

2023

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Marlon Eliu Rivera Boadla  
*Resident Physician; Maimonides medical Center;*

Azka Naeem  
*Resident Physician; Maimonides Medical Center*

Sapna Kumari  
*Medical Student at Ross University, School of Medicine*

Syed Mohammad Mazhar Uddin  
*Resident Physician; Maimonides medical Center*

Arafat Farooqui  
*Resident Physician; Maimonides medical Center*

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### Recommended Citation

Boadla, Marlon Eliu Rivera; Naeem, Azka; Kumari, Sapna; Uddin, Syed Mohammad Mazhar; Farooqui, Arafat; Maheshwari, Sanjay; Seitllari, Armando; Haq, Zara; Khan, Muhammad Hashim; Epstein, David J.; Singh, Sehajpreet; Hollander, Gerald; and Kumar, Kelash (2023) "Third-Degree Heart Block in COVID-19 Pneumonia Complicated by Methicillin- Resistant Staphylococcus Aureus (MRSA) Bacteremia. A case report and review of literature," *Journal of Community Hospital Internal Medicine Perspectives*: Vol. 13: Iss. 6, Article 18.

DOI: 10.55729/2000-9666.1269

Available at: <https://scholarlycommons.gbmc.org/jchimp/vol13/iss6/18>

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### Authors

Marlon Eliu Rivera Boadla, Azka Naeem, Sapna Kumari, Syed Mohammad Mazhar Uddin, Arafat Farooqui, Sanjay Maheshwari, Armando Seitllari, Zara Haq, Muhammad Hashim Khan, David J. Epstein, Sehajpreet Singh, Gerald Hollander, and Kelash Kumar

# Third-Degree Heart Block in COVID-19 Pneumonia Complicated by Methicillin-Resistant Staphylococcus Aureus (MRSA) Bacteremia. A Case Report and Review of Literature

Marlon E. Rivera Boadla<sup>a</sup>, Azka Naeem<sup>a</sup>, Sapna Kumari<sup>b</sup>, Syed M. Mazhar Uddin<sup>a</sup>, Arafat Farooqui<sup>a</sup>, Sanjay Maheshwari<sup>a</sup>, Armando Seitllari<sup>a</sup>, Zara Haq<sup>c</sup>, Muhammad H. Khan<sup>a,\*</sup>, David J. Epstein<sup>a</sup>, Sehajpreet Singh<sup>a</sup>, Gerald Hollander<sup>a</sup>, Klash Kumar<sup>a</sup>

<sup>a</sup> Maimonides Medical Center, United States

<sup>b</sup> Ross University, School of Medicine, United States

<sup>c</sup> Sindh Police Hospital, Karachi, Pakistan

## Abstract

Coronavirus disease 2019 (COVID-19) burden has been identified to cause multiorgan damage. Respiratory compromise is still one of the most common presentations, but cardiac injuries like myocardial injury, ischemia, and conduction abnormalities are also becoming prevalent. We present a case of an 87-year-old male with a history of dementia, type 2 diabetes mellitus, hypertension, chronic kidney disease, and a left kidney transplant hospitalized for respiratory distress and generalized tonic-clonic seizures. He was bradycardic to 27 beats per minute, hypotensive with mean arterial pressure <60 mm Hg. An electrocardiogram (EKG) depicted a high-grade atrioventricular block (AV-block). The transvenous pacemaker was placed via femoral access and tested positive for COVID-19. Work-up was done to rule out possible causes of bradycardia, like hypothyroidism, ischemia, AV nodal blocking agents, and drug-induced bradycardia was negative. His hospital stay got complicated by methicillin-resistant staphylococcus aureus (MRSA) pneumonia leading to empyema and bacteremia. Unfortunately, being critically ill, the family opted for comfort measures, and he passed away. Our clinical vignette signifies cardiovascular complications in COVID-19 patients are associated with poor outcomes if not addressed. The conduction abnormalities in patients with intact cardiac structure and function are becoming more common in the setting of COVID infection. Assessment with serial EKGs and cardiac monitoring might be essential as patients can develop AV blocks at any point of the disease.

**Keywords:** COVID-19, AV block, Heart block, Transvenous pacing, Bradycardia, Bradyarrhythmia

## 1. Introduction

The novel coronavirus commonly known as COVID-19 originated in Wuhan, China, and is notorious for primarily affecting the respiratory system ranging from sore throat, non-productive cough, fever, and shortness of breath to pneumonia

and acute respiratory distress syndrome in 19 % of the population.<sup>1</sup> Apart from affecting the respiratory system, life-threatening complications of COVID-19 infection include acute renal failure and cardiac issues in 24 % of the population like myocardial injury causing myocarditis, microthrombi, and acute coronary syndrome.<sup>2</sup> Literature shows that COVID-19

Received 11 May 2023; revised 5 September 2023; accepted 8 September 2023.  
Available online 4 November 2023

\* Corresponding author at: Maimonides medical Center, United States.

