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CASE REPORT

Reporting complete heart block in a patient with polyarteritis nodosa after COVID-19 vaccination

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Abstract

Complete heart block (CHB) is a serious health condition, and polyarteritis nodosa (PAN) is an important autoimmune disease. In the COVID-19 pandemy, several vaccines were developed for the COVID-19 disease that shown several side effects, and some of these complications are still unknown. This is the first report of CHB in a patient with history of PAN after COVID-19 vaccination. A 68-year-old man with a history of PAN referred to our hospital, complaining of presyncope episodes and dizziness after receiving a COVID-19 vaccine. Physical examination, laboratory tests, and transthoracic echocardiography were normal. In his electrocardiogram, a narrow QRS complex, AV dissociation, and junctional escape rhythm were seen. Coronary angiography showed a mild coronary artery disease. The patient, suffering from PAN for years, was hypothesized due to CHB a few days after COVID-19 vaccination. This case report suggests that COVID-19 vaccines may interrupt the conduction system of the heart and the fact that underlying PAN may predispose to CHB following COVID-19 vaccination. Further studies are needed to accurately assess a possible association between PAN, CHB, and COVID-19 vaccines.

Keywords Side effect; Atrioventricular block; Autoimmune disease; SARS-Cov-2

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Introduction

Complete heart block (CHB) is a serious and potentially life-threatening cardiovascular disease. Acquired CHB results from various pathological conditions causing infiltration, fibrosis, or loss of connection in portions of a healthy cardiac conduction system. Several rheumatic and autoimmune diseases have been associated with CHB.[1] So far, the vaccines developed for the COVID-19 disease have demonstrated several side effects, with many of them still unknown.[2] On the other hand, polyarteritis nodosa (PAN) is an autoimmune disease and a primary systemic necrotizing vasculitis predominantly targeting medium-size arteries.[3]

So far, there has been no report on the association between CHB and PAN, and there have been no reports suggesting a possible link between CHB and vaccination. We here described a patient, a known case of PAN, who developed CHB after receiving a COVID-19 vaccine.

Case report

A 68-year-old man, as a known case of PAN, referred to our hospital's emergency room, complaining of presyncope episodes and dizziness starting 5 days after receiving the Oxford–AstraZeneca COVID-19 vaccine. The patient was under treatment with azathioprine and prednisone due to PAN and losartan and hydrochlorothiazide for hypertension. Initial vital signs were as follows: respiratory rate = 14 breaths per minute, oxygen saturation = 97% in the room air, oral temperature = 37°C, blood pressure = 125/70, and the heart rate = 45 beats per minute (bpm).

On physical examination, lung auscultation was clear. The first, second, and fourth heart sounds were heard, and there was no sign of murmur. He was conscious and had a normal neurological performance.

Initial electrocardiogram (ECG) demonstrated normal indices; the atrial and ventricular rates were 65 and 45 bpm, respectively, and none of atrial impulses appeared to be conducted

to ventricles. A narrow QRS complex, AV dissociation (i.e. complete atrioventricular block), and junctional escape rhythms were seen with no dynamic ST-T change (*Figure 1*).

Transthoracic echocardiography (ETT) showed normal left ventricular size and preserved systolic function (LVEF = 50–55%) without any regional wall motion abnormality; however, mild concentric left ventricular hypertrophy (LVH) was observed. Right ventricular size and systolic function were normal. Mild mitral and tricuspid regurgitation was noticed, and pulmonary artery pressure was normal. Also, there were no signs of pericardial effusion and ventricular or atrial clots (*Figure 2*).

Regarding laboratory tests, troponin level and renal and hepatic functions were normal. Electrolytes, including potassium, magnesium, calcium, and sodium, were within normal limits. Complete blood cell count (CBC) showed no abnormality, but the serum level of C-reactive protein (CRP) was high (*Table 1*).

One of causes of the CHB is myocardial ischaemia, and when the older peoples have CHB, reason of myocardial ischaemia should be recognized and identified. Also, coronary artery of AV node should be checked. Therefore, in this patient, for rollout of coronary artery diseases, angiography was done. The patient was immediately admitted and underwent coronary angiography, which showed a mild coronary artery disease without significant stenosis (*Figure 3*). Then a temporary pacemaker (TPM) was installed, and the patient was monitored for several days, but his conduction abnormality remained unresolved. The patient eventually became a candidate for inserting a permanent pacemaker (PPM). Finally, he was discharged with a good general condition and advised to visit regularly for follow-up. Dual-chamber pacemaker was applied. The patient was discharged, after 1 week, and then after 1 month was followed up. During follow-up, he depended on the pacemaker, and heart block was not disappeared. According to the first month follow-up, the patient had a stable condition, and it was recommended to visit every 6 months for follow-up.

