Section: General Medicine

Case Report

DENGUE MYOCARDITIS LEADING TO ACUTE CARDIAC FAILURE – A CASE REPORT

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Abstract

Dengue is a viral infection spread via bite of an infected female Aedes species (Aedes aegypti or Aedes albopictus) mosquito with its prevalence in tropical and subtropical countries. Dengue fever is a self-limiting disease however; rare presentations and complications have been encountered as a consequence of surge in dengue reported cases globally. Cardiac complications are rare in dengue infections but can lead to severe complications. We report a case of an 18 years old male patient, who presented with clinical signs and symptoms of acute congestive cardiac failure secondary to myocarditis caused by dengue viral infection. Patient's clinical; laboratory and imaging investigations were in align with our clinical diagnosis of myocarditis leading to acute cardiac failure in the background of dengue infection. Patient was managed in the intensive care unit and made a drastic recovery with oxygen therapy, non-invasive ventilation, inotropic support and diuretics and was discharged with stable vitals and complete resolution of heart failure.

INTRODUCTION

Dengue, an arthropod borne viral disease predominantly in the urban and semi-urban setup owing to the fact that the Aedes species mosquito, the vector responsible for the transmission of Dengue virus breeds in stagnant water accumulated in any material that can hold water usually buckets, bowls, drums, flower pots, vases and vehicle tyres. The Aedes mosquito bites during both day and night.[1] Four distinct dengue serotypes have been identified namely, DEN1, DEN2, DEN3 and DEN4.

The usual presentations of Dengue infection are high grade fever, severe frontal headache, muscle and joint pains, pain behind the eyes which worsens with eye movement, low backache, decreased appetite, nausea and vomiting and loose stools.[1,2] Some individuals may present with bleeding manifestations in the form of non-blanchable rash, sub conjunctival haemorrhage, bleeding gums and epistaxis.[3]

Dengue is usually a self-limiting disease with complete recovery through symptomatic treatment and maintaining hydration. Dengue Haemorrhagic Fever and Dengue Shock Syndrome are dreadful severe complications of Dengue infection due to increased vascular permeability, thrombocytopenia and bleeding.[4]

Expanded Dengue Syndrome is an entity enclosing atypical manifestations of dengue infection, involving the neurological, cardiac, hepatic and renal systems.[5]

A variety of cardiac complications, though rare have been reported which include bradyarrhythmia's, left ventricular systolic dysfunction, pericardial effusion, pericarditis and myocarditis.[6]

The exact mechanism of cardiac injury in dengue is not known but have been hypothesised to be a consequence of direct invasion of the cardiac myocytes by Dengue virus and cytokine-induced myocardial cell injury caused by the ongoing inflammation.[7]

We report here a rare case of Dengue myocarditis leading to acute cardiac failure.

CASE REPORT

An 18 year old male without any comorbidities presented to Emergency Department of Gauhati Medical College and Hospital with complaints of shortness of breath and left sided chest pain over the last 3 days. The shortness of breath was sudden in onset, gradually progressive, associated with orthopnoea and paroxysmal nocturnal dyspnoea and aggravated on exertion. The chest pain was sudden in onset and patient described the chest pain as a sharp pain on the left side, relieved on bending

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forward and aggravated on lying down without any radiation. On further inquiry of the history, patient party states that, 9 days ago the patient had high grade fever, headache, pain behind the eyes, body ache and muscle pain with generalised weakness and was taken to local hospital for check-up, which on further evaluation his Dengue NS1 Antigen report came positive with thrombocytopenia and leukopenia without any bleeding manifestations. He was diagnosed with Dengue fever and treated on an outpatient basis with antipyretics, WHO-ORS and multivitamins. Patient developed shortness of breath 6 days after the onset of fever.

On presentation in the emergency department, patient was conscious, alert, oriented to time, place and person with dyspnoea (Modified Medical Research Council Dyspnoea Scale Grade 4) and profuse sweating.

On clinical examination, patient had raised jugular venous pulse, peripheral cyanosis, cold extremities, tachycardia, low blood pressure, tachypnoea and low SpO2 in room air with bilateral basal fine crepitations on chest auscultation without heart murmur and no pedal oedema. Patient was immediately put on non-rebreathing mask at high flow oxygen support at 15 litres per minute and chest X-ray was done which suggested pulmonary oedema [Figure 1].

