

ORIGINAL ARTICLE

Ischemic Necrosis of the Cecum: A Single Center Experience

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Background/Aims: Isolated cecal necrosis is a rare cause of the surgical abdomen. Its manifestation is similar to that of acute appendicitis. Thirteen cases, who were pre-diagnosed with acute abdomen and were finally diagnosed with isolated cecal necrosis after operation have been evaluated alongside with literature.

Methods: The records of 13 patients, who had isolated cecal necroses between 1995 and 2011 at Necmettin Erbakan University Meram Medical School's General Surgery Clinic (Turkey), were retrospectively evaluated.

Results: Eight of the patients were male, whereas 5 were female. Their mean age was 68.0 ± 11.7 (range 51-84) years. All the patients had at least one accompanying disease the most frequent of which were heart failure and chronic renal failure. Ten patients had right hemicolectomy and ileotransversostomy, two had right hemicolectomy and ileostomy, and one had wedge resection to the cecum by the help of linear stapler. Mortality was seen in 5 patients (38%) in the early postoperative period.

Conclusions: Isolated cecal necrosis should be considered in elderly patients with chronic diseases presenting with sudden right lower quadrant pains in the differential diagnosis. Isolated cecal necrosis may have a bad prognosis since it is seen in elderly patients with accompanying problems. Therefore, early diagnosis and immediate surgical management if necessary is important to reduce the risk of morbidity and mortality. (*Korean J Gastroenterol* 2013;61:265-269)

Key Words: Appendicitis; Cecum; Necrosis; Colectomy

INTRODUCTION

Acute colonic ischemia is frequently seen in the elderly population. It mostly develops in relation to atherosclerosis and low blood flow.^{1,2} Isolated cecal necrosis is a rare form of acute colonic ischemia and a rare cause of surgical abdomen.^{2,3} It generally presents with right lower quadrant pain and a manifestation similar to that of acute appendicitis clinically. These patients might have one or more accompanying diseases.³⁻⁸ Among these heart failure and chronic renal failure top the list. It generally has a bad prognosis since it is seen in elderly patients with accompanying diseases. Thirteen cases who were pre-diagnosed with acute abdomen and finally diagnosed with isolated cecal necrosis after operation have been evaluated alongside with literatures.

SUBJECTS AND METHODS

The records of 13 patients, who were seen to have isolated cecal necroses between 1995 and 2011 at Necmettin Erbakan University Meram Medical School's General Surgery Clinic (Konya, Turkey), were retrospectively evaluated.

The cases where the appendix was normal during the procedure, where the ischemia was only limited to the cecum (Figs. 1, 2), where no pathologies were detected in the other intraabdominal organs, and where necroses were histopathologically proven in the cecum were diagnosed as isolated cecal necrosis.

The patients were evaluated regarding their ages, complaints, the period when their complaints had begun, physical examination, the number of leucocytes, radiological findings, surgical incisions and surgical procedures, duration of hospitalization, morbidity and mortality. Long-term results

Received October 29, 2012. Revised March 5, 2013. Accepted March 25, 2013.

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Financial support: None. Conflict of interest: None.

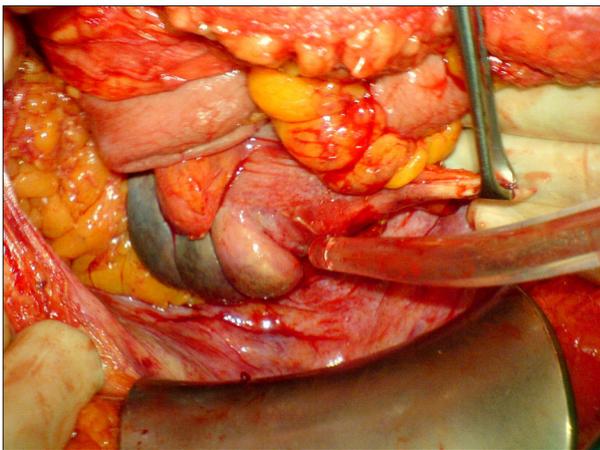


Fig. 1. Ischemic field (3×5 cm) on the cecal lateral wall.



