Case report:

Concomitant *Burkholderiapseudomallei* and *Staphylococcus aureus* Infection in a chronic kidney disease patient: A Case Report and Literature Review

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Abstract

Melioidosis can happen in humans and animals. It has a wide range of clinical presentations that include asymptomatic infection, ulcers or abscesses of the skin, pneumonia, and multiple internal organ abscesses that may lead to fulminant septic shock. The organism presence in soil and surface of the water. We present a case of a non-diabetic chronic kidney disease patient presented with multiple carbuncles and respiratory melioidosis in which we are able to isolate *B. pseudomallei* after prolonging the plate incubation for 48-hours. We also suggested available tests in most diagnostic microbiology laboratory for identification of the organism.

Keywords: melioidosis; chronic kidney disease; prolonged incubation; ADH; decarboxylase

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Introduction

Burkholderiapsedomallei is the causative agent for melioidosis. Is one of a notifiable disease with huge impact on public health services as it is endemic in Malaysia. Failure to identify this agent increase the risk for mortality as the treatment options and dosages of antimicrobials was specifically tailored to this agent. *B. pseudomallei* co-infections with other organisms such as leptospirosis has been reported widely. However, co-infection with *S. aureus* was scarcely reported. A review of melioidosis in Papua New Guinea and Oceania has recovered both *B. pseudomallei* and *S. aureus* from pus sample in a 5-year-old boy.[1]

Case Report

A 67-year-old man with underlying hypertension, dyslipidaemia, chronic kidney disease and cerebrovascular accident, presented to our hospital with a complaint of fever associated with worsening shortness of breath for 2 days duration. He also have multiple carbuncles over his upper back, buttock and lower limb. There was a history of taking unknown antibiotic from outpatient department and already completed for 1 week duration. Upon arrival, the patient was dehydrated, tachypnoeic with low oxygen saturation (SpO2) under high flow mask. He was hypothermic with low GCS score and intubated due to increasing drowsiness, persistent metabolic acidosis, and uraemia. Lung examination showed reduced air entry over right lower zone with perihilar haziness seen in his chest X-ray. The carbuncle size ranges from 15x10 cm and 4x3 cm with discharging pus. Laboratory investigations showed leucocytosis, moderate anaemia of 8.8 g/dL, deranged coagulation profile and acute renal failure. He was started on intravenous Meropenem 1 g once daily plus intravenous Cloxacillin 2 gm 4-hourly. Unfortunately, his ECG showed poor R wave progression, and inferior wall dyskinesia on echocardiogram with markedly high Troponin T level which was 1996 ng/l. He was diagnosed with acute inferior myocardial infection and started with heparin infusion and inotropic support. He was planned for incision and drainage of multiple carbuncles later. Blood, endotracheal tube (ETT) and pus swab

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specimens were sent for culture and sensitivity (C&S) testing. His blood culture specimen was incubated in BACTEC machine. After 1 day, it was flagged positive. The gram staining showed the presence of gram positive cocci in clusters. The isolate later identified as methicillin-sensitive *Staphylococcus aureus* (MSSA). Pus swab and ETT secretion also grew similar organism. Both antibiotics were continued. In view of high suspicion of melioidosis in a chronic kidney disease patient, further incubation of the plate for another 24-hours showed the presence of non-lactose fermenter colonies that was identified as *B. pseudomallei*. Second ETT C&S was sent and grew similar organisms; MSSA and *B. pseudomallei* that was identified using Vitek-2 machine. The *B. pseudomallei* isolate was sensitive to ceftazidime, amoxicillin-clavulanate, doxycycline, trimethoprim-sulfamethoxazole and imipenem by using E-test method. However, the patient succumbed to death on day two of admission before the culture result was released. Therefore, the antibiotic treatment was not optimized according to melioidosis treatment regime.

Discussion

The Darwin prospective melioidosis study over the 25 years showed that majority of the cases are recent infection that will progress to clinical disease with less than 4% were due to activation from latency.[2] The factors that influenced the outcomes in melioidosis are bacterial load, mode of transmission and virulence factor of the infecting organism with the most important determinant factor is the host's immune system.

In Malaysia, diabetes mellitus was the most common predisposing factor for melioidosis. Others were renal failure like what happen in this patient, renal calculi, and patient in immunosuppressed states such as having malignancy, on long-term steroid therapy, alcoholics as well as occupational exposure, trauma and intravenous drug abusers. The predisposition is possibly due to impaired innate immunity such as neutrophils and other phagocytic cells that affect mobilization, adherence, ingestion and killing.[3] The most common clinical feature is pneumonia that accounts for more than half of the melioidosis cases with acute as well as chronic manifestations.

Culture is 100% specific but sensitivity may vary and can become as low as 60%. The factors that can affect the sensitivity are methods of sample collection, media that is being used, as well as microbiologist expertise.[4] Appropriate specimens should be obtained for culture from blood, pus, urine, respiratory secretions (sputum, bronchial-alveolar lavage) and surface lesions. This case showed the need to prolong incubation of the plate for up to 48-hours to recover the presence of *B. pseudomallei*. Later, we encountered another two cases that able to grow *B. pseudomallei* after 48-hours plate incubation even though initially *S.aureus* has been already identified.

