CASE REPORT

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UNVEILING THE UNCOMMON: A PAEDIATRIC CASE OF INFLUENZA-RELATED ATRIOVENTRICULAR BLOCK


Abstract

This case report highlights a 5-year-old child who developed a first-degree atrioventricular (AV) block during an influenza B infection. Influenza is a common viral illness that can cause severe morbidity and mortality, especially in children with underlying medical conditions. The case emphasizes the potential cardiac complications of influenza and the need for prompt recognition in paediatric patients. The child presented with bradycardia and a prolonged PR interval on the electrocardiogram, indicating AV block. The child had no other symptoms and was discharged in stable condition after two days of observation. Prompt recognition and evaluation of cardiac manifestations in influenza-infected patients, including thorough medical history and diagnostic workup, are crucial for the timely management and prevention of long-term sequelae. This case underscores the importance of considering cardiac complications in severe cases of influenza, especially in the paediatric population, and emphasizes the need for healthcare providers to be vigilant in identifying potential cardiac manifestations during influenza outbreaks.

Keywords: Influenza B virus, AV block, Paediatrics, Virus infections

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Introduction

Influenza infection is a common viral illness that affects individuals of all ages, including children[1]. Globally, outbreaks of influenza are prevalent and have caused up to 41 million cases of sickness, 710,000 hospitalizations, and 52,000 fatalities in the United States during the period spanning from 2010 to 2020 [2]. The H1N1 pandemic of 2009 in Malaysia served as a wake-up call for healthcare personnel and the general public, emphasizing the significance of influenza as a consequential infectious disease that should not be disregarded [3]. Between August and September 2009, a total of 12,307 cases of the disease were reported, with 77 fatalities, representing the majority of the incidences [3]. The hospitalization incidence rates linked to influenza among individuals under the age of 18 varied between 10 to 375 per 100,000 people during each of the influenza seasons spanning from 2010-2011 through 2018-2019 [4]. According to a systematic review, influenza infection is frequently linked to various cardiovascular manifestations, including acute myocardial infarction, myocarditis, pericarditis, and myocardiopericarditis, but there is a lack of published literature on AV conduction block in the context of influenza infections [5].

Young children and infants are more susceptible to an increase in the infection rates and potential complications as opposed to adults, mainly due to various factors such as reduced protection from maternal antibodies, evolving immune systems, fewer prior infections, and higher rates of transmission [1,5]. While most cases are mild and self-limiting, some patients may develop severe complications, such as pneumonia, encephalitis, and myocarditis. Myocarditis, which is an inflammation of the heart muscle, can result in a range of cardiac abnormalities, including arrhythmias, heart failure, and even sudden death. Atrioventricular (AV) block, a type of arrhythmia that affects the conduction of electrical impulses from the atria to the ventricles, has

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been reported in some cases of influenza-associated myocarditis [6].

In this case report, we present a paediatric patient who had developed AV block during influenza infection. We describe the patient’s medical history, clinical presentation and diagnostic workup. Through this report, it is crucial to consider cardiac complications in patients with severe influenza infection, especially in the paediatric population. There is also a need for prompt recognition to prevent long-term sequelae.

**Case report**

A 5-year-11-month-old Malay boy with no known medical history presented to the emergency department with a fever lasting 6-days, accompanied by a cough and runny nose. He was seen by a general practitioner and tested positive for influenza B on the fifth day of his illness and was recommended for local hospital admission but his parents had requested a referral to a tertiary hospital for logistic reasons. Upon evaluation in the emergency department, the child found to have bradycardia, with a heart rate range of 55-68 bpm (Normal heart rate at this age for paediatric: 80-135 beats per minute). An electrocardiogram (ECG) revealed a prolonged PR interval of 0.2 seconds, indicating a first-degree atrioventricular (AV) block. Apart from these findings, the child was asymptomatic, with clear lungs and normal cardiovascular examination. There were no clinical features to indicate systemic lupus erythematosus (SLE) and rheumatic fever. The child had no radio-radial delay, with normal vital signs. Laboratory investigations, including full blood count, renal and liver function tests, and chest radiograph, were normal, and echocardiography showed normal heart’s structure with good cardiac function. The COVID-19 screening test was negative. The patient was immediately isolated and started on oral oseltamivir 3.5mg/kg every 12 hours for 5 days.

Further evaluation revealed that his father had a history of anxiety panic disorder and hypertension, previously treated with Caduet and then Bisoprolol medications. His mother had systemic lupus erythematosus with lupus nephritis and subacute cutaneous lupus, managed with Prednisolone, Hydroxychloroquine, and Azathioprine medications. The child was admitted for a 2-day observation period and subsequently discharged in a stable condition. At the time of discharge, the child exhibited a heart rate of 86 bpm, while ranging from 70 to 122 bpm during the ward stay and displayed a return to normal sinus rhythm on electrocardiography. This case highlights the potential association of influenza B infection with first-degree AV block in paediatric patients and the importance of thorough evaluation and management of associated risk factors.

**Discussion**

Influenza is an acute, self-limiting disease caused by influenza A or B viruses, and rarely by influenza C viruses. Although the disease is usually uncomplicated in healthy children, certain cases are associated with severe morbidity and mortality. Influenza outbreaks occur yearly, and the timing and duration of the influenza season vary from country to country and from year to year, with the disease being more prevalent during the winter season in temperate climates. The viruses are transmitted from person to person through contact with respiratory secretions or contaminated objects and can also be spread through airborne transmission by small particle aerosols. Understanding the patterns of influenza outbreaks and modes of transmission is important to developing effective prevention and control strategies [7,8].

