Case Report

Severe Thrombocytopenia Associated with Dengue Fever: An Evidence-Based Approach to Management of Thrombocytopenia

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Dengue is a mosquito-borne viral illness common in tropical and subtropical countries but very rare in the United States. Patients infected with dengue often present with thrombocytopenia. In the setting of dengue, platelet transfusions as a treatment for thrombocytopenia have no clear benefits in reduction of severe bleeding or improvement of the platelet count. Here, we present a case of a traveler infected with dengue virus and discuss the approach to treat thrombocytopenia.

1. Introduction

The dengue virus (DENV) is the most common arbovirus in the world transmitted by the Aedes aegypti mosquito. The virus belongs to the Flaviviridae family, and the disease can be spread by one of the four types: DENV-1, DENV-2, DENV-3, and DENV-4. Dengue is rare in the United States and is often described as the “fever in the returned traveler” due to its common presentation in travelers returning from an endemic region such as the tropical areas of Southeast Asia and the Caribbean [1, 2].

The course of illness ranges from asymptomatic to life-threatening, and incubation typically lasts three to fourteen days. Secondary infection with a second serotype often results in a worse prognosis. The three phases of infection include febrile, critical, and recovery. The febrile phase begins around day four to seven of infection and lasts around three to seven days. Fever is sudden during onset and typically high (greater than 40°C), lasting two to seven days. It can be accompanied by myalgias, arthralgias, nausea, vomiting, diarrhea, abdominal pain, lymphadenopathy, hepatomegaly, maculopapular rash, leukopenia, thrombocytopenia, and transaminitis [3]. The critical phase of infection can be followed after defervescence and is more common in patients with secondary infection and other comorbidities [4]. Thrombocytopenia is common and can occur with vascular leakage, shock, and organ impairment [5]. Theorized mechanisms for thrombocytopenia include platelet activation, which causes attachment to the vascular wall forming thrombi and removal from circulation, immune cytotoxic effects through opsonization of platelets and direct infection of platelets, and megakaryocytes by the virus [6]. The recovery phase occurs with resolution and stabilization of vitals. Diagnosis is with serology of antidengue IgM, and treatment is supportive [3].

Given the rarity of dengue in the United States, physicians should start to consider dengue when patients present with a history of travel from an endemic region and suggestive clinical symptoms. Here, we describe a case of dengue fever in a traveler from an endemic region presenting with severe thrombocytopenia.

2. Case

A 47-year-old Asian Indian male with no significant past medical history, who came from India four days prior to admission, presented with fever with diffuse body aches to the hospital in the Midwestern United States. He stated that he was fully vaccinated for COVID-19. As stagnant water is a breeding source for mosquitoes when asked, the patient did
Thrombocytopenia in dengue patients. Excessive platelet destruction could be the main reason for the drop in platelet counts. Usually, platelet counts are either high or normal in dengue patients; therefore, a significant decrease on the fourth day of the illness suggests enhanced platelet destruction. MPV is increased in peripheral blood. A high mean platelet volume (MPV) indicates increased peripheral destruction of platelets and clearance of platelets from the bone marrow or from increased peripheral destruction of platelets and clearance from peripheral blood. A high MPV indicates enhanced platelet destruction in patients. MPV is usually high or normal in dengue patients; therefore, excessive platelet destruction could be the main reason for thrombocytopenia in dengue patients.

The cross-reactive antibodies anti-NS1, prM, and E viral proteins against platelets, endothelial cells, or coagulatory molecules may cause platelet dysfunction, endothelial cell damage, coagulation defects, and macrophage activation. Hemorrhage and plasma leakage in dengue hemorrhagic fever result from vascular fragility due to impaired platelet functions. Several studies showed that the platelet count in dengue hemorrhagic fever (DHF)/dengue fever showed a significant decrease on the fourth day of the illness. In fact, previous studies reported DHF in adults without shock, in which platelet counts mildly to moderately decreased on the third day until the seventh day of illness and reached normal levels on the eighth or ninth day [10–12]. In our case, the platelet count started to improve from day seven and came to normal by day ten.

According to clinical guidelines, platelet transfusions should be given to patients who develop serious hemorrhagic manifestations or have very low platelet counts, platelet counts falling below 10–20×10^9/L. In a study of 106 pediatric patients with dengue with thrombocytopenia and coagulopathy, there was no significant difference in hemorrhage between patients who received preventive transfusions compared to those who did not. Patients who received transfusion had a higher frequency of pulmonary edema and the increased length of hospitalization [13]. There were significant side effects with platelet transfusions, and it did not prevent the development of severe bleeding or shorten the time to bleeding cessation. Thus, according to the authors, platelet transfusions should not be routinely performed in the management of dengue [14, 15].

