Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

Visual Journal of Emergency Medicine 22 (2021) 100920

Contents lists available at ScienceDirect

Visual Journal of Emergency Medicine

journal homepage: www.elsevier.com/locate/visj

Visual Case Discussion

COVID-19 patient with symptomatic bradycardia

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ARTICLE INFO

Keywords:
Bradycardia
COVID-19
Sick sinus syndrome

1. Discussion

Sick sinus syndrome (also known as sinus node dysfunction) is a disease characterized by the sinus node's abnormal functioning. This dysfunction can lead to cardiac insufficiency and bradycardia. Sick sinus syndrome most commonly affects the elderly but can affect all age groups. The causative factors can be divided into intrinsic and extrinsic. The intrinsic factors include idiopathic degenerative fibrosis, cardiomyopathies, and ischemia. The extrinsic factors include drugs, hypothyroidism, autonomic dysfunction, and electrolyte abnormalities. Patients typically present with syncope or near syncope, palpitation, dizziness, and fatigue. The treatment consists correcting underlying causes and inserting a pacemaker.[1]

COVID-19 is a newly immerging disease that affects mainly the respiratory system.[2] Although different cardiac complications and manifestations were reported, the relationship between SARS-CoV-2 infection and autonomic dysfunction is still not fully understood. This may be attributed to the neuroinvasive potential of SARS-CoV-2, that could result in damaging the cardiorespiratory center in the brain stem or altering the intrinsic cardiac nervous system that results in autonomic dysfunction.[3]

2. Visual case discussion

A 36-year-old male complained of fever, cough, and body ache. He had no past medical history. He followed with a health care facility where he received symptomatic management. Besides, he was tested for COVID-19. Two days later, the test came positive for SARS-CoV-2. Thus, he was transferred to a quarantine hospital and he received lopinavir/ritonavir. During his quarantine admission, the patient started to complain of chest pain and exertional dyspnea. He was found to have a slow pulse rate of 38-42/ min. Therefore, he was referred to the emergency department. The patient claimed tiredness and an occasional dizzy spell. He denied taking any medication that can decrease heart rate. His vital signs showed a heart rate of 42/min and a blood pressure of 119/75. His chest revealed a bilateral decrease in air entry with irregular heartbeats on auscultation.

Consequently, a set of blood tests, a computerized tomography (CT) of the chest and an ECG were done. His blood tests, including thyroid function test and troponin, were unremarkable. His chest CT scan showed a picture of COVID-19 with moderate severity (Fig. 1A and B). His ECG showed a junctional rhythm with atrial escape capture beats (Fig. 2). Consequently, the patient was admitted and started on antiviral medications. The cardiologist reviewed the patient and arranged for an echocardiography with an exercise stress test. Both of these tests came back normal. The patient's condition improved and he became asymptomatic, with a heart rate of 50-57/min. In addition, his COVID-19 PCR test came back negative repeatedly. His subsequent ECG showed sinus arrest with a junctional escape (Fig. 3). Nevertheless, a holter study of 24 hours confirmed that the patient had a junctional rhythm, and sinus node dysfunction, with frequent pauses of sinus node block alternating with sinus node arrest. The patient was discharged to follow up with the electrophysiology cardiac clinic, where a permanent atrial pacemaker was arranged for him.

3. Questions and answers

Question 1

Please choose one option:

Which of the following electrolyte abnormality most commonly leads to sick sinus syndrome?

1- Hyperphosphatemia.
2- Hyperkalemia.

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https://doi.org/10.1016/j.visj.2020.100920
Received 9 September 2020; Received in revised form 12 October 2020; Accepted 29 October 2020
Available online 11 November 2020

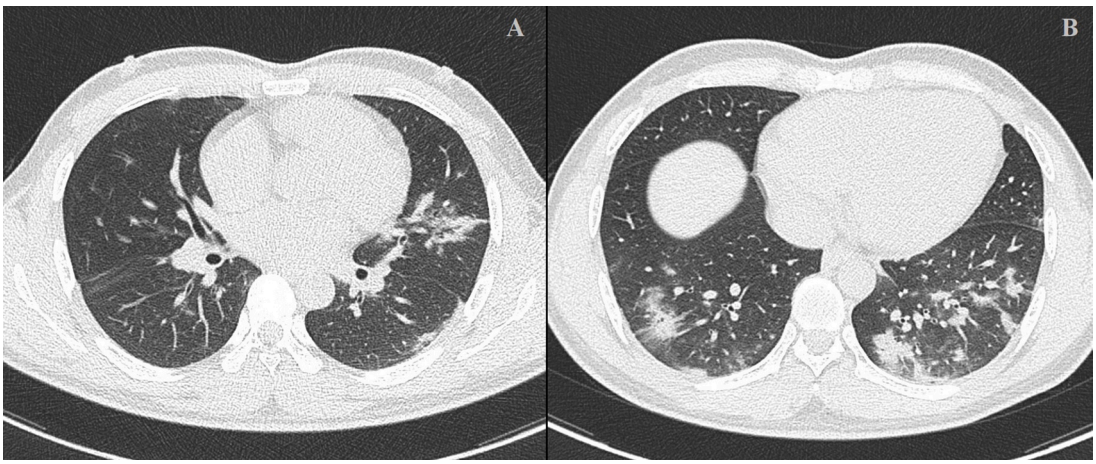

Fig. 1. A and B. Chest CT scan showed multiple bilateral sub pleural ground glass opacities with areas of consolidation.

