Engraftment Failure Associated With Peripheral Blood Stem Cell Transplantation After B19 Parvovirus Infection

To the Editor:

Human parvovirus B19 is a small single-stranded DNA virus of the family Parvoviridae. B19 is the only parvovirus known to cause clinical illness in humans. It was discovered unexpectedly in serum from blood-bank donors and since then has been associated with several human illnesses. Generally, B19 causes a self-limited illness with improvement in a few weeks without sequelae. However, in several groups, the infection can produce life-threatening complications and even death. In patients with chronic increased red blood...
cell (RBC) production, it may induce aplastic crisis in which erythroid production is acutely reduced. In patients with congenital or acquired immunodeficiency who are unable to produce neutralizing antibodies, the infection can cause chronic bone marrow (BM) failure, usually manifested as anemia, because the erythroid progenitors have greater affinity. It has been described in congenital combined immunodeficiency with decreased Ig (Nezelof syndrome), in children with acute lymphocytic leukemia in chemotherapy, in patients with acquired immunodeficiency syndrome, and after BM transplantation (BMT). However, it has occasionally been suspected to be a cause of graft failure after bone marrow or peripheral blood stem cell (PBSC) transplantation. We report a case of graft failure after PBSC transplantation whose laboratory findings showed parvovirus infection and its resolution coincident with intravenous Ig (IVIg) treatment.

A 58-year-old woman was diagnosed as having breast cancer stage III-B. Because of the high risk of relapse, six cycles of adjuvant chemotherapy was included in a program of high-dose chemotherapy supported with hematopoietic stem cells mobilized with granulocyte colony-stimulating factor (10 μg/kg/d for 5 days). A total of 2.5 × 10^9 CD34+ cells/kg and 9.2 × 10^9 mononuclear cells/kg was collected. She was conditioned with cyclophosphamide, carboplatin, and thiopeta at doses described elsewhere. On the day of infusion, she presented fever without clinical localization. Empirical antibiotherapy with cefazidime and amikacin was initiated, but low-grade fever persisted in the following days; vancomycin was added because Staphylococcus coagulase-negative cells were isolated in blood cultures. The neutrophil count was 0.2 × 10^9/L on day +9, decreasing thereafter to less than 0.1 × 10^9/L and persisting at that level until day +41, when a therapeutic trial with IVIg was initiated. The absence of reticuloocyte and platelet increase coincide with high transfusion requirements (10 RBC units and 11 occasions of platelet transfusion during the first 40 days of transplantation). The BM study performed on days +14 and +30 showed most cellularity being lymphocytes (64%), stromal cells, and isolated erythroid precursors. The presence of hemolysis and autoantibodies against erythrocytes and neutrophils was excluded. Parvovirus B19 serology (enzymeimmunoassay; MarDx Diagnostics) showed the presence of IgM antibodies and the absence of IgG type. The detection of Parvovirus B19 DNA using polymerase chain reaction (PCR) performed with BM aspirate material found positive results. Primers and probe used were described by Clewley. Amplified products were detected in 4% agarose gel and confirmed by liquid hybridization using the probe labeled with 32P. Therefore, with the presumption of graft failure due to B19 parvovirus infection, treatment with nonspecific IVIg was initiated on day +37 after the reinfusion of PBSC at a dose of 500 mg/kg/d for 5 days. On day +41, the neutrophil count increased, reaching 0.5 × 10^9/L on +56 days and 1.0 × 10^9/L on day +48, with a parallel increase in the platelet and erythrocyte levels.

Generally, the B19 infection produces a transitory IgM-B19-specific response followed by an IgG response that generally awards immunity. The incidence of B19 IgG seropositivity increases from 2% to 10% in children less than 5 years of age to 40% to 60% in adults more than 20 years of age. In immunocompromised patients, anemia is the most common clinic manifestation in B19 infection because of the viral tropism for late human erythroid cells, in which the infection induces cytotoxicity. The fact that P-surface antigen or globoside is the B19 cellular receptor explains why people who do not have P antigen are resistant to this infection. Viral replication and growth suppression has only been shown in colony-forming units-erythroid (CFU-E) and burst-forming units-erythroid (BFU-E) assays. However, thrombocytopenia, leukopenia, and lymphopenia have also been reported, and viral B19 DNA and RNA have been isolated from nonerythroid progenitors. The reason for this nonerythroid growth suppression is unclear, but has been suggested that some cytokines play a role in this suppression. When the infection would occur early after BMT, stem cell replication would be inhibited and manifested as graft failure.

In immunocompromised patients, the diagnosis is frequently difficult because of a waxing and waning course, the lack of antibody response, and a low-titer viremia. Our case shows a good B19 IgM response, indicating a recent infection, and B19 DNA detection by PCR confirms the diagnosis.

The route of transmission is difficult to know in this case. Inhalation of respiratory droplets from infected people is the major route of transmission. In this case, the patient was treated under HEPA-conditioned room and clinical infection was not detected in family or hospital members. Transmission via blood component transfusion has also been reported due to asymptomatic infection of the donor. The risk associated with the transfusion of RBCs and platelets seems to be low, although problems are possible.

In healthy people, B19 infection is a benign and self-limited illness and treatment is not required. However, in patients with chronic hemolytic anemia and congenital or acquired immunodeficiency, treatment is mandatory. There are reports in which IVIg has been used with resolution of viremia and improvement in RBC indices due to the neutralizing activity of a commercial Ig preparation against erythropoietic suppression by human parvovirus. The optimal dose is unclear. Most reports use high doses (>2 g/kg), but, in others, resolution has been described with lesser doses (<1 g/kg).

The clinical evolution of this patient suggests that parvovirus infection should be considered a treatable cause of primary graft failure.

REFERENCES


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