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A Rare Case of Complete Atrioventricular Block caused by Acute Rheumatic Fever in Young Adult: A Case Report

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Abstract

Acute rheumatic fever (ARF) causes an inflammatory process that can affect multiple organs including the heart conduction system. The most common rhythm issues are first-degree atrioventricular (AV) block, complete AV block, and another kind of aberrant conduction. The occurrence of second and third-degree AV block are less common in ARF. Modified major and minor of Jones criteria are used to diagnose ARF, other supportive laboratory examinations are helpful to confirm the diagnosis. We reported a 25-year-old man came to the emergency unit with a fever and chest pain. A complete AV block was found using an electrocardiogram along with high Anti-Streptolysin O (ASO) titers and troponin as proof of the inflammatory process in the cardiac conduction system. The patient is completely recovered with corticosteroid without any single residual symptom. Despite the rarity of its occurrence, adult-onset ARF may be one of the causes of complete AV block. AV block in rheumatic fever is a self-limiting condition that will recover within a few days to weeks, some cases need corticosteroid administration to resolve the inflammation process.

Keywords*: atrioventricular block, rheumatic fever*

Introduction

Acute rheumatic fever (ARF) remains one of the most common causes of acquired cardiac morbidity and mortality worldwide in children and young adults, especially among socially and economically disadvantaged populations in developing countries (Wirth et al., 2017; Agnew et al., 2019; Auala et al., 2022; Yakut et al., 2022). Abnormal immune response to group A beta-hemolytic Streptococcal (GAS) pharyngitis due to untreated infection can lead to a systemic autoimmune response that occurs within two to four weeks (Guilherme et al., 2017; Praneeth et al., 2020; Szczygielska et al., 2018; Yakut et al., 2022).

ARF commonly affects children between ages 5 and 15, but it is uncommon to develop it before three years of age and after 21 years of age (Guilherme et al., 2017; Serbout et al., 2021). The World Health Organization (WHO) estimates approximately 10 million cases of streptococcal pharyngitis infections. Due to this prevalence, there may be 30,000 new cases of RF, of which 15,000 could end up in cardiac lesions (Guilherme et al., 2017; Praneeth et al., 2020).

Cardiac conduction system involvement has been reported as a feature of rheumatic fever with various degrees of the atrioventricular block (AV block). Despite the obvious complacency over first-degree heart block in ARF, Stokes-Adams attacks, dysrhythmias, and aberrant conduction with dysrhythmias are all essential early indications of ARF and may occur before other signs (Guilherme et al., 2017). About 50% of patients with rheumatic fever had a prolonged PR interval, which is the most common sign. High-degree AV block is rarely reported (Agnew et al., 2019).

Rheumatic heart disease (RHD), which is a complication of carditis, continues to be an important public health problem in developing countries (Argun et al., 2018; Hidayah et al., 2018). Estimates suggest that, Indonesia's RHD mortality rate is approximately 4.8 per 100,000 individuals at risk (Arafuri et al., 2022). Before heart failure develops, the majority of cases with acute rheumatic carditis are asymptomatic, and chronic RHD can also be asymptomatic for years or decades. RHD occurs in about 40–60% of ARF episodes (Guilherme et al., 2017). Although

chronic RHD is exclusively the result of ARF, most RHD patients do not have a history of prior ARF, indicating that ARF is often misdiagnosed and that early or recurring injuries may have been subclinical or undetected (Kumar et al., 2020).

In this case, complete heart block finding is one feature to be considered in rheumatic patients despite its rarity. It is essential to diagnose ARF and initiate treatment earlier, furthermore, the patient would not end up with further complications, especially in the cardiovascular system regarding untreated GAS infection.

Case Report

A 25-year-old man came to the emergency department with a chief complaint of fever for seven days accompanied by chest pain several hours before admission. The fever was getting better with paracetamol. The symptom was not associated with upper respiratory infection, abnormal movement, and skin rash. No history of dental caries, recurrent upper respiratory tract infection, and arthralgia was admitted. No history of past medication but paracetamol.

On physical examination, he was febrile at 38°C, normotension 110/70 mmHg, and heart rate 84 bpm. There was a detectable grade 2 apical systolic murmur. No abnormalities were found on the extremities. A third-degree atrioventricular block was shown on the first electrocardiogram (ECG). From laboratory examination, there was leukocytosis (14.85 x 10^3/µL), high troponin I level (150 ng/L), and high anti-streptolysin O (ASO) titer (800 IU/mL). Chest x-ray examination shows a cardiomegaly with a CTR of 58.3%. No echocardiography examination was performed on admission.

The diagnosis of ARF was confirmed based on one major component (carditis, demonstrated by chest pain symptoms and high troponin level) plus two minor components (fever and prolonged PR interval on ECG) of the revised Jones criteria, as well as confirmatory evidence of a prior suspected streptococcal infection in the form of elevated ASO titers.

