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Mycotic internal carotid artery aneurysm as a complication of recurrent *Pseudomonas aeruginosa* bacteraemia in a late presenting HIV patient

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ABSTRACT:

Severe immunodeficiency is a risk factor for Pseudomonas aeruginosa bacteraemia. We report a case of recurrent Pseudomonas bacteraemia after antimicrobial therapy, causing a mycotic aneurysm and dissection of the internal carotid artery in a patient with advanced HIV disease.

Keywords: *Pseudomonas aeruginosa*, Bacteraemia, HIV, AIDS, Mycotic aneurysm.

INTRODUCTION

Despite improved awareness and policies aimed at increasing HIV testing in at risk populations[1], late presentation of HIV disease remains a frequent occurrence[2,3]. In the UK over a quarter of patients have a CD4 count < 200/ml at the time of the diagnosis[2]. Late presentation is linked with a significant increase in morbidity and mortality[4].

In the UK the commonest recorded immediate cause of death in HIV patients is bacterial sepsis[4]. Immunodeficiency, as seen in advanced HIV disease, is a risk factor for developing pseudomonal infections[5]. *Pseudomonas aeruginosa* accounts for around 10% of bacteraemia in HIV patients[6-8]. This often has an atypical presentation and the high relapse rate of infection poses a significant problem for clinicians involved in the care of HIV patients with pseudomonal infections.

Here, we present a case of a mycotic internal carotid artery aneurysm occurring due to recurrent *Pseudomonas aeruginosa* bacteraemia in a patient with advanced HIV disease.

CASE REPORT

A 30 yr old male presented to our hospital with a 3 days history of fever. He described an abrupt onset of fevers, occurring variably through the day with associated odynophagia, generalised myalgia, headache, lethargy and anorexia. At presentation he had no complaints of cough, shortness of breath, urinary tract or gastrointestinal symptoms. Prior to this, the patient had considered himself to be well, although he had noted unexplained weight loss of 6 kg in the preceding year.

The patient is a Malaysian immigrant who has resided in the United Kingdom since his late teens. He is a bisexual male, not currently in a relationship, and was employed as a chemist. He had recently returned from a 3 week holiday to Thailand and Cambodia. He was taking no regular medications. Notably, he had presented to our hospital one year prior to this admission with a Staphylococcal soft tissue abscess in his axilla, but HIV testing was not undertaken at that time

On examination, he appeared cachectic and was pyrexial at 38.5°C. His pulse rate was 98 bpm, BP 110/90,

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oxygen saturation 98% on room air and respiratory rate of 18 pm. Examination of his throat was normal. He had both axillary and inguinal lymphadenopathy. There were scattered crepitations at his right lung base although his initial chest x-ray appeared clear. He was commenced empirically on intravenous piperacillin/tazobactam on the day of his admission.

Serial blood cultures were taken, as well as serology for viral hepatitis, EBV, CMV and HIV. In view of his travel history, he also underwent screening for relevant tropical infections, the results of which were all negative. His HIV test was positive, with a plasma HIV RNA level of 5.8 x 10^5 IU/ml and a CD4 count of 0. Blood cultures grew Gram-negative bacilli, later identified as *Pseudomonas aeruginosa*. Within 24 hrs of presentation, he developed a productive cough and respiratory distress. Repeat chest x-ray showed evidence of consolidation in the right lower and middle lobes, consistent with pneumonia.

His antibiotic therapy was switched to IV meropenem after 48 hours, due to apparent clinical deterioration. He received a total of 14 days of intravenous antibiotics and appeared to make a steady recovery. Inflammatory markers normalised and interval blood cultures were negative (Table 1). During the admission he complained of nasal congestion and discharge and a CT scan of his paranasal sinuses was performed. This showed evidence of left sphenoid sinusitis, which was managed conservatively on the advice of our ENT service. Antiretroviral therapy was commenced with a combination of Truvada (tenofovir/emtricitabine) and Dolutegravir on the 12th day of admission.

By day 19 of his admission he was well enough to be discharged. However, he then developed a sudden onset right frontal headache. This was associated with recurrence of his fever together with the rapid development of right facial paralysis, right sided ptosis, and left-sided hemiplegia affecting both upper and lower limbs.

An urgent CT scan of his head showed right frontotemporal lobe loss of grey/white matter differentiation, suggesting possible right middle cerebral artery (MCA) territory infarction. A lumbar puncture showed RBC 84, WBC 1, with negative Gram stain. Meropenem was restarted and repeat blood cultures again grew *Pseudomonas aeruginosa*. MRI brain confirmed acute right MCA territory infarction with evidence of a mass at the cavernous internal carotid artery (Figure 1, panel A).

Cerebral angiography revealed recanalisation of an occluded right internal carotid artery, with evidence of recent dissection of a partially thrombosed cavernous aneurysm (Figure 1, panel B). The neurosurgical intervention was not undertaken, due to the suspected mycotic nature of the lesion and the presence of collateral blood supply distal to the lesion. After a further 14 days of IV meropenem, he was switched to oral ciprofloxacin. Repeat CT scan of his head confirmed established right middle cerebral territory infarction but no further progression (Figure 1, panel C). Serial measurements of his plasma C-reactive protein (CRP) are shown in Table 1.

