

CASE REPORT

Open Access



An unusual cardiac magnetic resonance finding in a patient with syphilis presenting with heart block

Akshay Nandagopal and Babu Peter Sathyanathan*

Abstract

Background Syphilis is caused by *Treponema pallidum* either via sexual exposure or vertical transmission during pregnancy. The disease course of infected individuals is divided into primary, secondary, and tertiary stages over a period of years. Latent syphilis most commonly involves the central nervous system and the aorta. Here we present a case of late latent syphilis presenting as heart block with evidence of myocardial fibrosis involving the septum and lateral wall in cardiac MRI.

Case presentation A 53-year-old female patient, who was clinically diagnosed with late latent syphilis, presented with multiple episodes of syncopal attacks and was rushed to an outside hospital where ECG revealed a complete heart block. She was referred to our tertiary care centre. The patient was received in the Cardiac Care Unit and then referred for a cardiac MRI to identify a potential cause for the complete heart block. Recently published new Lake Louise criteria (nLLC) (Li et al. in Front Cardiovasc Med, 2021. <https://doi.org/10.3389/fcvm.2021.739892>), following the introduction of myocardial mapping, redefined imaging diagnosis according to the combined presence of a T1 criterion [presence of LGE (late gadolinium enhancement) or increased T1 mapping or extracellular volume values] and a T2 criterion (hyperintensity in T2 weighted STIR or increased T2 mapping values). Cardiac MRI features in our case were consistent with myocarditis based on the above criteria.

Conclusions Myocarditis as a manifestation of late latent syphilis is very rare. Cardiac complications of late syphilis have so far been described in terms of ascending aortitis and dissection with coronary artery rupture. Syphilitic myocarditis occurs most commonly as a coincidental finding of endomyocardial biopsies. Targeted screening for involvement using CMR can be instrumental in elucidating this rare, but treatable diagnosis. We hereby report a rare case of myocarditis with heart block in a patient with late latent syphilis, hitherto unreported in the literature as of date.

Keywords Late latent syphilis, Fibrosis, Late gadolinium enhancement

Background

Syphilis is caused by *Treponema pallidum* either via sexual exposure or vertical transmission during pregnancy. The disease course of infected individuals is divided into primary, secondary, and tertiary stages over a period of

years [1]. In the stage of primary syphilis, the patient presents with chancre, especially on the genitals and regional lymphadenopathy. Following the resolution of the primary lesion, fever and maculopapular rash occur a few weeks later, which represents the secondary phase [1]. Latent syphilis most commonly involves the central nervous system and the aorta. Myocarditis as a manifestation of late latent syphilis is very rare [2]. We report a unique case of latent syphilis presenting as myocardial fibrosis.

*Correspondence:

Babu Peter Sathyanathan
drbabupeter@gmail.com
Barnard Institute of Radiology, Chennai, India

Case presentation

A 51-year-old female had episodes of syncope and headache a few months back for which the patient had consulted a neurologist. MR imaging of the brain was done to look for organic causes, which revealed no significant abnormality. The patient also had complaints of blurring of vision and was diagnosed with papillitis and was advised to screen for sexually transmitted diseases which revealed a positive *Treponema pallidum* hemagglutination (TPHA) test and a non-reactive Venereal Disease Research Laboratory (VDRL) test. She was referred to a sexually transmitted diseases clinic in our tertiary care centre and incidentally detected to have ulcers in bilateral groin regions. Serial investigations revealed Venereal Disease Research Laboratory (VDRL)-NR, VCTC (Voluntary Counselling and Testing Center) – ve, *Treponema pallidum* hemagglutination (TPHA).

+ve, HSV (Herpes simplex virus) 1, 2 IgM –ve. The culture for Trichomonas vaginitis and candida was negative. Hence, based on laboratory and clinical findings, the patient was diagnosed with late latent syphilis. Currently, she had presented with multiple episodes of syncopal attacks and was rushed to an outside hospital where ECG (electrocardiogram) revealed a complete heart block. She was again referred to our tertiary care centre. The patient was received in the cardiac care unit, following which she was stabilized.

IM Penicillin injection was continued for late latent syphilis.