Treatment was initiated with injectable benzathine penicillin G (BPG) 1.2 IU intramuscularly as a single dose and corticosteroids (prednisone 4x5 mg) including other supportive therapy (lansoprazole 2x30 mg and ibuprofen (3x400 mg). The fever and chest pain no longer exist on the second day after drug administration. Complete AV block was recovered into second-degree AV block on the fifth day of hospitalization.

The patient was discharged after nine days of hospitalization. Nonetheless, the second-degree AV block Mobitz I persisted. The echocardiography examination was performed shortly before being discharged from the hospital and showed both mild tricuspid and mitral valve regurgitation. Fortunately, our patient had no severe residual cardiac involvement after the infection occurred, and no symptom was reported by the time of discharge. Every month, a BPG injection was scheduled, and every two weeks, the dosage of corticosteroids was tapered.

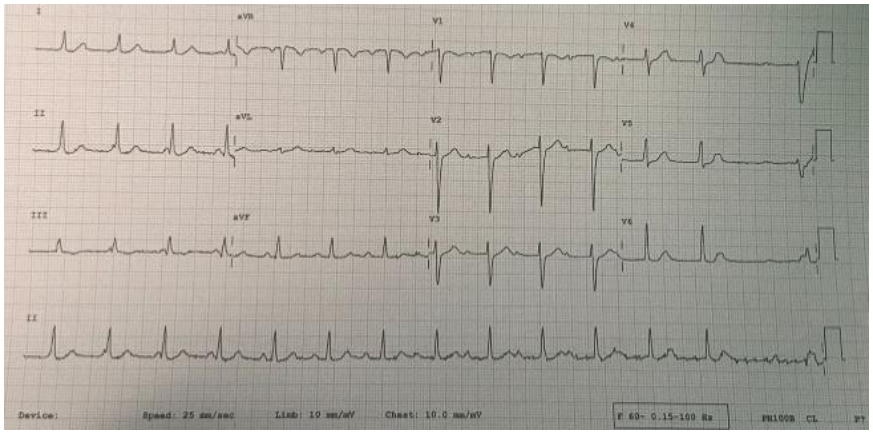

Figure 1. Baseline ECG with complete atrioventricular block was observed on admission.

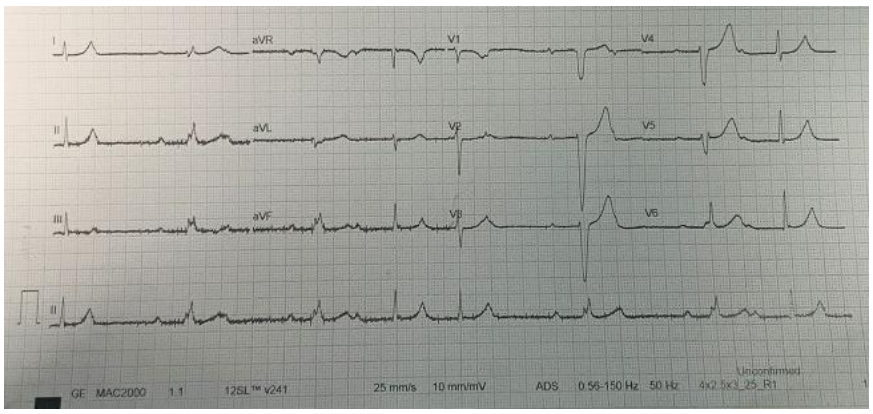

Figure 2. On the fifth day of hospitalization, the ECG shows a broad complex of left bundle branch morphology together with a second-degree AV block.

