



## A rare case of *Staphylococcus lugdunensis* septicemia associated with myocarditis and atrioventricular block

Alex Tsz Lai Ngan<sup>1,2,\*</sup>, Sharen Lee<sup>1,2,\*</sup>, Tong LIU<sup>3</sup>, Mark Tam<sup>1</sup>, Ka Hou Christien Li,<sup>1,2,4</sup>  
Michelle Vangi Wong,<sup>1,2</sup> Michael Huen Sum Lam<sup>5</sup>, Gary Tse<sup>1,2,#</sup>, Ishan Lakhani<sup>1,2,#</sup>

<sup>1</sup>Department of Medicine and Therapeutics, Faculty of Medicine, Chinese University of Hong Kong, Hong Kong, China

<sup>2</sup>Li Ka Shing Institute of Health Sciences, Faculty of Medicine, Chinese University of Hong Kong, Hong Kong, China

<sup>3</sup>Tianjin Key Laboratory of Ionic-Molecular Function of Cardiovascular Disease, Department of Cardiology, Tianjin Institute of Cardiology, Second Hospital of Tianjin Medical University, Tianjin, China

<sup>4</sup>Faculty of Medicine, Newcastle University, United Kingdom

<sup>5</sup>Faculty of Health and Wellbeing, Sheffield Hallam University, United Kingdom

*J Geriatr Cardiol* 2019; 16: 63–66. doi:10.11909/j.issn.1671-5411.2019.01.009

**Keywords:** Atrioventricular block; Conduction; Inflammation; Myocarditis; *Staphylococcus lugdunensis*

Myocarditis is a relatively rare, possibly life-threatening disease characterized by the inflammation of the myocardium.<sup>[1]</sup> The disease pathogenesis is primarily initiated by acute injury and necrosis of cardiomyocytes, leading to an inflammatory response mediated by the immune system that can potentially cause further aggravation of myocardial damage and organ dysfunction.<sup>[2,3]</sup> Prognosis in patients with myocarditis depends on the clinical presentation, which ranges from an asymptomatic disease course to the concomitant development of cardiac arrhythmias, heart failure, cardiogenic shock and even the occurrence of death in extreme cases.<sup>[1]</sup> Amongst the infective etiologies, although viral infections are the most common, infections of bacterial and protozoal origin have also been implicated.<sup>[4]</sup> The present study describes a rare case of *Staphylococcus lugdunensis* (*S. lugdunensis*) myocarditis complicated by 1<sup>st</sup> and 2<sup>nd</sup> degree atrioventricular block (AVB).

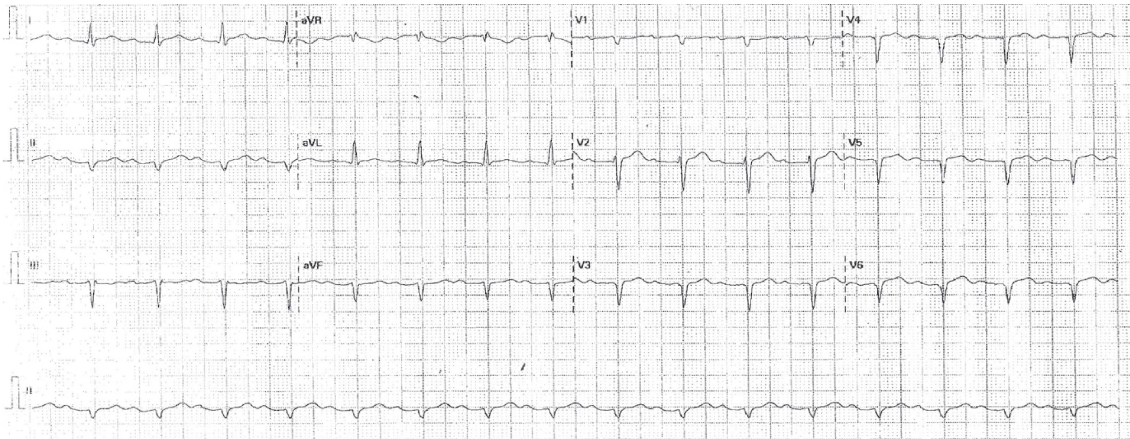
A 66-year-old male patient, with a history of type 2 diabetes mellitus, hypertension, renal impairment and cataract, presented to the emergency department with nausea, vomiting, chills and high fever (40°C). Physical examination revealed normal vital signs and jugular venous pressure. Heart sounds were dull and respiratory examination was normal. His initial electrocardiogram performed in the emergency department revealed 1<sup>st</sup> degree AVB (Figure 1), and blood samples taken on admission showed an elevated white blood cell count ( $14.0 \times 10^9/L$ ; normal range:  $3.7-9.2 \times 10^9/L$ ), creatinine (174  $\mu\text{mol/L}$ , normal range: 64–104  $\mu\text{mol/L}$ ),

