

Community-acquired necrotising pneumonia caused by Panton-Valentine leucocidin-producing methicillin-resistant *Staphylococcus aureus*

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SUMMARY

A 61-year-old male presented with community-onset pneumonia not responding to treatment despite given appropriate antibiotics. Computed tomography scan of the thorax showed large multiloculated pleural effusion with multiple cavitating foci within collapsed segments; lesions which were suggestive of necrotising pneumonia. Drainage of the effusion and culture revealed methicillin-resistant *Staphylococcus aureus*, which had the same antibiotic profile with the blood isolate and PVL gene positive.

INTRODUCTION

Staphylococcus aureus causing invasive infections usually carries the Panton-Valentine Leukocidin (PVL) genes. Although PVL genes can be found among methicillin-sensitive *Staphylococcus aureus*, it is detected at a higher frequency among community-acquired MRSA and rarely present in hospital-acquired MRSA.

MRSA causing community-onset pneumonia (COP) can also cause devastating illness in adult patients with underlying medical conditions. Necrotising pneumonia is one of the rare complications of COP associated with PVL-producing *Staphylococcus aureus*. The infection is rapidly progressive, and has high mortality rate. Thus, early recognition and prompt treatment is very important.

CASE HISTORY

A 61-year-old male, with underlying Type 2 diabetes mellitus, presented to Kuala Lumpur Hospital with a three-day history of high grade fever, productive cough and shortness of breath. His temperature was 39°C, blood pressure of 122/65mmHg and heart rate of 136 beats per minute, saturating at 98% under room air. His blood sugars were high at 27.1mmol/L.

Clinically, examination of his lungs revealed bilateral lower zone consolidation and chest x-ray showed left lower zone opacities with minimal left pleural effusion (Figure 1).

His lab investigations on admission showed marked leucocytosis with TWBC of $20.4 \times 10^9/L$ and CRP was raised at

192mg/L. He was treated for community-acquired pneumonia with intravenous amoxicillin/clavulanic acid 1.2g TDS.

Despite treatment, he became more septic, requiring higher levels of oxygenation. His TWBC also increased to 24.1×10^9 . On the 5th day of treatment, his blood cultures grew methicillin-resistant *Staphylococcus aureus* (MRSA) that was sensitive vancomycin, erythromycin, cotrimoxazole, rifampicin and clindamycin.

His antibiotics were then changed to intravenous vancomycin which was adjusted based on therapeutic drug monitoring.

While on two weeks of vancomycin, his TWC improved to 10.4×10^9 . Three surveillance blood cultures showed no growth. He was also worked up for tuberculosis which came back as negative. Vancomycin was changed to rifampicin 450mg BD and clindamycin 600mg QID as his renal function started to worsen likely due to vancomycin nephrotoxic effect.

A computed tomography (CT) thorax was done subsequently which showed large multiloculated pleural effusion at the left posterior upper lobe, extending to the left lung base measuring 6.0cm x 14.2cm x 17.6cm and multiple cavitating foci (Figure 2). Multiple consolidations on the right upper lobe with extensive mediastinal lymph nodes enlargement were also observed. A pig-tail drain was inserted but only minimal fluid was drained as the effusion was multiloculated. A 32F chest tube was inserted over the same area by the cardiothoracic team and multiple doses of streptokinase were administered via the chest tube in order to clear the septations and improve drainage; only then, 570cc of pus mixed with haemerosous fluid was successfully drained. The pleural fluid analysis showed white cell count of $>1000/ml$, predominantly polymorphs, while pleural fluid for culture grew MRSA which had the same antibiotic profile with the blood isolate. The MRSA was also Panton-Valentine Leukocidin (PVL) gene positive and has SCCmec Type V.

He finally became afebrile day two of rifampicin and clindamycin combination therapy. Both his TWBC and renal

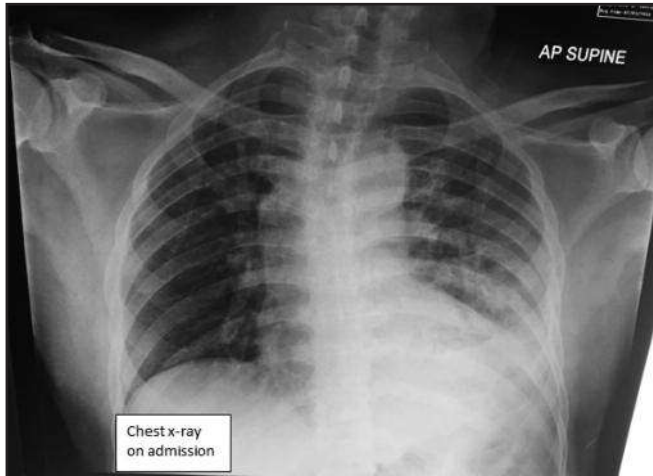


Fig. 1: Chest x-ray showed left lower zone opacities with minimal left pleural effusion.