The patient was then referred for cardiac MRI to identify a potential cause for the complete heart block. The magnetic resonance imaging was performed in 3T magnetic resonance scanner (Siemens Healthineers, Erlangen, Germany). Standard institute cardiac MR protocol with TRUFISP (True Fast Imaging with steady-state free precession) (white blood) images and HASTE (half Fourier single-shot turbo spin echo) (dark blood) axial and coronal sections were done for morphologic imaging. Two-chamber, four-chamber, and short-axis cine images were obtained to evaluate wall motion abnormalities and cardiac function. Parametric mapping with Native T1 and T2 mapping was done, and ECV (extracellular volume) was calculated as per SCMR (Society for Cardiovascular magnetic resonance) guidelines. Pre-contrast T1 maps were obtained from three short-axis images (basal, mid cavity, and apical) of the left ventricle using a single short true FISP based on the modified look-locker inversion recovery (MOLLI) sequence.

The standard T1 and T2 mapping values in our institute were as follows: normative T2 values: 38.25 ± 1.2 ms, normative T1 values: 1186.47 ± 45 ms. Normative ECV values were $25.2 \pm 3.55\%$.

Gadolinium contrast was administered at 0.1 mmol/kg. Late gadolinium images were obtained at 10, 12, and 15 min. The findings noted in cardiac MRI were significant hypertrophy (18 mm) of the lateral wall of base of left ventricle (Fig. 1A–G). Delayed phase-sensitive inversion recovery (PSIR) imaging revealed significant subepicardial delayed hyperenhancement involving the lateral wall of base of left ventricle and septal wall (Figs. 2A, B and 3), reflecting fibrosis. There was corresponding increased native T1 (Fig. 4A, B), T2 (Fig. 5) and ECV values. The native T1 values in the septum and lateral wall were 1351 and 1331, respectively. The T2 values were 50.03 and 39.45, respectively. The ECV values were 68.46 and 39.2, respectively.

No significant wall motion abnormality was noted, and a normal ejection fraction was observed.

A temporary pacemaker was inserted to maintain cardiac rhythm. Hence in a patient with late latent syphilis (clinical and laboratory results positive), the above features in parametric mapping and late gadolinium enhancement reflect myocardial infiltration/myocarditis.

To rule out other causes of myocarditis, an infectious panel was done and *Treponema pallidum* hemagglutination (TPHA) was found to be positive. Investigations for Candida, HSV, Trichomonas, Rubella, Adenovirus, parvovirus, enterovirus, EBV, CMV, and mumps were found to be negative. KOH smear was negative. Venereal Disease Research Laboratory (VDRL) was non-reactive, and VCTC (Voluntary Counselling and Testing Center) was negative. A neurologist's opinion was sought and lumbar puncture was attempted to obtain a diagnostic CSF (cerebrospinal fluid) tap, which was found to be acellular with no growth on CSF culture. Blood cultures were found to be negative.

The patient was later referred to PET (positron emission tomography) scan, which revealed status post-temporary cardiac pacing with few nonspecific sub-centimetric nodules in both lungs with low-grade FDG avidity.

A few prominent mediastinal lymph nodes were seen with a few of them showing mild increased FDG (fluorodeoxyglucose) avidity, the largest subcarinal node measuring $\sim 19 \times 12$ mm (SUV max = 3.4).

The likelihood of infective aetiology was suggested, and a differential of sarcoidosis was suspected; however, no other characteristic features like interlobular septal thickening and perilymphatic nodules were detected. ACE (angiotensin-converting enzyme) levels were done to rule out sarcoidosis and were found to be within normal limits. TB quantiferon samples were also sent, which were found to be negative.

Dilated left ventricle with patchy increased metabolic activity was seen in the wall of the left ventricle (SUV