total bilirubin (113  $\mu\text{mol/L}$ , normal range: 5–21  $\mu\text{mol/L}$ ), alkaline phosphatase (133 U/L, normal range: 30–120 U/L), alanine aminotransferase (301 U/L, normal range: < 248 U/L), high-sensitive troponin I (hsTnI) (6789 ng/L, normal range:  $\leq 34.2$  ng/L), along with a lowered serum phosphate level (0.54 mmol/L, normal range: 0.81–1.45 mmol/L). His initial working diagnosis was sepsis and the patient was transferred to the medical ward. A septic workup was performed and empirical antibiotic therapy with ceftriaxone was administered.

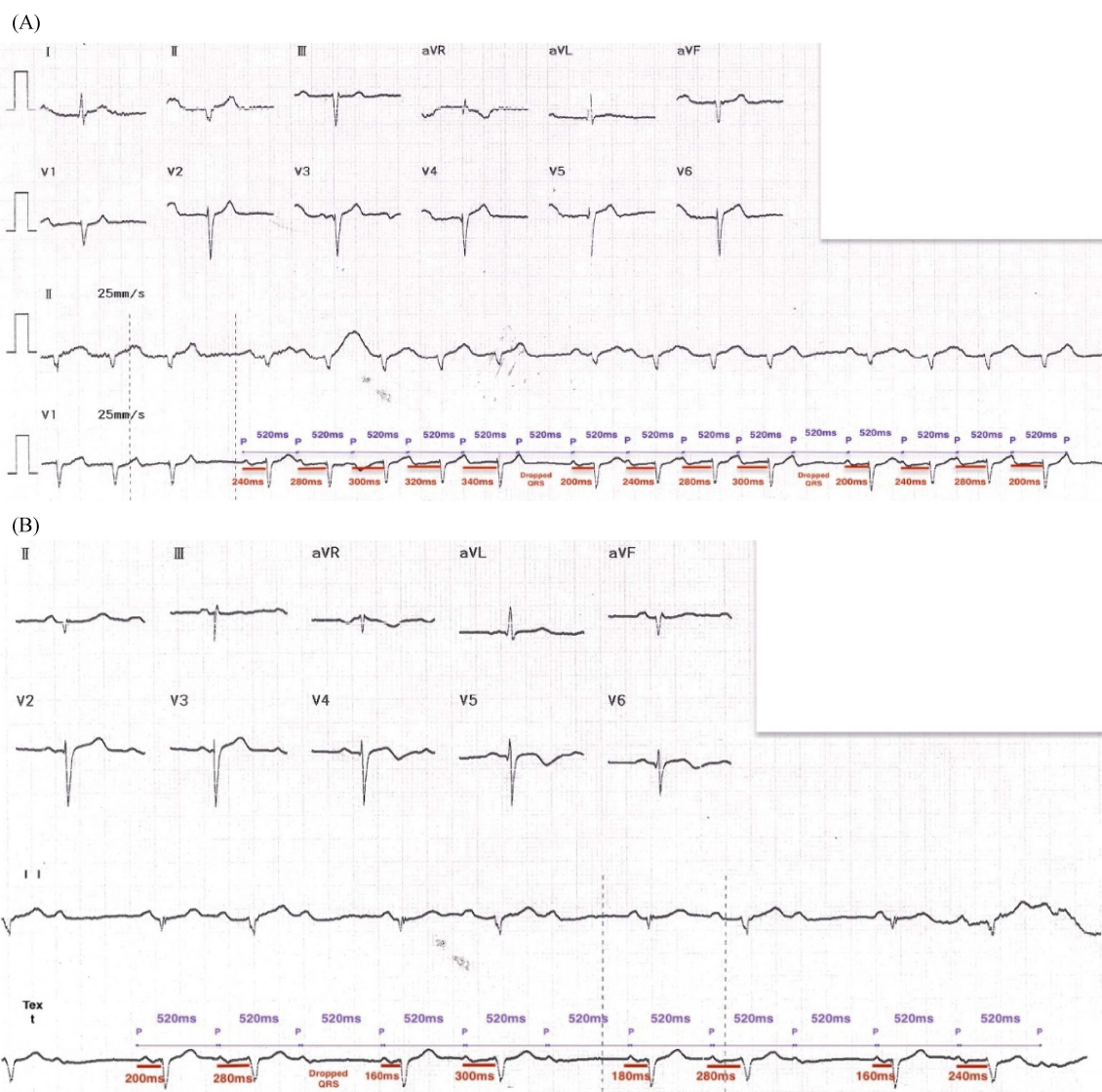
Subsequent blood tests revealed a serial rise in hsTnI to 21869 ng/L and creatine kinase to 1220 U/L. A repeat of the ECG two hours later showed progression to a Mobitz type 1, 6: 5 and 5: 4 AVB (Figure 2A). The patient remained hemodynamically stable. Four hours after admission, the patient became drowsy and hemodynamically unstable, with both blood pressure and heart rate falling to 60/48 mmHg and 50 beats/min. His third ECG displayed 3: 2 AVB (Figure 2B). Inotropes (adrenaline and dopamine) and fluid resuscitation therapy were prescribed, after which the patient was subsequently transferred to the intensive care unit. Echocardiogram showed a depressed left ventricular ejection fraction (LVEF) of 30%, despite continued inotrope support. Blood tests revealed markedly elevated C-reactive protein (205 mg/L, normal range: < 5.0 mg/L), lactate (6.2 mmol/L, normal range: 0.5–2.2 mmol/L), hsTnI (57481 ng/L) and creatinine (236  $\mu\text{mol/L}$ ). His fourth ECG showed 4:3 AVB (Figure 3A). At this juncture, positive blood culture for *S. lugdunensis* was found. After stabilization in the intensive care unit, his lactate, hsTnI and creatinine improved with weaning of inotrope therapy. The patient was transferred