E-mail address: marlonrivera26@gmail.com (M.E. Rivera Boadla), azkanaeem85@gmail.com (A. Naeem), Sapna.kumari1@outlook.com (S. Kumari), syed\_mazhar92@hotmail.com (S.M. Mazhar Uddin), arafatalifarooqui@gmail.com (A. Farooqui), smaheshwari@maimonidesmed.org (S. Maheshwari), aseitllari@maimonidesmed.org (A. Seitllari), haqzara@gmail.com (Z. Haq), muhammadhashim412@outlook.com (M.H. Khan), dje91090@gmail.com (D.J. Epstein), Sehajpreet.14@gmail.com (S. Singh), ghollander@maimonidesmed.org (G. Hollander), kelash.khiloi@yahoo.com (K. Kumar).

<https://doi.org/10.55729/2000-9666.1269>

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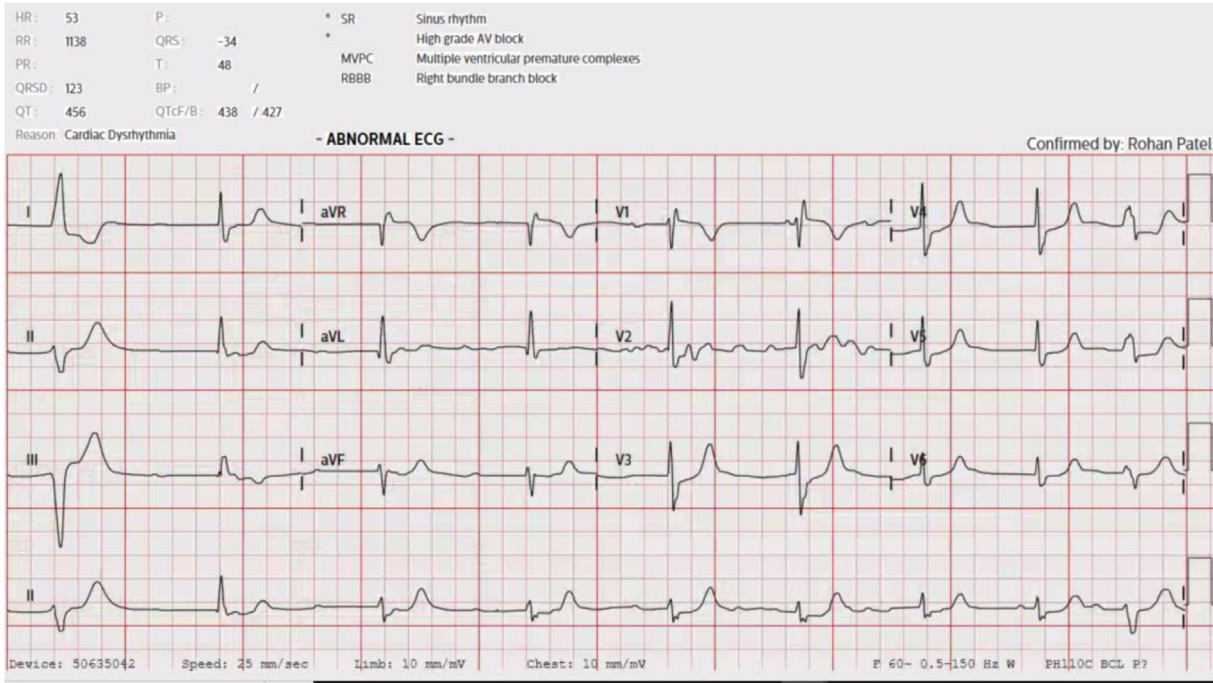


Fig. 1. EKG showing high degree AV block before transvenous pacing.

infection is also associated with conduction abnormalities mainly atrial fibrillation and atrioventricular block, the latter being defined as either delay or complete dissociation of the electrical signal from atria to ventricles.<sup>3,4</sup> Atrioventricular block can be first-degree (increased PR interval),

second-degree (dropped beats), High degree (Second-degree heart block with a P:QRS ratio of 3:1 or higher), or third-degree (complete atrioventricular dissociation).<sup>5,6</sup> AV block in the setting of COVID infection can either be paroxysmal or permanent, sometimes requiring pacemaker placement.

