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Case Report
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Pantoea Piersonii (Basionym *Kalamiella Piersonii*) Identified in Polymicrobial Scrotal Infection with Fistulating Tracts

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Abstract

Pantoea piersonii (Basionym *Kalamiella piersonii*), is a newly identified bacterial organism, first isolated in 2019 from surface samples from the International Space Station [1]. *P.piersonii* has only been implicated three times to the best of our knowledge in human infections since 2019 [2-4] and has been isolated three times in humans outside of the setting of acute infection [5-7].

We present a case of a male in his seventies who presented to our emergency department with polymicrobial scrotal infection and associated fistulating tracts in the scrotum. A wound swab taken on admission identified several potentially implicated pathogens, including the rare organism *P. piersonii.* During this admission, the patient developed signs and symptoms concerning for infective endocarditis but investigations were ultimately negative and he recovered well following intravenous antibiotic therapy and surgical excision of the fistulating area in the scrotum.

Keywords: *Pantoea Piersonii,* Microbiology, Urology, Rare pathogen, Scrotal infection

Introduction

P.piersonii is a member of the *Erwiniaceae* family, in the Enterobacterales order, first isolated in 2019 from surface samples on the International Space Station [1]. In humans, *P.piersonii* has been identified three times in active infection [2–4] and three times outside of active infection [5-7].

In 2020, *Rekha et al* isolated *P.piersonii* from the urine of a struvite stone patient without active urinary tract infection [5]. Following genome sequencing, several metabolic characteristics and virulence factors which may promote urinary tract colonisation were identified.

Alpizar-Rivas et al described the first case of active *P.piersonii* infection in a human in a 56-year-old female with central line-associated *P.piersonii* bacteraemia [2]. She recovered following central line removal and a 14-day course of intravenous piperacillin-tazobactam.

The second reported active *P.piersonii* infection is a case of *P.piersonii* bacteraemia in a two-month old who presented with diarrhoea, poor oral intake and vomiting. They recovered following intravenous treatment with cefotaxime and ampicillin [3].

Most recently, *P.piersonii* has been implicated in an endocardial infection following isolation from tissue excised from the aortic valve in a 42-year-old male who underwent aortic valve replacement for a gradually expanding aortic diameter [4].

Current literature on *P. piersonii*'s typical sensitivities and resistance is limited, however isolates have shown resistance to ceftazidime, cefpodoxime, cefoxitin nalodixic acid and rifampicin. Genotyping by McDonagh *et al* revealed traits suggesting potential for hypervirulence [7].

We describe the case of a man in his seventies presenting with a polymicrobial scrotal infection, with the emerging pathogen *P.piersonii* identified as a potentially implicated bacterium.

To the best of our knowledge, this is the first case reported where *P.piersonii* has been isolated in a polymicrobial infection such as the one described.

Case Presentation

A man in his seventies presented to our emergency department with a one-month history of scrotal pain, swelling, discharge, redness and intermittent dysuria. He was referred by his General Practitioner due to concern for Fournier's gangrene when he didn't improve on oral amoxicillin/

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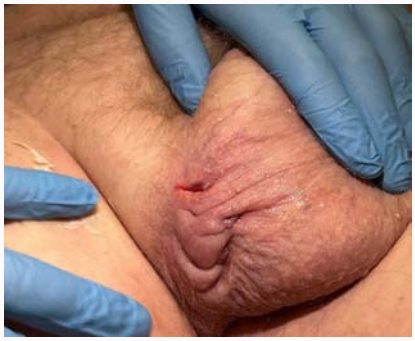

Figure 1: Chronic fistulation scrotal infection at presentation. Note the discharge from the superior sinus. No evidence of cellulitis, skin erythema or necrosis.

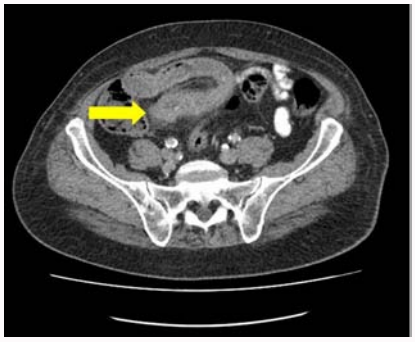

Figure 2: CT scan of the patient's abdomen. The yellow arrow is pointing to the inflamed terminal ileum.

