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Severe multi-system inflammatory syndrome in 3-year-old child complicated by acute kidney injury and cytomegalovirus infection: A case report and literature review

Manar Darwish*; Doaa Abu Nawas; Ahmed Khelif; Nidal Al Hashaykeh

***Corresponding Author: Manar Darwish**

Pediatrics Department, Tawam Hospital, Al-Ain, United Arab Emirates.

Email: manardarwish31@gmail.com

Abstract

Following an infection with SARS-CoV-2, a paediatric hyper-inflammatory condition known as Multisystem Inflammatory Syndrome (MIS-C) presents with fever, gastrointestinal symptoms, cardiac dysfunction, acute kidney injury and shock can occur. The use of immune modulators like pulse steroids, anakinra and infliximab is regarded as a supplementary therapy to IVIG in treating MIS-C. However, these immunomodulating therapies can increase the risk of developing opportunistic infections, including those caused by cytomegalovirus, tuberculosis, and Epstein-Barr virus. Here, we present a 3-year-old child, previously healthy who had severe MIS-C and was treated with immunoglobulin, infliximab, and high-dose methylprednisolone and was complicated with acute kidney injury and cytomegalovirus infection.

Keywords: Multisystem inflammatory syndrome; Acute kidney injury; Opportunistic infections; Bloody diarrhea; Immune dysregulation.

Introduction

Multisystem Inflammatory Syndrome in Children (MIS-C) is an illness that is associated with COVID-19 infection. It was postulated that it's related to immune system dysregulation, and if this illness left untreated it is associated with a devastating outcome [1-3]. MIS-C is associated with multisystem involvement including the heart, kidney, and Gastrointestinal system. Presence of acute kidney injury is associated with poor prognosis in critically ill patients [3]. Severe MIS-C cases might require treatment with immunomodulator, a high index of suspicion for opportunistic infections (CMV, EBV, TB) is needed if a patient received immunomodulator therapy. Here, we present a 3-year-old child, previously healthy who had severe MIS-C and was treated with immunoglobulin, infliximab, and high-dose methylprednisolone and was complicated with acute kidney injury and Cytomegalovirus infection.

Case Description

Patient is a 3 year old, previously healthy child, presented to the hospital with history of fever of four days, persistent diarrhea for five days, diarrhea was watery non-bloody diarrhea around seven episodes per day, with two episodes of vomiting for one day, patient visited a health care center with the onset of the symptoms, stool culture was done and reported as positive for Entamoebae histolytica and then family decided to visit our hospital seeking treatment. His past medical and surgical history were all unremarkable, patient was fully immunized and he was born by normal vaginal delivery without any complications. His examination upon his hospital admission was reassuring, with fever of 38.5C, Hear rate: 99 beats per minute, Respiratory rate: 24 breaths per minute, Blood pressure 102/80, chest was clear, abdomen was soft, nontender, no rash noted. The patient was kept on IV fluids to maintain adequate hydration. His labs that were done on admission (CBC, Urea and electrolytes, stool culture and CRP) were all normal.

Patient was admitted for hydration and observation at our hospital and was started on metronidazole based on the previous stool culture result, repeated stool culture including stool PCR were negative in our hospital, so metronidazole was stopped.

At around his second day of admission, patient deteriorated rapidly, patient developed four episodes of bloody diarrhea, his vomiting was still present without improvement, high grade fever of 39^{o}C, Tachycardia reaching up to 140 beats/minute, Respiratory rate was 40 breaths per minute, Blood pressure dropped to 65/40, O_2 saturation 88% on room air, patient didn't pass urine for around 10 hours, was complaining of abdominal pain, looks lethargic on examination, Patient developed respiratory distress, lung auscultation showed bilateral basal crepitation, significant abdominal distention and tenderness all over the abdomen with dullness to percussion, No skin rash, Repeat Labs were done and showed the following CBC showed leukocytosis of 61.5 x 10^9/L with predominant neutrophilia, microcytic anemia with Hbg of 10.3 g/l and normal platelets, worsening kidney function as his serum Creatinine increased to 336 micromole/L, Urea of 15.90 mmol/L, hyponatremia of 125 meq/L, Labs were also notable for elevations in CRP, procalcitonin, AST, ALT, INR, pro-Brain Natriuretic Peptide (pro-BNP), and troponin levels, Chest x-ray showed bilateral pleural effusion, Ultrasound abdomen identified the following abnormalities: ascites, perirenal fluid and thick edematous colon. His echocardiogram showed evidence of pericardial effusion with dilated left main coronary artery. At that time our differentials were Severe MIS-C with multiorgan failure, septic shock, toxic shock syndrome.

