention. Thus, we saw that the patient was managed conservatively only because of unstable vitals otherwise he was planned to undergo operation. All other conservatively managed patients survived whose diagnoses included amebic...
typhlitis with liver abscess, idiopathic typhlitis, and a patient with Ogilvie’s syndrome involving the cecum alone. Hence, selective conservatism can be applied to the management of certain patients of primary cecal pathology with acute abdomen.

**Tube cecostomy**

Benacci and Wolff defined the use of cecostomy 1995 for the following indications – colonic pseudo-obstruction, distal colonic obstruction, cecal perforation, cecal volvulus, preanastomotic decompression, and miscellaneous usage.

However, in the current day practice, cecostomy is no longer used for any of the above-mentioned indications. The only frequently required indication for cecostomy (open/laparoscopic) today is in children and includes: intractable fecal incontinence (as seen in cases of myelomeningocele, anorectal malformations, caudal regression syndrome, and Hirschsprung disease with encopresis with convulsions) and constipation with encopresis (as seen in sacrococcygeal teratoma and patients of cerebral palsy and acquired megarectum with psychiatric and social disorders).

In the review of our cases, we also found that tube cecostomy was performed in only one unstable patient of non-perforated diverticulitis who later expired. Thus, the use of tube cecostomy in the current settings is very limited and should be used cautiously as a temporary measure in non-perforated unstable patients with cecal diverticulitis and cecal volvulus.

**Right hemicolecotomy**

It is still the most commonly practiced procedure by most surgeons even in emergency settings in developed as well as developing countries. Laparoscopic right hemicolecotomy has been described as the gold standard procedure for malignancies of the right side of the colon in elective settings.

Open approach serves the same purpose in emergency setting in an optimal way to stable patients. Right hemicolecotomy can also be used in suspicious lesions in stable patients. It is also described as the preferred procedure for cecal volvulus. In emergency setting, a right hemicolecotomy with proximal fecal diversion appears to be a wise choice in stable patients. However, even proximal fecal diversion is associated with high morbidity and mortality.

Use of right hemicolecotomy for most of the benign inflammatory colonic pathologies is limited. Even in our study, it resulted in an unacceptably high mortality rate of 66.7%. We recommend the usage of right hemicolecotomy for acute pathologies only limited to cecal malignancies. Most other cases can be adequately tackled with the use of limited colonic resection.

**Primary repair of cecal perforation/limited right colectomy/ileoceleal resection with or without proximal diversion**

The use of limited right colectomy or ileoceleal resection has increasingly been practiced in emergency settings. In fact, it is the standard procedure for emergency operative cases of Crohn’s disease with reported excellent outcomes. Its use has been demonstrated in previous studies for cecal pathologies. Singh et al. have reported a good survival with conservative surgical resection even in patients with fulminant amebic colitis which generally have a poor outcome. Sarkar et al. evaluated the use of ileoceleal resection for infection and inflammatory condition of the right iliac fossa and found it to be safe option even without proximal diversion. Conservative ileoceleal/colonic resection with proximal diversion, in our experience also, has a favorable overall outcome as compared to radical resection in the form of hemicolectomies. The overall mortality rate in patients undergoing conservative resection for acute primary cecal pathologies in our study was 35.7% (10/28) and that of end ileostomy with mucous fistula (excluding cases of ileoascending anastomosis) was 33.3% (7/21). Both of these figures are less than the overall mortality rate of 41.9%, and 66.7% mortality rate of hemicolectomies in our study. The above-reduced mortality rate in conservative colonic resection can be partly explained by the reduced operative time associated with it. Thus, conservative ileocecal resection seems to be a more plausible option in emergency settings for management of patients of acute primary cecal pathology due to the relatively shorter operative time and less loss of bowel segment. Moreover, ileocecal resection with primary ileoascending anastomosis is a valid option for cecal volvulus without gangrene.

We did not manage patients of volvulus by detorsion and colopexy alone due to high chances of recurrence as depicted in various previous studies. We would have thought about right hemicolecotomy in such patients only if an extended dilated suspicious or nonviable colonic segment had been present.

**Limitations of our study**

No study is perfect after all. Our study also has several limitations which we would like to acknowledge. First of all, this is a retrospective study and not a prospective study so it suffers from all the limitations a retrospective study can have like selection bias and information bias.