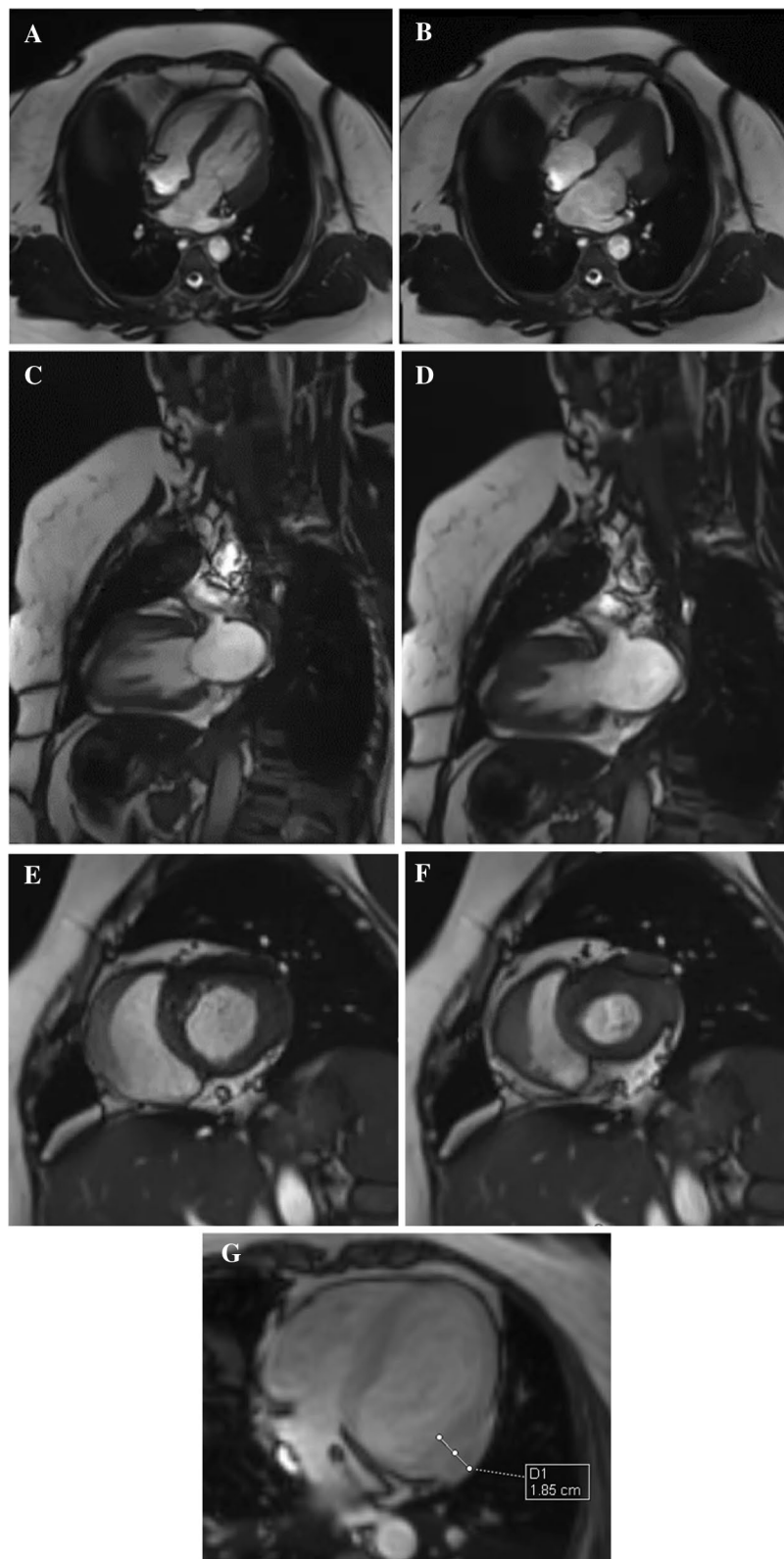


Fig. 1 **A** and **B** CINE TRUFISP Four chamber images showing lateral left ventricular hypertrophy during diastole and systole, respectively. **C** and **D** CINE TRUFISP Two chamber images showing ventricular hypertrophy during systole and diastole. **E** and **F** CINE TRUFISP Short axis images showing left ventricular hypertrophy during diastole and systole. **G** Axial TRUFISP image reveals relative thickening (18 mm) of lateral wall of base of left ventricle

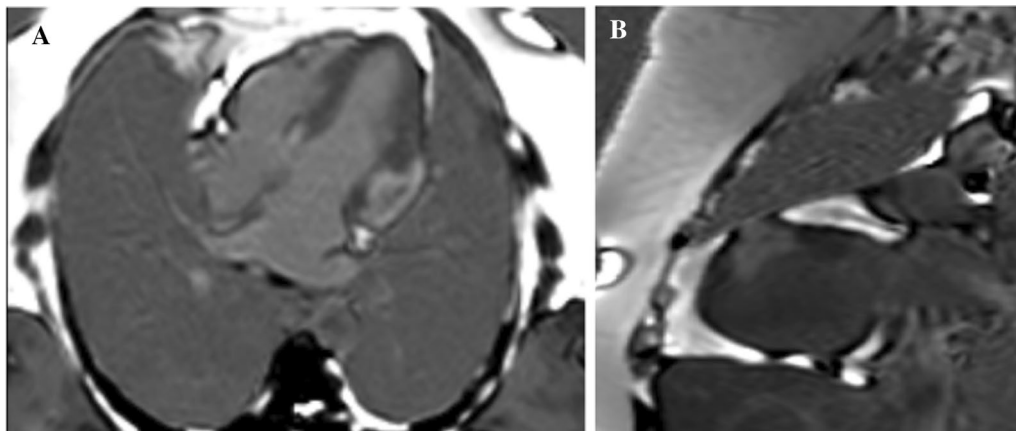


Fig. 2 A and B Axial and short axis delayed contrast PSIR images reveals significant subepicardial hyperenhancement involving lateral wall of base of left ventricle