B. pseudomallei is not one of the colonizing microbial, therefore any positive culture is considered a true pathogen and confirmed the diagnosis of melioidosis. The use of selective media is critical and important because most samples are from nonsterile sites. Ashdown agar is cost-effective but not commercially available. The microscopic feature of *B. pseudomallei* from patients on antimicrobial agents may be atypical, filamentous-like or yeast-like and may not having the typical bipolar staining ("safety pin" appearance) as shown in Figure 1.

We strongly recommend that these criterias of isolate in an immunocompromised patients; oxidase positive gram-negative bacilli which is non–*pseudomonas aeruginosa*, isolated from any clinical specimen should be presumed to be *B. pseudomallei* unless proven otherwise.[5] Confirmation by API 20NE test (bioMérieux Inc., Durham, NC, USA) or by using Vitek II GN card (bioMérieux Inc.) might help even though both systems have reported incidence of misidentifications with *B. cepacia*. However, ADH sugar which is 99% positive for *B. cepacia* in API 20NE can exclude *B. pseudomallei* infection. Resistant to aminoglycosides (e.g., gentamicin), colistin, and

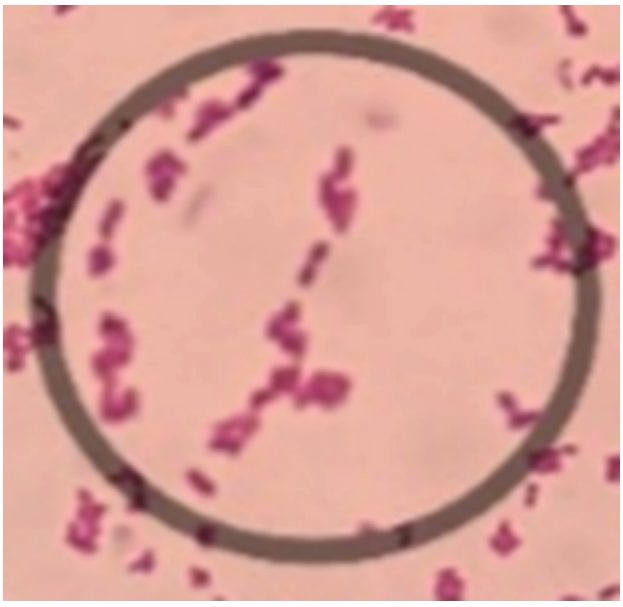

Figure 1: Gram stain of *B. pseudomallei* showed safety-pin appearance

polymyx in but susceptible to amoxicillin-clavulanic acid is quite typical for *B.pseudomallei*.[6] PCR with variety of published systems can help in definitive species identification. Laboratories may also consider using 16S rRNA gene sequencing.

In this patient, we are isolating *S. aureus* from the carbuncle as well as the tracheal aspirate, but we just able to isolate *B. pseudomallei* only from the second sample of endotracheal tube aspirate. This is possibly due to the overgrowth of the *S. aureus* that halt the growth of *B. pseudomallei*. Besides, *S. aureus* is one of a fast-growing organism. Overgrowth of the commensal or contaminating bacteria is one of the important problem that can be prevented by using selective media such as Ashdown media especially when handling nonsterile samples such as ETT in order to support the growth of *B. pseudomallei*. In this patient, we believe that *B. pseudomallei* is a true pathogen as lung colonization with this organism is very rare and just only be seen in cystic fibrosis or severe bronchiectatic patient.

Conclusion

In conclusion, we suggest to prolong incubation of the streaking plate for up to 48 hours in suspected cases of melioidosis. In this patient, we are able to grow *B. pseudomallei* after prolonging the incubation of the plate even though in the presence of *S. aureus* overgrowth. Besides, we suggest to do API 20NE and looking for ADH sugar which is 99% positive for *B. cepacia* which was always misidentified via Vitek-2. Other key characteristic to differentiate *B. pseudomallei* from *B. cepacia* is by doing decarboxylase test in which lysine is 100% positive in *B. cepacia* but negative in *B. pseudomallei*. Both API 20 NE and decarboxylase test are available in most routine diagnostic microbiology laboratory.

Ethical clearance: not needed

Competing interest: None declared

Author's contribution

a. Data gathering and idea owner of this study: Dr Norjihan Abdul Hamid
b. Conception and design: Dr Zeti Norfidiyati Salmuna
c. Case management :Dr MohdZulfakar Mazlan
d. Writing and submitting manuscript: Dr Norjihan Abdul Hamid/Dr Zeti Norfidiyati Salmuna
e. Editing and approval of final draft: Dr Zeti Norfidiyati Salmuna/Dr Norjihan Abdul Hamid/ Dr MohdZulfakar Mazlan

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