

Severe Immune Thrombocytopenia Following MMR Vaccination with Rapid Recovery: A Case Report and Review of Literature

This article was published in the following Dove Press journal:
International Medical Case Reports Journal

Majd Akbik¹
Dima Naddeh²
Anas A Ashour^{1,3,4}
Azzam Ashour¹

¹Al-Thumama Health Center, Primary Health Care Corporation, Doha 26555, Qatar; ²Muaither Health Center, Primary Health Care Corporation, Doha 26555, Qatar; ³College of Medicine, QU Health, Qatar University, Doha 2713, Qatar; ⁴Medical Education, Hamad Medical Corporation, Doha 3050, Qatar

Abstract: Immune thrombocytopenia (ITP) is an autoimmune disease that occurs following viral illnesses and may also infrequently occur after measles, mumps, and rubella (MMR) vaccination. ITP typically presents with the sudden appearance of a petechial rash, bruising, and/or bleeding in an otherwise healthy-appearing child. However, ITP following MMR vaccine does not commonly cause severely depleted platelets. We report a case of ITP after MMR vaccination in a 13-month-old baby boy, who presented with petechial rash all over his body. The child had severe thrombocytopenia but was successfully treated with a single dose of intravenous immunoglobulin without complications. The study highlights that ITP post-MMR vaccine is an easily treatable condition.

Keywords: immune thrombocytopenia, MMR vaccine, thrombocytopenia, case report

Introduction

Immune thrombocytopenia (ITP) is defined by thrombocytopenia that is not associated with other hematologic abnormalities. While it commonly results in severe thrombocytopenia, it is usually not linked to life-threatening bleeding in children.¹ ITP can be caused by systemic diseases, immune deficiencies or viruses.¹ Although rare, vaccines such as measles, mumps, and rubella (MMR) vaccination is a recognized cause of ITP.² ITP post-MMR incidence is reported as 2.5 cases per 100,000 vaccinations.² ITP caused by MMR vaccine usually develops 2 to 6 weeks following the vaccine but is usually self-limiting with mild to moderate thrombocytopenia.³ Complications such as severe hemorrhage or very low platelets are treated with Intravenous Immunoglobulins (IVIG) or glucocorticoids.¹ Another alternative first-line therapy that could be used in selected patients is Anti-D immunoglobulin (Anti-D). However, Anti-D has no effect and should not be used in children who have Rhesus factor negative blood or in children who underwent splenectomy.⁴ In children with chronic ITP who continue to have thrombocytopenia for more than 12 months, other second-line treatments such as rituximab, thrombopoietin receptor agonist, and splenectomy might be indicated.⁵ Herein, we report a case of ITP caused by MMR vaccine presenting as severe thrombocytopenia which was treated successfully with IVIG.

Case Presentation

A 13-month-old baby boy, full-term, normal vaginal delivery with no neonatal intensive care unit admission, presented with rash for one day. The baby was

Correspondence: Anas A Ashour
Qatar University, Doha, Qatar
Tel +974 55336238
Email aa1510042@qu.edu.qa

doing well until the mother noticed rash on his feet that spread to the back, abdomen, neck and face. The rash was pinpoint, purple in colour, non-itchy and not preceded by trauma. There was no bleeding from the mouth or nose, no change in urine colour, and no blood in stool. The mother did not report any fever, hypoactivity, poor feeding, diarrhea, or vomiting. The patient had no history of recent upper respiratory tract infection or any viral infection.

Past medical history was unremarkable with no recent medications used. The boy received his one-year MMR vaccine 3 weeks before the presentation. The patient lives with the father and the mother with no history of substance abuse in household or signs of Injuries, abuse or neglect. Family history is negative for bleeding disorders.

On examination, the patient had a petechial rash and bruising on the head, back, upper and lower limbs, with some on the abdomen as well. There was no palpable lymph node or hepatosplenomegaly. Examination otherwise was normal.

Complete blood count (CBC) showed white blood cells of $9.3 \times 10^9/L$ (reference range: $4.0\text{--}12.0 \times 10^9/L$), hemoglobin of 12.8 g/L, and mean corpuscular volume of 71.6 fL. Platelets was $1000/\mu L$ (reference range $150\ 000\text{--}400\ 000/\mu L$). Peripheral smear showed red blood cells with mild microcytosis and anisocytosis, some reactive lymphocytes with few atypical forms, and severe thrombocytopenia with few large reactive platelets consistent with ITP or infection.

