

Intraoperative diagnosis of cecal diverticulitis during surgery for acute appendicitis: Case series

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ABSTRACT

Objective: Cecal diverticulum is a rare entity, and can cause acute abdomen by the way of diverticulitis and perforation of diverticulitis. In this study, we aimed to perform an analysis of patients that have cecal diverticulitis, and presented with acute abdomen.

Material and Methods: Patients who were admitted to emergency clinic between 2009-2012 and had acute abdomen due to cecal diverticulitis were included into study retrospectively.

Results: Six patients were included in the study with a mean age of 34 years (range 24-43). Four patients were male and two were female (male/female: 2). All six patients presented with abdominal pain, additional symptoms were nausea in five patients, and vomiting in one patient. The mean white blood cell count was 11.900/mm³ (5850-17.400/mm³), while the remaining laboratory results were normal. There were no specific findings on abdominal X-ray or ultrasonography. The surgical exploration revealed an inflamed cecal diverticulitis and normal appendix in all patients. Five patients underwent appendectomy and diverticulectomy. Right hemicolectomy was performed in one patient due to suspicion of malignancy. The early postoperative period was uneventful in all patients. The mean length of hospital stay was 4.5 days with a range of 2-6 days. Histopathological examination showed acute perforated diverticulitis with underlying true diverticulum in three patients, and true diverticulum with acute diverticulitis in the remaining three patients.

Conclusion: Pre-operative diagnosis of cecal diverticulitis is challenging due to symptoms and signs that resemble acute appendicitis. Diverticulectomy and incidental appendectomy is the treatment of choice in uncomplicated cases.

Keywords: Cecum, diverticulitis, acute abdomen, acute appendicitis

INTRODUCTION

The incidence of cecal diverticulitis within patients diagnosed with diverticulum is between 0.9 to 5% in Western countries. Cecum diverticulum can appear either as an incidental finding during surgery or as a complicated clinical presentation. Cecum diverticulum is usually asymptomatic and clinically presents with similar signs and symptoms with acute appendicitis when complicated (1).

Appendectomy for a preliminary diagnosis of acute appendicitis is the most commonly performed emergency surgery, and cecal diverticulitis (CD) is detected in about 1/300 appendectomies. Cecum diverticulum can present with acute abdomen in case of diverticulitis or perforation (2-4). The incidental detection of cecum diverticulum during appendectomy for acute appendicitis can lead to some uncertainty in terms of the extent of surgical treatment. Performing concurrent appendectomy and extending the resection to right hemicolectomy in complicated cases are controversial issues (3, 5, 6).

In this study, we aimed to analyze patients with CD that was incidentally encountered intraoperatively in the differential diagnosis of acute appendicitis.

MATERIAL AND METHODS

Patients who presented with acute abdomen to our clinic between 2009-2012, who underwent surgery for a preliminary diagnosis of acute appendicitis and were diagnosed intraoperatively with CD were retrospectively analyzed. Demographic characteristics, causes of hospital admissions and their past medical histories were recorded. Preoperative laboratory and radiological evaluations were also reviewed. Operative findings, surgical methods, early postoperative follow-up and pathologic examination results were evaluated. All patients were re-evaluated six months after surgery and their follow-up examinations were recorded.

Statistical Analysis

Data were analyzed by descriptive statistics. Mean and standard deviations were used for continuous variables, and percentage and numbers for categorical data.

RESULTS

During the study, 1163 surgeries were performed for acute appendicitis. The study group consisted of 6 (0.5%) patients. Their mean age was 34 years (range: 24-43). Four patients were male and two were female (male / female: 2). The main complaint in all hospitalized patients was abdominal pain, five

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patients also had nausea and one had vomiting. Their past medical and surgical histories were uneventful. Five patients had elevation in their white blood cell count, and the white blood cell count was normal in one patient. The mean white blood cell count was $11,900 \pm 4,100/\text{mm}^3$, ranging from 5850 and $17,400/\text{mm}^3$. Other laboratory tests were within normal limits. Two female patients who underwent preoperative gynecologic obstetric evaluation did not have any emergent gynecologic pathology. The data of all patients are shown in detail in Table 1.

