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Case Report

Pelvic cellulitis caused by *Raoultella planticola* in a neutropenic patient☆

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ABSTRACT

Raoultella planticola is a gram-negative, encapsulated, aerobic bacterium within the *Enterobacteriaceae* family. It has been primarily described as pathogen in cases with pneumonia and gastrointestinal infections. Here we describe a case of severe pelvic cellulitis in a patient with neutropenia following induction therapy for myeloid sarcoma. The patient experienced a septic shock and was treated successfully with antibiotic therapy. A literature review is provided to put this case in context with previous reports on *R. planticola*. This report highlights that awareness for uncommon pathogens is crucial in the clinical management of infections in neutropenic patients.

1. Introduction

Raoultella planticola is a gram-negative, aerobic, non-motile rod and a member of the *Enterobactericeae* family [1]. In particular, there are similarities between *R. planticola* and *Klebsiella* species regarding characteristics like cellular surface proteins, capsular antigens and serum resistance. Hence, it was initially termed *Klebsiella planticola*, however, differences in 16S rRNA and rpoB genes lead to a definition of the new genus *Raoultella* [2]. This genus includes *Raoultella planticola*, *ornithinolytica*, *terrigena* and *electrica* [3–6]. *R. planticola* is most frequently isolated from plants and has been observed as a human pathogen in recent years. Characteristics that contribute to its pathogenicity are lipopolysaccharides, fimbriae, toxins and biofilm formation [7,8]. The following report describes a case of severe pelvic cellulitis caused by *R. planticola* in a patient with neutropenia following induction therapy for myeloid sarcoma.

2. Case presentation

A 38-year-old male patient was admitted to the neurology department complaining of double vision as well as sudden back pain. The symptoms had started one week earlier and had slowly progressed. In addition, he showed symptoms of fatigue, weakness and loss of appetite. His general practitioner had prescribed him a daily dose of 60 mg prednisolone over 4 days, which had not lead to symptom relief. A cranial MRI revealed enlarged right lacrimal glandules but no cerebral lesions. After one day the patient was referred to our intermediate care unit due to quickly deteriorating general condition for further diagnostic workup. A CT scan of chest, abdomen and small pelvis revealed multiple enlarged thoracic, mesenteric, retroperitoneal and inguinal lymph nodes. An inguinal lymph node was extracted for histopathologic examination and a bone marrow biopsy as well as a lumbar puncture were performed. The liquor showed B-lymphocytes with blastic appearance suggesting meningeal dissemination of a of a B-cell Non-Hodgkin lymphoma. As biopsies of bone marrow and lymph nodes revealed infiltration by a malignant myeloid sarcoma, i.e. an extramedullary acute myeloid leukaemia, B-lymphocytes in the liquor were later interpreted as reactive population that did not constitute for a

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separate malignancy. Control lumbar punctures did not show this population after initiation of therapy anymore.

Due to the high tumour burden and a lactate dehydrogenase of over 6000 U/l, creatinine of 2.15 mg/dl and hyperphosphatemia of 1.6 mmol/l, intravenous fluids as well as rasburicase were administered for treatment of tumour lysis syndrome. Moreover, a prephase chemotherapy for debulking was administered starting with 200 mg/m^2 of cyclophosphamide for two days, followed by 200 mg/m^2 of cytarabine. Induction therapy was started with high dose cytarabine (1000 mg/m^2) and mitoxantrone (10 mg/m^2). Remission control by bone marrow aspirate showed <5% blasts after 16 days. On day 7 of neutropenia, the patient developed fever (38.7 °C) and empiric antibiotic therapy with piperacillin/tazobactam (4.5 gm IV q8h) was initiated after sampling of blood cultures. Throat smears tested positive for *metapneumovirus* and blood cultures showed vancomycin-resistant *Enterococcus faecium*. Anti-infective therapy was switched to linezolid (600 mg IV q12h) and subsequent blood cultures were negative within two days of appropriate antimicrobial therapy. However, after six days of continuous therapy on the oncology ward, the patient still had fever episodes with body temperatures up to 39 °C. The patient was transferred to our intensive care unit (ICU) and was treated for septic shock (heart rate 140 bpm, blood pressure 90/60 mmHg, respiratory rate 30/min) and acute renal failure (creatinine 1.65 mg/dl, creatinine clearance 52 ml/min, see Table 1). Upon transferral, thorough physical examination revealed an anal fissure with a surrounding erythema, which, after surgical consultation, required analgesic therapy but no surgical intervention. In order to cover a probable infection with gram-negative bacteria, meropenem (1 gm IV q8h) was added to the anti-infective therapy.