Other laboratory investigations included C reactive protein (<0.3), Bilirubin (12 mmol/L), and albumin (47 mmol/L). Urine dipstick was negative. Blood virology was negative for Epstein-Barr virus with positive Cytomegalovirus IgG.

The patient was diagnosed with Post-MMR ITP after excluding other common causes. Due to the very low platelet count and the risk of bleeding, the patient was admitted in general pediatrics ward of Hamad General Hospital for monitoring and was given IVIG 1 g/kg over 12 hours (one dose). After 24 hours of treatment, platelet count increased to $59,000/\mu L$. The patient was discharged from the hospital and the family were advised to avoid trauma as the patient is still considered a high risk for bleeding. The patient was seen in hematology clinic for follow-up after one week. He was doing well, and the CBC showed platelets of $495,000/\mu L$.

Discussion

Although ITP post-MMR vaccine is previously reported in the literature, it usually presents with mild to moderate

thrombocytopenia.³ In our case, the patient had severe thrombocytopenia with a platelet count reaching a nadir of $1000/\mu L$. More importantly, it also highlights that even with very low platelet counts, ITP following vaccination is a treatable condition with a low risk of complications. This was evident in the rapid rise of platelet count after treatment and the absence of major or life-threatening bleeding. The benign course of the condition is consistent with previously published reports.³ In the study published by Miller et al, ITP following MMR vaccine showed to have a more self-limited course and a shorter duration of hospitalization (3 vs 5 days) compared to non-vaccine-related ITP.⁶ Moreover, the incidence of post-MMR vaccine ITP is reported in the literature as 2.5 cases per 100,000 vaccinations which is a much lower rate when compared to ITP following rubella virus infection (6/100 000) or measles infection (33/100 000).^{2,7,8} Few case reports have described developing ITP following other vaccinations such as tetanus-diphtheria-acellular pertussis, varicella, and hepatitis A. However, a study by O'Leary et al reported no increased risk of ITP following these vaccinations compared to the general population.⁹ Consequently, A causal relationship can only be identified following MMR vaccination. While physicians should be aware of the association between the MMR vaccine and ITP, the milder course and the rare incidence should encourage physicians not to withhold the vaccination. Nevertheless, patients' families should be educated about the possible adverse effects of vaccination.

The pathogenesis of Post-vaccination ITP is similar to drug-induced ITP in which Antibodies that are formed following vaccination cross-react with platelets antigens such as GP Ib/IX, GP Ia/IIa, and GP VI.¹⁰ This mechanism can be confirmed by the fact that 79% of patients with ITP following vaccination have antibody-coated platelets.¹¹ MMR vaccine is believed to cause ITP by the same mechanism. A study published by Okazaki et al demonstrated an evidence of the presence of anti-measles and anti-rubella virus antibodies attached to the platelets of a child who suffered from post-MMR ITP.¹² Furthermore, it is believed that the immaturity of the immune network in younger ages is the reason behind the higher incidence of post-vaccination ITP when compared to teenagers and adults.¹³ As the vaccine could theoretically trigger ITP when obtaining booster doses, an essential part of the long-term management of such cases is the decision whether to administer the second dose of MMR or not. A systematic review of published

studies reported that out of 37 children received MMR vaccine following vaccine-related ITP, none developed a recurrence of ITP following the second dose of MMR. Also, in 94 children with non-vaccine related ITP, none developed the condition following the first dose of the MMR vaccine.³ Based on these findings, The American Society of Hematology recommends vaccinating children with previous history of ITP unless the child received the first dose of MMR and has a serologic evidence of immunity.¹⁴ This recommendation is in view of the fact that the benefits of the vaccine greatly outweighs the risks of developing ITP.

Conclusion

Even though it is important to highlight that ITP can be caused by MMR vaccination, the incidence of ITP following vaccination is significantly lower than the incidence of the condition following the infections prevented by this vaccine. Consequently, post-MMR vaccine ITP should not limit the universal MMR vaccination of children.

Ethics Approval and Informed Consent

This case report has been prepared after obtaining an informed consent from the patient's parents to publish the case details. Hamad Medical Corporation IRB has determined that the case report does not require institutional approval.

