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IP International Journal of Medical Paediatrics and Oncology

Journal homepage: https://www.ipinnovative.com/journals/IJMPO

Case Report

Post covid-19 Multisystermic Inflammatory Syndrome in Children (MIS-C): Case report

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ARTICLE INFO

Article history:
Received 12-11-2020
Accepted 01-12-2020
Available online 09-01-2021

Keywords:
Mis-c
Covid-19

ABSTRACT

As we know, the spread of COVID-19 throughout 2020 has had many different manifestations in all different age groups. Our focus is the hyperinflammatory multisystemic effect it has had on the pediatric age group.

Background: Our patient, was a male child aged 9 years, presented with clinical symptoms of multisystemic inflammatory syndrome in children; a rare form of COVID-19 seen in the pediatric age group.

Case: Our patient presented with a fever and GI complaints. He subsequently developed other systemic symptoms such as a rash, along with mild breathing difficulties. His lab reports, of a positive IgG and IgM of SARS-Cov-2 antibodies and elevated inflammatory markers, were suggestive of a classic case of MIS-C. This was treated with initial intravenous steroids, followed by oral steroids.

1. Introduction

At the end of 2019, Wuhan became the origin of the novel corona virus which led to a rapid increase in cases of pneumonia that spread throughout the world. What started as an epidemic in China quickly transformed into a pandemic by March 2020. The virus was named by World Health Organization (WHO) as the COVID-19 virus, which caused severe acute respiratory syndrome.[1]

In India, the COVID-19 cases began to rise in March 2020. Ever since, we have had 8,684,039 cases and 163,403 deaths with a recovery rate of 98%. The total number of cases globally have been 52,440,433 with a total of 1,289,730 deaths.[2]

The incidence of COVID-19 in the pediatric age group is significantly less and often less serious, but there have been cases where children present with severe manifestations that differ from adults.

There has been a post-COVID hyperinflammatory condition termed as MIS-C, or multisystemic inflammatory syndrome in children, which was noticed in mid-April 2020 by investigations conducted in South Thames Retrieval Service in London, UK. Unprecedently, this study revealed a cluster of eight children presenting with a hyperinflammatory condition, resembling an atypical Kawasaki shock syndrome. This is a new phenomenon in what was previously asymptomatic SARS-Cov-2 infections.[3]

2. Case Presentation

A male child, aged 9 years, presented to the private facility hospital on the 21st of October, 2020, with complaints of a high-grade fever with 2-3 episodes of non-projectile, non-bilious vomiting and loose motions for the past 3 days. There was no significant past, family or personal history. The child had no history of any major chronic illness. There was no significant contact history. The child was vaccinated as per schedule with normal development.

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https://doi.org/10.18231/j.ijmpo.2020.037

At the time of presentation, the patient was well-oriented and cooperative, but sick-looking with a temperature of 99.5°F, a heart rate of 110bpm and a respiratory rate of 30 per minute with mild pallor. There were no signs of cyanosis, clubbing, lymphadenopathy or edema. Our systemic examination revealed no abnormalities in the CNS or cardio-respiratory systems. However, there was mild generalized abdominal tenderness without organomegaly or any palpable mass. The patient had visited his primary pediatrician before presenting to us and after primary investigation, he had received some oral medication on an out-patient basis for his illness.

On the basis of history and clinical examination along with the presented lab reports on an out-patient basis [Table 1], a suspicion of enteric fever was made and the was child admitted. Blood samples were sent for blood cultures and treatment was started in the form of intravenous fluids, injectable antibiotics (ceftriaxone), antipyretics and other symptomatic management.

After admission, the patient developed a rash on the abdomen and chest overnight, along with respiratory issues in the form of mild difficulty in breathing.