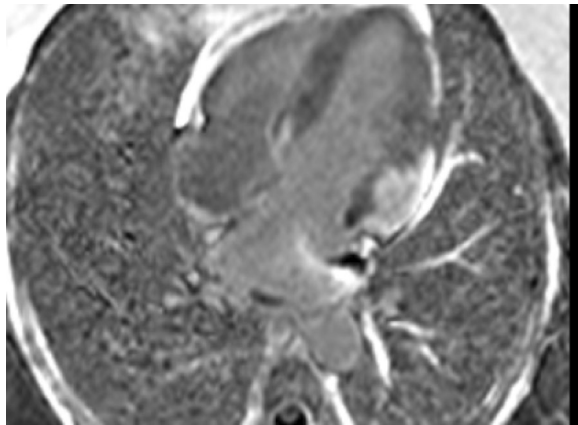


Fig. 3 Delayed contrast PSIR imaging reveals significant subepicardial hyperenhancement involving lateral wall of left ventricle

max=8) (Fig. 6). Increased metabolic activity was also seen along the right lateral wall of the superior vena cava.

Repeated attempts to withdraw the patient from a temporary pacemaker resulted in the patient developing RBBB (right bundle branch block) or CHB (Complete heart block) 2–3 days post-temporary pacemaker removal.

Hence, a permanent pacemaker was inserted, following which the patient maintained a normal sinus rhythm. Based on the above findings, a clinical diagnosis of late latent syphilis, with a rare manifestation presenting as a complete heart block, was made, following which the patient was discharged and advised follow-up. Cardiac MRI with parametric mapping and delayed contrast imaging was helpful not only in picking up the correct diagnosis of myocarditis in this patient with a

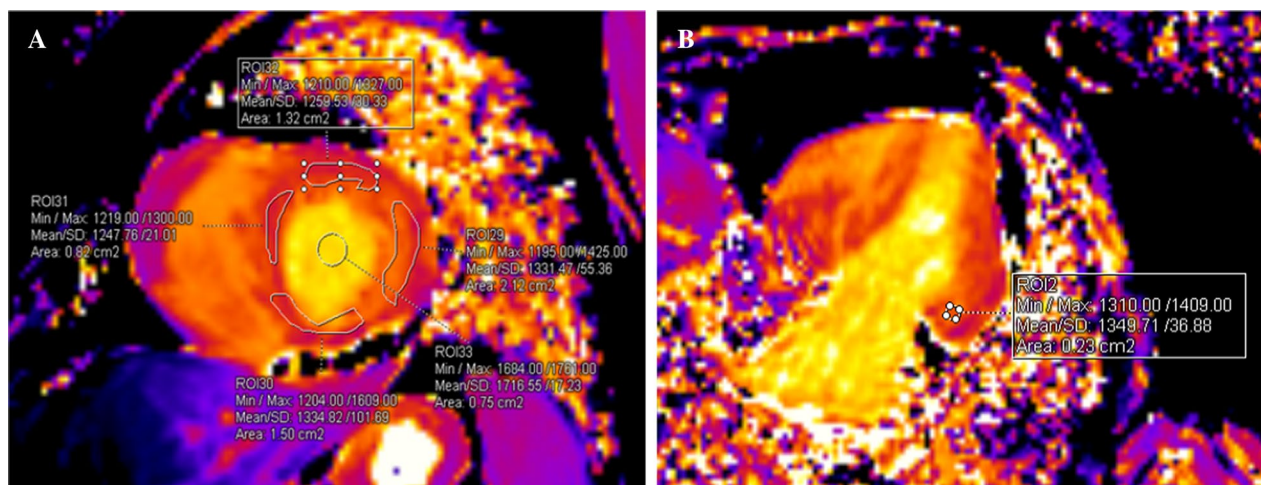


Fig. 4 A and B Native T1 mapping shows increased T1 relaxation values in inferior and lateral wall (1334 ms and 1349 ms) of base of left ventricle