\*The first two authors contributed equally to this manuscript.

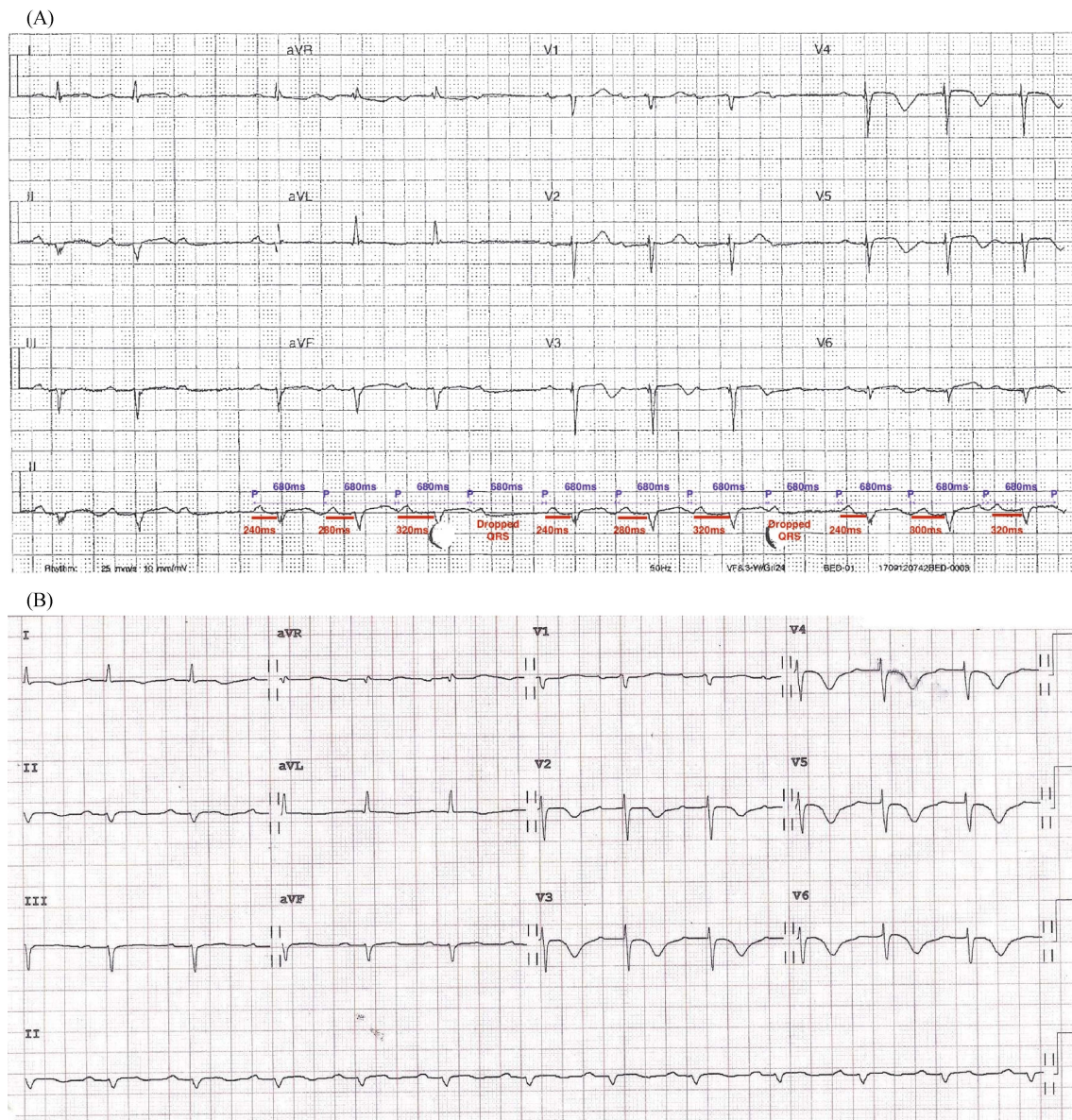
#Correspondence to: tseg@cuhk.edu.hk; ishan.lakhani@outlook.com