Fig. 2. Ischemic outlook covering almost the entire cecum.

were obtained from file records and follow-up examination of the patients. All the patients were operated with acute abdomen diagnosis. All the patients were considered to have acute appendicitis for the pre-diagnosis before the surgical interventions.

Statistical analysis was performed by using SPSS software ver. 15.0 for Windows (SPSS Inc., Chicago, IL, USA). To test significance, Student's t-test was used for continuous variables and chi-squared or Fischer's exact test was used for categorical variables. A p-value of <0.05 was considered significant.

RESULTS

1. Clinical and diagnostic features

Eight of the patients were male, whereas 5 of them were female. Their mean age was 68 (51-84) years. The first com-

Table 1. Symptoms and Signs of Patients with Isolated Cecal Necrosis

| Symptom and sign | Data |
|--|----------|
| Abdominal pain or tenderness | 13 (100) |
| Distention | 8 (61.0) |
| Vomiting | 8 (61.0) |
| Muscular defense or rebound tenderness | 13 (100) |
| Fever | 7 (53.0) |
| Hypokinetic/akinetic bowel | 6 (46.1) |

Values are presented as n (%).

Table 2. Comorbid Diseases of Patients (n=13)

| Comorbid disease | Case |
|-------------------------------|----------|
| Heart failure | 6 (46.1) |
| Chronic kidney disease | 5 (38.4) |
| Hypertension | 3 (23.0) |
| Atrial fibrillation | 2 (15.3) |
| Diabetes mellitus | 2 (15.3) |
| COPD | 1 (7.6) |
| FMF | 1 (7.6) |
| Atherosclerotic heart disease | 1 (7.6) |
| Cerebrovascular disease | 1 (7.6) |

Values are presented as n (%).

COPD, chronic obstructive pulmonary disease; FMF, familial mediterranean fever.

plaint of all the patients was abdominal pain. The duration of complaints before visiting the hospital was an average of 3 (1-7) days. The main symptoms were abdominal pain in 13 patients (100%), abdominal distention in 8 (61%) and vomiting in 8 (61%). The main signs were abdominal tenderness in 13 patients (100%), muscular rigidity in 13 (100%), fever in 7 (53%) and hypokinetic/akinetic bowel in 6 (46%). The symptoms and signs are provided in Table 1.

All the patients had at least two accompanying disease the most frequent of which were heart failure and chronic renal failure (Table 2).

The leukocyte number of 11 patients was found to be over > 10,000. Radiological evaluation revealed that 3 patients had normal ultrasonography results, 5 had fluid in the right lower quadrant and contamination in the fatty planes as revealed by the ultrasonography. Two patients had thickening and inflammation in the cecal wall as seen in their abdominal computed tomography. The patients' laboratory findings and clinical characteristics including treatment modality are shown in Table 3.