Within a day of transferral to the ICU, the erythema spread to the whole pelvis, including the scrotum, which showed a massive swelling and lead to an acute urinary retention (Fig. 1A*; a catheter was placed to ensure drain*). An MRI of the pelvis was performed and showed disseminated fluid retention in all extra- and intra-abdominal soft tissues, including pelvic muscles and scrotum (Fig. 2). After repeated surgical as well as urological consultations, no surgical intervention was performed as no abscess formation was visible in this neutropenic patient after induction-chemotherapy.

Table 1
Laboratory data at ICU admission.

Parameter	Reference range	Value
Sodium	135–145 mmol/l	120 ↓
Potassium	3.6–4.8 mmol/l	4.9 ↑
Chloride	94–110 mmol/l	89 ↓
Glucose	74–109 mg/dl	144 ↑
Calcium	2.04–2.59 mmol/l	2.15
Phosphate	0.81–1.45 mmol/l	0.93
Albumin	35–52 g/l	20 ↓
Creatinine	0.50–1.10 mg/dl	1.65 ↑
Urea	<50 mg/dl	64 ↑
Uric acid	3.4–7.0 mg/dl	5.8
GOT	<50 U/l	43
GPT	<50 U/l	34
gGT	<60 U/l	80 ↑
Bilirubin	<1.2 mg/dl	4.7 ↑
CK	<190 U/l	2230 ↑
LDH	<250 U/l	423 ↑
Haptoglobin	0.3–2.0 g/l	4.91 ↑
CRP	<5.0 mg/l	403.8 ↑
PCT	<0.1 µg/l	35 ↑
Leukocytes	4.4–11.3 G/l	0.13 ↓
Haemoglobin	13.5–18.0 g/dl	11.6 ↓
Thrombocytes	150-400 G/l	8 ↓
Neutrophils	1.8–6.98 G/l	0.03 ↓
INR		1.5
APTT	<36 sec	29

Fig. 1. Clinical presentation. Initial clinical presentation; a urethral catheter was placed to ensure drainage.

One day after admission to the ICU, blood cultures, which were collected daily during fever, were repeatedly positive with gram-negative rods. The organism was identified as *Raoultella planticola* using MALDI-TOF MS (Biotyper, Bruker Daltonics, Bremen, Germany) and antimicrobial susceptibility testing was performed with Vitek 2 (Biomerieux, Nürtingen, Germany). The *R. planticola* isolate tested sensitive to Piperacillin-Tazobactam exhibiting a minimum inhibitory concentration (MIC) of ≤4 had shown (Table 2). Therefore, and given that the patient was still neutropenic, antibiotics were switched to piperacillin-tazobactam (4.5g IV q8h). Within three days, the patient's condition as well inflammatory markers improved, renal function recovered completely and following blood cultures were negative. Subsequently, the patient was transferred back to the oncology ward for treatment continuation. Piperacillin/tazobactam was continued for a total of 12 days and the patient did not show any further signs of cellulitis (see Fig. 3).

3. Discussion

Several reports have described *R. planticola* as a cause of gastrointestinal infections, including cholangitis [9], cholecystitis [10] and pancreatitis [11], as well as necrotizing fasciitis [12], cellulitis [13] and cystitis [14]. Of note, most affected patients had an underlying solid or haematological malignancy. In our case, the patient had a myeloid sarcoma and received intensive induction chemotherapy with high dose cytarabine and mitoxantrone. Therefore, the patient was severely immunocompromised at the time of infection. Antimicrobial resistance in *R. planticola* therapy is not fully understood yet, however, in our case the isolates from the series of blood cultures were only resistant to ampicillin, which was overcome by addition of sulbactam. Otherwise, no resistance to any of the tested agents was observed. The overall favourable outcome is in line with most previously described cases of *R. planticola*