Iconography

Test result			
	Capture	Sense	Lead impedance
A	**0.5 V @ 0.4 ms** (Bi)	**3.3 mV** (Bi)	**560 Ω** (Bi)
	0.5 V @ 0.4 ms (Bi)	3.1 mV (Bi)	560 Ω (Bi)
V	**0.75 V @ 0.4 ms** (Bi)	**8.2 mV** (Bi)	**530 Ω** (Bi)
	0.5 V @ 0.4 ms (Bi)	7.5 mV (Bi)	560 Ω (Bi)

Parameters	
Mode	DDDR
Mode switch	On
Lower rate	60 bpm
Upper tracking rate	130 bpm
Upper sensor rate	110 bpm
Paced AV delay	200 ms
Sensed AV delay	150 ms

Capture and sense	A	V
Pulse amplitude (margin)	2.5 V (5.0:1)	2.5 V (3.3:1)
Pulse width	0.4 ms	0.4 ms
Sensitivity (safety margin)	0.5 mV (6.4:1)	2.0 mV (2.4:1)

Diagnostics summary	
VP	91%
ANS episodes	0
Mode switch	0%
AT/AF burden	0%

Figure 1 The patient's electrocardiogram. The red arrow shows the P wave without QRS association (AV dissociation).

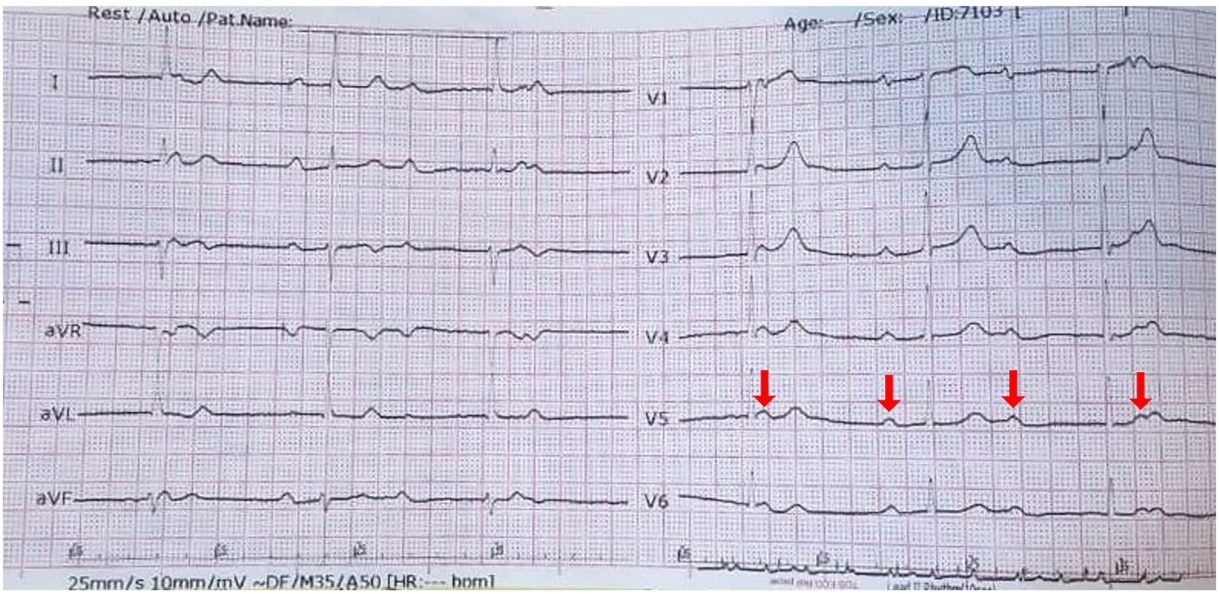
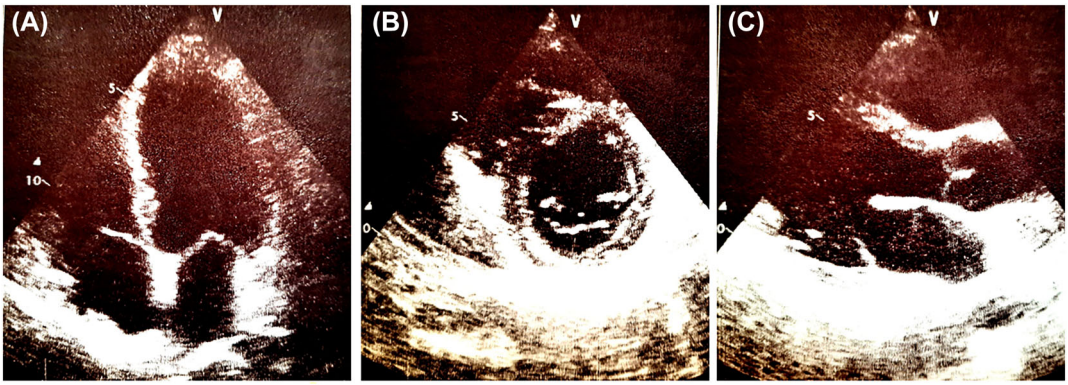


Figure 2 The patient's transthoracic echocardiography findings, showing no abnormalities. (A) The apical four-chamber view. (B) The parasternal short axis view. (C) The parasternal long axis view.