Table 3. Laboratory Findings and Treatment Modality

| Age (yr) | Gender | WBC (/ μ L) | LDH (U/L) | CK (U/L) | CRP (mg/L) | Treatment | Complication | Perioperative mortality |
|----------|--------|-----------------|-----------|----------|------------|---------------------------------|------------------|-------------------------|
| 51 | M | 16,300 | 418 | 100 | 90 | Right hemicolectomy | | |
| 80 | M | 18,000 | 880 | 350 | 15 | Right hemicolectomy + ileostomy | | Yes |
| 51 | M | 18,000 | 400 | 330 | 120 | Right hemicolectomy | | |
| 69 | F | 13,400 | 317 | 55 | 84 | Right hemicolectomy | Wound infection | |
| 53 | F | 14,100 | 546 | 435 | 10 | Right hemicolectomy | | |
| 68 | F | 9,900 | 413 | 10 | 76 | Right hemicolectomy | | |
| 74 | M | 29,000 | 734 | 659 | 130 | Right hemicolectomy | | |
| 83 | M | 20,000 | 213 | 20 | 40 | Right hemicolectomy + ileostomy | Evisceration | Yes |
| 67 | M | 18,000 | 256 | 328 | 65 | Right hemicolectomy | | |
| 64 | M | 13,200 | 174 | 564 | 90 | Partial cecal resection | | |
| 72 | F | 21,300 | 756 | 46 | 60 | Right hemicolectomy | Anastomotic leak | Yes |
| 84 | F | 8,700 | 428 | 54 | 73 | Right hemicolectomy | Wound infection | Yes |
| 68 | M | 13,100 | 678 | 73 | 105 | Right hemicolectomy | | Yes |

WBC, white blood cell count.



Fig. 4. (A) Ischemic field (2×2 cm) on the cecal anterior wall. (B) Cecal wedge resection material by the help of stapler. (C) The outlook of the cecum following resection with stapler.



Fig. 3. Right hemicolectomy was performed because of cecal necrosis.

2. Surgical therapy

No patient in our series had perforation during the procedure and the abdomen was clean. Primary anastomosis (right hemicolectomy and ileotransversostomy) following resection (Fig. 3) was performed on ten patients. Right hemicolectomy, and ileostomy were performed on two patients because that the intestinal wall was over edematous and the general condition of the patients was not good. Cecal wedge resection with linear stapler was performed on one case in which necrosis was limited to the cecum and which was detected in the early phase (Fig. 4).

3. Morbidity and mortality

Post-operative surgery related complications included surgical site infections in two cases; anastomotic leak in one case, and evisceration in one case. The patients with surgical site infections were treated by antibiotic and daily dressings.

Table 4. Factors Affecting Postoperative Mortality

| Parameter | n | Mortality, n (%) | p-value |
|------------------------------|----|------------------|---------|
| Age (yr) | | | |
| < 65 | 5 | 0 | 0.024 |
| > 65 | 8 | 5 (62.0) | |
| Sex | | | |
| Male | 8 | 3 (37.0) | 0.928 |
| Female | 5 | 2 (40.0) | |
| Complaints start time (hour) | | | |
| > 24 | 4 | 4 (100.0) | 0.010 |
| < 24 | 9 | 1 (11.0) | |
| Leukocyte | | | |
| < 15,000 | 4 | 1 (25.0) | 0.506 |
| > 15,000 | 9 | 4 (44.0) | |
| CRP | | | |
| < 10 | 1 | 0 | 0.410 |
| > 10 | 12 | 5 (41.0) | |
| Comorbid diseases | | | |
| < 2 | 5 | 0 | 0.024 |
| ≥ 2 | 8 | 5 (62.5) | |

The patient with the anastomotic leak was reoperated and ileostomy with mucus fistula was opened up. The patient developed sepsis in the follow-ups and died on the postoperative day five. The patient with the evisceration was taken into surgery again. No pathologies were detected in the abdomen during the procedure. The patient's skin was closed up with retention stitches and was transferred to the intensive care unit. This patient also died due to sudden cardiac arrest about 24 hours following the second operation.

Five (38%) mortality cases were seen in the early postoperative period. When the risk factors regarding mortality were analyzed the period between the symptoms onset and the surgical procedure, age, and the number of accompanying diseases were significantly associated with mortality ($p < 0.05$). Sex, leukocyte, and CRP were not found to be effective factors on mortality ($p > 0.05$). Table 4 demonstrates the statistical analyses of the mortality cases.