Further, all the patients were not operated by a single surgeon so it may have an impact on final outcome as can be due to different experience level of different operating surgeons. No controls have been included. The data that have been reviewed was not digitally stored rather it was from patient files so there might be some loss of information that can occur with such data storage. Standardization of procedure, treatment protocol, data recording, and follow-up has not been present. Taking into account all the limitations of our study, a prospective case–control study can be planned with standardized protocols for diagnosis and treatment which will further analyze the outcomes related to acute primary cecal pathologies.
CONCLUSION

Fulminant amebic colitis that is perforated amebic typhilitis with a ruptured or intact liver abscess seems to be the most common clinical primary cecal enti

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Conflicts of interest
There are no conflicts of interest.

REFERENCES

1. Shin JH, Son BH, Kim H. Clinically distinguishing between appendicitis and right-sided colonic diverticulitis at initial presentation. Yonsei Med J 2007;48:511-6.
2. Bassiouny RH, El Maati AA. Acute right lower quadrant pain beyond acute appendicitis: MDCT in evaluation of benign and malignant gastrointestinal causes. Egypt J Radiol Nucl Med 2014;45:627-40.
3. Guven H, Koc B, Saglam F, Bayram IA, Adas G. Emergency right hemicolecction for inflammatory cecal masses mimicking acute appendicitis. World J Emerg Surg 2014;9:7.
4. Albers JH, Smith LL, Carter R. Perforation of the cecum. Ann Surg 1956;143:251-5.
5. Athié-Gutiérrez C, Rodea-Rosas H, Guízar-Bermúdez C, Alcántara A, Montalvo-Javé EE. Evolution of surgical treatment of amebiasis-associated colon perforation. J Gastrointest Surg 2010;14:827-7.
6. Takashashi T, Gamboa-Dominguez A, Gomez-Mendez TJ, Remes JM, Rembis V, Martinez-Gonzalez D, et al. Fulminant amebic colitis: Analysis of 55 cases. Dis Colon Rectum 1997;40:1362-7.
7. Singh B, Moody J, Ramdial PK. Fulminant amoebic colitis: A favorable outcome. Int Surg 2001;86:77-81.
8. Eggleston FC, Yergese M, Handa AK. Amoebic perforation of the bowel: Experiences with 26 cases. Br J Surg 1978;65:45-71.
9. Carkman S, Ozben V, Aytac E. Cecum perforation due to tuberculosis in a renal transplant recipient: A case report. J Med Case Rep 2009;3:132.
10. Jain DK, Aggarwal G, Lubana PS, Moses S, Joshi N. Primary tubercular caecal perforation: A rare clinical entity. BMC Surg 2010;10:12.
11. Greenstein AJ, Sachar DB, Mann D, Lachman P, Heitmann T, Aufses AH Jr, et al. Spontaneous free perforation and perforated abscess in 30 patients with Crohn's disease. Ann Surg 1987;205:72-6.
12. Masters H. Volvulus and gangrene of the cecum in a patient with ulcerative colitis. Calif Med 1961;94:36-7.
13. Blotner C. Trapped fecalith in cecal haustration with local necrosis. Am J Surg 1948;76:446.
14. Aloysius MM, Kaye PV, Lobo DN. Non-steroidal anti-inflammatory drug (NSAID)-induced colonic strictures and perforation: A case report. Dig Liver Dis 2006;38:276-8.
15. Tsushima T, Kurazumi H, Takemoto Y, Oka K, Inokuchi T, Seyama A, et al. Laparoscopic necrosectomy for mobile cecum syndrome manifesting as cecal volvulus: Report of a case. Surg Today 2008;38:359-62.
16. Barut I, Tarhan OR. Cecum perforation due to biliary stent migration. Saudi Med J 2014;35:747-9.
17. Vuong PN, Eichelbrenner D, Houissa-Vuong S, Desoutter P. Pseudomembrinous perforation of the cecum by a duck bone. Ann Chir 2001;126:175-7.
