

CASE REPORT

Clostridium perfringens: a rare cause of postoperative septic shock

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Abstract

Postoperative infections with *Clostridium perfringens* are rare. We report a case of a 59-year-old male, admitted to our ICU for postoperative monitoring after an elective retroperitoneoscopic radical nephrectomy. This patient developed septic shock within 22 hours after laparoscopic surgery. Due to clinical deterioration, he was intubated and taken to the operating room, after a CT scan was performed. Surgery revealed an infected retroperitoneal haematoma, which was drained. Cultures identified *C. perfringens* as the causative pathogen. Postoperative *C. perfringens* infection is potentially life-threatening and rapid antibiotic treatment and surgical drainage play a pivotal role in its management.

Introduction

Postoperative infections with *Clostridium perfringens* are rare but have been reported.^[1-4] *C. perfringens* is an anaerobic, spore forming, Gram-positive rod,^[5] present in nature and often found as a normal component of the human intestinal flora. It has an optimal growing temperature of 37 °C. It is the main cause of clostridial myonecrosis after traumatic injury, an acute and very painful infection in which muscles and subcutaneous tissues become filled with gas and exudate. Occasionally, this clinical picture can be caused by other Clostridial subtypes as well (*C. novyi*, *C. septicum*, *C. histolyticum*, *C. bifermentans* and *C. fallax*). Clostridial myonecrosis is more commonly known as gas gangrene. Gas gangrene is a key symptom and is easily confused with the usual intraoperative gas used during laparoscopic surgery. It is of the utmost importance to consider *C. perfringens* in a patient with fulminant septic shock and intraperitoneal and/or retroperitoneal gas post laparoscopic surgery, because patients may die before the diagnosis of gas gangrene has been made. To our knowledge, we present the first case of *C. perfringens* infection after a retroperitoneoscopic radical nephrectomy.

Case report

Our 59-year-old patient was admitted to our ICU after left-sided retroperitoneoscopic nephrectomy. Surgery was indicated because of suspected renal cell carcinoma. Past medical history of this patient includes: right-sided nephron-urethrectomy due to urothelial cell carcinoma and chronic intermittent haemodialysis, diabetes and morbid obesity. To remove the specimen at the end of the surgical procedure, a lumbotomy was performed. No perioperative antibiotic prophylaxis was given. The surgical procedure was uncomplicated so far and the patient was extubated in the operating room, prior to transfer to the ICU. On admission to the ICU, the only symptoms were local postoperative pain and hypotension (80/40 mmHg). This low blood pressure was within the normal range for this patient and had frequently been reported prior to haemodialysis sessions. Approximately 20 hours after arrival on the ICU, he developed progressive local pain, fever, chills and bruise-like coloration of the skin. The blood pressure dropped further, and the patient became unresponsive. Physical examination revealed subcutaneous emphysema in the left flank. Noradrenaline was started through a central line, empirical antibiotic therapy (piperacillin/tazobactam 4500 mg 3 times daily) was commenced and one dose of gentamycin (6 mg per kg) was administered. Hydrocortisone (100 mg 3 times daily) was added because of the septic shock. Blood cultures were drawn before starting antibiotic therapy. The patient was intubated later that day.

A CT scan (*figure 1*) was performed and confirmed subcutaneous emphysema in the left flank. Furthermore, free air was seen in the intra-abdominal and left renal fossa space, with some fluid, but no signs of an abscess. The subcutaneous emphysema and intraperitoneal and retroperitoneal air were interpreted as post laparoscopic surgery. After consulting with the urologist,

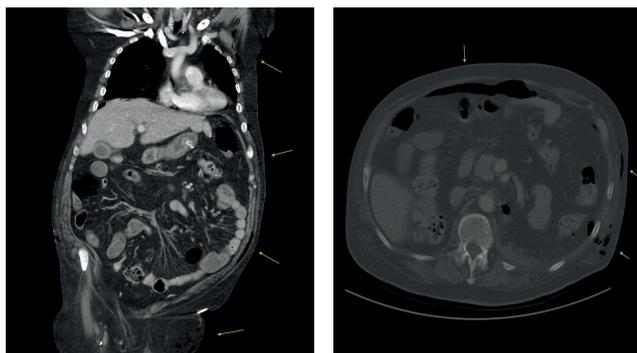


Figure 1. Coronal (left) and axial view of the first CT abdomen. Subcutaneous and free intra-abdominal air is indicated by green arrows.