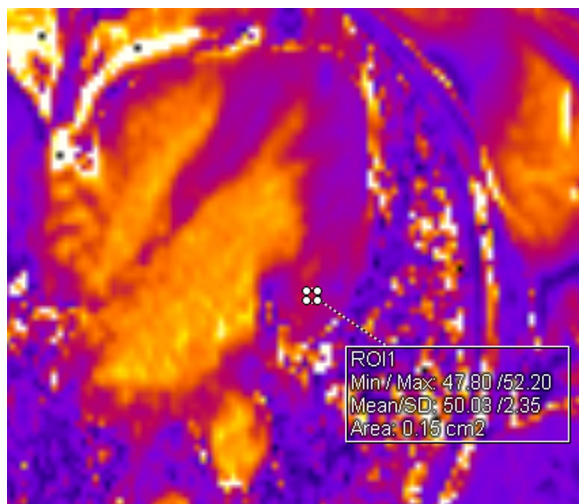


Fig. 5 Native T2 mapping reveals increase T2 relaxation values (50.03 ms) in lateral wall of base of left ventricle

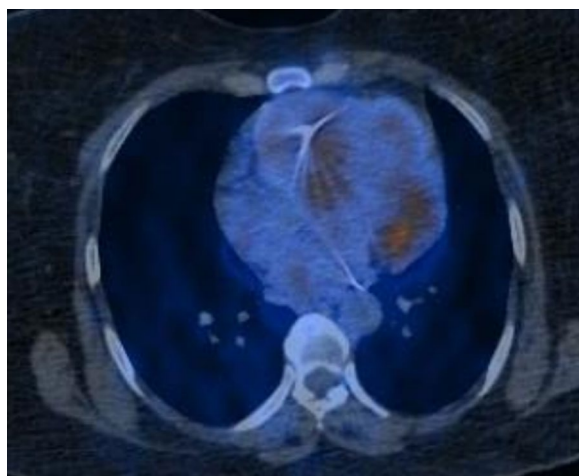


Fig. 6 PET CT fusion image showing dilated left ventricle with patchy increased metabolic activity is seen in the wall of the left ventricle (SUV max = 8)

background of syphilis, but also demonstrated fibrosis of the septal wall, involving the conduction pathway and possible cause of the heart block.

Discussion

The clinical manifestations of syphilis are due to the local inflammatory response elicited by spirochetes.

At present, serological tests are utilized to diagnose syphilis both in symptomatic patients and as a screening tool in asymptomatic patients. Serodiagnostic tests for syphilis can be broadly categorized into non-treponemal tests (NTTs)—Venereal Disease Research Laboratory

(VDRL) tests—and treponemal tests (TTs)—*T. pallidum* haemagglutination (TPHA) assay [1].

NTTs measure immunoglobulins (IgM and IgG) produced in response to lipoidal material released from bacteria. In patients who have been diagnosed and have not undergone any treatment, the titre reaches its peak 1–2 years after infection and has low titres even in the late stage of the disease [1]. In cases where the patient has undergone treatment, the titres usually decline and become non-reactive 6 months later in immunocompetent individuals, whereas TTs used to detect the antibodies that are produced against *T. pallidum* proteins are highly specific. TTs become positive 6–14 days after the primary chancre appears and may be used to diagnose early syphilis missed by NTT tests [1].

We have accustomed ourselves to thinking of latent syphilis as involving most commonly the central nervous system and the aorta. Myocarditis as a manifestation of latent syphilis is extremely rare [2]. Cardiac MR imaging may play a major role in the identification of this entity, with the findings of diffuse non-ischaemic (epicardial and intramyocardial) late gadolinium enhancement pattern within the LV myocardium and elevated native T1 and native T2 values [2], reflecting fibrosis.

In our case, the presence of late gadolinium enhancement in anteroseptal and anterolateral walls reflects focal myocardial fibrosis. Parametric mapping also revealed a corresponding increase in native T1 and T2 values as well as ECV values, reflecting ongoing myocarditis. No other areas of increased values were noted in the rest of the myocardium.

This presence of focal myocardial infiltration may reflect myocarditis or focal infiltrative lesion.

The gold standard for the diagnosis of acute myocarditis is still endomyocardial biopsy (EMB). However, EMB being an invasive procedure has several limitations, such as lack of standard protocols, sampling errors, and low sensitivity [3]. Since the clinical condition of our patient was not conducive to myocardial biopsy, the latter could not be done to obtain the pathological diagnosis.