18. Miyahani H, Yoshida Y, Kiyozaki H. Cecal perforation with an ascending colon cancer caused by upper gastrointestinal endoscopy. Ther Clin Risk Manag 2009;5:301-3.
19. Sánchez-Muñoz D, Ortiz-Moyano C, Ramírez-Martin del Campo M, Núñez-Hospital D, García-Romero D, Delgado C, et al. Pneumatic perforation of the cecum during diagnostic sigmoidoscopy. Endoscopy 2007;39 Suppl 1:E183.
20. Ruiz-Tovar J, Calero García P, Morales Castiñeiras V, Martínez Molina E. Cecal volvulus: Presentation of 18 cases and review of literature. Cir Esp 2009;85:110-3.
21. Hasbahceci M, Basak F, Alimoglu O. Cecal volvulus. Indian J Surg 2012;74:476-9.
22. Yilmaz O, Kiziltan R, Bayrak V, Çelik S, Çalli I. Solitary caecum diverticulitis mimicking acute appendicitis. Case Rep Surg 2016;2016:3.
23. Lane JS, Sarkar R, Schmit PJ, Chandler CF, Thompson JE Jr. Surgical approach to cecal diverticulitis. J Am Coll Surg 1999;188:629-34.
24. Wylie EJ, Lee WC. Cecal diverticulitis: Changing trends in management. South Med J 1988;81:313-6.
25. Çiftci F, Abdurrahman I, Eren A. A rare cause of acute abdominal disease: Two reports of cecal diverticulitis perforation. Ulus Travma Acil Cerrahi Derg 2016;22:290-2.
26. Gifford JP. Perforation of the cecum by ascaris. J Fla Med Assoc 1954;41:118.
27. Chen DF, Chao IM, Huang SH. Neutropenic colitis with cecal perforation during antithyroid therapy. J Formos Med Assoc 2003;102:644-6.
28. Rodrigues FG, Dasila G, Wexner SD. Neutropenic enterocolitis. World J Gastroenterol 2017;23:42-7.
29. Dirican A, Unal B, Bassulu N, Tafi F, Aydin C, Kayapal C, et al. Isolated cecal necrosis mimicking acute appendicitis: A case series. J Med Case Rep 2009;3:7443.
30. Hunter JP, Saratzis A, Zayyan K. Spontaneous, isolated cecal necrosis: Report of a case, review of the literature, and updated classification. Acta Chir Belg 2013;113:60-3.
31. Sorokin AS, Solonskii SS, Propan AP. Suppuration of a cecal cyst. Sov Spontaneous free perforation and perforated abscess in 30 patients as an unusual presentation of pancreatic carcinoma. World J Surg Oncol 2014;20:8717-21.
32. Rashid A, Nazir S, Hakim SY, Chalkoo MA. Epiploic appendagitis of caecum: A diagnostic dilemma. Ger Med Sci 2012;10:Doc14.
33. Alizadeh Otaghvar H, Hosseini M, Shabestanipour G, Tizmaghz A, Sedehi Esfahani G. Cecal endometriosis presenting as acute appendicitis. Case Rep Surg 2014;2014:519631.
34. Harbaugh C, Siddiqui S, Sutherland C, Rabah-Hammad R, Hirschl. Case report of idiopathic cecal perforation presenting as acute appendicitis on ultrasound. J Pediatr Surg Case Rep 2016;11:28-30.
35. Nizaiwa M, Maie O, Asanuma Y, Saito T. Adult dermatomyositis with angiopathy and cecum perforation. Nihon Hifuka Gakkai Zasshi 2001;191:49-53.
36. Harbaugh C, Siddiqui S, Sutherland C, Rabah-Hammad R, Hirschl. Case report of idiopathic cecal perforation presenting as acute appendicitis on ultrasound. J Pediatr Surg Case Rep 2016;11:28-30.
37. Niizawa M, Maie O, Asanuma Y, Saito T. Adult dermatomyositis with angiopathy and cecum perforation. Nihon Hifuka Gakkai Zasshi 2001;191:49-53.
38. Harbaugh C, Siddiqui S, Sutherland C, Rabah-Hammad R, Hirschl. Case report of idiopathic cecal perforation presenting as acute appendicitis on ultrasound. J Pediatr Surg Case Rep 2016;11:28-30.
39. Nizaiwa M, Maie O, Asanuma Y, Saito T. Adult dermatomyositis with angiopathy and cecum perforation. Nihon Hifuka Gakkai Zasshi 2001;191:49-53.
40. Harish E, Sundep VK, Kola SK, Dharma Kumar KG. Spontaneous cecal perforation associated with Oglivie's syndrome following vaginal delivery – A case report. J Clin Diagn Res 2014;8:ND68-9.
