



Contents lists available at ScienceDirect

American Journal of Emergency Medicine

journal homepage: www.elsevier.com/locate/ajem

Second date appendectomy: Operating for failure of nonoperative treatment in perforated appendicitis

Marco Lotti, MD

Advanced Surgical Oncology Unit, Department of General Surgery 1, Papa Giovanni XXIII Hospital, Bergamo, Italy

ARTICLE INFO

Article history:

Received 29 December 2016

Accepted 29 December 2016

Available online xxxx

Keywords:

Laparoscopic appendectomy

Appendicitis

Antibiotics appendicitis

ABSTRACT

Background: Nonoperative treatment of acute appendicitis is embraced by many surgical teams, driven by low to moderate quality randomized studies that support noninferiority of antibiotics versus appendectomy for treatment of acute uncomplicated appendicitis. Several flaws of these studies have emerged, especially in the recruitment strategy and in the diagnostic criteria that were used. The growing confidence given to antibiotics, together with the lack of reliable criteria to distinguish between uncomplicated and perforated appendicitis, exposes patients with perforated appendicitis to the likelihood to be treated with antibiotics instead of surgery. Among them, those patients who experience a temporary relief of symptoms due to antibiotics, followed by early recurrence of disease when antibiotics are discontinued, are likely to undergo appendectomy at their second date. Second date appendectomy, i.e. the removal of the appendix when acute inflammation relapses within the scar of a previously unhealed perforated appendicitis, is the unwanted child of the nonoperative treatment and a new challenge for both the surgeon and the patient.

Methods: Between June and July 2016, two patients were readmitted and operated for failure of nonoperative treatment with antibiotics.

Results: A video is presented, which focuses on the different anatomic presentation and technical challenges between prompt and second date laparoscopic appendectomy.

Conclusions: When proposing nonoperative treatment for acute appendicitis, surgeons should be aware and inform their patients that if the appendix is perforated and an incomplete healing and early recurrence occur, a second date appendectomy could be a more challenging operation compared to a prompt appendectomy.

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1. Introduction

In the recent years, the availability of a large number of broad-spectrum antibiotics has led to an increasing interest for nonoperative treatment of uncomplicated acute appendicitis, which has become the preferred first-line treatment strategy for many surgical teams.

This strategy has been driven by some low to moderate quality randomized studies, that support noninferiority of antibiotics versus appendectomy for treatment of acute uncomplicated appendicitis [1–7]. However, several flaws of these studies have been pointed out, especially in the recruitment strategy (i.e. the information given to the patients to achieve their consent) and in the diagnostic criteria that were used [8–9]. These flaws include inconsistent diagnostic criteria, high cross-over rates, absence of patient-reported outcomes assessment, and small homogenous study populations, all of which limit generalizability to a broad population. Moreover, minimal information was provided on the success of treating recurrent episodes of appendicitis with antibiotics during the follow-up period [8].

The growing confidence given to antibiotics, together with the lack of reliable criteria to distinguish between uncomplicated and perforated appendicitis, exposes patients with perforated appendicitis to the likelihood to be treated with antibiotics instead of surgery [1,10–12]. The increasing use of broad-spectrum antibiotics in these patients, which are often required for a longer time than in patients with uncomplicated appendicitis, could have some adverse effects.

The first adverse effect, which is well recognized, is the promotion of the emergence of resistant organisms, as well as *C. difficile* infections [9]. The second adverse effect, which is still not well recognized and reported, is the attenuation not resolution of the disease process, which leads to discontinuation of the antibiotic therapy when symptoms are settled but the focus of infection (i.e. the gangrene and/or perforation of the appendix) is still not dominated [2]. As a consequence, those patients with perforated appendicitis who experience a temporary relief of symptoms due to antibiotics, followed by early recurrence of disease when antibiotics are discontinued, are likely to undergo appendectomy at their second date.

Second date appendectomy is the unwanted child of the nonoperative treatment and a new challenge for both the surgeon and the patient, because it involves the removal of the appendix when acute

E-mail address: im.marco.lotti@gmail.com.

inflammation relapses within the scar of a previously unhealed perforated appendicitis. Several studies have shown that, when a focus of peritoneal infection and inflammation persist, fibroblast and endothelial cell proliferation is observed after 3–5 days [13,14]. It is recognized that the mesothelium covering the small bowel represents the major part of the fibrinolytic capacity of the peritoneal cavity: therefore, when a perforated appendix is covered by the terminal ileum the destruction of the mesothelium due to infection leads to the loss of dismantling of the fibrin exudate, which becomes organized as a cocoon covering the appendix and the surface of the terminal ileum [15]. Also, unresolved infection is associated with intense fibrosis and a thicker abscess wall [16].

The aim of this brief report is to put in evidence the challenges of the second date appendectomy, when facing the perforated appendix in the context of fibrosis, as a result of peritoneal infection that is not eradicated by antibiotics.

