

Case Report

A rare postoperative complication of perforated appendicitis: necrotizing fasciitis

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Abstract: Perforated appendicitis is a type of acute appendicitis with a morbidity rate of 15.8%. In addition, potentially fatal postoperative complications associated with laparoscopic appendectomy for perforated appendicitis may occur with wound infections comprising 15.2% of such complications. Herein we report a case in which a 35-year-old woman presented with acute appendicitis in the clinic. After failure with conservative treatment, laparoscopic appendectomy was performed. Five days after the operation, the patient developed necrotizing fasciitis which was then treated with surgical debridement. After ten days of conservative treatment with intravenous antibiotics and forty days of modified vacuum sealing drainage, the patient attained full recovery. This case represents a potentially fatal postoperative complication of perforated appendicitis which is especially rare. Retroperitoneal inflammation and/or abscesses may cause necrotizing fasciitis through lumbar triangles, which are two weak areas in the loin. Therefore, modified vacuum sealing drainage is a simple and effective treatment to treat necrotizing fasciitis.

Keywords: Necrotizing fasciitis, perforated appendicitis, postoperative complication, lumbar triangles, vacuum sealing drainage

Introduction

Appendicitis is one of the most common abdominal surgical emergencies usually managed by appendectomy. Perforated appendicitis is a type of acute appendicitis with a morbidity rate of 15.8% [1-3]. Postoperative complications occur in approximately 29% of patients [2]. Compared to other complications, necrotizing fasciitis (NF) is an exceptionally rare event [4]. Although the incidence is relatively low, NF is a life-threatening soft tissue infection associated with high mortality (6%-76%) [5]. Rouse et al. reported that prompt recognition and treatment of NF is essential [6]. However, since there are no specific clinical features associated with NF, it is often difficult to make an early-stage diagnosis [7]. Additionally, no standard approach is available for managing NF caused by perforated appendicitis. This case report describes a rare postoperative complication of perforated appendicitis and emphasizes the feasibility of a modified vacuum sealing drainage device for effective postoperative treatment of NF.

Case presentation

The patient was a 35-year-old woman whose chief complaint was right-sided abdominal pain. She had no significant medical history. After 5 days of conservative treatment with intravenous antibiotics in the clinic, her situation showed no improvement.

On admission, her body temperature was 37.0°C; blood pressure, 118/60 mmHg; and pulse rate, 96 beats/min. Physical examination revealed a tender mass (5×6 cm in size) in the right iliac fossa. Her laboratory data on admission were: white blood cell count, $25.2 \times 10^9/L$ (neutrophils: 89.2%); hemoglobin, 135 g/L; creatine, 65 $\mu\text{mol/L}$. Computed tomography (CT) of the pelvis showed a perforated appendix surrounded by gas and a fluid collection. The perforation was confirmed by laparoscopic exploration, which showed that the appendix had been perforated and had developed a great deal of fester around appendix and ascending colon (**Figure 1A** and **1B**). Emergency surgery, which included a laparoscopic appendectomy, was performed. During the procedure, the root