41. Ahmed K, Darakhshan A, Au E, Khamashta MA, Katsoulis IE. Postpartum drug (NSAID)-induced colonic strictures and perforation: A case report. Dig Liver Dis 2006;38:276-8.
spontaneous colonic perforation due to antiphospholipid syndrome. World J Gastroenterol 2009;15:502-5.
42. Pashkova VS, Filippova IA. Cecum gangrene as a complication of amyloidosis in myeloma. Arkh Patol 1992;54:44-5.
43. Melek M, Beger B, Simsek M, Epcaçan S, Kösem M, Edrne Y, et al. Polyarteritis nodosa with perforation of the cecum. Turk J Gastroenterol 2012;23:188-9.
44. Simsek I, Dinc A, Mas MR, Günhan O, Kocabalkan F. Behçet's disease with a cecal perforation. Clin Exp Rheumatol 2000;18:268-9.
45. Gachoka DN, Yu S, Kaw D. Caeccum perforation after renal transplantation: A case report and review of literature. Int Urol Nephrol 2014;46:1141-4.
46. Turner JR. The gastrointestinal tract. In: Kumar V, Abbas AK, Aster JC, editors. Robbins and Cotran Pathologic Basis of Disease. 9th ed. Philadelphia, PA: Elsevier/Saunders; 2015. p. 795.
47. Sharma MP, Gupta V. Amebiasis. In: Munjal YP, editor. API Textbook of Medicine. 10th ed., Vol. 2. New Delhi: Jaypee Brothers Medical Publishers (P) Ltd; 2015. p. 1620-3.
48. Pritt BS, Clark CG. Amebiasis. Mayo Clin Proc 2008;83:1154-9.
49. Youn CA, Gracie DJ, Subramanian V, Wyatt JJ. Ameobic colitis. Diagn Histopathol 2017;23:563-5.
50. Popa F, Strâmbu V, Constantin V, Bălălău C, Ciocoiu E, Cuibac A, et al. The clinicno-evolutionary and therapeutic aspects in diastatic perforation of the cecum. Chirurgia (Bucur) 1997;92:337-42.
51. Carvalho AT, Esberard BC, da Luz Moreira A. Current management of spontaneous intra-abdominal abscess in Crohn's disease. J Coloproctol, forthcoming. [DOI: 10.1016/j.jcol.2016.05.003].
52. Ji EH, Kim YM, Kim SJ, Yeon SJ, Ha SE, Kang HH, et al. A case of typhlitis developed after chemotherapy with irinotecan and cisplatin in a patient with small cell lung carcinoma. Tuberc Respir Dis (Seoul) 2012;73:288-91.
53. Kyziridis DS, Parpoudi SN, Antoniou ND, Konstantaras DC, Moysidis MG, Christoforidis EC, et al. Cecal diverticulitis is a challenging diagnosis: A report of 3 cases. Am J Case Rep 2015;16:206-10.
54. Benacci JC, Wolff BG. Cecostomy. Therapeutic indications and results. Dis Colon Rectum 1995;38:530-4.
55. Becmeur F, Demarche M, Lacreuse I, Molinaro F, Kauffmann I, Moog R, et al. Cecostomy button for antegrade enemas: Survey of 29 patients. J Pediatr Surg 2008;43:1853-7.
56. Franklin ME, Liang S, Moreno MA. Right hemicolectomy and ileocecectomy: Laparoscopic intracorporeal anastomosis. In: Bardakcioglu O, editor. Advanced Techniques in Minimally Invasive and Robotic Colorectal Surgery. Boston, MA: Springer US; 2015. p. 69-75.
57. Sawai RS. Management of colonic obstruction: A review. Clin Colon Rectal Surg 2012;25:200-3.
58. Tsueh JJ, Pessaux P, Regenet N, Derouet N, Bergamaschi R, Arnaud JP, et al. Results of resection for volvulus of the right colon. Tech Coloproctol 2002;6:97-9.
59. Tan KK, Liu JZ, Yeow Y, Gunasekaran S, Tan JJ. Is emergency right hemicolecotomy still associated with significant morbidity and mortality rates? An institution's experience of 207 cases over 6 years. Int J Colorectal Dis 2011;26:1157-61.
60. Cullen G, O'toole A, Keegan D, Sheahan K, Hyland JM, O'donoghue DP, et al. Long-term clinical results of ileocecal resection for Crohn's disease. Inflamm Bowel Dis 2007;13:1369-73.
61. Sarkar R, Bennion RS, Schmit PJ, Thompson JE. Emergent ileocecectomy for infection and inflammation. Am Surg 1997;63:874-7.
62. Majeski J. Operative therapy for cecal volvulus combining resection with colopexy. Am J Surg 2005;189:211-3.

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