

Fatal pancreatic pseudocyst co-infected by *Raoultella planticola*: an emerging pathogen

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ABSTRACT

Raoultella planticola is an aerobic Gram-negative bacterium belonging to the Enterobacteriaceae family. Initially identified in the 1980s, its pathogenic potential was further recognized when the first case of bacteremia was reported. Since then, only a few infections caused by this pathogen have been described. Although considered an opportunistic agent, fatal outcomes are associated with the infection by this pathogen, since it is more prevalent among the patients with immunodeficiency. The authors report the case of a middle-aged man diagnosed with end-stage renal disease and alcoholic pancreatitis, who was admitted to the emergency department with septic shock. Physical examination disclosed peritoneal irritation and a laparotomy was undertaken. Purulent peritonitis was found as well as a retroperitoneal abscess, which was drained. The postoperative period was troublesome, and the patient died. The autopsy showed a ruptured, infected pancreatic cyst and purulent peritonitis, among other findings. The culture of the peritoneal fluid and two blood sample sets were positive for *R. planticola*. The authors call attention to the importance of this emerging pathogen associated with severe gastrointestinal infections.

Keywords

Enterobacteriaceae Infections; Pancreatic Diseases; Peritonitis; Autopsy

CASE REPORT

A 52-year-old man was brought to the emergency unit complaining of colicky upper abdominal pain over the previous 7 days, which had worsened in the last 2 days and was accompanied by nausea and vomiting. His past medical history included two episodes of pneumonia, one of which was complicated with thoracic empyema and chronic pancreatitis with acute exacerbation 2 years ago, hypertension, and stage IV chronic renal disease. The biliopancreatic

imaging referred the presence of pneumobilia. He was a tobacco smoker and a heavy drinker, but denied illicit drugs use. He was not taking any antibiotics, antiemetics, or painkillers before coming to the hospital. On admission, he looked critically ill, emaciated (body mass index was 18), dehydrated, tachypneic, tachycardic, and with poor peripheral perfusion. His blood pressure was 70/50 mmHg, room air oximetry was 88%, and Glasgow coma

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scale was 15. Cardiac and pulmonary examinations were unremarkable, but his abdomen was distended, diffusely painful with rebound tenderness and the presence of normal bowel sounds. The laboratory work-up revealed mild anemia and leukocytosis with marked left shift, acute renal failure with metabolic acidosis, increased hepatic enzymes and normal amylase, lipase, bilirubin, and clotting tests.

With the clinical diagnosis of peritonitis, the patient underwent an exploratory laparotomy, which disclosed an enormous amount of free purulent effusion within the abdominal cavity, edema of the intestinal loops and the great omentum, and an abscess in the retro-cavity of the epiploon (at the tail of the pancreas). The surgical procedure consisted of peritoneal lavage, abscess drainage, and closure of the abdominal wound with a Bogotá bag. The patient was referred to the intensive care unit in the early postoperative period, where, despite mechanical ventilatory support and vasoactive drugs, hemodynamic instability remained uncontrolled, and the patient died less than 24 hours after hospitalization.

The culture obtained from the abdominal cavity was positive for *Escherichia coli*, Group F β -hemolytic *Streptococcus*, and *Raoultella planticola*; the latter two agents were also isolated in two blood culture sets.

Bacterial identification was performed using VITEK-2 compact (version 07.01, BioMérieux, France).

AUTOPSY FINDINGS

The ectoscopic examination of the corpse showed a median xipho-pubic surgical incision and a Bogotá bag closure of the abdomen. At the opening of the cavities, pleural adhesion in the left hemithorax was present, and 400 mL of sero-hemorrhagic effusion covered the swollen viscera of the peritoneal cavity, which was thoroughly coated with a fibrinoid material.

The pancreas weighed 183 g (reference value: 60-100 g) and presented a distorted shape surrounded by increased fat tissue. At the cut surface, the usual lobulation was effaced; the color was mousy and intermingled by white areas of a hardened consistency. A purplish 3 cm pseudocyst was present with the rupture of the external wall (Figure 1).

The microscopy revealed that the pancreatic parenchyma was replaced by extensive fibrosis, acinar atrophy, intraductal eosinophilic protein plugs, and chronic inflammatory infiltration (Figure 2A and 2B). The surrounding pancreatic fat tissue, as well as the whole peritoneum, was thoroughly coated with fibrin, which, at histology, confirmed the presence



Figure 1. Gross appearance of the pancreas showing the replacement of the pancreatic parenchyma with fat tissue and, at the center, the perforation hole of the pseudocyst.

of peritonitis (Figure 2C). The internal surface of the pseudocyst presented acute inflammatory infiltration, venules thrombosis, and granulation tissue (Figure 2D).