Acknowledgment

We would like to thank Qatar National Library for funding the publication of the manuscript.

Disclosure

The authors have no conflict of interest to declare.

References

1. D'Orazio JA, Neely J, Farhoudi N. ITP in children: pathophysiology and current treatment approaches. *J Pediatr Hematol Oncol.* 2013;35(1):1–13. doi:10.1097/MPH.0b013e318271f457
2. Di Pietrantonj C, Rivetti A, Marchione P, Debalini MG, Demicheli V. Vaccines for measles, mumps, rubella, and varicella in children. *Cochrane Database Syst Rev.* 2020;4(4):Cd004407. doi:10.1002/14651858.CD004407.pub4
3. Mantadakis E, Farmaki E, Buchanan GR. Thrombocytopenic purpura after measles-mumps-rubella vaccination: a systematic review of the literature and guidance for management. *J Pediatr.* 2010;156(4):623–628. doi:10.1016/j.jpeds.2009.10.015
4. Scaradavou A, Woo B, Woloski BM, et al. Intravenous anti-D treatment of immune thrombocytopenic purpura: experience in 272 patients. *Blood.* 1997;89(8):2689–2700. doi:10.1182/blood.V89.8.2689
5. Grace RF, Despotovic JM, Bennett CM, et al. Physician decision making in selection of second-line treatments in immune thrombocytopenia in children. *Am J Hematol.* 2018;93(7):882–888. doi:10.1002/ajh.25110
6. Miller E, Waight P, Farrington CP, Andrews N, Stowe J, Taylor B. Idiopathic thrombocytopenic purpura and MMR vaccine. *Arch Dis Child.* 2001;84(3):227–229. doi:10.1136/adc.84.3.227
7. Bayer WL, Sherman FE, Michaels RH, Szeto IL, Lewis JH. Purpura in congenital and acquired rubella. *N Engl J Med.* 1965;273(25):1362–1366. doi:10.1056/nejm196512162732504
8. Lokietz H, Reynolds FA. Postrubella thrombocytopenic purpura. *J Lancet.* 1965;85:226–230.
9. O'Leary ST, Glanz JM, McClure DL, et al. The risk of immune thrombocytopenic purpura after vaccination in children and adolescents. *Pediatrics.* 2012;129(2):248–255. doi:10.1542/peds.2011-1111
10. Fujita H. [Idiopathic thrombocytopenic purpura following viral infection]. *Nihon Rinsho.* 2003;61(4):650–654. Japanese.
11. Cecinati V, Principi N, Brescia L, Giordano P, Esposito S. Vaccine administration and the development of immune thrombocytopenic purpura in children. *Hum Vaccin Immunother.* 2013;9(5):1158–1162. doi:10.4161/hv.23601
12. Okazaki N, Takeguchi M, Sonoda K, et al. Detection of platelet-binding anti-measles and anti-rubella virus IgG antibodies in infants with vaccine-induced thrombocytopenic purpura. *Vaccine.* 2011;29(31):4878–4880. doi:10.1016/j.vaccine.2011.04.036
13. Perricone C, Ceccarelli F, Neshet G, et al. Immune thrombocytopenic purpura (ITP) associated with vaccinations: a review of reported cases. *Immunol Res.* 2014;60(2–3):226–235. doi:10.1007/s12026-014-8597-x
14. Neunert C, Terrell DR, Arnold DM, et al. American Society of Hematology 2019 guidelines for immune thrombocytopenia. *Blood Adv.* 2019;3(23):3829–3866. doi:10.1182/bloodadvances.2019000966

International Medical Case Reports Journal

Publish your work in this journal

The International Medical Case Reports Journal is an international, peer-reviewed open-access journal publishing original case reports from all medical specialties. Previously unpublished medical posters are also accepted relating to any area of clinical or preclinical science. Submissions should not normally exceed 2,000 words or 4

published pages including figures, diagrams and references. The manuscript management system is completely online and includes a very quick and fair peer-review system, which is all easy to use. Visit <http://www.dovepress.com/testimonials.php> to read real quotes from published authors.

Submit your manuscript here: <https://www.dovepress.com/international-medical-case-reports-journal-journal>

Dovepress