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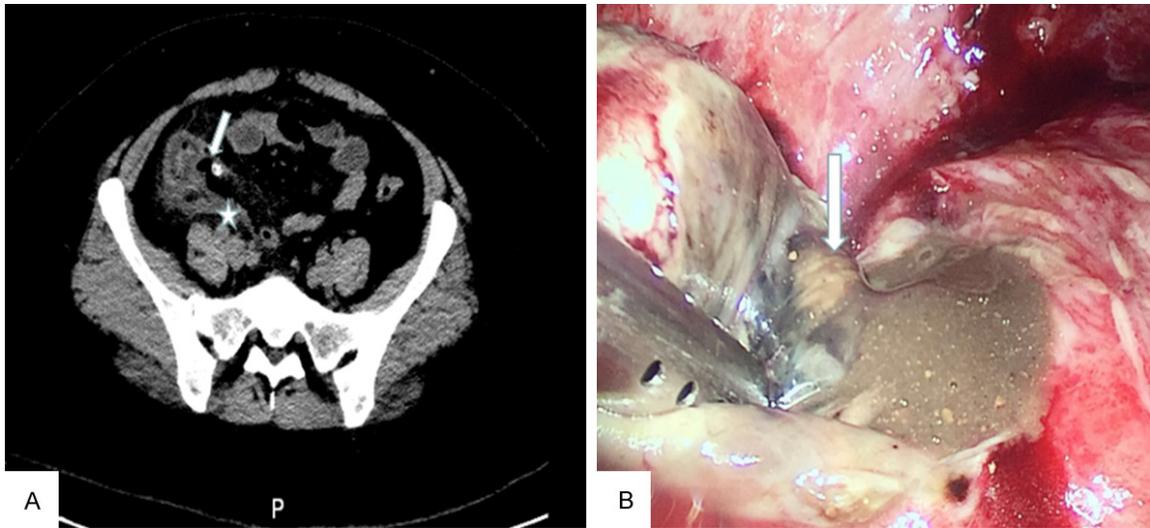


Figure 1. A. Computed tomography performed on the patient's admission shows a perforated appendix (white arrow) and gas and fluid collection around the appendix (white asterisk). B. Laparoscopic exploration shows the perforated appendix (white arrow).