Patient was shifted to PICU with impression of Severe MIS-C with multiorgan failure intubated in the PICU and was started on Inotropes, IVIG, IV pulse steroids and was started on ceftriaxone and clindamycin, further immunosuppression was needed as patient was sick and developed multiorgan failure so anakinra and infliximab were given, despite providing this therapy and ensuring adequate hydration patient had Persistent elevated serum creatinine and was diagnosed with oliguric acute kidney injury secondary to severe MISC and acute tubular necrosis that required hemodialysis. After four days, the patient was extubated, repeated echocardiogram in three days came out to be normal.

The patient required permanent hemodialysis due to his kidney injury manifested by persistent elevation in serum creatinine and planned by nephrology team for renal biopsy after his 3 months of discharge from the hospital.

During his fifth day of hospital admission, the patient developed persistent bleeding per rectum fresh red blood as well as melena, bleeding was persistent on daily basis and was associated with frequent drops in his serum hemoglobin, requiring repeated blood transfusions. For that patient underwent upper GI endoscopy, which was remarkable for edematous stomach mucosa, which was covered with haemorrhagic spots suggestive of gastropathy, no active bleeding was seen in the stomach, no ulcers noted, and the esophagus was normal. Lower GI colonoscopy was done and showed there was a dark red fluid in the rectum, sigmoid and descending colon but no obvious bleeding point or ulcer seen. Patient was placed on PPI and was provided with supportive measures.

However, patient was still having persistent bleeding per rectum and since the source of bleeding was not yet identified by colonoscopy, CT angiogram was done and showed that there is evidence of contrast extravasation in the lumen of the large bowel at the ascending colon suggesting active bleeding and minor bleeders were also suspected in the descending and sigmoid colon. For that patient was planned for repeat upper GI endoscopy and colonoscopy which was done in 5 days after the first one and yielded the same findings of the previous one, capsule endoscopy was done, and no active bleeding was identified.

Considering the stormy course that the patient went through in PICU, the rapid clinical deterioration and the persistent unexplained bleeding per rectum EBV and CMV PCR from blood was sent and CMV PCR came out to be positive and patient was started on ganciclovir from Infectious disease perspective. Repeat Upper and lower GI was done for the third time multiple biopsies from the colon were taken and CMV PCR was taken from the terminal illum and the cecum which came positive, cecum biopsy result showed severe acute active Cytomegalovirus colitis with ulceration and granulation tissue formation. Patient was kept on ganciclovir till repeat CMV PCR came negative twice one week apart. After starting the treatment patient didn't had any further episodes of GI bleed and was safely discharged from the hospital.

Patient was placed on permanent Haemodialysis due to his end stage renal disease, renal biopsy was done four months after discharge from the hospital and showed acute tubular necrosis with chronic interstitial nephritis and the glomeruli are globally sclerosed after which the patient underwent renal transplant donated by his mother and he is currently doing well.

Discussion/conclusion

It is believed that infection-related autoimmune dysregulation causes MIS-C [4], and that multiple system involvement, including acute kidney disease, has been linked to MIS-C [5]. AKI occurs in roughly 25 to 33% of the patients with MIS-C and is linked with poor prognosis in critically ill patients [3]. Among the possible causes of acute kidney injury in MIS-C patients are cardiac dysfunction, hypovolemia, endothelial dysfunction, rhabdomyolysis, nephrotoxic medications and Tubular damage [6,7].

In this case report, the patient had developed severe MIS-C complicated by acute kidney injury manifested by rapid and persistent increase in serum creatinine and decreased urine output. This could be attributed to multiple factors related to severe renal hypoperfusion, cytokine storm and direct tubular damage. Not only so, but recent study has also reported that presence of elevated inflammatory marker such as white blood cells, procalcitonine, D-dimer, ferritin and CRP in patient presenting with MIS-C are associated with acute kidney injury [5] and in our case report, we can see that two components can lead to kidney injury including elevated inflammatory markers and the prerenal component. Although a lot of discussion was made about MIS-C that it was centered toward cardiac complications, pediatric providers must be aware about renal manifestations in MIS-C as it is associated with poor prognosis, as our patient ended up with permanent hemodialysis and renal transplant.

In this report, we describe a case of concomitant CMV infection in a patient receiving immunomodulating treatment for MIS-C, although the causal relationship between these conditions remains unclear. Our case report emphasizes the significance of continuing to be vigilant and carrying out thorough investigations in order to discover and better understand such associated infections, especially in light of the low number of studies on infections that occur concurrently with MIS-C.