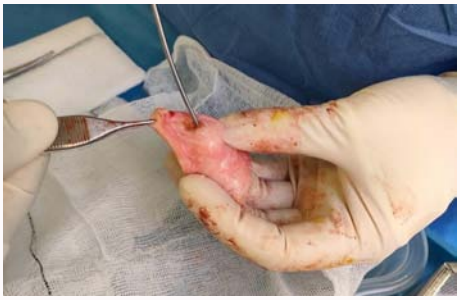

Figure 3: The excised area from the patient's scrotum. The surgical probe identifies the fistulating tract.

clavulanic acid. His medical history is significant for iron deficiency anaemia and triple vessel coronary artery disease with stenting to the left anterior descending artery and right circumflex artery. He is an ex-smoker of 1.5 years with a 40-pack-year history.

On examination, there was an area of indurated tissue measuring two by two centimetres on the posterior base of the scrotum with three pustular-appearing lesions anterior to this (Figure 1). He was systemically well and was admitted by urology for management of fistulating scrotal infection. Wound swabs were collected and empiric IV flucloxacillin 2g and benzylpenicillin 2.4g 8 hourly were commenced. Results of bloods taken on admission are represented in Table 1.

Culture results from wound swabs demonstrated *Pantoea piersonii*, *Staphylococcus aureus, Corynebacterium aurimucosum, Coagulase negative Staphylococcus* species and an anaerobe which

Table 1: Results of bloods taken on admission.

		Reference
WBC	7.2	4.4 -11.3 x10^9/L
RBC	3.92	4.2 - 5.6 x10^12/L
HB	11	13 - 17 g/dL
HCT	0.34	0.38 - 0.49 L/L
MCV	87.3	80 - 96 fl
MCH	27.9	27 - 33 pg
MCHC	32	32 - 36 g/Dl
PLT	261	140 - 440 x10^9/L
Neutrophils	4.89	1.4 - 6.6 x10^9/L
Lymphocytes	1.51	0.9 - 3.2 x10^9/L
Monocytes	0.46	0.15 - 1.33 x10^9/L
Eosinophils	0.08	0.04 - 0.4 x10^9/L
Basophils	0.06	0 - 0.1 x10^9/L
CRP	14	0-5 U/L

Table 2: Susceptibilities performed as per 2024 EUCAST criteria.

	S.aureus	*P.piersonii*	*C.aurimucosum*
Amikacin		S	
Amoxycillin		R	
Cefuroxime		R	
Cephalexin		S	
Ciprofloxacin		S	R
Co-amoxiclav IV		I	
Flucloxacillin	S		
Gentamicin	S	S	
Penicillin	R		
Tetracycline	S		
Vancomycin	S		S

Table 3: A summary of antimicrobial therapy during this admission is outlined.

Antimicrobial	Dose & Route	Days Antibiotic Received (total duration in days)
Benzyl Penicillin	2.4g QDS IV	Days 1-3 (3)
Flucloxacillin	2g QDS IV	Days 1-3 (3)
Piperacillin/ Tazobactam	4.5g TDS IV	Days 3-10 (8)
Vancomycin	Adjusted per serum levels, IV	Days 3-15 (13)
Meropenem	1g TDS IV	Days 10-15 (6)

failed to grow for further testing. The *P.piersonii* organism was identified using Matrix-Assisted Laser Desorption/Ionization Time-of-Flight Mass Spectrometry. Susceptibilities performed as per 2024 EUCAST criteria are listed below in Table 2. There was nil growth on mid-stream urine (MSU) sample.

Microbiology advised on management throughout admission. Empiric cellulitis cover was switched to piperacillin/tazobactam 4.5 g 8 hourly and vancomycin 1g 12 hourly while culture and susceptibility testing proceeded. Surgical excision was planned as polymicrobial infections of the scrotum often require source control in tandem with antimicrobial therapy.

The patient developed a pyrexia of 38.6 degrees celsius prior to excision. Other vitals remained within normal limits. A grade 3 systolic murmur radiating to the carotids was auscultated. Following discussions with microbiology and cardiology, piperacillin-tazobactam was escalated to meropenem and investigations to rule out infective endocarditis were arranged including echocardiogram and serial blood cultures. These were ultimately negative. *P.piersonii* has previously been implicated in urolithiasis [5]. A CT to investigate for same was negative but revealed an abnormal ileum. Contrast-enhanced CT revealed thickening of the distal and terminal ileum with surrounding fat stranding, vascular engorgement, and reactive caecal lymph nodes (Figure 2). Differentials included inflammatory bowel disease (IBD), infection and ischaemia. He denied any associated symptoms.

Repeat swab of the scrotal lesions following six days of intravenous antibiotics guided by sensitivities grew *Staphylococcus haemolyticus*, *Klebsiella oxytoca*, and an anaerobic organism that failed to grow for further testing.

