

Cardiogenic shock with complete heart block secondary to dengue myocarditis requiring temporary pacing

Brief Report

Cite this article: Mohd Ramdzan MY, Mohd Khalid KF, and Che Mood M (2022) Cardiogenic shock with complete heart block secondary to dengue myocarditis requiring temporary pacing. *Cardiology in the Young* 32: 494–496. doi: [10.1017/S1047951121003152](https://doi.org/10.1017/S1047951121003152)

Received: 17 May 2021
Revised: 25 June 2021
Accepted: 5 July 2021
First published online: 2 August 2021

Keywords:

Complete heart block; dengue; temporary pacing; myocarditis

Author for correspondence:

Muhammad Yusoff Mohd Ramdzan, Clinical Fellow, Paediatric and Congenital Heart Centre, National Heart Institute, Jalan Tun Razak, 50480 Kuala Lumpur, Malaysia.
Tel: +603-26178991.
E-mail: dr.myusoff@ijn.commy

Muhammad Yusoff Mohd Ramdzan , Khairul Faizah Mohd Khalid and Marhisham Che Mood

Paediatric and Congenital Heart Centre, National Heart Institute, Kuala Lumpur, Malaysia

Abstract

This case illustrates acute myocarditis with complete heart block in a 13-year-old teenager as a rare complication of acute dengue illness. He required urgent temporary pacing with inotropic support and antifailure medications. Complete heart block in dengue myocarditis is an acute but reversible condition. A similar presentation in a dengue-endemic country or with a history of travelling to tropical countries warrants a suspicion of dengue infection.

Case report

A 13-year-old boy presented with syncope to a primary hospital following a history of fever, chest pain, and dizziness for 2 days. He had no known medical illness. On examination, he had complete heart block with a heart rate of 40 beats per minute and blood pressure of 90/50 mmHg. He was referred to us for further management. Upon admission to the ICU, his heart rate was 30 beats per minute with signs of cardiogenic shock. He was immediately intubated, resuscitated, and started on dobutamine and adrenaline infusions.

Initial blood investigations showed normal total white cells ($8.4 \times 10^9/L$), normal platelets ($299 \times 10^9/L$), and normal haemoglobin (13.8 g/dl) and haematocrit (41%). Electrolytes, renal function, and hepatic function tests were normal. C-reactive protein (CRP) was 123.9 mg/L. Cardiac enzymes at day 2 of illness were elevated: creatine kinase MB (CK-MB) was 64 U/L (reference range <25), Troponin T was 2207 pg/ml (reference range <14), NT-proBNP was 7107 pg/ml (reference range <125). Electrocardiography (ECG) showed complete atrioventricular block and ST segment elevation at V2–V4 (Fig 1). Chest radiograph showed a normal heart size and clear lung fields. Echocardiography revealed a structurally normal heart with hypokinetic left ventricular wall motion, mild mitral regurgitation, and an ejection fraction of 38%. In view of unstable haemodynamics, an urgent transvenous temporary pacemaker was inserted at the cardiac catheterisation lab. The temporary pacing was set using VVI mode at a rate of 70 beats per minute.

Simultaneous cardiac catheterisation findings showed a left ventricular end-diastolic pressure of 17 mmHg, and at the same time, concluded as acute myocarditis with left ventricular diastolic dysfunction. Coronary angiography was done for a history of chest pain and ST changes showed a normal coronary anatomy study. The haemodynamics and blood gases improved overnight, and he was extubated the next day. He was started on an ACE inhibitor and diuretics to support the impaired left ventricle. In view of acute myocarditis, IV hydrocortisone 100 mg QID was added, and he was also covered for sepsis with IV ceftriaxone.

Viral studies taken at day 4 of illness yielded a negative dengue non-structural protein 1 (NS-1) antigen, positive dengue IgM and IgG antibodies. COVID-19, influenza A and B, respiratory syncytial virus (RSV), Epstein-Barr virus (EBV), and Herpes simplex virus (HSV) serologies were negative. Blood, tracheal, and urine cultures found no bacterial growth. Connective tissue screening was also negative. The diagnosis of a secondary dengue infection was made based on a positive serological test, without the commonly seen haematological and biochemical derangements.