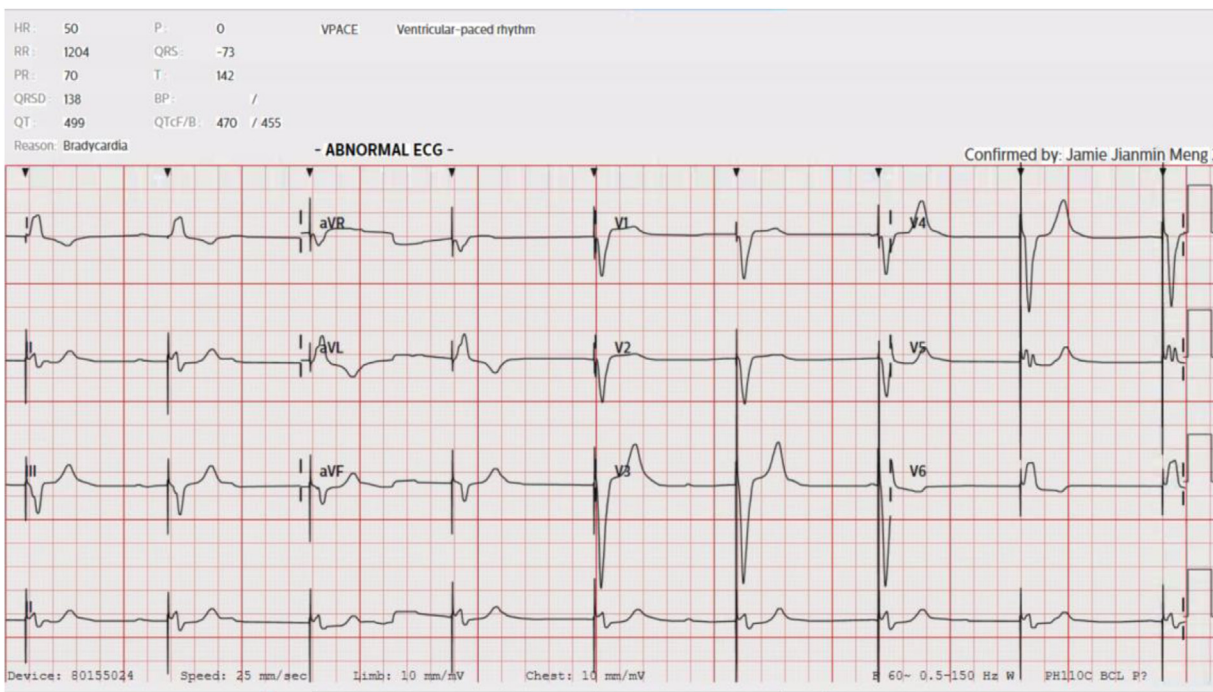


Fig. 2. EKG showing ventricular paced rhythm after transvenous pacing.

Table 1. Pleural fluid analysis. As per Light's criteria, exudative in nature.

Fluid color	Brown
Fluid pH	<6.8
Fluid RBCs	59000
Fluid WBCs	3197
Fluid glucose levels	233
Fluid LDH levels	1617
Fluid amylase levels	15
Fluid culture analysis	Positive for Methicillin Resistant Staphylococcus Aureus Mycobacterium Avium complex by DNA probe No fungus detected

## 2. Case presentation

An 87-year-old male with a past medical history of dementia, type 2 diabetes mellitus, hypertension, chronic kidney disease, and left kidney transplant taking prednisone for it, presented to the emergency room with shortness of breath followed by an episode of syncope associated with generalized tonic-clonic seizures. He was intubated due to persistent hypoxia despite non-invasive positive pressure ventilation (BiPAP). He was found to be bradycardic to 27 beats per minute, hypotensive with mean arterial pressure <60 mmHg. The EKG showed a third-degree atrio-ventricular block with premature ventricular complexes (Fig. 1). After pushes of atropine, transvenous pacing was started via femoral access (Fig. 2). The workup showed normal thyroid function, down-trending troponins, and normal cardiac function on transthoracic echocardiogram. He was tested positive for COVID-19 infection with elevated inflammatory markers (CRP 26.33 mg/dL, ESR 30 mm/h, procalcitonin >52 ng/mL, LDH 165U/L) hence, the high degree AV block was presumed to be caused by COVID-19 infection. He was started on vasopressor

support in the setting of cardiogenic and septic shock. During his hospital stay, he was treated for super imposed Methicillin Resistant Staphylococcus Aureus (MRSA) pneumonia complicated by empyema and chest tube placement. The pleural fluid analysis is shown in Table 1. Unfortunately, his vasopressor requirements were exhausted, therefore, he was made comfort care by the family. His transvenous pacing was turned off by the family at the bedside. He became an asystolic and was pronounced dead (see Fig. 3).