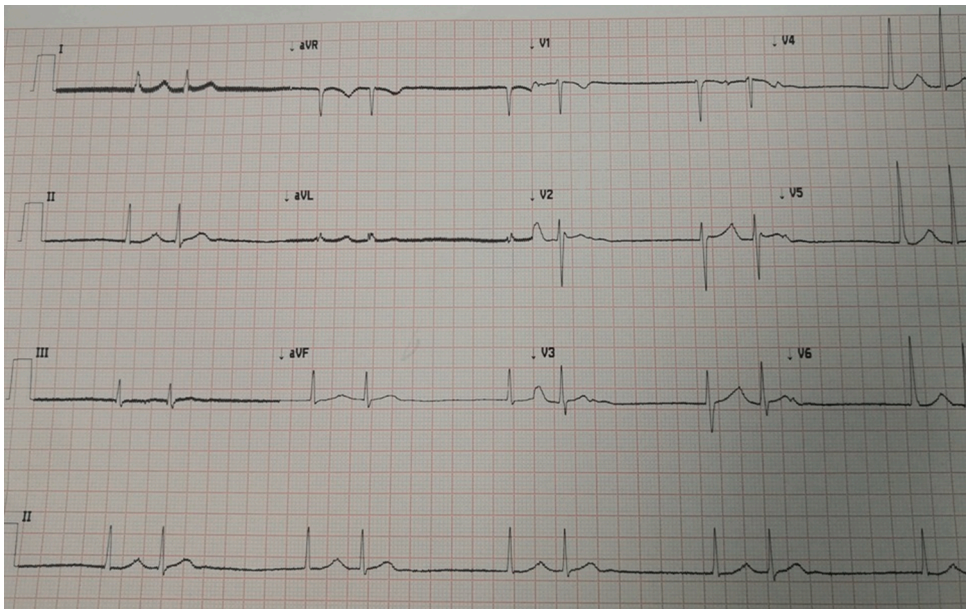

Fig. 2. ECG showed junctional rhythm with atrial escape capture beats (atrial bigeminy).

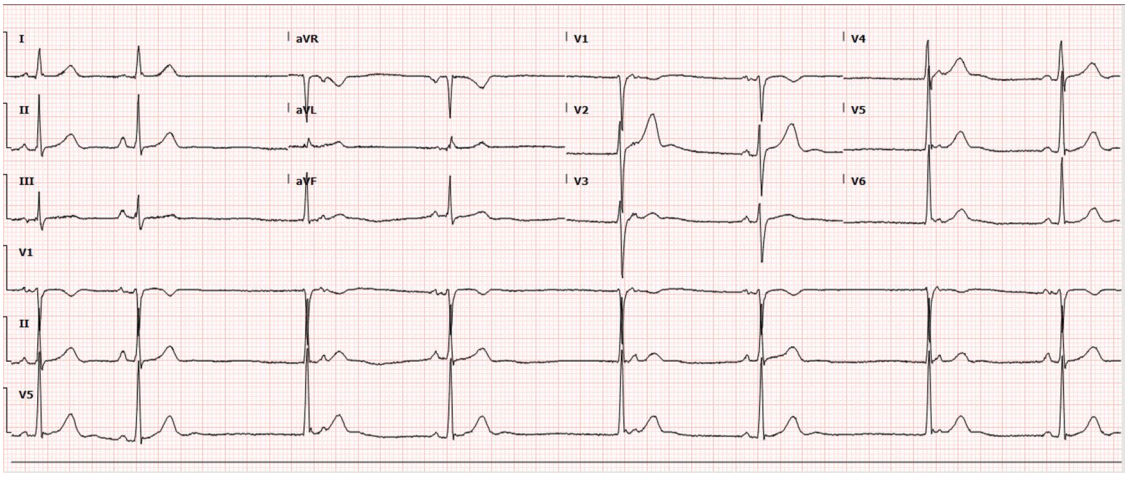

Fig. 3. ECG showed sinus arrest with a junctional escape rhythm.

3- Hypercalcemia.
4- Hypernatremia.
5- Hypomagnesemia.

The correct answer is (2- Hyperkalemia)

Explanation: Potassium is vital for regulating the normal electrical activity of the heart. Increased extracellular potassium reduces myocardial excitability, with depression of both pacemaking and conducting tissues.

Progressively worsening hyperkalaemia leads to suppression of impulse generation by the SA node and reduction in the conduction by the AV node and His-Purkinje system, resulting in bradycardia, conduction blocks, and ultimately cardiac arrest.[1]

Question 2

Please choose one option:

Where is the Sinus node situated?

1- Junction of the superior vena cava and right atrium.
2- Junction of right atrium and left atrium.
3- Junction of inferior vena cava and right atrium.
4- Junction of coronary sinus and right atrium.
5- Junction of coronary sinus and left atrium.

The correct answer is (1- Junction of the superior vena cava and right atrium)

Explanation: Sinus node is situated subepicardially, in the upper part of the right atrium, at its junction with the superior vena cava. Subepicardial location explains the common occurrence of sinus tachycardia in pericarditis – due to irritation of the sinus node by the inflamed pericardium.

The atrioventricular node is a subendocardial structure situated near the lower part of the right side of the interatrial septum and penetrates the annulus fibrosis. Annulus fibrosis electrically isolates the atria from the ventricles.[1]

Declaration of Competing Interest

I have no conflicts of interest to disclose. The generic template was filled and was submitted with the manuscript.

Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.visj.2020.100920.

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