Abdominal ultrasound was performed in all patients for diagnostic imaging. Ultrasound findings were in favor of acute appendicitis in four patients and of perforated appendicitis in two patients. All patients underwent emergency surgery for acute abdomen. No patient underwent computed tomography (CT) since there was no doubt in the preliminary diagnoses. Four patient's surgery was performed with Mc-Burney incision until the end. In two patients, the operation was started with diagnostic laparoscopy and was completed with an infra-umbilical midline incision. The appendix was macroscopically normal during surgery in five patients, a diverticulum was detected on the cecum and diverticulectomy along with incidental appendectomy was performed. In a patient, whether the mass over the cecum was a diverticulum or a tumor could not be differentiated during surgery, which was perforated. Therefore, a right hemicolectomy was applied. Patients' early postoperative follow-up was uneventful. The mean length of stay was 4.5 days, with an interval of 2-6 days. On histopathologic examination, three patients had acute perforated diverticulitis in a true diverticulum while the other three patients had acute diverticulitis in a true diverticulum. The histopathology of the appendix revealed lymphoid hyperplasia in three patients, focal acute appendicitis in two patients, and acute suppurative appendicitis in one patient. In cases with pathologically detected focal appendicitis, appendicitis was not suspected during surgery. There were no problems in any patient in the 6th month follow-up evaluation. Patients were informed on requirement for a colonoscopy during follow-up. Four patients had a colonoscopy (Table 2). The patients are still being followed-up.

DISCUSSION

Cecal diverticulum results from pulsion of the cecum in the 6th week of pregnancy. Cecal diverticulum was first described by Potier in 1912 (1). It can be seen in two ways: congenital and acquired. Congenital diverticulum is a true diverticulum containing all layers of the cecum, while an acquired diverticulum is a false diverticulum that does not contain the muscular layer (1, 2, 5). Cecal diverticulum is frequently detected in younger age groups and its incidence varies among Western and Asian populations (1, 2).

The incidence of right colon diverticulum among all patients with diverticulosis is between 60-80% in the Asian population. Although it is generally asymptomatic it may present with complications such as inflammation, hemorrhage and perforation.

Colonoscopy is a valuable diagnostic tool in the diagnosis of diverticulum. It is possible to determine some diverticulum by colonoscopy that is not mentioned in computerized tomography reports. The reasons for CT under-reporting are reported as the limited number of diverticuli and absence of inflammation (7).

Cecal diverticulitis is a rare condition that may cause acute abdomen. Its signs and symptoms resemble acute appendicitis and therefore it is difficult to diagnose before surgery. It may be associated with right iliac fossa pain, fever, and leukocytosis. Cecal diverticulitis should be suspected in patients with longer duration of symptoms and reduced frequency of nausea and vomiting (4, 5). In our study, the prominent complaint was abdominal pain. Nausea and vomiting was only observed in one patient.

Table 2. Colonoscopy results

| | Colonoscopy findings | Biopsy |
|-----------|---|---------------------|
| Patient 2 | Diverticulum and polyp in the sigmoid colon | Polipectomy: benign |
| Patient 4 | Polyp in the transverse colon | Polipectomy: benign |
| Patient 5 | Normal | None |
| Patient 6 | 2 diverticuli in the sigmoid colon | None |

Table 1. Demographic characteristics and details of patients

| | Age | Gender | WBC (/mm ³) | Incision | Surgery | Pathology-appendix | Pathology-diverticulum | Hospital stay (days) |
|-----------|-----|--------|-------------------------|--------------------------------|--|--------------------------------|---------------------------------|----------------------|
| Patient 1 | 28 | Male | 17.400 | Diagnostic laparoscopy, median | Diverticulectomy and incidental appendectomy | Acute focal appendicitis | Acute perforated diverticulitis | 5 |
| Patient 2 | 36 | Male | 10.260 | Mc-Burney | Diverticulectomy and incidental appendectomy | Lymphoid hyperplasia | Acute diverticulitis | 2 |
| Patient 3 | 24 | Male | 14.480 | Mc-Burney | Diverticulectomy and incidental appendectomy | Acute focal appendicitis | Acute perforated diverticulitis | 5 |
| Patient 4 | 43 | Male | 9.730 | Mc-Burney | Diverticulectomy and incidental appendectomy | Lymphoid hyperplasia | Acute diverticulitis | 5 |
| Patient 5 | 32 | Female | 13.680 | Diagnostic laparoscopy, median | Right hemicolectomy | Acute suppurative appendicitis | Acute perforated diverticulitis | 6 |
| Patient 6 | 41 | Female | 5850 | Mc-Burney | Diverticulectomy and incidental appendectomy | Lymphoid hyperplasia | Acute diverticulitis | 4 |