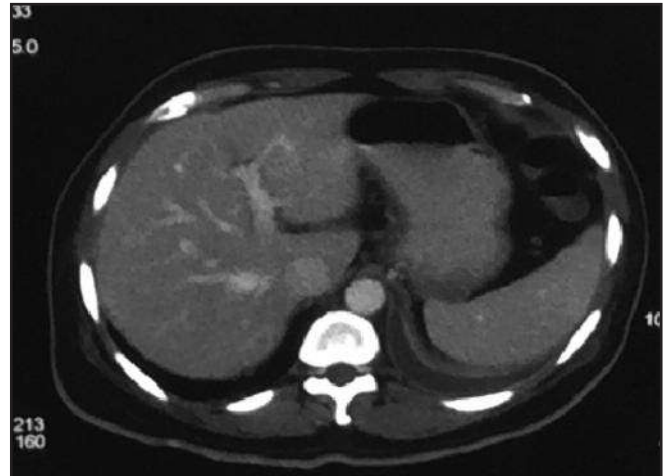


Fig. 2: Multiloculated left sided pleural effusion.

function normalised. A repeated CT thorax was done which showed marked improvement in his left pleural effusion and resolution of mediastinal lymphadenopathy.

He was then discharged well after completing four weeks of Clindamycin/Rifampicin therapy.

DISCUSSION

This is the first report of community-acquired necrotising pneumonia caused by PVL gene positive MRSA in Malaysia. Adult patients with necrotising pneumonia usually have underlying co-morbid illness and in this case uncontrolled diabetes mellitus. The patient also had elevated inflammatory markers such as leucocytosis and raised C-reactive protein.

The use of computed tomography scan was helpful in showing the extent of the lesion in the lungs, pleural cavity and mediastinal region. Multiple consolidations and necrosis of the lung tissue, resulting in cavitations and collection of pus in the pleural cavity are suggestive of necrotising pneumonia.¹

Although treatment with intravenous amoxicillin/clavulanate is recommended in the Malaysian Antibiotic Guidelines for severe community-acquired pneumonia, this patient, however, did not respond to the antibiotic. The drainage of pus from the pleural cavity and change of antibiotics to clindamycin and rifampicin manage to alleviate the symptoms and improved the patient's condition. It has also been reported that treatment with clindamycin showed good outcome in MRSA PVL positive strains because of its potential in lowering PVL production.

PVL is a cytotoxin, a virulence factor in *Staphylococcus aureus* commonly associated with necrotising infections especially necrotising pneumonia. It has been proven to induce rapid activation and cell death in human neutrophils, thus play an important role in the severity and progression of the disease.

Since this patient was previously admitted in a district hospital 6 months ago for skin infection of the left foot, he did not fit into one of the criteria of community-acquired MRSA definition, which is no hospitalization during the previous year. David MZ et al.,³ have shown that association with the healthcare environment has little predictive value for distinguishing patients with infection due to multidrug resistant MRSA isolates from those infected by CA-MRSA isolates. The epidemiological criteria of community-acquired MRSA are now being replaced with phenotypic and genotypic criteria. The MRSA in this case was sensitive to erythromycin, clindamycin and rifampicin which otherwise would not be exhibited by hospital-acquired MRSA. This strain was also PVL gene positive and carries SCCmec type V, which befit the phenotypic and genotypic characteristics of community-acquired MRSA.

In conclusion, necrotising pneumonia should be considered in the differential diagnosis of severe community-acquired pneumonia in an adult with underlying co-morbidity. Infection with PVL-producing methicillin-resistant *Staphylococcus aureus* can be severe and appropriate investigative tools such as the CT scan are very useful in the confirmation of diagnosis.

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REFERENCES

1. Tsai Y, Ku YH. Necrotizing pneumonia: A rare complication of pneumonia requiring special consideration. *Curr Opin Pulm Med* 2012; 18: 246-52.
2. Löffler B, Hussain M, Grundmeier M, Brück M, Holzinger D, Varga G, et al. *Staphylococcus aureus* Pantone-Valentine Leukocidin Is a very potent cytotoxic factor for human neutrophils. *PLoS Pathog* 2010; 6(1): e1000715.
3. David MZ, Glikman D, Crawford SE, Peng J, King KJ, Hostetler MA, et al. What is community-associated methicillin-resistant *Staphylococcus aureus*? *J Infect Dis* 2008; 197(9): 1235-43.