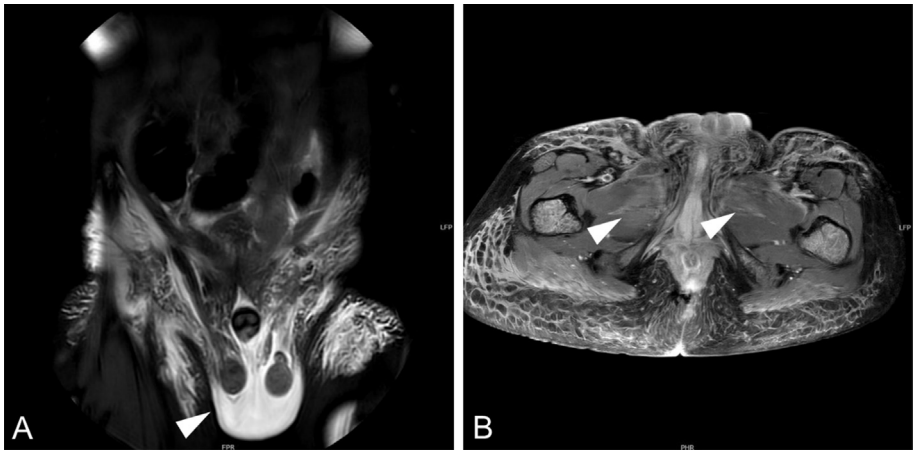

Fig. 2. MRI scan of pelvic region. T2 weighted images. Arrow heads indicate oedematous swellings and fluid retention.

Table 2
Antimicrobial susceptibility of *Raoultella planticola* isolated from a series of blood cultures. *R* resistant, *S* sensitive.

Antimicrobial	Minimum inhibitory concentration [mg/l]	Interpretation
Ampicillin	16,000	R
Ampicillin-sulbactam	≤2000	S
Piperacillin	8000	S
Piperacillin + tazobactam	≤4000	S
Cefuroxime	≤1000	S
Cefotaxime	≤1000	S
Ceftazidime	≤1000	S
Imipenem	≤0,250	S
Meropenem	≤0,250	S
Gentamicin	≤1000	S
Ciprofloxacin	≤0,250	S
Moxifloxacin	≤0,250	S
Trimethoprim-sulfamethoxazole	≤20,00	S

infections. In two cases with fatal outcomes, patients carried an *R. planticola* isolate that harboured the *bla*KPC gene leading to carbapenem resistance [15]. Moreover, patients with polymicrobial infections seem to have a poorer overall outcome as compared to patients with *R. planticola* as a sole pathogen. Given the similarities between *Raoultella* and *Klebsiella* species, further investigations on resistance to carbapenems are warranted.

Based on the reported cases, *R. planticola* infections do not seem to be as virulent as other *Klebsiella* species. In our case, the patient's condition, while initially presenting with severe symptoms of septic shock and acute renal failure, stabilized and improved rapidly upon antimicrobial therapy even though the patient had not experienced haematological recovery yet.

This case also shows that in immunosuppressed patients the pathogen spectrum can be considerably broader as compared to patients with an uncompromised immune system. Our patient did not recall having contact with soil or aquatic environments prior to infection and other culture tests, including urine and stool tests as well as pharyngeal and inguinal swabs, were negative at admission. While cellulitis is usually caused by gram-positive organisms like *Streptococcus spp.* or *Staphylococcus spp.*, our case indicates that awareness for uncommon pathogens is crucial in the clinical management of infections in neutropenic patients. Systematic accrual of data is needed to complete our understanding of *R. planticola* infections and best clinical management.

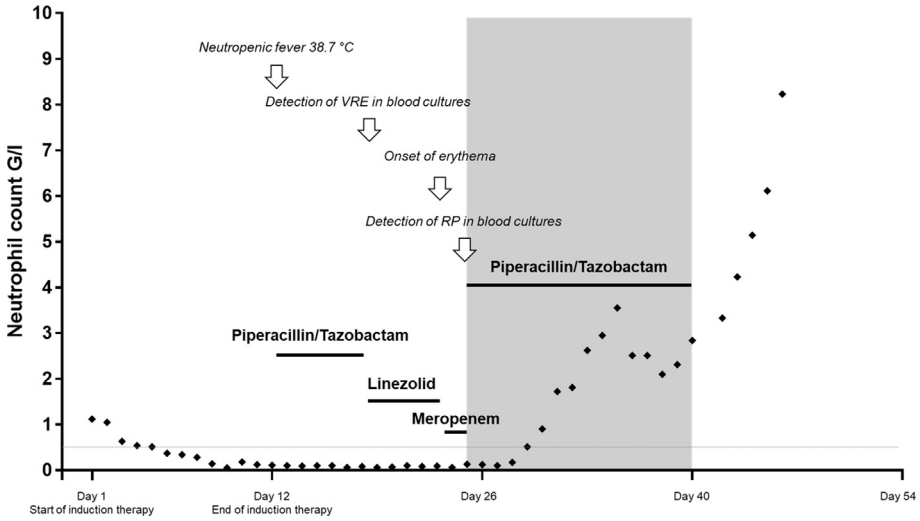

Fig. 3. Neutrophil count and clinical course.

Conflicts of interest

On behalf of all authors, the corresponding author states that there is no conflict of interest.

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