we chose to manage this patient conservatively. During the following hours, however, further clinical deterioration was noted. Laboratory analysis revealed a CRP of 458 mg/l (144 mg/l, 24 hours earlier) and a lactate of 3.9 mmol/l. The patient was then taken to the operating room (approximately 48 hours after the first surgical intervention) for surgical exploration of the wound. During surgery, an infected deep wound haematoma was found and drained. Intraperitoneal exploration revealed no signs of bowel perforation. The wound was closed leaving two drains and the patient was transferred back to the ICU. During the next 48 hours, the results of cultures (retroperitoneal fluid and tissue, separate cultures) were reported positive for *C. perfringens* (as determined by MALDI-TOF-MS). Repeated blood cultures remained negative. The drains were removed after two days because of no drainage. Piperacillin/tazobactam was continued for six consecutive days. Five days post-surgery, the patient developed worsening pain in his left flank and his recovery stagnated. A repeated CT scan revealed fluid in the nephrectomy area, the wound was – again – surgically drained. A new drain was placed, but fell out spontaneously the day after. From the second operation on, the patient steadily recovered. We started piperacillin/tazobactam per protocol (this is our hospital's protocol in abdominal sepsis without positive cultures). Susceptibility testing revealed *C. perfringens* which was sensitive to piperacillin/tazobactam, so we chose to continue this treatment. Pathology of the renal specimen revealed multiple benign cysts, without signs of carcinoma. Negative pressure wound therapy was started in order to improve wound healing because the past medical history included multiple factors that might restrict wound healing, for example: obesity, diabetes etc. The patient was discharged to the urology ward 11 days after admission to the ICU.

Discussion

Our case illustrates a fulminant septic shock due to a postoperative infection with *C. perfringens*. After *C. perfringens* enters the body (in our case, most likely via the surgical site), the usual manifestation is a necrotising infection of the abdominal wall, often accompanied by hypotension and renal failure due to septic shock.

C. perfringens consists of five serotypes, A-E. They differ in the types of extracellular toxins they make and their form of tropism. Alpha toxin is a haemolytic toxin which is largely responsible for the tissue necrosis. Under optimal conditions for the bacterium, its multiplying time is as little as eight minutes and is accompanied by gas production. This is the reason why the progression of the infection is so fulminant. Because *C. perfringens* is an anaerobic bacterium, blood supply must be impaired in some way in order for it to thrive. When the ability of the host to mount an inflammatory response involving phagocytes is not suppressed, infection with *C. perfringens* may progress into a fulminant septic shock.

Most cases of gas gangrene arise after penetrating trauma and therefore it is often considered to be a typical military disease: during World War I an estimated 10% of soldiers lost their lives as a direct result.^[6] Postoperative complications account for approximately 30% of the cases and are most frequently associated with surgery to the appendix, intestine or biliary tract. Known risk factors include: diabetes, coronary artery disease, obesity, malnutrition and intravenous drug use.^[1] It seems difficult to determine the incidence of the disease;^[7] however, when haemolysis occurs, mortality rates are as high as 70%.^[8] Since *C. perfringens* has the ability to spread very fast, it is of the utmost importance to recognise and treat early. This provides the patient the best chance of recovery.

Harmsen et al.^[1] described a case of postoperative infection with *C. perfringens* after laparoscopic cholecystectomy. They report that trocar port infections are rare, only nine cases were reported until 2016. Trocar port wounds are considered ideal sites for infections. A penetrating wound is made, CO₂ is insufflated for creating a pneumoperitoneum. This positive intra-abdominal pressure (12-15 mmHg) and continuous CO₂ flow reduces blood flow in the abdominal wall, making it relatively hypoxic. Trocars damage the abdominal muscles, and cause a 'chimney effect'^[9] (gas passing alongside the trocars, leaving the body), by leakage of CO₂ from the abdominal cavity into the subcutis. This results in subcutaneous emphysema with an environment in which anaerobic bacteria might thrive easily. A trocar infection may have been present in this case.