### 4. Conclusion

Since dengue viral illness is quite rare in the United States, clinicians should always consider dengue in their differentials if travelers from tropical countries present with suggestive symptoms. Thrombocytopenia is a very common clinical manifestation in dengue. The platelet count may drop very abruptly, but most of the time it follows its own clinical course and should be managed conservatively. It is very important for clinicians to know that platelet transfusions have no benefit in treating thrombocytopenia in dengue and should be avoided as they may cause significant side effects.
Conflicts of Interest
The authors declare that they have no conflicts of interest.

References
[1] S. Bhatt, P. W. Gething, O. J. Brady et al., “The global distribution and burden of dengue,” Nature, vol. 496, no. 7446, pp. 504–507, 2013.
[2] L. E. Adams, S. W. Martin, N. P. Lindsey et al., “Epidemiology of dengue, chikungunya, and zika virus disease in U.S. States and territories, 2017,” The American Journal of Tropical Medicine and Hygiene, vol. 101, no. 4, pp. 884–890, 2019.
[3] J. Whitehorn and J. Farrar, “Dengue, British Medical Bulletin,” Dengue, vol. 95, no. 1, pp. 161–173, 2010.
[4] M. A. M. Khalil, J. Tan, M. A. U. Khalil, S. Awan, and M. Rangasami, “Predictors of hospital stay and mortality in dengue virus infection—experience from Aga Khan University Hospital Pakistan,” BMC Research Notes, vol. 7, no. 1, p. 473, 2014.
[5] T. Adane and S. Getawa, “Coagulation abnormalities in Dengue fever infection: a systematic review and meta-analysis,” PLoS Neglected Tropical Diseases, vol. 15, no. 8, Article ID e0009666, 2021.
[6] M. Raadsen, J. Du Toit, T. Langerak, B. van Bussel, E. van Gorp, and M. Goeijenbier, “Thrombocytopenia in virus infections,” Journal of Clinical Medicine, vol. 10, no. 4, pp. 877, 2021.
[7] B. Murugue, O. Cassar, M. Guigon, and E. Chungue, “Dengue virus inhibits human hematopoietic progenitor growth in vitro,” The Journal of Infectious Diseases, vol. 175, no. 6, pp. 1497–1501, 1997.
[8] A. Basu, P. Jain, S. V. Gangodkar, S. Shetty, and K. Ghosh, “Dengue 2 virus inhibits in vitro megakaryocytic colony formation and induces apoptosis in thrombopoietin-inducible megakaryocytic differentiation from cord blood CD34+ cells,” FEMS Immunology and Medical Microbiology, vol. 53, no. 1, pp. 46–51, 2008.
[9] S. Nakao, C.-J. Lai, and N. S. Young, “Dengue virus, a flavivirus, propagates in human bone marrow progenitors and hematopoietic cell lines,” Blood, vol. 74, no. 4, pp. 1235–1240, 1989.
[10] C. Mitrakul, “Bleeding problem in dengue haemorrhagic fever: platelets and coagulation changes,” Southeast Asian Journal of Tropical Medicine & Public Health, vol. 18, no. 3, pp. 407–412, 1987.
[11] T. Srichaikul and S. Nimmanitaya, “Haematology in dengue and dengue haemorrhagic fever,” Best Practice & Research Clinical Haematology, vol. 13, no. 2, pp. 261–276, 2000.
[12] F. R. F. G. Azin, R. P. Gonçalves, D. M. Lima, and I. C. Branco, “Dengue: profile of hematological and biochemical dynamics,” Revista Brasileira de Hematologia e Hemoterapia, vol. 34, no. 1, pp. 36–41, 2011.
[13] L. C. S. Lum, M. E.-A. Abdel-Latif, A. Y. T. Goh, P. W. K. Chan, and S. K. Lam, “Preventive transfusion in dengue shock syndrome—is it necessary?” The Journal of Pediatrics, vol. 143, no. 5, pp. 682–684, 2003.
[14] M. I. H. Khan, E. Anwar, A. Agha et al., “Factors predicting severe dengue in patients with dengue fever,” Mediterranean Journal of Hematology and Infectious Diseases, vol. 5, no. 1, 2013.
[15] P. Kaur and G. Kaur, “Transfusion support in patients with dengue fever,” International Journal of Applied and Basic Medical Research, vol. 4, no. 3, p. 8, 2014.