Preoperative diagnosis is difficult in emergent cases especially if advanced imaging modalities such as CT have not been performed. Especially ultrasound and CT are helpful in the early stages of the disease in patients with suspicion of diverticulosis. The major sonographic finding is an oval, round, hypoechoic focus sign protruding from the segmental thickened colon wall (1, 6). Patients with suspicion of diverticulitis may undergo CT. Wall thickening and pericolonic contamination may be more prominent on tomography. These findings may be associated with abscess formation in the advanced stages of the disease. CT is also effective in showing complications such as fistula or abscess. These methods may guide treatment in small intestine and large intestine diverticulitis perforations (8). Most surgeons prefer contrast enhanced examinations in patients with suspicion of diverticulitis. Perforation can be proven in this way in the emergency setting (9). In our clinics, abdominal ultrasound is routinely performed within the diagnostic algorithm of patients with suspicion of acute appendicitis, and CT is only performed in equivocal findings. In all patients in this study, physical examination and ultrasound findings were sufficient for a preliminary diagnosis of acute appendicitis, and CT scan was not obtained in any patient.

It is recommended that appendectomy should be performed together with diverticulectomy in patients with CD detected during surgery (1). Rarely, right hemicolectomy may be required in some specific and suspicious circumstances. Second generation cephalosporins and metronidazole should be continued for at least three days after surgery in patients undergoing appendectomy and diverticulectomy (5, 6).

In CDs detected prior to surgery or by diagnostic laparoscopy, if the appendix is normal and there is no CD perforation then the question is "can these patients be followed-up with nonoperative treatment similar to left colon diverticulitis?". Nonoperative management is being increasingly used and thus can provide an affirmative answer to this question. However, since diagnosis before surgery is very difficult and there is a high likelihood of perforation, implementation of nonoperative treatment does not seem practical. We think that in new studies, uncomplicated CD cases will be followed-up nonoperatively like uncomplicated diverticulitis of the sigmoid.

Chou et al. (10) classified CD depending on the degree of inflammation. Grade 1 refers to inflamed diverticulitis, Grade 2 to inflamed cecal mass, Grade 3 to localized abscess and fistula, Grade 4 to diffuse peritonitis or free perforation. While diverticulectomy is sufficient for Grade 1 and 2 disease, right hemicolectomy is recommended for Grade 3 and 4 (10, 11).

Preoperative diagnosis of CD can only be achieved in 1% of patients. In 90% of cases they are operated on for a preliminary diagnosis of acute appendicitis. It is difficult to distinguish diverticular disease from acute appendicitis or perforated cecal tumor. The reported rate of intraoperative accurate diagnosis is between 65% and 89% (12-14). All of our patients were operated with a preoperative diagnosis of acute appendicitis. One patient who was considered to have perforated cecal tumor underwent right hemicolectomy. In our series, the pathologic examination of patients with

diverticulitis perforation revealed focal appendicitis in one and suppurative appendicitis in two cases. This finding was thought to occur secondary to perforation.

In patients with acute abdominal symptoms and suspicion of CD, diagnostic laparoscopy can guide the incision to be used. Performing appendectomy in addition to diverticulectomy is considered as an appropriate surgical treatment. As in one of our patients, in case of suspicion of a tumor, if anastomosis and repair are not technically feasible, in case of perforation risk and severe surrounding tissue inflammation then right hemicolectomy will be a more appropriate surgical option.

CONCLUSION

Preoperative diagnosis of CD is challenging since the signs and symptoms are similar to acute appendicitis. Diverticulectomy and incidental appendectomy are the preferred method of treatment in uncomplicated cases. Right hemicolectomy is a recommended treatment option in complicated patients or those suspicious for tumor during surgery.

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