He was extubated on day 4 of illness. The ECG had reverted to sinus rhythm by day 5 of illness (Fig 2). After optimising the antifailure medications, IV dobutamine was weaned off. The repeat echocardiography showed improved left ventricular function. Dengue recovery rashes appeared on the same day. His temporary pacemaker was removed on day 7 of illness. His cardiac enzymes normalised, and serial echocardiography showed good left ventricular systolic function (ejection fraction of 61%, no mitral regurgitation). There was no fever throughout admission. He made a full recovery and was discharged on day 12 of illness with oral enalapril, frusemide, and spironolactone for 6 weeks.

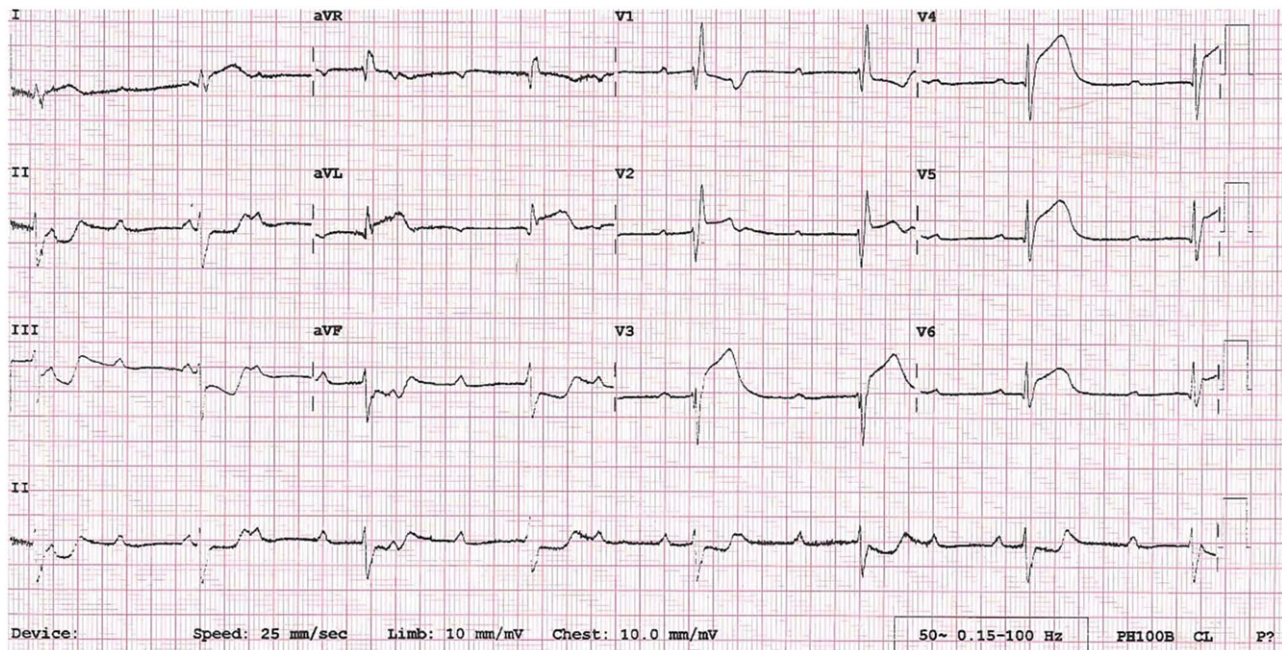


Figure 1. ECG upon admission to our centre.