Because the pathophysiology of MIS-C involves hyper-immune reactivation against previous COVID-19, high-dose steroids or immunomodulatory drugs, like infliximab and anakinra, can be considered as additional treatment if the primary treatment fails, especially in hemodynamically unstable patients [8,9]. Although these biological agents are highly effective in managing various chronic inflammatory diseases, their effect on the immune system can increase the risk of opportunistic infections like tuberculosis and cytomegalovirus [10]. In our case, our patient was clinically ill and had multiorgan failure with persistent bloody stools so extensive workup was done to role out the possibility of any concurrent infections especially that the patient was regarded as immunocompromised, for that we sent for CMV PCR from blood which came positive another PCR was collected from the cecum as CMV colitis which had explained the persistent bloody stools. From this case report we learn that a rapid diagnostic tool is needed whenever patient is taking immunomodulator to role out any concurrent infection especially if patient started to have any unexplained symptoms.

Abbreviations: MIS-C: Multisystem Inflammatory Syndrome; CMV: Cytomegalovirus; EBV: Epstein-Barr Virus; TB: Tuberculosis; AKI: Acute Kidney Injury; CBC: Complete Blood Count; CRP: C-Reactive Protein; PICU: Pediatric Intensive Care Unit; PPI: Proton Pump Inhibitor; IVIG: Intravenous Immunoglobulins; CT : Computed Tomography; GI: Gastrointestinal; PCR: Polymerase Chain Reaction.

Conflicts of interest: We have no conflict of interest to declare.

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References

1. Rowley AH. Understanding SARS-CoV-2-related multisystem inflammatory syndrome in children. Nature reviews. Immunology. 2020; 20(8): 453-454. https://doi.org/10.1038/s41577-020-0367-5.

2. Kabeerdoss J, Pilania RK, Karkhele R, Kumar TS, Danda D, et al. Severe COVID-19, multisystem inflammatory syndrome in children, and Kawasaki disease: Immunological mechanisms, clinical manifestations and management. Rheumatology international. 2021; 41(1): 19-32. https://doi.org/10.1007/s00296-020-04749-4

3. Basalely A, Gurusinghe S, Schneider J, Shah S, Siegel L, et al. Acute kidney injury in pediatric patients hospitalized with acute COVID-19 and multisystem inflammatory syndrome in children associated with COVID-19. Kidney International. 2021; 100(1): 138-145.

4. Fabi M, Filice E, Biagi C, Andreozzi L, Palleri D, et al. Multisystem Inflammatory Syndrome Following SARS-CoV-2 Infection in Children: One Year after the Onset of the Pandemic in a High-Incidence Area. Viruses. 2021; 13(10): 2022. https://doi.org/10.3390/v13102022

5. Irfan O, Muttalib F, Tang K, Jiang L, Lassi Z, et al. Clinical characteristics, treatment and outcomes of paediatric COVID-19: A systematic review and meta-analysis. Archives of disease in childhood. 2021; 106(5): 440-448. https://doi.org/10.1136/archdischild-2020-321385

6. Sethi S, Rana A, Adnani H, McCulloch M, Alhasan K, et al. Kidney involvement in multisystem inflammatory syndrome in children: A pediatric nephrologist's perspective. Clinical kidney journal. 2021; 14(9): 2000-2011.

7. Lipton M, Mahajan R, Kavanagh C, Shen C, Batal I, et al. AKI in COVID-19-associated multisystem inflammatory syndrome in children (MIS-C). Kidney360. 2021; 2(4): 611-618.

8. Vella L, Rowley A. Current insights into the pathophysiology of multisystem inflammatory syndrome in children. Current pediatrics reports. 2021; 1-10.

9. Yamaguchi Y, Takasawa K, Irabu H, Hiratoko K, Ichigi Y, et al. Infliximab treatment for refractory COVID-19-associated multisystem inflammatory syndrome in a Japanese child. Journal of Infection and Chemotherapy. 2022; 28(6): 814-818.

10. Jeong G, You J. A Case of 1-Month Fever Caused by CMV Infection in a Patient With MIS-C Treated With IVIG, Infliximab, and High-Dose Methylprednisolone. Pediatric Infection & Vaccine. 2023; 31.

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Authors Information: Manar Darwish[1]*; Doaa Abu Nawas[1]; Ahmed Khelif[2]; Nidal Al Hashaykeh[3]

[1]Pediatrics Department, Tawam Hospital, Al-Ain, United Arab Emirates.

[2]Pediatric Intensive Care Department, Pediatric Intensive Care Consultant, Tawam Hospital, Al-Ain, United Arab Emirates.

[3]Pediatric Intensive Care Unit, Pediatric Intensive Care Consultant, Tawam Hospital, Al-Ain, United Arab Emirates.

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