Other findings consisted of small areas of lungs atelectasis, and alterations consistent with long-term tobacco abuse (respiratory bronchiolitis and tracheal squamous metaplasia); myocardial hypertrophy, bone marrow hypercellularity at the expense of myeloid hyperplasia; and changes consistent with shock, such as a loss of hepatocytes centrilobular trabeculation and vacuolation, acute tubular necrosis, and acute splenitis.

DISCUSSION

Initially labeled as *Klebsiella planticola*, in 1981,¹ *R. planticola* was subsequently identified, in 2001, by Drancourt et al.² based on 16S *rRNA* genes and *rpo B* sequence analyses. Therefore, *R. planticola* is a Gram-negative, aerobic, encapsulated nonmotile

bacillus, belonging to the *Enterobacteriaceae* family, which requires laboratory refinements for its precise identification. These challenges were responsible for previous misidentification to such an extent that some cases formerly classified as *K. pneumoniae* or *Klebsiella oxytoca* could, in fact, be *R. planticola*.³⁻⁶ Although *R. planticola* is an environmental bacterium found in the water, soil, and plants, it is also isolated from nearly all human tissues and fluids.⁷⁻⁸ After its identification, the clinical significance of *R. planticola* remained uncharacterized for almost a decade.⁸ However, since the description of the case of septicemia reported by Freney et al.⁹ in 1984 (identified as *Klebsiella trevisanii* at the time), many other cases of infections in humans have been reported; therefore the pathogenicity of *R. planticola* needs to be revised.

The actual incidence of *R. planticola* infection is difficult to estimate because of misidentification and underreported cases. To date, this infection is still rare.