**Figure 1.** Initial ECG revealed first degree atrioventricular block with PR segment depression.



**Figure 2.** The 2<sup>nd</sup> and 3<sup>rd</sup> ECG. (A): The 2<sup>nd</sup> ECG showing two hours after admission showed progression to a Mobitz type 1, 6:5 and 5:4 atrioventricular block; (B): four hours after admission, the third ECG displayed 3:2 atrioventricular block.



**Figure 3. The 4<sup>th</sup> and 5<sup>th</sup> ECG.** (A): His fourth ECG showed 4:3 atrioventricular block associated with T-wave inversion in V<sub>3</sub> to V<sub>6</sub>; (B): His fifth ECG revealed recovery to first degree AVB but persistent T-wave inversion in V<sub>3</sub> to V<sub>6</sub>.

to the cardiac ward with his fifth ECG revealed recovery to first degree AVB only (Figure 3B). A follow-up two weeks later found first degree AV block with intermittent Mobitz type 1 AVB pattern.

We describe a rare case of *S. lugdunensis* sepsis complicated by myocarditis and progressive atrioventricular block that partially normalized following disease resolution. *S. lugdunensis* is a coagulase-negative staphylococcus that was initially considered as a skin flora in the inguinal region.<sup>[5]</sup> Now, it is currently recognized as a pathogenic source of various infections, including but not limited to osteomyelitis, encephalitis, peritonitis, endophthalmitis, central nervous

system infections and has been associated with cerebrovascular accidents.<sup>[6,7]</sup> *S. lugdunensis* has also been identified as a more frequent cause of endocarditis as opposed to myocarditis, and such cases are often found to be associated with infection of native heart valves and a subsequent high mortality rate owing to the destructive disease life course.<sup>[8,9]</sup>

In 2006, the first potential case of *S. lugdunensis*-positive myocarditis was reported in Finland,<sup>[5]</sup> in which a patient with rapidly progressing heart failure and widespread myocardial necrosis presented with a double infection of *S. lugdunensis* and cytomegalovirus. In our case, the

diagnosis of myocarditis was based on clinical findings of fever and chills, elevated serum hsTnI and creatine kinase levels, and reduced LVEF on echocardiography. The work-up was negative for Enterovirus and Coxsackie virus B, which are commonly associated with myocarditis.<sup>[10]</sup> Nevertheless, his latter blood cultures were positive for *S. lugdunensis*. Whilst this finding could be due to sample contamination from the skin flora,<sup>[11]</sup> the prospect of an *S. lugdunensis* etiology remained due to the absence other pathogenic causes. The interesting aspect of our case is the progressive abnormalities in the cardiac conduction system, as reflected by first degree AVB progressing to second degree AVB.