Given the patient's comorbidities, scrotal lesions were excised under local anaesthetic. Fistulating disease was noted. All amenable tracts were excised (Figure 3). A tract extending towards the rectum could not be fully excised under local anaesthetic.

Histological analysis revealed acute and chronic inflammation with dermal fibrosis. Cultures from excised tissue grew *Corynebacterium striatum, Corynebacterium amycolatum, Citrobacter braakii, Prevotella buccae, Klebsiella oxytoca, Staphylococcus haemolyticus and Bacteroides thetaiotaomicron.*

The patient had received fourteen days of intravenous antibiotics prior to excision and was clinically well post operatively. Following discussions between microbiology and urology, given clinical improvement and source control, antibiotics were discontinued 24 hours after excision.

The patient remained well and was discharged the following day. One week later in clinic his wounds were healing without recurrent infection. Outpatient colonoscopy under gastroenterology is planned for investigation into possible underlying IBD.

Discussion

The first report describing *P.piersonii* predicted that it would not be a human pathogen [1]. However, including this case, there have been 4 incidences of active *P.Piersonii* infections in humans [2-4] and 2 cases where the bacterium may have contributed to other pathological processes (urolithiasis and IBD) [5,6]. To date, the bacterium has been isolated in blood, endocardial tissue, urine, faeces, saliva and now scrotal tissue [2-7].

In 2023, a study by *Dahal et al.* investigating gut dysbiosis in patients with IBD and ischaemic colitis identified *P.piersonii* in the gut microbiota in 11% of total isolates and found that *P.piersonii* was the second most dominant organism in 11 disease-associated faecal samples, indicating that *P.piersonii* would be of interest in future studies on IBD dysbiosis [6].

Another 2023 study by *McDonagh et al* isolated a multidrug resistant strain of *P.piersonii* from the saliva of a patient with schizophrenia [7]. Five antibiotic resistance genes and five virulence factors associated with secretion, biofilm formation, surface motility, capsule formation and transcriptional regulation were identified. Susceptibility testing revealed resistance to ceftazidime, cefpodoxime, cefoxitin, rifampicin and nalidixic acid.

Following analysis of the *P.piersonii* genome sequenced by Rekha et al. following isolation from the urine of a struvite stone patient, several metabolic characteristics and virulence factors which may promote urinary tract colonisation were identified [2]. Given that gastrointestinal flora are a common cause of urinary tract infection, this may be the source of the bacterium.

Another case of *P.piersonii* infection is a case of bacteraemia diagnosed in a two-month-old who presented with diarrhoea, poor oral intake and vomiting [3]. The patient improved following intravenous treatment with cefotaxime and ampicillin however diarrhoea persisted, and a non-IgE-mediated food allergy was diagnosed. Bacterial translocation of *P.piersonii* related to the non-IgE-mediated gastrointestinal food allergy was suspected [6].

While the exact source of *P. piersonii* was not identified in all reported cases and more research is required to further investigate its pathogenicity and presence in human flora, given that the bacterium has been isolated in human faeces and saliva outside of the setting of infection, it is possible that it was residing in the flora of the affected patients and this led to opportunistic infections.

In our case, *P.piersonii* was present in a polymicrobial scrotal infection with fistulating tracts. Polymicrobial infections can be very difficult to treat due to the complex interactions between the involved microorganisms such as synergy, syntropy, mutualism, immune modulation and creation of a niche environment for other organisms to inhabit [8,9]. As there is limited literature on management of polymicrobial infections associated with fistulating disease in the scrotum, this case was managed based on principles of management of other scrotal infections which are typically polymicrobial such as scrotal abscesses and Fournier's gangrene.

Conclusion

This case report describes the diagnosis and treatment of a polymicrobial scrotal infection where the rare pathogen *P.piersonii* was identified. Although *P.piersonii* has only been implicated in a small number of human infections to date, the importance of monitoring the evolution and reporting the incidence of newly discovered organisms has become increasingly clear over the last two decades. Emerging pathogens are a global health threat. Several infectious disease outbreaks have significantly affected populations worldwide including the swine flu pandemic, Ebola virus, Zika Virus and the COVID-19 pandemic. Several factors have been attributed to the increasing development of emerging pathogens including increasing population densities, urbanization, climate change and increasing global travel [10].

While in-depth genomic analysis of the implicated *P. piersonii* strain was outside the scope of this case report, in detailing the antibiotic sensitivities and resistances of this bacterium and the successful treatment of a polymicrobial scrotal infection in which it was implicated, this report adds to the limited but growing body of literature on the pathogenicity of this novel opportunistic pathogen.

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