Multisystem inflammatory syndrome in children

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1 Multisystem inflammatory syndrome in children (MIS-C) is a hyperinflammatory condition associated with a history of SARS-CoV-2 infection

From March 2020 to May 2021, 406 cases were reported in Canada.¹ As of January 2022, the United States reported 1 MIS-C case per 3200 SARS-CoV-2 infections, and 59 deaths.² Patients usually present within 6 weeks after SARS-CoV-2 infection, and most are positive for SARS-CoV-2 antibodies.³⁻⁵

- Diagnostic criteria include fever and multiorgan involvement
 Most patients are school-aged children (median age 8 yr). Risk factors include male sex; obesity; and Black, Hispanic or South Asian ethnicity. ^{2,3,5} Although case definitions vary worldwide, diagnostic criteria include fever for at least 24 hours, multisystem involvement and evidence of inflammation. ²⁻⁴ Cardiovascular shock is common. Older children usually present with gastrointestinal involvement (abdominal pain, diarrhea and vomiting), whereas younger children present with rash, conjunctivitis, strawberry tongue or swollen extremities, similar to Kawasaki disease. ³⁻⁵ Differential diagnoses include bacterial sepsis, appendicitis and toxic shock syndrome.
- Suspected or confirmed MIS-C should prompt hospitalization
 Initial symptoms may be mild; however, children can deteriorate quickly
 and may require intensive care support. Most patients have elevated
 inflammatory markers (C-reactive protein, ferritin), lymphopenia, elevated cardiac enzymes (troponin, B-type natriuretic peptide) and evidence of coagulopathy, including elevated D-dimer.³⁻⁵ Initial treatment
 with broad-spectrum, intravenous (IV) antibiotics is essential as clinical
 features overlap with sepsis.^{1,4,5} Immunomodulation with IV immunoglobulin, with or without methylprednisolone, is the first-line treatment,
 and should be guided by specialists.^{2,4,5}
- Two-thirds of patients will have cardiac involvement
 Electrocardiography and echocardiography should be performed in all patients, and may identify features of myocarditis, pericarditis, valvulitis and pathological changes in coronary arteries.²⁻⁵ Treatment includes fluid resuscitation, inotropic support and antiplatelet therapy.
- Most patients recover fully from the hyperinflammatory state
 Response to immunomodulation is usually excellent. Patients should be
 reviewed by a cardiologist to check resolution of cardiac dysfunction and
 development of aneurysms of the coronary arteries. Follow-up data are
 limited; however, in a cohort of 46 children, most (98%) were able to
 resume full-time education by 6 months, although some continued to
 report reduced exercise capacity and emotional dysregulation.⁶

References

- El Tal T, Morin M-P, Morris SK, et al. Epidemiology and role of SARS-CoV-2 linkage in paediatric inflammatory multisystem syndrome (PIMS): a Canadian Paediatric Surveillance Program national prospective study. medRxiv 2022 May 27. doi: 10.1101/2022.05.27.22275613.
- COVID-19 updates: what clinicians need to know about multisystem inflammatory syndrome in children [webinar].
 Atlanta: Centers for Disease Control and Prevention; 2022
 Feb. 10. Available: https://emergency.cdc.gov/coca/calls/2022/callinfo_021022.asp (accessed 2022 June 1).
- Laverty M, Salvadori M, Squires SG, et al. Multisystem inflammatory syndrome in children in Canada. Can Commun Dis Rep 2021;47:461-5.
- Berard RA, Tam H, Scuccimarri R, et al. Paediatric inflammatory multisystem syndrome temporally associated with COVID-19 (spring 2021 update). Ottawa; Canadian Paediatric Society; 2020, updated 2021 May 3. Available: https://cps.ca/en/documents/position/pims (accessed 2022 June 1).
- Merckx J, Cooke S, el Tal T, et al.; Pediatric Investigators Collaborative Network on Infections in Canada (PICNIC). Predictors of severe illness in children with multisystem inflammatory syndrome after SARS-CoV-2 infection: a multicentre cohort study. CMAJ 2022;194:E513-23.
- Penner J, Abdel-Mannan O, Grant K, et al.; GOSH PIMS-TS MDT Group. 6-month multidisciplinary follow-up and outcomes of patients with paediatric inflammatory multisystem syndrome (PIMS-TS) at a UK tertiary paediatric hospital: a retrospective cohort study. Lancet Child Adolesc Health 2021;5:473-82.

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