He required extensive inpatient and outpatient physiotherapy, but at four months post-discharge he has regained partial use of both his left arm and leg. He is now able to mobilise with the aid of a stick. He completed a three-month course of ciprofloxacin without evidence of further relapse of *Pseudomonas bacteraemia*.

Table 1. CRP levels following admission

	Day 1	Day 3	Day 12	Day 19	Day 20	Day 30	Day 43
CRP (mg/L)	188	205	18	7	57	4	2

DISCUSSION

Pseudomonas aeruginosa, a Gram-negative non-fermenting bacillus, is an environmental pathogen found predominately in soil and water. Human infections usually arise due to a breach in the host immune system (e.g. urinary catheters, central venous catheters, endotracheal intubation and burns)[9].

Clinical presentation of pseudomonal infections is variable and dependent on the site of primary infection. In HIV patients the most common sites of infection are the respiratory tract (upper and lower), urinary tract and occult bacteraemia[6,10]. *Pseudomonas aeruginosa* have multiple virulence factors, some of which facilitate evasion of host defences and several mechanisms that confer resistance to various antibiotic agents, making treatment complex and prone to failure[11].

Our case demonstrated two unusual characteristics of *Pseudomonas bacteraemia* in HIV patients. Firstly, his occult bacteraemia was diagnosed prior to the development of localising symptoms arising from the disease at the primary infection site. In this patient, cough, dyspnoea and x-ray findings lagged behind fever. Secondly, bacteraemia has a high incidence of recurrence, reported in up to 20% of cases[6,9,12].

In our patient's case his *Pseudomonas bacteraemia* recurred with catastrophic consequences. Although previous cases have been reported, mycotic aneurysm is not a well-recognised complication of *Pseudomonas bacteraemia*[13,14].

We have reflected on our management decisions in this case – specifically, whether a change in practice with a longer duration of antibiotic therapy is required to improve the outcome of HIV patients with *Pseudomonas bacteraemia*. We opted to treat our patient with piperacillin/tazobactam, then meropenem monotherapy (guided by laboratory sensitivity testing) for a total of 14 days, discontinuing once fever and inflammatory markers had resolved. There is a question as to whether combination therapy is preferable to targeted monotherapy in *Pseudomonas* infections. However, the premise that dual antibiotic chemotherapy improves outcome in terms of mortality, treatment failure and acquired resistance, has not been proven[15]. Unfortunately, data do not exist to guide optimal management strategies in patients specifically with advanced HIV infection or for prolonged use of antibiotics to reduce recurrence rates in this setting [16]. This case highlights a need for further examination of *Pseudomonas bacteraemia* in this population, in order to develop consensus on best practice.

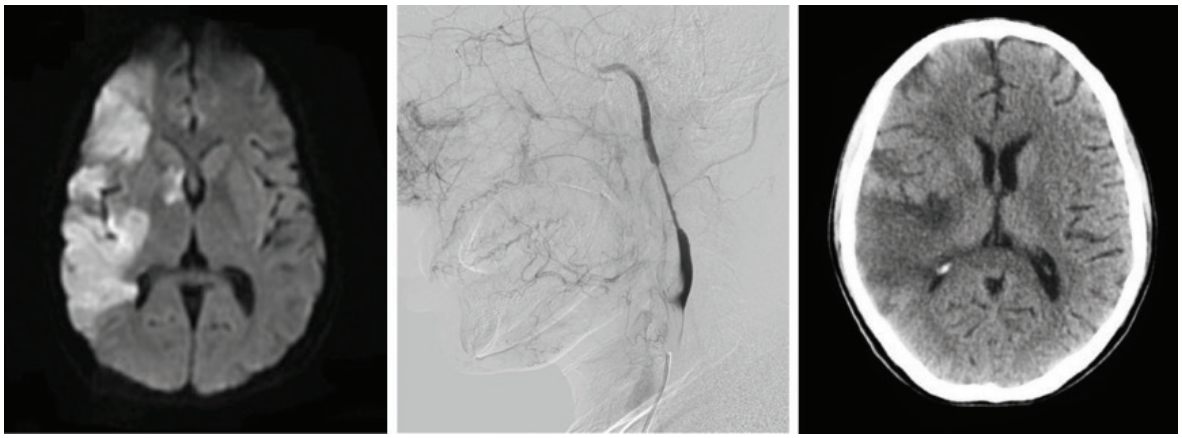

Figure 1. Images depicting ICA dissection and resultant cerebral infarction. *A*, Diffusion weighted MRI demonstrating acute fronto-temporal infarction. *B*, Cerebral angiogram demonstrating occluded right internal carotid artery secondary to dissection (*C*) CT scan demonstrating an established Right MCA territory infarct.

Pseudomonas aeruginosa infection remains a significant problem in both community and hospital settings. In advanced HIV disease, the risk of infection is higher and cases present atypically, with substantial morbidity and mortality. Added to this there is a substantial risk of recurrence despite seemingly adequate therapy, with a lack of clarity as to best practice.

Conflict of Interests:
The Authors declare that they have no conflict of interests.

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