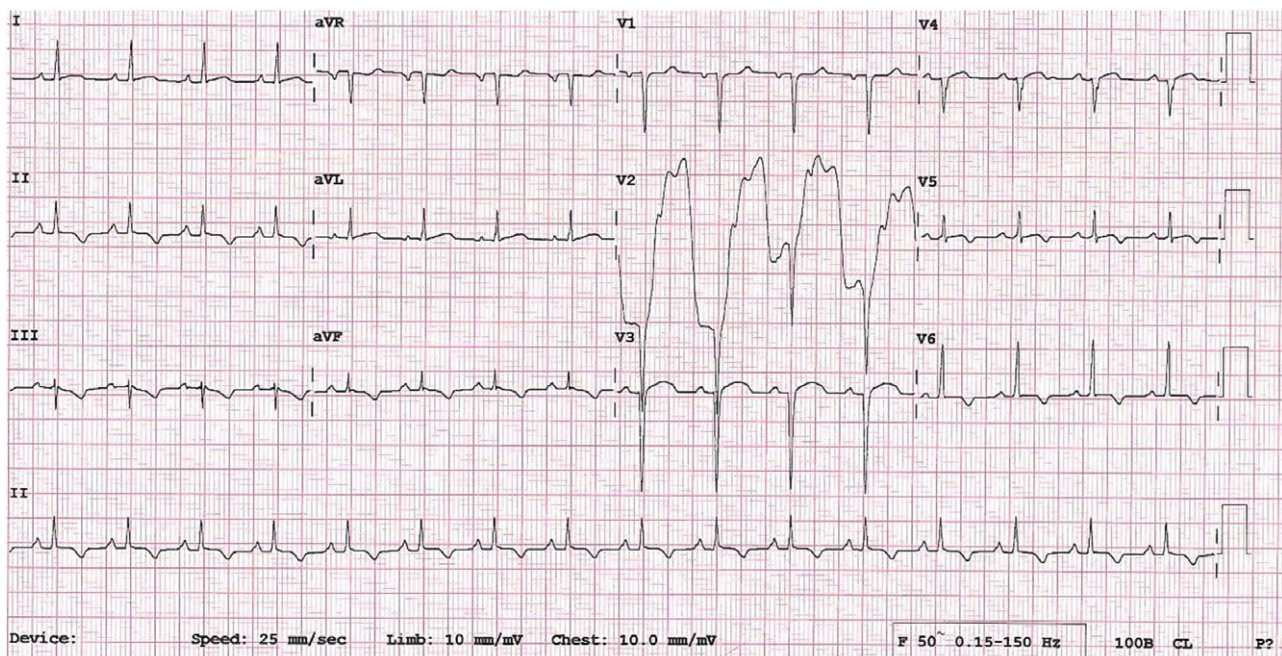


Figure 2. ECG upon discharge.

Discussion

Dengue infection is the most prevalent mosquito-borne virus in the world and it is endemic in Malaysia. Total cases have increased from 7103 in 2010 to 130,101 in 2019 with a case fatality rate of 0.16–0.30% for the past decade. DEN1 and DEN2 have been responsible for the recent increase in cases.¹

Expanded dengue syndrome

Malaysian frontline healthcare workers are trained at detection and outpatient management of dengue fever without warning signs. Dengue cases with warning signs or severe cases (dengue haemorrhagic fever and dengue shock syndrome) are referred early to tertiary centres. Atypical cases, grouped into a new subgroup called

expanded dengue syndrome by WHO,² are underrecognised as their diagnosis is challenging. Examples of this syndrome include acute disseminated encephalomyelitis, thyroiditis, acute hepatic failure, glomerulonephritis, haemolytic uremic syndrome, pneumonitis, and haemophagocytic lymphohistiocytosis.

Complete heart block is part of the expanded dengue syndrome. The initial symptoms, examination, and haematological investigations of our patient did not suggest typical dengue infection; a high index of suspicion helped to clinch the diagnosis. Identification of the serotype was not done as it was not routine in Malaysia.

Cardiac involvement in dengue infection

Thirteen and seven percentage of dengue-related deaths in Malaysia in 2013–2014 had cardiac involvement.¹ While cardiac involvement in dengue infection is not uncommon, it is not routinely screened for when the patient is haemodynamically stable. DEN2 and DEN3 serotypes cause most of the cardiac complications.³ There is a wide variation in the reported incidence of myocarditis in hospitalised patients (7–23%) due to different definitions and a lack of endomyocardial biopsy for gold standard confirmation.^{4–6} The cardiac presentation can vary from benign to severe life-threatening condition. Commonly reported cardiac manifestations are elevated cardiac biomarkers or ischemic ECG changes due to myocarditis with various degrees of functional impairment. Sinus tachycardia is most frequently reported. Atrioventricular block is rarely reported. Only 2 patients out of 1782 dengue patients in an outbreak in China in 2014 had complete heart block.⁶

Complete heart block in dengue infection is reported to last 2–7 days before reverting to sinus rhythm.^{3,7,8} Other associated arrhythmias include sinus bradycardia, tachyarrhythmias (atrial fibrillation and ventricular tachycardia), and variable atrioventricular blocks.⁶ Inflammation of directly invaded myocytes leading to a cytokine storm, plasma leakage causing myocyte interstitial oedema, and reduced coronary perfusion predispose to arrhythmias.⁹ Despite this, complete heart block in dengue fever can occur without fulfilling the definition of myocarditis.³ It can also occur at different phases of the infection including the recovery phase as post-inflammatory fibrosis sets in.