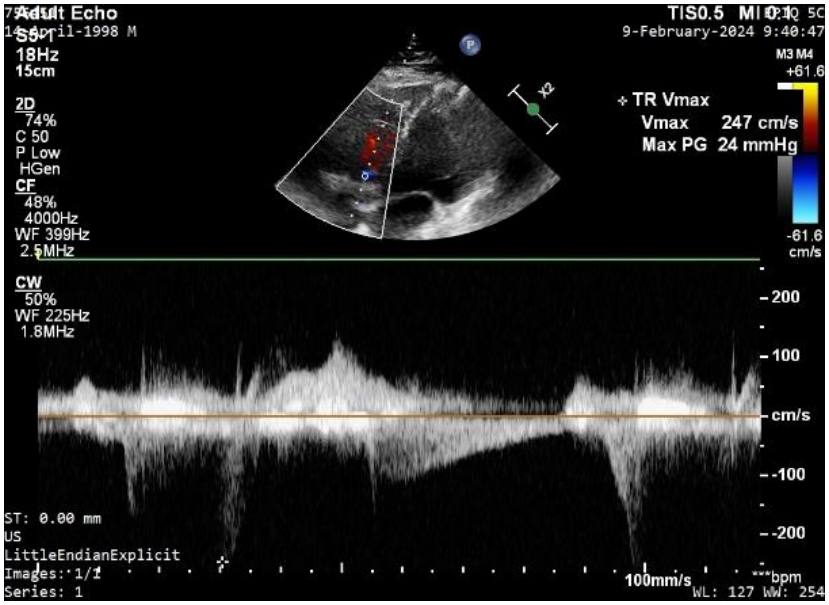

Figure 3. Apical four-chamber view with continuous wave doppler at the tricuspid valve showing tricuspid regurgitation with a peak velocity 247 cm/sec and pressure gradient of 24 mmHg.

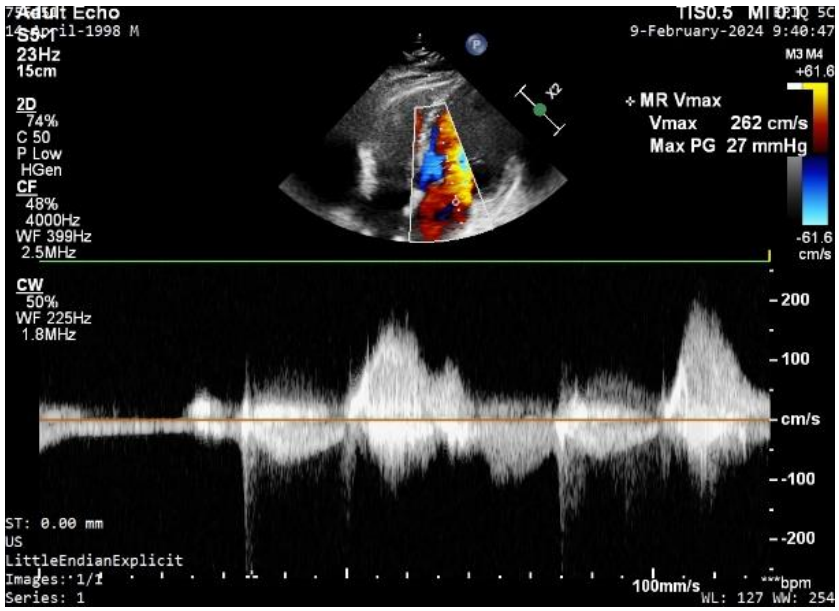

Figure 4. Apical four-chamber view with continuous wave doppler at the mitral valve showing mitral regurgitation with a peak velocity 262 cm/sec and pressure gradient of 27 mmHg.

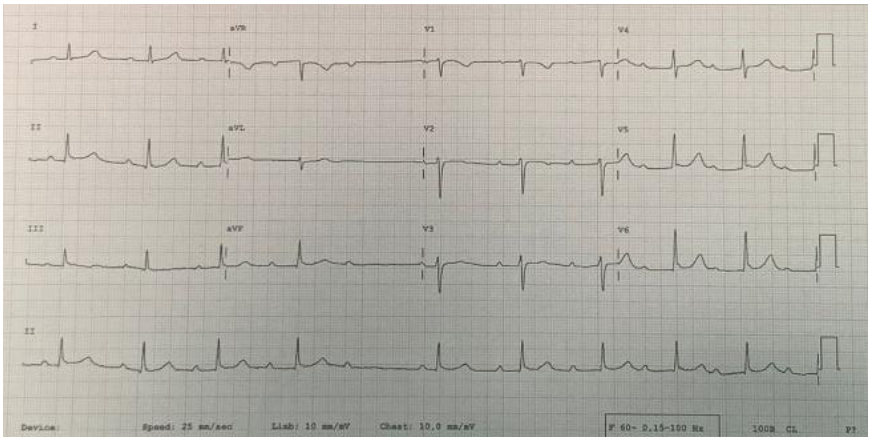

Figure 5. Final ECG was taken on discharge, second degree AV block Mobitz I was still remained

Discussion

Cardiac involvement secondary to ARF defined as carditis is considered to be pancarditis which the pericardium; myocardium; and endocardium can all be involved, concomitant valvulitis is rarely associated (Hubail & Ebrahim, 2016; Suwansumrit & Jittham, 2022). The general inflammatory process caused by ARF predominantly involves the heart, joints, subcutaneous tissues, and the skin (Praneeth et al., 2020; Suwansumrit & Jittham, 2022; Umapathy & Saxena, 2018). Carditis is the most important major finding of the disease (Argun et al., 2018; Ralph & Currie, 2022).