Bedside 12 Lead Electrocardiogram showed ST segment depression in limb leads II, III, aVF and in precordial leads V5 and V6 [Figure 2].

Patient was shifted to intensive care unit. In the intensive care unit, patient was put on non-invasive ventilation with high PEEP and high FiO2 in view of pulmonary oedema evident by increasing respiratory rate and non-maintenance of oxygen saturation even with non-rebreathing mask at 15 litres per minute. Arterial blood gas analysis revealed hypoxaemia as indicated by PaO2 - 53 mmHg, PaO2/FiO2 ratio of 133 and respiratory alkalosis with partial renal compensation as interpreted by pH - 7.5, PaCO2- 22 mmHg and $HCO3^-$ - 20 mEq/L. Central venous catheter was placed via right sub-clavian vein due to difficulty in attaining peripheral vascular access and for starting dopamine to maintain the mean arterial pressure. Dopamine infusion was started at 10 mcg/kg/min. Empirical antibiotic with a third generation cephalosporin was started. Baseline laboratory reports revealed elevated CRP and liver enzymes, normal leucocyte and platelet counts and slightly elevated serum creatinine.

Cardiac markers report showed elevated hsTropI and CKMB and a very high NTproBNP levels indicating heart failure. Sample result for Dengue IgM antibody came positive.

Investigations for possible causes of fever namely typhoid, malaria came negative. On assessment of the patient 12 hours later, he showed marked improvement to non-invasive ventilation as evidenced by improvement of oxygen saturation, a decrease in respiratory rate but heart rate was still on the higher side. Bedside 2D Echocardiography showed dilated left ventricle with diffuse hypokinesia of left ventricular wall, severe left ventricular dysfunction with ejection fraction of 27%, interventricular septum was normal [Figure 3]. Ultrasonography of whole abdomen revealed thickened gall bladder wall with mild ascites. Patient's blood pressure gradually improved with Dopamine infusion at 10 mcg/kg/min. On the second day of intensive care, with NIV support and inotropic support, patient showed improvement in vitals however he was still agitated with his respiratory rate still high with persistent presence of bilateral basal fine lung crepitations and repeat ABG showed no improvement with persistent hypoxaemia and respiratory alkalosis. Hence, with the patient's improving blood pressure with dopamine infusion he was started on diuretic infusion with Furosemide at 10 mg/hr in the background of pulmonary oedema while continuing dopamine infusion at 10 mcg/kg/min and NIV support. Serum procalcitonin was normal which ruled out sepsis. Repeat blood reports showed slightly elevated leucocyte counts, normal electrolyte levels and pre renal acute kidney injury. On the third day of ICU care, with patient on Dopamine support tapered to 8 mcg/kg/min and furosemide infusion at 10 mg/hr, he showed gross improvement in overall condition evident by no agitation, decrease in respiratory rate, no tachycardia, blood pressure maintained, improvement in SpO2 levels and decrease in basal lung crepitations.

Patient was shifted to alternating intermittent non-invasive ventilation and non-rebreathing mask at 10 Litres per minute. Urine output was slightly higher than input. PEEP and FiO2 on NIV gradually tapered to 6 cm H2O and 40% respectively. Dopamine and Furosemide infusions were gradually tapered over the next 24 hrs and stopped. Patient was continued on injectable Furosemide 40 mg at 8 hourly intervals. On the fourth of day intensive care, with improved arterial blood gas parameters as indicated by a PaO2/FiO2 ratio of 370, patient was weaned off from non-invasive ventilation and non-rebreathing mask and was put on continuous oxygen support via face mask at 6 litres per minute.

Repeat renal function tests and blood counts were normal with significant reduction in levels of NTproBNP, CKMB, hsTropI, ALT, AST and CRP. Urine and blood culture sensitivity reports came sterile.

On the sixth day of intensive care, patient showed overall improvement in terms of no shortness of breath, normal respiratory rate and heart rate, SpO2 of 98% in room air trial and clear chest on auscultation.

He was weaned off from oxygen support and shifted to General Medicine ward. Patient was discharged 2 days later with stable vitals and no shortness of breath even on exertion, with advice to follow up after 2 weeks. On follow up assessment of the

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patient, he was stable and maintaining vitals without fresh complaints.