DISCUSSION

Intestinal ischemia is divided into three main categories according to its clinical properties as acute mesenteric ischemia (AMI), chronic mesenteric ischemia, and colonic ischemia (ischemic colitis). AMI is not a clinical entity on its own but is a complex clinical situation that covers acute mesenteric arterial emboli and thrombus, mesenteric venous thrombus, and non-occlusive mesenteric ischemia.² Ischemic colitis is

the most frequently seen form of gastrointestinal ischemia.^{1,9} Isolated cecal necrosis may develop in accordance with the atherosclerotic or thromboembolic occlusion of the cecal artery. It has been argued that non-occlusive cecal necrosis develops in relation to open heart surgery, chronic heart disease, and hemodialysis.^{3,5,8,9} Hemodialysis patients have a greater risk of ischemic colitis because there is an increase in the incidence of arterial vascular diseases. In addition to this, hypotension is frequently seen during hemodialysis.^{3,4,10-12} Studies have also defined cecal necrosis related to cocaine abuse.¹²

The arterial feeding of the cecum happens by way of anterior and posterior cecal arteries, which are the terminal branches of the ileocolic artery. These terminal arteries are fed by the colic or the ileal branch of the ileocolic artery, or by an arc that might develop between these veins. The presence of an ileocolic vascular arc assumes an important role in the protection of cecal ischemia.¹⁰

Isolated cecal necrosis is a rare cause of surgical abdomen. Very few cases have been reported in literature and they are all case presentations.^{3,5,10,13} Total of 243 patients were operated at our clinic due to AMI and among these 13 had cecal necrosis.

Cecal necrosis patients frequently present with right lower quadrant pain, nausea, vomiting, and fever complaints. Leukocytosis is frequently present. Therefore, cecal necrosis clinically imitates acute appendicitis.³⁻⁷ The first complaint of all our patients was abdominal pain. They also had nausea and vomiting. The leukocyte level was over 10,000 in 11 patients. With these findings acute appendicitis was considered initially.

In cecal necrosis CT may reveal thickening of the cecal wall, intramural bleeding, increase in focal or diffuse intestinal diameter, mesenteric arterial thrombus, intestinal pneumatosis, portal or mesenteric venous gas, pneumoperitoneum, and intraabdominal free fluid.^{10,14}

Two of our patients showed cecal wall thickening and edema on CT scan, which helped preoperative differential diagnosis in our case series although it was not definite for the diagnosis of isolated cecal necrosis.

If the clinical history and evaluation of the patient directs the physician to suspect cecal necrosis, the patient needs to have emergency surgery. Laparoscopy may be performed for diagnosis and treatment. Laparoscopic partial cecal re-

section may be performed in appropriate cases.¹³ The appropriate incision type can be determined according to the diagnostic laparoscopy results. Mid-line incision is frequently preferred since it allows for the exploration of all the intra-abdominal organs and the intestines. Many authors suggest right hemicolectomy and anastomosis.^{3,5,7,9,12} There are also cases reported in literature with ileostomy following resection³ and partial cecal resection.¹³ We detected anastomotic leak only in one out of ten patients who had received resection and anastomosis. Therefore, we think that the most appropriate treatment form is anastomosis following resection.

There is an ample number of studies in literature. However mortality related to cecal necrosis is not seen in most studies.³⁻⁶ In contrast, mortality was detected only in a few studies.^{7,9} Mortality rate in our study was 38%. We think that the high rate of mortality in our study was related to the old age of the patients, the fact that there were many comorbid diseases, the fact that the patients were operated under emergency conditions, and the delay in the patients' presentation to the hospital.

Isolated cecal necrosis should be considered in the differential diagnosis in elderly patients with chronic diseases presenting with sudden right lower quadrant pains. It is more frequently seen in patients with heart failure and chronic renal failure. Radiological findings might not be specific in isolated cecal necrosis. Since isolated cecal necrosis is seen in elderly patients with accompanying diseases it has a bad prognosis. Right hemicolectomy and anastomosis are the appropriate surgical methods in treatment. Wedge resection, however, may also be considered in cases with more limited necroses. Therefore, early diagnosis is significant in order to reduce

morbidity and mortality.

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