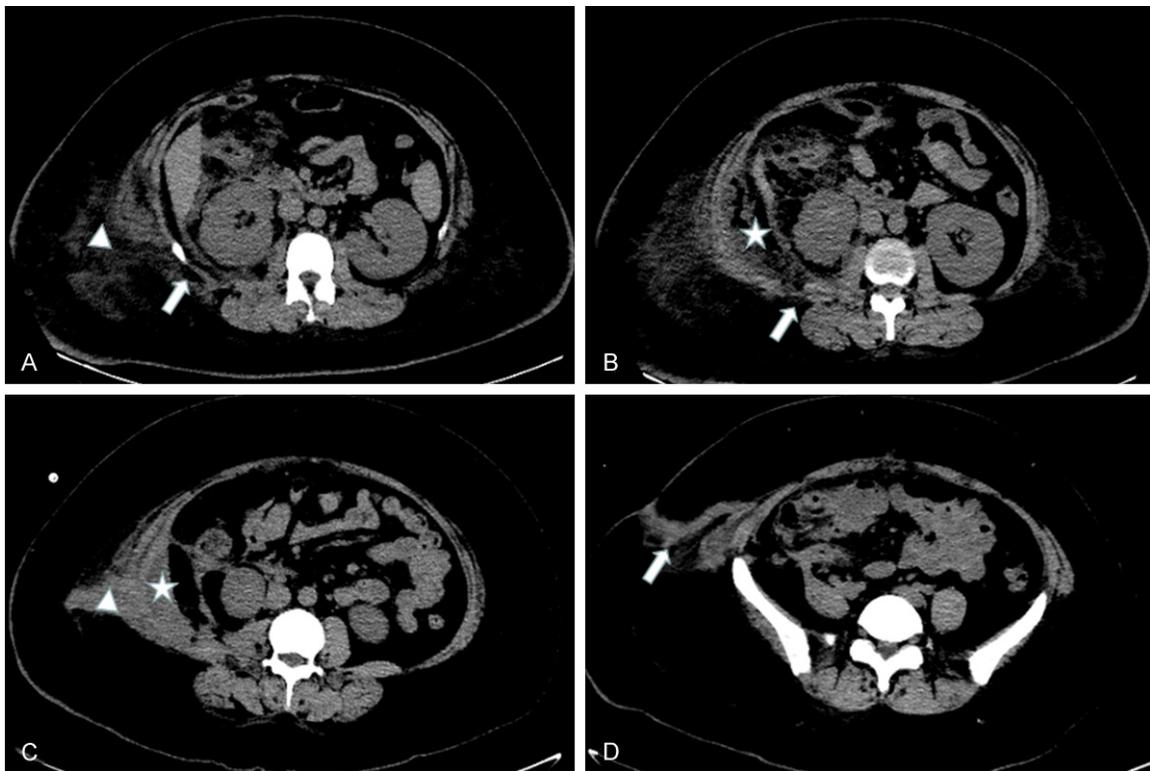


Figure 2. A. A second computed tomography scan shows gas and fluid collection in the right loin (white triangle) through the superior lumbar triangle (white arrow). B. Abscess formation in the retroperitoneum (white asterisk) and the inferior lumbar triangle (white arrow). C. Computed tomography before the patient left the hospital shows that the abscess was absorbed (white asterisk) and the gas and liquid collection cleared (white triangle). D. The incision had healed (white arrow).

of the appendix was clipped, and the appendix was removed. Peritoneal lavage and intrave-

nous antibiotics (moxifloxacin 0.4 g/day) were continued.



Figure 3. The picture of modified vacuum sealing drainage.

Over the next 5 days, the patient's condition declined. She developed a higher fever ($>39.0^{\circ}\text{C}$), superficial abdominal pain, and her C-reactive protein levels increased to 200 mg/dL. Another CT scan showed an abscess formation in the retroperitoneum along with gas and fluid collection extending from her retroperitoneal cavity to the subcutaneous layer of her right loin (**Figure 2A** and **2B**). Surgical debridement was performed. A 10-cm right incision was made in her right loin. Pus and foul-smelling gas were released, and necrotic tissue was also present which was cleared to the best of our ability using two indwelling drainage tubes. During subsequent fresh dressing changes for the wound, it was flushed with 0.2% metronidazole and reserved 10 minutes within the wound. Based on this clinical manifestation, including the location of the necrotic tissues, CT imaging findings and the foul-smelling gas production, the complication was identified as NF.

Bacterial culture of the pus revealed *Escherichia coli*. Antibiotic sensitivity tests showed that the most sensitive antibiotic was meropenem and therefore we switched her treatment to meropenem (2 g/day). Over the preceding 3 days after the secondary surgery, the white blood cell count decreased. However, the pain in right loin was severe and an area of erythema grew larger in size. The drainage tube was then changed to a modified vacuum sealing drainage which improved the effectiveness of the flushing capability compared to a regular vacuum sealing

drainage (**Figure 3**). The modified device flushed the wound with 0.9% physiological saline while keeping the drainage tube open. The drainage tube and flushing apparatus were then placed in the lowest area of the right inferior lumbar triangle, which dramatically improved the status of her right loin. Considering the complications associated with long-term administration of antibiotics, after 10 days of meropenem and three respective readings of a similar white blood cell count ($11.1 \times 10^9/\text{L}$, $12.3 \times 10^9/\text{L}$, $11.2 \times 10^9/\text{L}$), meropenem was stopped. Conservative treatment was then

continued using the modified vacuum sealing drainage for the next 30 days. CT revealed retroperitoneal abscesses absorption and the gas and liquid collection in the loin was cleared (**Figure 2C**). The incision healed (**Figure 2D**) and the patient was then discharged from the hospital.

Discussion

NF is a fatal and rapidly progressive infection that attacks superficial as well as deep fascia, subcutaneous fat tissue, and muscle [6, 7]. The incidence is relatively low, but the mortality rate is high, with an average of 30% [8]. To our knowledge, cases reporting on the occurrence of NF postoperatively are rare and there is no standard approach for this disease's management [9].