[Table 1] shows the laboratory investigations of the patient on day 1 and on day 4 of admission respectively.

Table 1: Laboratory values on day 1 and on day 4 of admission respectively

Test (Unit)	Values		Normal reference range
	Day 1 of admission	Day 4 of admission	
Dengue IgM antibody	Positive	NA	NA
Malaria (Peripheral blood smear)	Negative	NA	NA
Typhi Dot	Negative	NA	NA
hsTropI (ng/L)	47	7	12
CKMB (U/L))	56	13	<3.38
NTproBNP (pg/mL)	>30,000	2800	<450
Creatinine (mg/dL)	1.3	0.7	0.66-1.20
C-Reactive Protein (mg/L)	70	17	0-10
ALT (U/L)	5300	1300	4-50
AST (U/L)	4700	1000	17-59
Total Leucocyte Count (/cumm)	10,000	8000	4-10
Platelet Count (/cumm)	1,80,000	2,10,000	150-400

[hsTrop I - High Sensitive Troponin I, CKMB - Creatine Kinase-Myoglobin Binding, NTproBNP - N-Terminal prohormone of Brain Natriuretic Peptide, ALT - Alanine Aminotransferase, AST - Aspartate Aminotransferase, NA – Not Applicable]

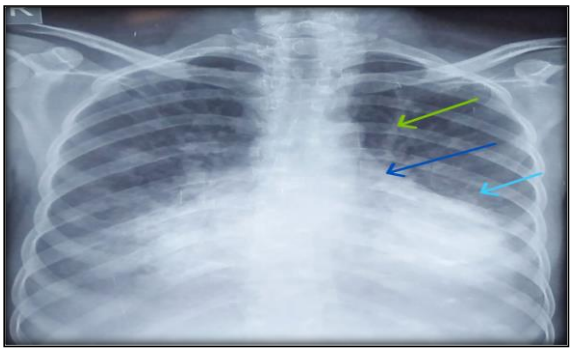

Figure 1: Chest X-ray Antero-Posterior view showing pulmonary oedema [Green arrow: Cephalization of vessels, Purple arrow: Full fuzzy hilum, Blue arrow: Kerley B lines].

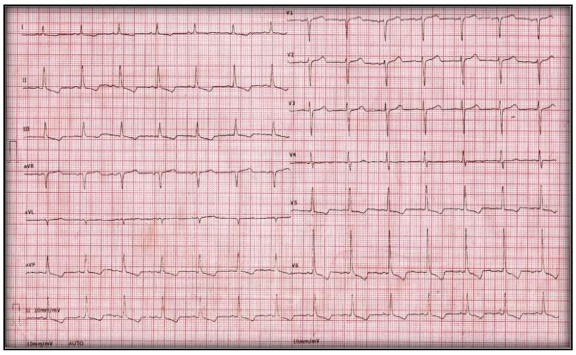

Figure 2: 12 Lead Electrocardiogram showing ST segment depression in limb leads II, III, aVF and in precordial leads V5 and V6

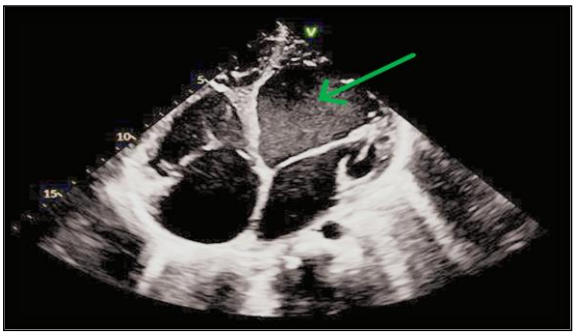

Figure 3 : 2 Dimensional Echocardiography showing dilated left ventricle in Transthoracic apical four-chamber view. [Green arrow: Dilated left ventricle]

DISCUSSION

Dengue is an emerging public health burden with almost half of the world's population, approximately 4 billion people live in areas with a high risk and annually up to 400 million people are infected by a dengue virus out of which 100 million people develop illness from the infection and 40,000 die from severe dengue.[8] Viral infection is the most common cause of acute myocarditis, out of which the adenovirus family is most commonly associated with dengue myocarditis.[9,10]

