

An unusual case of pediatric inflammatory multisystem syndrome, due to severe acute respiratory syndrome coronavirus-2 infection, presenting with complete heart block needing permanent pacing

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ABSTRACT

Pediatric inflammatory multisystem syndrome due to severe acute respiratory syndrome coronavirus-2 infection is not very common. It may vary from a simple febrile inflammatory response to a severe multisystem involvement including myocarditis and shock. Here, we report the case of a 10-year-old female child with fever, rash, and mucositis who presented with shock and complete heart block along with encephalopathy and convulsions. The primary investigations revealed raised inflammatory markers along with a high titer of COVID antibodies. She was given full inotrope support along with immunomodulators. She underwent temporary pacing but ultimately needed a dual-chamber pacemaker. The novel coronavirus in children can present with a myriad of manifestations affecting almost every organ. In these pandemic times, one must always keep in mind the possibility of COVID-19 infection in a child that presents with shock, carditis, and arrhythmias. These children need intense immunosuppression and must be managed very aggressively

Key words: Complete heart block, Pediatric inflammatory multisystem syndrome, Permanent pacing

The COVID-19 pandemic has not only affected adults; on the contrary, it has also affected children of all age groups, starting from the neonate to the adolescent. The majority of infections in children are asymptomatic. Pediatric inflammatory multisystem syndrome (PIMS) is a serious multisystem inflammatory syndrome affecting almost all organs, but most significantly the gastrointestinal and cardiovascular systems. The prevalence of PIMS due to severe acute respiratory syndrome coronavirus (SARS-CoV)-2 in patients less than 21 years of age is very rare, less than 0.6% [1]. Cardiac involvement in PIMS usually occurs in the form of carditis or heart failure. Arrhythmias may also occur.

Here, we report the case of a 10-year-old female child with fever, rash, and mucositis who presented with shock and complete heart block along with encephalopathy and convulsions. The main reason for presenting this case is to keep clinicians aware that though bradyarrhythmias leading to complete heart block that may occur in PIMS due to SARS-CoV-2 infection are usually reversible, in some cases, it may be refractory and irreversible.

CASE REPORT

A 10-year-old female child presented to the emergency in March 2021 with a history of fever for 5 days along with pain abdomen, recurrent vomiting, and loose stools. She also had three episodes of generalized tonic-clonic convulsions. There was no history of any cough, coryza, or respiratory distress. According to her caregivers, she was an apparently well child and did not have any past significant medical history. She was fully immunized according to the national immunization schedule and her developmental history was normal. She was studying in standard three. She had three siblings who were all doing well.

On examination, the child was drowsy, weighed 35 kg with a height of 130 cm. Her pulse was very feeble, blood pressure was not recordable, and SpO₂ was 80% in room air. There was a macular rash measuring about <1 cm, over her abdomen and trunk along with redness of the oral mucosa and some conjunctival redness. Her systemic examination did not reveal any organomegaly or lymphadenopathy. On the basis of these findings, we kept the differential diagnoses of acute encephalopathy syndrome with myocarditis, probably viral in origin, and dengue shock syndrome with encephalopathy.

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Her initial investigations showed hemoglobin 9.6 g%, total leukocyte count was 12,000/cumm (polymorphs 85, lymphocyte 10, monocyte 3, and eosinophil 2), platelet count was 4.89 lakh/cumm, C-reactive protein was 150 mg/dl (normal <6 mg/dl), and erythrocyte sedimentation rate was 40 mm. Ferritin was 1200 ng/dl and lactate dehydrogenase was 76 IU/ml. Her procalcitonin was negative. Electrolytes and renal functions were normal. The liver function tests showed transaminitis (serum glutamic-oxaloacetic transaminase 279 IU/ml and serum glutamic pyruvic transaminase 350 IU/ml). Thyroid functions were normal. Infective serology mainly dengue and other viral serology (cytomegalovirus, Epstein–Barr virus, Coxsackie, and parvovirus) were negative. COVID reverse transcription-polymerase chain reaction was also negative. Since there was a history of a prior episode of fever 3–4 weeks back which lasted for 4 days, we also sent a COVID antibody which was strongly positive (IgG>IgM). Her d-dimer was 2000 ng/ml ($n<250$ ng/ml) and N-terminal pro b-type natriuretic peptide was 29,085 pg/ml. Because she had convulsions with encephalopathy, her cerebrospinal fluid analysis was done, which was also normal.

After initial stabilization, magnetic resonance imaging along with electroencephalogram was also done, which turned out to be normal. Electrocardiography (ECG) showed bradycardia with complete atrioventricular dissociation (Fig. 1) and echocardiography showed moderate pericardial effusion with an ejection fraction <40%. There was, however, no dilatation of coronary arteries.

She was immediately shifted to the pediatric intensive care unit. She was resuscitated with moist oxygen and intravenous fluids. She was put on inotrope support, dopamine at 10 mg/kg/min which was later increased to 15 mg/kg/min. For her convulsions, she received levetiracetam, loading dose 20 mg/kg, and later was put on maintenance of 5 mg/kg. Her inotrope support was continued and isoprenaline was added for complete heart block. Since there was a hyperinflammatory state associated with SARS-CoV-2, she was also given intravenous immunoglobulin (IVIG) at 2 g/kg and aspirin (3 mg/kg) along with pulse methylprednisolone at 30 mg/kg/d for 3 days. After 72 h of inotrope support and immune modulators, she showed clinical improvement. She recovered from the shock, the echocardiogram showed considerable improvement; the pericardial effusion had regressed and the ejection fraction increased to 60%; her inflammatory markers were also on the decline, but her ECG continued to show persistent heart block.