2. Methods

Between June and July 2016, two patients were readmitted a few days after their discharge and operated for failure of their nonoperative treatment with antibiotics. Both patients experienced a temporary relief of symptoms followed by early recurrence. Patient characteristics are shown in Table 1.

3. Results

Both patients underwent second date laparoscopic appendectomy after failure of their initial nonoperative treatment, and experienced complete recovery after their operation. Details of treatment and outcomes are shown in Table 2.

Intense fibrosis involving the appendix and the ileocecal region was observed in both patients, which made the dissection and pursuit of the appendix particularly challenging (Figs. 1, 2). The video recording of both operations was retrospectively analyzed and a short video is presented herein, which focuses on the different anatomic presentation and technical challenges between prompt and second date laparoscopic appendectomy (Supplementary Video). Relative positions between the appendix and the adjacent structures are shown in the video and the risks of their dissection are pointed out.

4. Discussion

The local acute inflammatory response to an initially localized intra-abdominal infectious process in the normal sterile peritoneum is called intra-abdominal sepsis and is one of the most important defense mechanisms of the organism, which tends to control a septic process by focusing the local inflammatory host defense to eliminate or isolate the insult and to avoid systemic dissemination. Fibrinogen is one of the

Table 2
Treatment and outcomes.

	Patient 1	Patient 2
Initial nonoperative treatment	Ertapenem 1 g i.v. qd for 5 days, then Amoxicillin/Clavulanate 875/125 mg tid for 5 days	Ertapenem 1 g i.v. qd for 3 days, then Amoxicillin/Clavulanate 875/125 mg tid for 5 days
Time of recurrence (days after the discontinuation of antibiotics)	2	45
Symptoms at recurrence	Right iliac fossa pain and tenderness, nausea and vomiting	Right iliac fossa pain and tenderness, nausea and vomiting
White blood cell count	11,460/ml	9960/ml
Neutrophils count and %	8250/ml (72%)	6440/ml (65%)
C reactive protein	4.9 mg/dl	6.0 mg/dl
US findings	Non-compressible, enlarged appendix (diameter 10 mm) with loss of the expected multilayered appearance, surrounded by a 4 cm fluid collection; swelling of the terminal ileum	Non-compressible, oedematous appendix (diameter 15 mm) surrounded by free fluid
Treatment of recurrence	Laparoscopic appendectomy	Laparoscopic appendectomy
Duration of the operation (minutes)	90	155
Postoperative complications	Prolonged postoperative ileus due to oedema of the terminal ileum	Temporary postoperative ileus due to cecal wall thickening
Histology	Gangrenous appendicitis	Gangrenous appendicitis
Discharge (days after the operation)	7	3
Complete recovery (days after the operation)	14	10

major acute-phase proteins produced in response to intra-abdominal sepsis and it contributes to the isolation of a septic focus: fibrinogen activation produces fibrin deposition, which acts as a temporary scaffold for collagen formation.

In presence of a septic focus, starting from day 3 to 5 the collagen is deposited in a dense, concentrated pattern, taking up almost all of the space of the extracellular matrix and producing a thick layer extending through to the serosal surfaces [13,14]. To counteract the obliteration of the peritoneal cavity it lines, mesothelium has the ability to secrete prostacycline, lubricant surfactant, and tissue plasminogen activator: the activation of fibrinolysis assumes a role of importance in the controlled removal of fibrinous exudates from the surfaces of the peritoneal

Table 1
Patient characteristics.

	Patient 1	Patient 2
Sex and age	Male, 51 years	Male, 29 years
Symptoms at first episode	Right iliac fossa pain and tenderness, fever, vomiting	Right iliac fossa pain and tenderness, nausea
White blood cell count	13,660/ml	11,490/ml
Neutrophils count and %	11,370/ml (83%)	8760/ml (76%)
C reactive protein	13.7 mg/dl	2.4 mg/dl
US findings	Non-compressible, enlarged appendix (diameter 23 mm) with oedema, surrounded by free fluid	Oedematous appendix (diameter 11 mm) surrounded by free fluid
Comorbidities	None	None

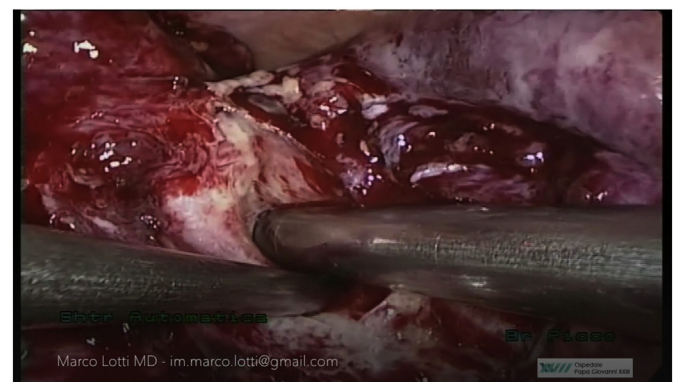


Fig. 1. The terminal ileum and its thickened mesentery are encased by fibrosis.

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