Dengue fever is caused by bite of an infected female Aedes mosquito and is usually a self-limiting disease with mild or no symptoms recovering over a period of 1-2 weeks [1b]. Patients having dengue fever usually present with high grade fever, headache, retro-orbital pain, body ache, vomiting and loose stools with weakness and lethargy over the few days from the onset of infection. Dengue has an incubation period of 4-10 days and in those having symptoms usually resolves with 7-10 days [1c]. In some patients however, there may be

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spontaneous bleeding manifesting as epistaxis, bleeding from gums, sub-conjunctival haemorrhage and dysentery.[11]

Dengue infection confers lifelong immunity to a particular dengue serotype post infection. However, subsequent dengue infection to the same individual by another dengue serotype may result in severe life-threatening disease which manifests as dengue haemorrhagic fever and dengue shock syndrome.[12] Dengue non-structural protein 1 (NS1) antigen is used to detect dengue infection in the initial 7 days after symptom onset and Dengue IgM antibody is used for testing Dengue in patients presenting more than 1 week after fever onset.[13]

In 2011, WHO SEARO (South East Asia Region Country Office) revised 2009 WHO guidelines for dengue coined a new entity named as expanded dengue syndrome which includes the unusual and atypical manifestations of dengue involving the neurological, cardiac, hepatic and renal systems occurring as a complication of profound shock or associated host comorbidities.[14]

Dengue rarely affects the heart and has variable presentations. Cardiac complications encountered in dengue are myocarditis, pericarditis, pericardial effusion, arrhythmias and atrio-ventricular conduction block which have been reported.[6,15,16] Majority of the patients with dengue fever are asymptomatic or have mild cardiac symptoms even in the presence of bradycardia and atrioventricular block but however, some patients progress to a severe course developing acute pulmonary oedema and cardiogenic shock leading to left ventricular failure.[17] The mechanism of dengue myocarditis is unknown but have been hypothesised to be due to direct viral invasion of the cardiac myocytes and immune mediated damage.[18] The severity of myocardial injury is more in patients with dengue shock syndrome in comparison to dengue haemorrhagic fever.[18]

Dengue myocarditis leading to acute cardiac failure causing patient morbidity and mortality is extremely rare. The short duration of clinical presentation and examination findings in our patient suggests of an acute cardiac failure as evidenced by elevated NTproBNP levels, ST segment depression in limb leads II, III, aVF and in precordial leads V5 and V6 on ECG with pulmonary oedema suggestive on chest X-ray and 2D Echocardiography showing dilated left ventricle with reduced ejection fraction. Sepsis was ruled out by normal procalcitonin levels and negative culture reports. Malaria and typhoid tests were negative. The patient history of a recent dengue infection and the presence of Dengue IgM antibodies attribute myocarditis as the cause of acute cardiac failure in our patient with dengue as the primary infection. The prompt resolution of symptoms over a short duration of time with non-invasive ventilation and diuretics while maintaining the mean arterial pressure with inotropes and the decrease in NTproBNP levels further supports that the patient had an acute cardiac failure.

Endomyocardial biopsy which is the gold standard for confirming myocarditis was not done in our patient as the procedure has high risks and complications and the overall condition of the patient was not favourable to undergo an invasive procedure.[19,20] Acute cardiac failure in the background of Dengue infection can lead to high morbidity and mortality, if not recognised and treated early. Our patient showed good response to treatment with complete resolution of dyspnoea even on exertion and with stable vitals he was discharged on day 9 of hospital admission.

Dengue infection can have atypical presentations, out of which myocarditis progressing to acute cardiac failure is a rare occurrence. Early clinical suspicion of myocarditis and detecting acute cardiac failure in a dengue infected patient will facilitate prompt medical intervention and favour patient recovery, thereby preventing morbidity and mortality. Suspicion should arise in patients coming from dengue endemic regions with respiratory distress.

Early non-invasive ventilation will decrease the increased work of breathing precipitated by pulmonary oedema. Maintenance of mean arterial pressure with inotropic support in patients presenting in shock is critical which can give way for additional judicious diuretic use when warranted in scenarios where there is non-resolution of pulmonary oedema with non-invasive ventilation. Important to note is the balanced administration of intravenous fluids in patients who present in shock with heart failure along with the judicious use of diuretics and concurrent strict monitoring of vitals, input and output charting..

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