## 3. Discussion

Since 2019, understanding of COVID-19 infection and subsequent complications has evolved, and cardiovascular complications are among the most life-threatening. Given that the SARS-CoV-2 virus has a strong predilection for ACE 2 receptors that are abundant in the respiratory system, arteries and heart, COVID-19 infection is often associated with cardiac complications and related sequelae.<sup>7,8</sup> The most common cardiac manifestations described in the literature are heart failure, myocarditis, acute coronary syndrome, atrial fibrillation, and pulseless electrical activity.<sup>9,10</sup> Elevated cardiac markers such as cardiac troponins, CK-MB, myoglobin and B-type natriuretic peptide, and electrocardiographic changes such as ST-T, ST segment elevation, and atrial arrhythmias may be seen as well. Recently, reports of bradyarrhythmia, particularly high-degree and third-degree blocks are also emerging in the literature on patients with normal cardiac structure and function.<sup>11</sup> Multiple cases of severe sinus bradycardia and sinus node dysfunction in the setting of SARS-CoV-2 infection also support the involvement of the conduction system associated with the disease.<sup>10</sup>

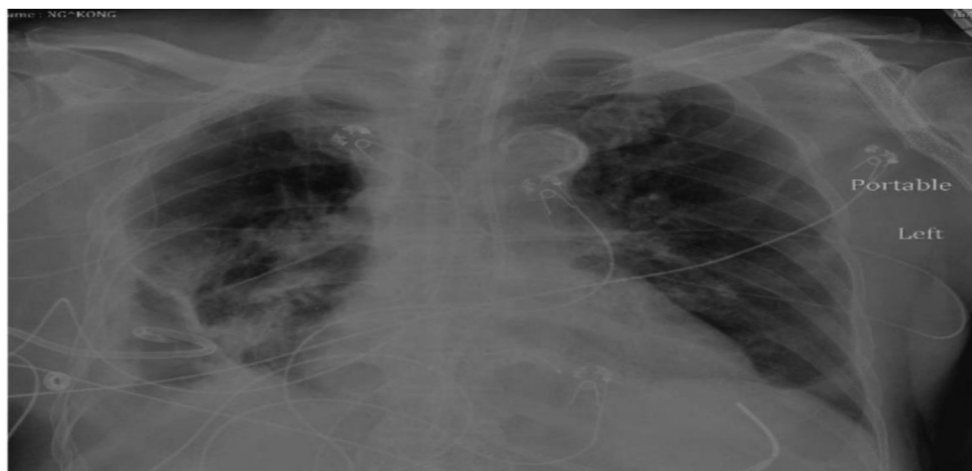


Fig. 3. Chest X-ray featuring opacification of the peripheral aspect of the right hemithorax, most pronounced in the right middle of the lung.

In general, new-onset AV block is usually caused by the underlying degeneration of the conduction system, structural anomalies, acute myocardial infarcts, thyroid disorder, metabolic or electrolyte disturbances, infections, or adverse reactions to treatment.<sup>11</sup> In our case, normal troponin, no ST/T segment changes, absence of ventricular dysfunction, normal thyroid function tests, normal electrolytes, and absence of any AV nodal blocking agents on medication review reinforce that high degree AV block in our patient is associated with underlying COVID-19 infection. Also, the literature review reveals that AV block with persistent MRSA bacteremia in the absence of endocarditis is very unlikely.

It has been proposed that cytokine storm and a high-level systemic inflammation may cause microthrombi leading to myocardial ischemia that may disturb the conduction system. Another theory postulates that direct viral damage to the myocardium in the context of viral myocarditis is another possible mechanism, eventually predisposing to arrhythmias.<sup>12</sup> Heart block in SARS-CoV-2 infection can present either as a primary symptom or as a sequel of the disease that may be temporary or permanent.<sup>13</sup> Supportive treatment with transvenous pacing in temporary and permanent pacemaker implantation in the persistent AV block is recommended. The long-term effects of COVID-19 infection on the heart in recovered patients remain unknown and still a niche that requires more research.

#### 4. Conclusion

Cardiovascular complications have become known to occur frequently in patients with COVID-19. The exact mechanism is still to be established, nevertheless, inflammatory burden and direct myocardial infection seem to be some of the most accepted hypotheses. Arrhythmias such as atrial fibrillation, being the most common, and AV block, being uncommon and present as paroxysmal, are now being increasingly correlated with COVID-19. Extensive evaluation with inflammation and cardiac

markers and monitoring for risk stratification is advised in COVID-19-infected patients. In addition, the identification of co-morbidities and electrocardiographic features should be evaluated, as drugs can affect the electrical conduction system and worsen the patient's progress and outcome.

#### Conflicts of interest

No conflict of interest.

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