Recently published new Lake Louise criteria (nLLC) [3], following the introduction of myocardial mapping, redefined imaging diagnosis according to the combined presence of a T1 criterion (presence of LGE or increased T1 mapping or extracellular volume values) and a T2 criterion (hyperintensity in T2 weighted STIR or increased T2 mapping values).

Cardiac MRI features in our case were consistent with myocarditis based on the above criteria.

This is one of the very few rare reports of cardiac MR showing myocardial infiltration in a patient with clinically proven syphilis, presenting with heart block. Other viral causes of myocarditis were excluded. PET scan

features also did not suggest the possibility of sarcoidosis. Based on the above features, it was concluded that the cause of myocarditis in this patient with heart block was syphilis.

The heart block could be explained due to the presence of fibrosis involving the conducting system, elegantly depicted with cardiac MRI [4].

Conclusions

Myocarditis as a manifestation of late latent syphilis is very rare. Cardiac complications of late syphilis have so far been described in terms of ascending aortitis and dissection with coronary artery rupture. Syphilitic myocarditis occurs most commonly as a coincidental finding of endomyocardial biopsies. Targeted screening for involvement using CMR can be instrumental in elucidating this rare, but treatable diagnosis. We hereby report a rare case of myocarditis with heart block in a patient with late latent syphilis, hitherto unreported in literature as of date.

Abbreviations

TPHA	<i>Treponema pallidum</i> hemagglutination
VDRL	Venereal Disease Research Laboratory
VCTC	Voluntary Counselling and Testing Center
HSV	Herpes simplex virus
ECG	Electrocardiogram
ECV	Extracellular volume
SCMR	Society for Cardiovascular Magnetic Resonance
MOLLI	Modified look-locker inversion recovery
PSIR	Phase-sensitive inversion recovery
nLLC	New Lake Louise criteria
CSF	Cerebrospinal fluid
FDG	Fluorodeoxyglucose
ACE	Angiotensin-converting enzyme
NTTs	Non-treponemal tests
TTs	Treponemal tests
EMB	Endomyocardial biopsy
LGE	Late gadolinium enhancement

Acknowledgements

Not applicable.

Author contributions

BP analysed and interpreted the patient data regarding the cardiac infiltration, AN performed the study and was a major contributor in writing the manuscript. All the authors have read and confirmed the manuscript.

Funding

Not applicable.

Availability of data and materials

The datasets used or analysed during the current study are available from the corresponding author on reasonable request.

Declarations

Ethics approval and consent to participate

Consent to participate was obtained from the patient and her attenders. Verbal consent was obtained from the patient.

Consent for publication

Consent to publication was obtained. Informed verbal consent was obtained from the study participant.

Competing interests

The authors declare that they have no competing interests.

Received: 17 October 2022 Accepted: 31 December 2022

Published online: 11 January 2023

References

1. Peeling RW, Mabey D, Kamb ML, Chen XS, David Radolf J, Benzaken AS (2017) Syphilis. *Nat Rev Microbiol*. <https://doi.org/10.1038/nrdp.2017.73>
2. Zainal Abidin HA, Arendt C, De Leuw P, Zhou H, Arcari L, Nagel E, Puntmann V (2019) Tertiary syphilis manifested as myocarditis. *Eur Heart J Cardiovasc Imaging* 20(Supplement_2):jez127.001. <https://doi.org/10.1093/ehjci/jez127.001>
3. Li S, Duan X, Feng G, Sirajuddin A, Yin G, Zhuang B, He J, Xu J, Yang W, Wu W, Sun X (2021) Multiparametric cardiovascular magnetic resonance in acute myocarditis: comparison of 2009 and 2018 Lake Louise criteria with endomyocardial biopsy confirmation. *Front Cardiovasc Med*. <https://doi.org/10.3389/fcvm.2021.739892>
4. Yahalom M, Roguin N, Antonelli D, Suleiman K, Turgeman Y (2013) Association of heart block with uncommon disease states. *Int J Angiol* 22(3):171–176. <https://doi.org/10.1055/s-0033-1349164>

Publisher's Note

Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

Submit your manuscript to a SpringerOpen[®] journal and benefit from:

- Convenient online submission
- Rigorous peer review
- Open access: articles freely available online
- High visibility within the field
- Retaining the copyright to your article

Submit your next manuscript at ► [springeropen.com](https://www.springeropen.com)