AVB is a common complication of myocarditis, and the severity of the block is proportion to the extent of myocardial injury.<sup>[12, 13]</sup> The pathogenesis of such arrhythmias in myocarditis can be explained by the diffuse inflammation of right and left bundle branches, most notably at terminal portions, thereby impairing AV conduction.<sup>[14]</sup> This seemingly transient nature of conduction blocks is not uncommon, and has been reported in various other instances of myocarditis wherein disturbances in AV transmission were spontaneously resolved following treatment of the underlying condition.<sup>[15]</sup> However, in our case, although the second-degree AVB gradually recovered to a first degree AVB on discharge, a follow-up two weeks later revealed the presence of intermittent second-degree AVB.

The present case is among the few to describe myocarditis secondary to *S. lugdunensis* sepsis complicated by progressive AV block that was partially resolved.

## References

- Schultz JC, Hilliard AA, Cooper LT, Jr. and Rihal CS. Diagnosis and treatment of viral myocarditis. *Mayo Clin Proc* 2009; 84: 1001–1009.
- Tse G, Yeo JM, Chan YW, *et al.* What is the arrhythmic substrate in viral myocarditis? Insights from clinical and animal studies. *Front Physiol* 2016; 7: 308.
- Tse G, Yan BP, Chan YW, *et al.* Reactive oxygen species, endoplasmic reticulum stress and mitochondrial dysfunction: the link with cardiac arrhythmogenesis. *Front Physiol* 2016; 7: 313.
- Blauwet LA, Cooper LT. Myocarditis. *Prog Cardiovasc Dis* 2010; 52: 274–288.
- Pirila L, Soderstrom KO, Hietarinta M, *et al.* Fatal myocardial necrosis caused by Staphylococcus lugdunensis and cytomegalovirus in a patient with scleroderma. *J Clin Microbiol* 2006; 44: 2295–2297.
- Kuzhively J, Patel SA, Abraham H. The Long CoN(S): A case of staphylococcus lugdunensis endocarditis with cerebral and coronary embolism. *J Med Cases* 2014; 5: 535–537.
- Kyaw H, Raju F, Shaikh AZ, *et al.* Staphylococcus lugdunensis endocarditis and cerebrovascular accident: a systemic review of risk factors and clinical outcome. *Cureus* 2018; 10: e2469.
- Koh TW, Brecker SJ, Layton CA. Successful treatment of Staphylococcus lugdunensis endocarditis complicated by multiple emboli: a case report and review of the literature. *Int J Cardiol* 1996; 55: 193–197.
- Vandenesch F, Etienne J, Reverdy ME, Eykyn SJ. Endocarditis due to Staphylococcus lugdunensis: report of 11 cases and review. *Clin Infect Dis* 1993; 17: 871–876.
- Lampropoulos K, Bazoukis G, Kolyviras A, *et al.* Pancreatitis and myocarditis coexistence due to infection by Coxsackie B1 and B4 viruses. *Clin Case Rep* 2018; 6: 23–26.
- Heldt Manica LA, Cohen PR. Staphylococcus lugdunensis infections of the skin and soft tissue: a case series and review. *Dermatol Ther (Heidelb)* 2017; 7: 555–562.
- Caughey RW, Humphrey JM, Thomas PE. High-degree atrioventricular block in a child with acute myocarditis. *Ochsner J* 2014; 14: 244–247.
- Tse G, Lai ET, Yeo JM and Yan BP. Electrophysiological mechanisms of bayes syndrome: insights from clinical and mouse studies. *Front Physiol* 2016; 7: 188.
- Wu MH. Myocarditis and complete atrioventricular block: rare, rapid clinical course and favorable prognosis? *Pediatr Neonatol* 2008; 49: 210–212.
- Ogunbayo GO, Elayi SC, Ha LD, *et al.* Outcomes of heart block in myocarditis: a review of 31,760 patients. *Heart Lung Circ* 2017; 28: 272–276.