Influenza infection can exacerbate cardiac and pulmonary dysfunction, resulting in an increased mortality rate. Most of reported cases predominantly involved adult patients, and the first case of complete atrioventricular (AV) block associated with influenza was documented in 1968 [9]. The remaining cases were characterized by a patient necessitating permanent pacemaker placement [10] and another patient exhibiting self-resolution of heart block within 10-days of hospital admission [11].

This case report describes a previously healthy 5-year-old child who experienced transient first-degree atrioventricular heart block attributed to influenza B infection. Potential cardiac complications of influenza, include myocardial infarction, myocarditis, pericarditis, and inflammation of the conduction system, although uncommon, may have posed serious consequences, particularly in children [12].

In our case, the atrioventricular (AV) block was incidentally discovered when the patient was observed to have bradycardia, with a heart rate fluctuating between 50 to 70 beats per minute. Subsequent electrocardiograms (ECGs) demonstrated prolonged PR intervals that persisted for several days before coming to spontaneous resolution. The patient remained asymptomatic throughout, and influenza was thought to be the most probable cause of this newly acquired conduction abnormality, although the exact mechanism remains unknown.
Patient did not show any signs of hypotension, indicating a stable haemodynamic circulation.

Following antiviral treatment, we observed a positive outcome with subsequent normalization of electrocardiography. This case highlights the significance of early initiation of antiviral therapy once influenza infection is recognized, as it can contribute to a faster recovery.

Although we are still uncertain on the potential association between influenza illness and atrioventricular (AV) block, it is worth mentioning that the patient had a family history of maternal autoimmunity. It is unusual for AV block to acquire at this stage, as it typically manifests earlier in foetal life or after delivery.

According to the literature review, cardiovascular complications can arise during acute influenza infections, either through direct viral effects on the myocardium or by exacerbating pre-existing cardiovascular conditions [13]. Cardiovascular manifestations range from asymptomatic to severe cardiac shock and death among patients with influenza infections. Multiple research studies have demonstrated that influenza virus infection has the potential to induce harmful cardiovascular occurrences [14,15]. Upon viral infection, a complex interplay of signalling pathways is initiated within both the innate and adaptive immune systems, resulting in the induction of multiple interferons including type I (IFNα/b), type II (IFNg), and type III (IFNi), as well as a wide range of inflammatory cytokines and chemokines (17–19). The recruitment of monocytes, neutrophils, and macrophages to the lungs by the interferons and inflammatory mediators facilitates viral control. However, an uncontrolled influx of innate immune cells and dysregulated production of inflammatory cytokines result in deleterious host-mediated pathological responses during viral infection [17,18].

Influenza infection has the potential to induce myocarditis, ventricular arrhythmia, and heart failure via the actions of both systemic and local inflammatory mediators [19]. Pan et al. found that trypsin induction may account for the presence of the virus within the heart. Moreover, influenza virus infection induces the upregulation of various inflammatory markers including IL-6, IL-1β, TNFα, and MMPs within the myocardium and that the administration of trypsin inhibitors can alleviate these effects [20]. A recent study conducted on mice has shown influenza viral replication within both cardiomyocytes and Purkinje cells [21]. Kenny and colleagues stated on the essential role of interferon-induced transmembrane protein-3 (IFITM3) in regulating influenza viral replication within the heart [22]. The findings indicate that the induction of pro-inflammatory cytokines and proteases during influenza infection may serve as a potential mechanism underlying infection-associated myocarditis. Various mediators such as inflammatory cytokines and chemokines, acute phase proteins, and coagulation factors promote for the subsequent development of ventricular arrhythmias and heart failure [23–25]. These studies provide strong support for the assertion that influenza virus infection exerts both direct and indirect effects on the onset of cardiovascular events.

In our case, we observed a fortunate outcome with complete recovery and resolution of the atrioventricular block, whereas previous literature reviews have indicated instances where pacemaker placement was required. Previous reports also have documented transient atrioventricular block in cases of acute myocarditis, necessitating the temporary implantation of a pacemaker (27,28). Atrioventricular block of a high grade is associated with increased myocardial injury, and the severity of pathological changes may indicate the potential for reversibility of the block. In the majority of cases, the cardiac rhythm abnormality is transient and does not necessitate the implantation of a permanent pacemaker (28).

**Conclusion**

It is imperative to recognize such complications, including cases of simple atrioventricular (AV) conduction block, during the influenza season. Early detection of cardiac involvement is critical for patients with influenza infections especially for those with hemodynamically compromised. To ensure comprehensive care for children presenting with influenza symptoms at the clinic, it is vital that healthcare professionals to conduct a thorough cardiovascular examination. Prompt administration of antiviral medications may be beneficial for these patients.

**References**


[27] Rivera-Guzmán N, Olmo-Arroyo F del, Robles-Arias C, Rodriguez-Cintron W. Transient AV Block as a Hemodynamic Complication of the Influenza
[28] Caughey RW, Humphrey JM, Thomas PE. High-Degree Atrioventricular Block in a Child with Acute Myocarditis. Ochsner J. 2014 Summer;14(2):244-7