ARF is diagnosed based on the Modified Jones criteria, which classifies the clinical manifestations and laboratory results into major and minor criteria. Major characteristics of ARF include carditis, joint involvement (mono or polyarthritis or polyarthralgia), chorea, skin manifestation (subcutaneous nodules or erythema marginatum), and carditis (Alqanatish et al., 2019; Suwansumrit & Jittham, 2022). Dr Jones introduced his criteria for the diagnosis of rheumatic fever in 1944 and that continued in all subsequent revisions of the criteria in 2015 (Hubail & Ebrahim, 2016; Suwansumrit & Jittham, 2022).

Prolongation in the PR interval on ECG is a minor diagnostic finding not specific to carditis, it can also be observed in the presence of fever (Agnew et al., 2019; Argun et al., 2018). The most frequent type of AV block in ARF is first-degree included in Jones's criteria, which is then followed by second-degree. Complete AV block is rarely occurred approximately in 0.016 - 4.6% of cases (Praneeth et al., 2020; Sunbanu, 2024). Higher degrees of atrioventricular block consistently present to be included in the criteria (Hubail & Ebrahim, 2016). The most frequent causes identified are congenital heart disease, congenital atrioventricular block, radiofrequency ablation complications, myocarditis, cardiomyopathies, and inflammatory diseases (Praneeth et al., 2020; Sunbanu, 2024).

As we mentioned in the literature above, our patient was a 25-year-old young adult with Complete AV block presentation suffering from ARF. The exact mechanism underlying AV block caused by ARF remains unclear, two following causes an excessive vagal tonus activation and immunologic response that stimulates inflammation on the AV node and His bundle (Umapathy & Saxena, 2018; Serbout et al*.,* 2021; Yakut et al., 2022). Complete AV block typically manifests itselves temporarily (Sunbanu, 2024). No electrolyte examination was performed to exclude extracardiac causes.

Our patient had a fever (38°C) on admission. Regarding fever, 38.5°C is considered febrile in the low-risk population, whereas in the moderate- to high-risk population, 38.0°C is considered a fever (Alqanatish et al., 2019).

Currently, echocardiography has been included in the latest update of modified Jones criteria as a major criteria due to its high sensitivity, especially to show valvular involvement in ARF. In broad terms, the American College of Cardiology has distinguished criteria for pathologic regurgitation as follows: mitral valve regurgitation detected in two or more views, jet length >2 cm, peak velocity >3 m/s, and pan systolic. Aortic valve regurgitation if detected in two or more views, jet length > 1 cm, peak velocity >3m/s, and pan diastolic (Alqanatish et al., 2019). Unfortunately, major criteria were not met by our patient for carditis as the result was both mild mitral and tricuspid regurgitation.

Evidence of group A beta-hemolytic streptococcal infection is an essential thing for the diagnosis of an initial attack of ARF. Additional or supportive evidence, elevated ASO titers, can be a key investigation in diagnosing and treating ARF (Guilherme et al., 2017; Wirth et al., 2017). In our patient, the presence of fever, increased leukocyte count, and high troponin level led to the consideration of inflammatory disease. The recent onset of symptoms and no previous heart disease rule out the congenital etiology. He did not have a typical history of rheumatic fever such as an upper respiratory tract infection or polyarthritis.

Our patient received injectable BPG 1.2 million IU intramuscularly as a single dose for streptococcal eradication. Although ARF symptoms might not indicate a streptococcal infection, treatment for any potentially lingering streptococci is advised (Ralph & Currie, 2022). ARF-related conduction problems are self-limiting, temporary, and reversible without significant residual damage over several days to weeks following the start of traditional non-steroidal anti-inflammatory medication (Agnew et al., 2019; Praneeth et al., 2020; Yakut et al., 2022). This shows that corticosteroid is the first choice for advanced-degree AV block treatment due to ARF (Praneeth et al., 2020; Yakut et al., 2022). Anti-inflammatory drugs are administered for four to six weeks, or until the inflammatory markers return to baseline (Guilherme et al., 2017). In some cases, treatment with a transient pacemaker is indicated in patients with symptomatic complete AV block due to ARF (Argun et al., 2018; Sunbanu, 2024). Our patient had a transient complete AV block recovered over five days after using prednisone. We tapered the dose for dosage adjustments. As literature showed rhythm problems of our cases were resolved with the anti-inflammatory treatment (Praneeth et al., 2020; Yakut et al., 2022).

Conclusion

Based on this case, ARF should be considered by a physician when assessing a patient with mild symptoms who may have a significant suspicion of rheumatic fever, tachycardia, or deteriorating heart failure symptoms. Despite the rarity of its occurrence, high-degree AV block is an essential feature of adult-onset ARF. Interestingly, the conduction anomalies associated with rheumatic fever are typically temporary and self-limited, returning to sinus rhythm within a few weeks, but they infrequently have the potential to last longer. Corticosteroid administration is recommended as a treatment to resolve inflammation, especially in high-degree AV block.

Conflict of interest

The authors declare no conflict of interest.

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