Combining the GI symptoms, fever spikes and absence of growth in blood cultures with the rash and difficulty breathing, we now have two systems involved; skin and respiratory. Therefore, due to the current global pandemic, the patient was suspected to have COVID-19 or MIS-C. As a result, the patient was shifted to the isolation ward on the second day of admission and lab investigations were sent for: repeated complete blood count, SARS-Cov-2 RTPCR, SARS-Cov-2 antibodies and inflammatory markers. The SARS-Cov-2 PCR from nasopharyngeal and throat swabs and peripheral smear for malarial parasite both came back negative, whilst platelet count was 2.05 $x10^5$/mL. The inflammatory markers C-reactive protein level 155.7mg/L and serum LDH 424.6mg/dL were seen to be elevated. Serum ferritin was 148.1mg/dL and was well within range [Table 1]. The above test results alongside the clinical symptoms led to a suggest diagnosis of MIS-C.

The patient was started on methyl prednisolone with 10mg/kg/dose given intravenously slowly under monitoring. Prior to starting the steroids, cardiac markers and a 2D-echo were done, showing no abnormalities. Intravenous antibiotics ceftriaxone and amikacin were continued for broad spectrum coverage along with other intravenous medications for symptomatic support.

On the fourth day of admission, and third day of his IV steroid, he was vitally stable throughout the day with one fever spike. Repeated investigations showed a decrease in C-reactive protein level towards normal range (83.5mg/L) with no significant change in serum ferritin and LDH levels of 147.9ng/mL and 460.7 IU/L, respectively [Table 2]. On the $25^{th}$of October, the child was shifted to oral prednisolone (Tablet OMNACORTIL) 20mg once a day (1 mg/kg/day) after completing three days on intravenous methyl prednisolone. The child was observed for one day where he had no fever spikes and was vitally stable with no significant complaints.

He was discharged on the 26^{th} of October with a pulse of 88 beats per minute and a respiration rate of 22 per minute. The patient was afebrile with systemic examination normal and no complaints.

He was discharged with oral prednisolone and other symptomatic medication, and put on a regular follow-up plan.

3. Discussion

Multisystemic inflammatory syndrome in children is a newfound syndrome seen in post-infectious COVID-19 patients, typically found in patients aged 0-19 years.

According to WHO, MIS-C is defined with a number of parameters. Patients must be aged 0-19 years with a fever > 3 days and exhibit two or more of the following: rash or bilateral non-purulent conjunctivitis or muco-cutaneous inflammation (oral, hands or feet); hypotension or shock; features of myocardial dysfunction, pericarditis, valvulitis, or coronary abnormalities (including ECHO findings or elevated Troponin/NT-proBNP); evidence of coagulopathy (by PT, PTT, elevated D-dimer); acute gastrointestinal problems (diarrhea, vomiting, or abdominal pain). Patients must show elevated markers of inflammation, such as ESR, C-reactive protein or procalcitonin. Patients must have evidence of COVID-19 (RT-PCR, antigen test or serology positive), or likely contact with patients with COVID-19. Finally, patients should not exhibit any other obvious microbial causes of inflammation, including bacterial sepsis, staphylococcal or streptococcal shock syndromes.

Specific to this case, our patient presented with a persistent fever spike for three days as well as the involvement of the GI tract in the form of vomiting and abdominal tenderness, mucocutaneous manifestations, such as a rash, and respiratory involvement including mild breathing difficulty. His lab reports show elevated inflammatory markers (CRP, and serum LDH), along with a positive SARS-COV2 IgG and IgM, suggesting a diagnosis of multisystem inflammatory syndrome post-COVID.

The closest diseases to be considered in the differential of MIS-C are Kawasaki's disease and toxic shock syndrome. Kawasaki is a vasculitis that presents with fever and acute mucocutaneous inflammation in children less than 5 years. The diagnosis is made on the basis of a >5day fever along with any 4 of the 5 criteria: 1. conjunctivitis 2. Rash 3. Erythema and edema of hands and feet 4. Cervical lymphadenopathy 5. Oral mucosa changes.[5]

Toxic shock syndrome is a life-threatening condition that occurs due to bacterial septicemia and presents with shock, hypotension, fever and rash; treated by antibiotics and hemodynamic stabilization.[6] As our patient did not

Table 1:

	On OPD Basis	On Admission	On Discharge	Reference value
Date	19/10/20	22/10/20	24/10/20	
Hemoglobin	11.2g/dL	9.3g/dL	8.8g/dL	11.9–15.0g/dL
Total Leukocyte Count	5800/mm^3	8900/mm^3	11800/mm^3	5000-10000/mm^3
Differential leukocyte count	Not available	1.Polymorphs:85% 2.Lymphocyte:15% 3.Eosinophils:01% 4.Monocyte:02%	1.Polymorphs:77% 2.Lymphocyte:20% 3.Eosinophils:02% 4.Monocyte:01%	1.Polymorphs:50-70% 2.Lymphocyte:20-40% 3.Eosinophils:1-6% 4.Monocyte:2-10%
Platelet Count	2.3x10^5/mL	2.05x10^5/mL	3.3x10^5/mL	1.65-4.15x10^5/mL
Peripheral smear for malarial parasite	Negative	Negative	Negative	
Bacterial Culture		Negative		
C- Reactive Protein	56 mg/L	155.7 mg/L	83.5 mg/L	< 10mg/L
Serum LDH		424.6 IU/L	460.7 IU/L	60-170 IU/L
Serum Ferritin		148.1 ng/mL	147.9 ng/ml	7-140 ng/L
Troponin-I		Negative		

Table 2:

Serial Number		Lancet[4]	Our Case
1.	Gender	Male (52.3%)	Male patient
2.	Age	Mean Age 9.3 +/- 0.5	9 years of age
3.	SARS-Cov2 positive (PCR/Antibody)	84.7%	Positive
4.	Mean number of days symptomatic before hospital presentation	4.8 +/- 0.3 days	3 days
Symptoms			
1.	Fever	100%	Present
2.	GI symptoms (Abdominal pain, diarrhea)	73.3%	Present
3.	Rash	56.2%	Present
4.	Dyspnea	18.3%	Present
5.	Conjunctivitis	51.8%	Absent
6.	Headache, dizziness	19.5%	Absent
7.	Lymphadenopathy	92.5%	Absent
Hematological (Mean +/- SD)			
1.	White blood count (10^3/mL)	13.2 +/- 0.8	8,900
2.	C-Reactive Protein(mg/L)	160 +/- 7.0	155.7
3.	Serum Ferritin (ng/mL)	997 +/- 55.8	148.1

present with any conjunctival symptoms or oral mucosal changes, nor developed lymphadenopathy and edema, we were able to rule out Kawasaki's disease. He also did not respond to the antibiotics and intravenous fluids as a toxic shock syndrome patient would. We hence developed a clinical doubt of MIS-C which was then confirmed by our lab results alongside the multisystemic involvement.

Despite the positive antibody test, the swab for SARS-COV2 PCR was negative. It suggested a remote infection /post-COVID multi-systemic involvement and it rules out the role of antiviral medication. The patient did not develop significant respiratory trouble and never required oxygen, hence we did not recommend a chest-CT.

In recent studies of MIS-C, there have been reported cases of left ventricular dysfunction (20-25%), and coronary artery dilation/aneurysm (~20%). The echocardiograms performed at the time of diagnosis and during follow-up were to properly evaluate the presence of pericardial effusion, and to check normal cardiac dimensions of the ventricles and coronary artery.[7,8]

We monitored our patient's cardiac activity by testing the cardiac serum markers (Trop-I) as well as a 2D echocardiogram on the second day of intravenous methylprednisolone, to ensure complete monitoring. As all parameters were within normal range we did not need to repeat the tests during patient admission, but kept a check on them during subsequent follow-up visits.

Below is a table comparing the data collected by the LANCET journal through a systemic review with 39 observational studies (total patients=662)[4] starting

from January 5^{th}2020 - July 25^{th}, 2020against our own case:[Table 2]

4. Source of Funding

No financial support was received for the work within this manuscript.

5. Conflict of Interest

The authors declare they have no conflict of interest.

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Cite this article: Joshi DN, Patel SC, Patel MG, Bhatt HR. Post covid-19 Multisystermic Inflammatory Syndrome in Children (MIS-C): Case report. *IP Int J Med Paediatr Oncol* 2020;6(4):163-166.