Discussion

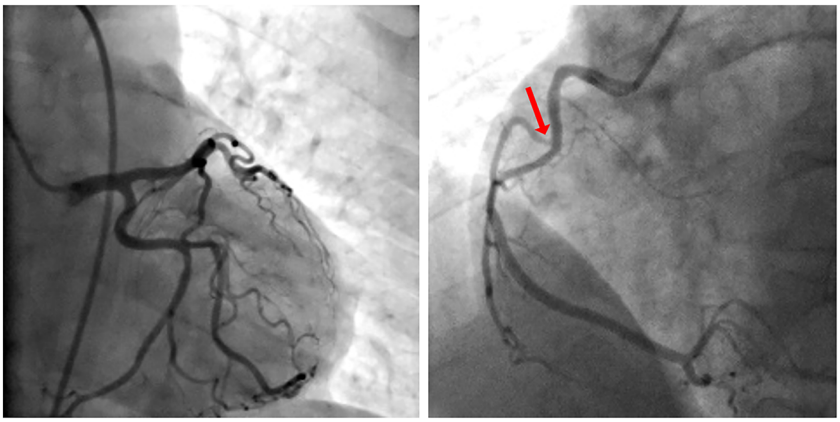
The AstraZeneca vaccine is a monovalent product consisting of a single recombinant replication-deficient chimpanzee adenovirus vector encoding the SARS-COV-2 S-glycoprotein.[2] There have been reports of side effects associated with this vaccine, the most commonly reported of which have been pain and tenderness at the injection site, arthralgia, myalgia, pyrexia, fatigue, malaise, fever, chills, nausea, and minor neuro-inflammatory events.[2] So far, there have been no reports of CHB following the injection of this or any other COVID-19 vaccine. Complete heart block is a third-degree cardiac or atrioventricular block and a disorder of the cardiac conduction system.[1] According to our searching, we did not find any reports or studies about association between COVID-19 vaccination and CHB. In this case report, we described a patient who developed CHB a few days after receiving a COVID-19 vaccine.

Table 1 Laboratory findings of a PAN patient that was received COVID-19 vaccine

Parameters	Result	Normal range	Unit
White blood cells	9.2	4.50–11	10*3/μL
Neutrophils	48%	35–70	%
Lymphocytes	22%	20–50	%
Red blood cells	6.5	4.70–6.10	10*6/μL
Haematocrit	49.1	41–52	%
Haemoglobin	15.7	12–16	g/dL
Platelet count	235	150–450	10*3/μL
Sodium	137	135–145	mmol/L
Potassium	4	3.5–5.1	mmol/L
Calcium	9.5	9–10.5	mg/dL
Magnesium	2	1.3–2.1	mEq/L
Glucose	95	70–100	mg/dL
D-dimer	0.1	0–0.45	ug/mL
C-reactive protein	20	Less than1.0	mg/dL
Troponin	0.04	0–0.8	ng/mL
Aspartate transaminase	41	17–60	U/L
Alanine aminotransferase	32	0–49	U/L
Creatinine	0.9	0.5–1.20	mg/dL
Blood urea nitrogen	25	12–45	mg/dL

Regarding his clinical history, he declared suffering from PAN for years, which is a rare autoimmune disease with an annual incidence from 0 to 1.4 cases/million.[4,5] The clinical manifestations of PAN include weight loss, arthralgia, myalgia, malaise, and fever.[4,6] The involvement of the peripheral nervous system and skin is also common.[6,7] As a multi-systemic disorder, the involvement of the cardiovascular system may also occur in PAN, but so far, no definite link has been reported between complete heart AV block and PAN. The present case report is the first to suggest a potential link between PAN and CHB. However, the possible triggering role of a COVID-19 vaccine, which was infused a few days before the occurrence of CHB, cannot be ignored. Regarding that COVID-19 vaccines have been just developed, many of their side effects are still unknown. We had no strong hypotheses about relationship between vaccination and CHB, and the usual triggers of CHB did not find about this patient, and no related reasons were recognized. Therefore, the only related trigger may be vaccination, and we presented our finding and suggested to more evaluation about these findings. We found no reports of CHB following COVID-19 vaccination, and this report, for the first time, suggests that COVID-19 vaccines may disrupt the cardiac conduction system. Another hypothesis is a possible synergism between the COVID-19 vaccine and underlying vasculitis to trigger CHB, which deserves further investigations given that CHB is an emergency and life-threatening condition. Subsequent studies are needed to more accurately assess the complications of PAN and fully evaluate the side effects of COVID-19

Figure 3 The patient underwent coronary angiography. There was no significant stenosis in the right coronary artery (the red arrow).



vaccines. Warning about COVID-19 vaccination for PAN patients needs more data and should be studied in the future, and with one case report, we cannot warn PAN patients about possible risk after vaccination.

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