There is no specific treatment for complete heart block in dengue infection. While the mainstay of myocarditis treatment is symptomatic management, some centres have used methylprednisolone, immunoglobulins, and immunosuppressive agents to expedite recovery. IV steroids in acute myocarditis, especially

eosinophilic myocarditis, improves left ventricular ejection fraction.¹⁰

Acknowledgements. None.

Financial support. This report received no specific grant from any funding agency, commercial or not-for-profit sectors.

Conflicts of interest. None.

Ethical standards. Not applicable.

References

1. Woon YL, Hor CP, Hussin N, Zakaria A, Goh PP, Cheah WK. A two-year review on epidemiology and clinical characteristics of dengue deaths in Malaysia, 2013–2014. *PLoS Neglected Trop Dis* 2016; 10: 1–16. PLOS. DOI: [10.1371/journal.pntd.0004575](https://doi.org/10.1371/journal.pntd.0004575).
2. World Health Organization Regional Office for South-East Asia. Expanded dengue syndrome (unusual or atypical manifestations). In *Comprehensive guidelines for prevention and control of dengue and dengue haemorrhagic fever*. Revised and expanded edition. SEARO Publications, 2011. ISBN: 978-92-9022-387-0.
3. Virk HUH, Inayat F, Rahman ZU. Complete Heart Block in Association with Dengue Hemorrhagic fever. *Korean Circ J* 2016; 46: 866–869. The Korean Society of Cardiology. DOI: [10.4070/kcj.2016.46.6.866](https://doi.org/10.4070/kcj.2016.46.6.866).
4. Bhatt M, Soneja M, Farooqui FA, et al. Myocarditis in admitted patients with dengue fever. *Infection* 2020; 48: 899–903. Springer Link. DOI: [10.1007/s15010-020-01500-w](https://doi.org/10.1007/s15010-020-01500-w).
5. Miranda CH, de Carvalho Borges M, Alessandra Kimie Matsuno A, et al. Evaluation of cardiac involvement during dengue viral infection. *Clinical Infectious Dis* 2013; 57: 812–819. Oxford University Press. DOI: [10.1093/cid/cit403](https://doi.org/10.1093/cid/cit403).
6. Li Y, Hu Z, Huang Y, et al. Characterization of the Myocarditis during the worst outbreak of dengue infection in China. *Medicine* 2016; 95: e4051. Medicine. DOI: [10.1097/MD.0000000000004051](https://doi.org/10.1097/MD.0000000000004051).
7. Navinan MR, Yudhishdran J, Herath S, et al. Complete heart block in dengue complicating management of shock due to both bleeding and leakage: a case report. *BMC Res Notes* 2015; 8: 1–7. Springer Nature. DOI: [10.1186/s13104-015-1036-9](https://doi.org/10.1186/s13104-015-1036-9).
8. Mohd Sazly Lim S, Fan KH, Wan Sulaiman WA. A case of Dengue Hemorrhagic Fever with myocarditis and complete heart block. *Rawal Med J* 2014; 3: 104–106. eJManager. <http://www.rmj.org.pk/index.php?fulltxt=43912&fulltxtj=27&fulltxtp=27-1378475217.pdf>.
9. Arora M, Patil RS. Chapter 2: cardiac manifestations in dengue fever. *Prog Med* 27: 8–11. The Association of Physicians of India. http://apiindia.org/wp-content/uploads/pdf/progress_in_medicine_2017/mu_02.pdf.
10. Tim B, Tom A, Walter D, Christophe V. Fulminant eosinophilic myocarditis treated with steroids and mechanical unloading: a case report. *Eur Heart J – Case Rep* 2020; 4: 1–5. DOI: [10.1093/ehjcr/ytaa444](https://doi.org/10.1093/ehjcr/ytaa444).