No distinctive clinical or physical examination can be performed to assess for NF and consequently, identifying the spreading of the soft tissue infection associated with the early stage of NF is challenging. However, early-stage diagnosis is vital for the treatment of NF [9, 10]. CT may provide some useful information to help confirm the diagnosis of a soft tissue infection and will be more effective when an air fluid level is found. To obtain a final diagnostic confirmation or exclude the diagnosis of NF surgical exploration must be performed with a histological and microbiological workup [10]. We identified NF based on erythema and swelling of the right loin, the CT which showed an air and fluid col-

lection, and by finding subcutaneous necrotizing tissues during the surgery, which resulted in subsequent histological and microbiological workup.

NF is found most frequently in the abdominal wall and is predominantly a postoperative complication of abdominal surgery. The causes of NF include appendicitis, incarcerated hernia, colocolic fistula, and perforated viscus [6]. In our case, NF presented as a postoperative complication of appendicitis, which is rarely reported and usually associated with perforation [9]. The role of the lumbar triangles should be emphasized for understanding the development of a retroperitoneal abscess and NF. There are two weak areas in the loin: the superior lumbar triangle (triangle of Grynfeltt-Lesshaft) and the inferior lumbar triangle (triangle of Petit). Because muscular layers are lacking within these triangles, the areas are relatively weak and unusual traumatic lumbar hernias are known to occur through them [9, 11, 12]. Retroperitoneal abscesses, caused by perforated appendicitis, can also lead to NF in the loin by passing through the two triangles. Based on a bacteriologic culture analysis, NF is classified into two types: type 1 is polymicrobial as it involves more than one type of bacteria; type 2 is monomicrobial as it consists of only a single type of bacteria. The pathogenesis of NF is more often polymicrobial and is associated with a morbidity rate of 69% [4, 6]. Based on the bacterial culture of the pus in our case, the NF was type 2 and only a single type of bacteria, *Escherichia coli.*, was present.

Maintaining hemodynamic stability by aggressive resuscitation should be initiated immediately when conditions permit. Antibiotic therapy is the key treatment for both polymicrobial and monomicrobial infections, but we should be vigilant for the complications of long-term administration of antibiotics [13]. Surgery is the primary treatment for NF and early-stage surgical debridement is a life-saving procedure [6]. Some studies have indicated that early diagnosis significantly improves the prognosis of patients with NF. Studies also show that outcomes improve with early and aggressive debridement [6, 9, 10]. The scope and spread of infection may be rapid and the boundary of tissues in need of debridement will increase without prompt surgical debridement. Additionally,

without prompt surgical debridement, severe sepsis and multiple organ failure may also occur leading to death [6, 9]. Regeneration of soft tissue can only begin once all the affected tissue is cleared. Otherwise, the condition remains as a progressive skin necrosis and the patient will require another debridement. In our experience, the use of modified vacuum sealing drainage provided a significant improvement of the soft tissue infection and decreased the frequency of reoperation. Modified vacuum sealing drainage can continuously remove fluid from open wounds so that the surface of the infected area stays clean preventing the boundary of infection from increasing. Modified vacuum sealing drainage can therefore improve the prognosis of NF and help decrease the patient's hospital stay [14]. Once NF is identified, modified vacuum sealing drainage should be promptly applied. It is also important to keep in mind that the end of the tube should be placed within the lowest area of the lumbar triangles for the most effective outcome.

Conclusions

NF as a postoperative complication of perforated appendicitis is rare but fatal. Additionally, more attention should be paid to the role of the lumbar triangles in the development of a retroperitoneal abscess and/or NF. If the patient's postoperative situation does not improve after actively administering conservative treatment, timely surgical debridement should be considered before life-threatening complications occur. The boundary of erythema could be a simple and effective indication to judge the patients' situation. Early-stage diagnosis, antibiotic therapy, and timely surgical debridement are the typical conventional treatments of NF. Modified vacuum sealing drainage can serve as an effective approach to improve the prognosis remarkably and decrease the patient's hospital stay. Although appendicitis is a common disease, vigilance is required for treating rare but fatal complications.

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patients in this study and approval for these studies was obtained through the institutional Ethics Committee.

Disclosure of conflict of interest

None.

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