One of the clinical dilemmas we encountered in this case was to evaluate whether the amount of gas, as visualised by a CT scan, was within the 'normal range' for the given time post-laparoscopic surgery. To our knowledge, there are no studies or guidelines elucidating this issue. During retroperitoneoscopic surgery about 3 litres of CO₂ are insufflated in the retroperitoneal space. If there happens to be a tear in the peritoneal membrane, this amount easily doubles.^[10] The total amount of CO₂ used during surgery depends on the duration and leakage alongside the trocars. Within 72 hours post-surgery, the CO₂ has usually resolved. Visible intraperitoneal or retroperitoneal gas 72 hours after surgery is considered an ominous finding.

Conclusion

When a patient rapidly develops severe abdominal septic shock following laparoscopic surgery, and subcutaneous emphysema and intra-abdominal air are present, gas gangrene must be considered. These signs should not always easily be attributed to peroperative carbon dioxide insufflation. The treatment of choice for *C. perfringens* infection is surgical debridement of all involved gangrenous tissue, intravenously administered high-dose penicillin, combined with clindamycin^[11] and supportive measures. This approach might provide the patient with a better chance for survival.

Acknowledgements

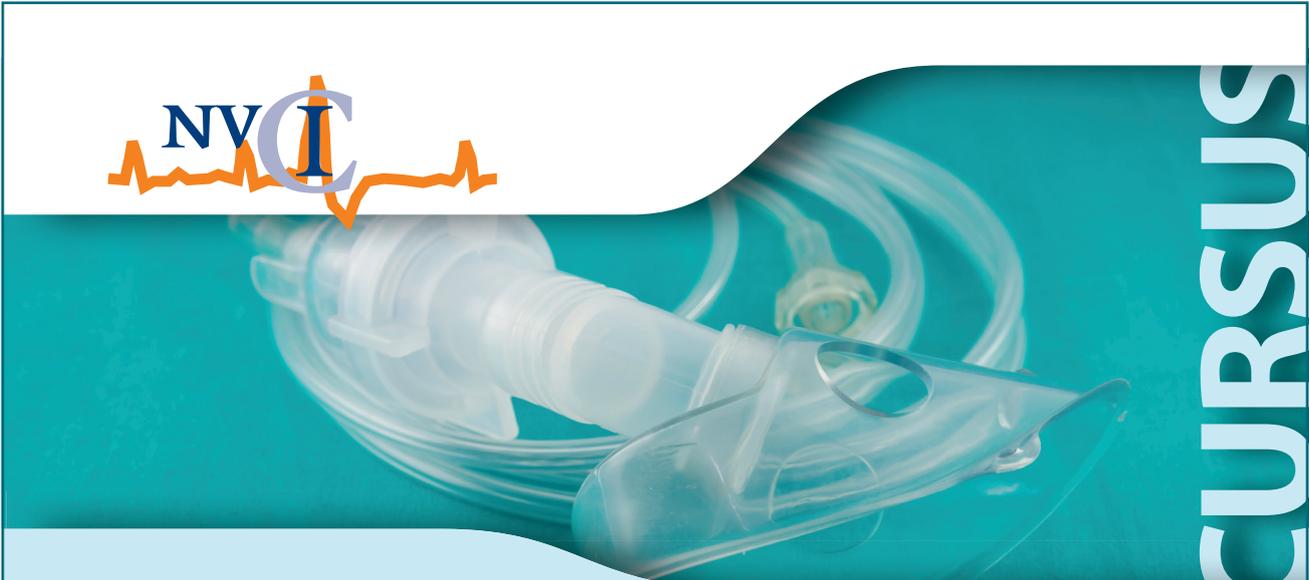
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Disclosures

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