She was then shifted to a higher cardiac center for temporary pacing. There temporary pacing was done with VOO at 100 transvenous pacemaker. However, even a week after temporary pacing, despite her clinical improvement, her cardiac rhythm did not normalize and she was entirely dependent on the temporary pacemaker. Eventually, dual-chamber cardiac pacemaker had to be inserted ten days after temporary pacing. The patient remained stable post-procedure for 3 days. Fig. 2a shows ECG following the pacemaker insertion. She was subsequently discharged after about 3 weeks of the hospital stay and is now doing well (Fig. 2b).

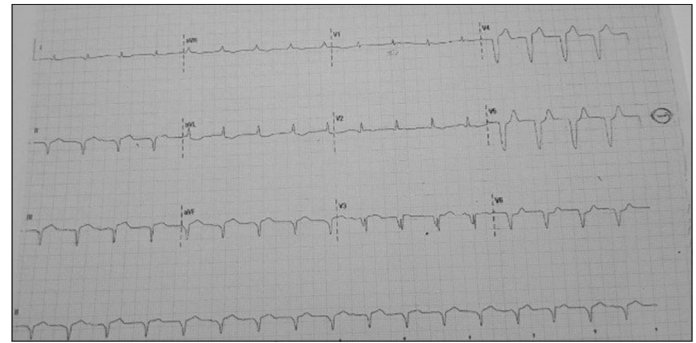


Figure 1: Electrocardiography showing bradycardia and AV dissociation

DISCUSSION

Children tend to have a much milder course of COVID-19 infection as compared to adults. A small fraction may proceed to develop a multisystem inflammatory response (MIS-C) also known as PIMS [2]. A significant portion of these children has cardiovascular and gastrointestinal involvement.

Cardiovascular involvement may be in the form of myocarditis, ventricular dysfunction, and even coronary artery dilatation or aneurysm [3]. Possible causes of myocardial injury include ischemia, hypoxia causing microvascular injury, coronary artery disease, or as a result of systemic inflammatory response. Arrhythmias are less common in children as compared to adults [4,5]. In a study from the United States involving about 186 children with MIS-C associated with COVID-19 infection, only 12% had arrhythmias [6]. In another study from France involving 35 children with PIMS, only one had ventricular arrhythmia [3]. However, in both these studies, there was no specification regarding the type of arrhythmia. Bradyarrhythmias are quite uncommon in children. The etiology of bradyarrhythmia is unclear and may result from inflammation and edema of the conduction tissue as a part of the systemic inflammation or resulting from the vascular insufficiency of the atrioventricular node or the conduction fibers.

There are very few cases of the atrioventricular block (AVB) due to SARS-CoV-2, reported in children. A case of recurrent AVB has been reported in a 10-year male child with evidence of SARS-CoV-2 infection, as a part of PIMS. This child recovered with conservative management [7]. In another study, out of 25 children and young adults with PIMS, five developed first-degree AVB on the 6th day of fever, which eventually progressed to the second and third degrees blocks. None of these required interventions [8]. In another case report, an 11-year-old male child with MIS-C developed severe hemodynamic instability and third-degree heart block and eventually needed temporary pacing [9].

Hence, a multisystem involvement revolving around carditis, encephalopathy, and gastrointestinal tract along with raised inflammatory marker in the background of fever for 3 days, rash, and some mucositis along with a high titer of COVID antibodies, led to the final diagnosis of PIMS. However, the noteworthy feature, in this case, was bradyarrhythmia and complete heart block which was somewhat refractory to immunomodulators and eventually needed a permanent pacemaker. Our case is unique in various aspects: (a)

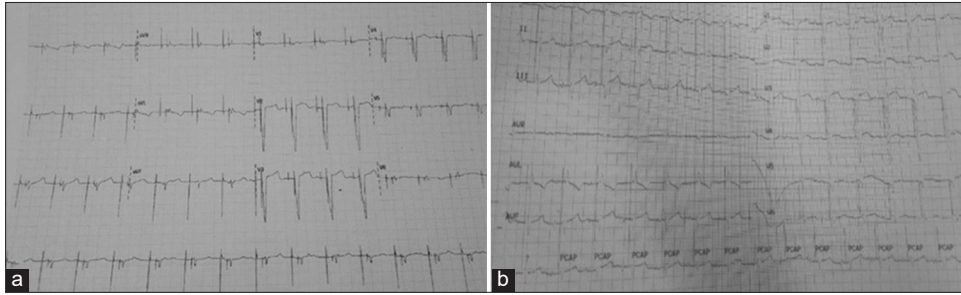


Figure 2: (a) Electrocardiography (ECG) following permanent pacing; (b) ECG 2 weeks after follow-up

Although bradyarrhythmia in PIMS needing temporary pacing has been reported in the past, this is perhaps the first case of MIS-C having bradyarrhythmia in the form of third-degree heart block which needed a permanent pacemaker; (b) compared to other viral illnesses, conduction defects in SARS-CoV-2 infection usually occur some days after the disease progress; but in our case, the patient presented with the third-degree heart block in the very beginning.

CONCLUSION

As far as our knowledge, this is perhaps the first case of complete heart block associated with PIMS due to COVID-19 infection, needing a permanent pacemaker. It brings into light the many important learning points. Arrhythmias, especially bradyarrhythmia, though uncommon may occur as a part of the syndrome complex in PIMS. It is reversible in most cases (with supportive therapy and immunomodulation), in very rare cases, it may be permanent and pacing may be necessary.

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