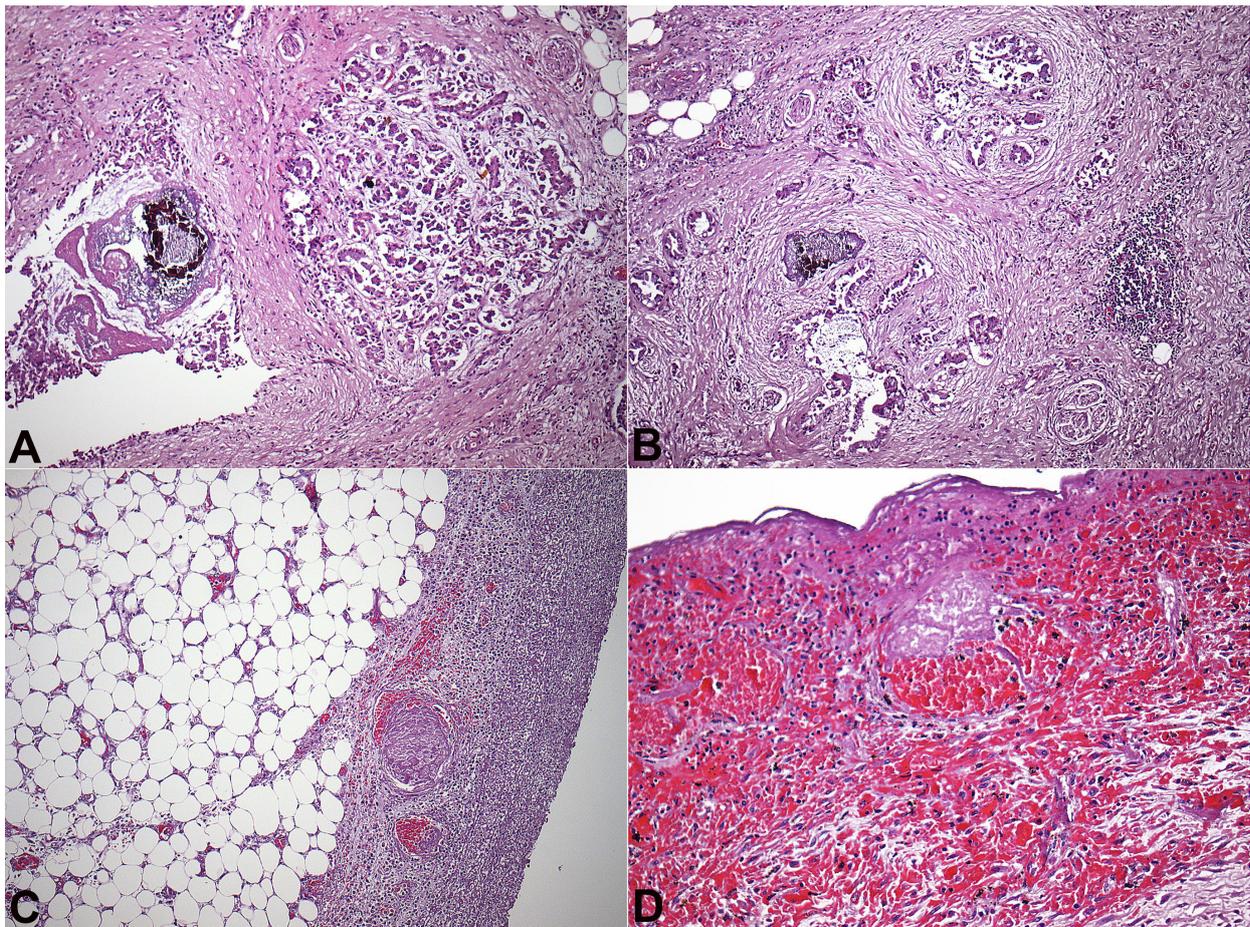


Figure 2. **A** and **B** - Photomicrography of the pancreas showing substantial replacement of the pancreatic parenchyma by fibrous tissue and chronic inflammatory infiltration wrapping the remaining pancreatic acini and the dilated pancreatic duct with a protein plug and calcification (H&E, 4X); **C** - Photomicrography of the peripancreatic tissue showing the fat tissue and the marked peritonitis (H&E, 10X); **D** - Photomicrography of the pseudocyst's inner lining showing the absence of epithelium (H&E, 20X).

The infection by this emerging pathogen is associated with either immunosuppression states, such as neoplasia, chronic renal disease, and diabetes mellitus, or invasive procedures and trauma.^{7,10} The infection sites reported so far that are caused by *R. planticola* are: (i) sepsis/bacteremia;^{9,11-17} (ii) pneumonia;¹⁴⁻¹⁸ (iii) abdominal infections;^{8,10-12,19-21} (iv) urinary tract;^{22,23} (v) skin and soft tissues;²⁴⁻²⁶ and (vi) conjunctivitis,²⁷ which account for a little more than 20 cases.

R. planticola was originally described as being sensitive to cephalosporins, aminoglycosides, fluoroquinolones, and carbapenems. However, recent studies^{18,28,29} have reported the emergence of carbapenem-resistant strains, which has changed what was an easily treatable infection into a therapeutic challenge. Polymicrobial infection of the peritoneal cavity concomitant with positive blood cultures, which included *R. planticola* among the other isolated agents, had also been reported.¹⁹

Considering the aforementioned concepts on *R. planticola*, our patient presented many characteristics found among the reported cases. The site of infection (i.e. the gastrointestinal tract in this case), has been reported as the second site of infection after bacteremia.^{10,11} Yokota et al.¹¹ support the hypothesis that *R. planticola* colonizes the gastrointestinal tract and becomes a potential source of infection. Our patient was a heavy drinker with the clinical diagnosis of chronic pancreatic disease, and had previous hospitalizations due to pneumonia and thoracic empyema, which confers some degree of malnutrition besides chronic renal disease. Both chronic organic failures associated with immunologic disturbance,^{10,11,18,19} facilitated the infection caused by *R. planticola*.

We deemed the presence of pneumobilia as an important risk factor for the development of the polymicrobial infection of our patient's pancreatic cyst since there must have had a contact between the intestinal flora and the biliopancreatic system. *R. planticola*, as the other bacteria of the Enterobacteriaceae family, is an opportunistic agent of the intestinal environment, and under immunosuppression it acts as an invasive agent. The fatal outcome of this patient is closely related to his poor clinical status and severe disease. We cannot blame the *R. planticola* for being entirely responsible for the drastic outcome; however it did play a role in the development of this severe infection.

The antibiogram of the *R. planticola* strain involved in our case showed sensitivity to cephalosporins,

fluoroquinolones, and carbapenems, but the severity of the infection and the early fatal outcome hampered the evaluation of the antimicrobial response.

In our literature search of *R. planticola* infections, we found only one case of pancreatic infection; therefore, we call attention to the rarity of this case.

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