short report
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CYTOPENIA CAUSED BY PARVOVIRUS IN AN ADULT ALL PATIENT

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ABSTRACT

A young woman in maintenance therapy for acute lymphoblastic leukemia in second complete remission developed fever and a skin rash associated with severe anemia, neutropenia and erythroblastopenia. A complete recovery was obtained in 4 weeks' time after red cell transfusion, i.v. immunoglobulin and withdrawal of the maintenance chemotherapy. Parvovirus B19 infection was demonstrated by detection of B19 DNA in the patient's serum using a dot-blot hybridization assay and a nested polymerase chain reaction. Serological tests were positive for anti-B19 IgG but not for IgM. Erythroblastopenia due to parvovirus infection has already been reported in ALL patients. B19 infection should be suspected in leukemic patients if unexplained cytopenia (mainly anemia) follows an acute febrile illness. Very sensitive methods are often needed to confirm the diagnosis, since routine serological tests may be unreliable in immunocompromised patients.

Key words: parvovirus, cytopenia, acute leukemia

Acute cytopenias in leukemic patients in remission often herald hematological relapse; they may also come from drug toxicity or intercurrent viral infections. B19 parvovirus is the agent of the so-called *fifth disease*, a well-known acute illness characterized by fever and skin rash. B19 virus lytically infects erythroid precursors,[1] leading to transient bone marrow erythroblastopenia, which may be unapparent in healthy subjects but is a cause of acute hyporegenerative anemia in hemolytic patients.[2] The persistence of B19 infection in immunocompromised patients has been reported as a cause of chronic hyporegenerative anemia.[3] We report a patient with severe acute anemia and neutropenia following B19 infection during maintenance treatment for relapsed acute lymphoblastic leukemia (ALL).

Case report

A 22-year-old woman was diagnosed as having ALL-L2 in 1983 and achieved complete remission (CR) following standard chemotherapy and prophylactic cranial irradiation plus intrathecal methotrexate (IT MTX).

Maintenance treatment was stopped in 1985. In 1987 a meningeal relapse occurred and the patient received a new course of chemotherapy and IT MTX, achieving a second CR. In June 1989, while on maintenance therapy with 6MP+MTX and pulses of VCR+PDN, she exhibited fever and skin rash, associated with a sudden reduction of the hemoglobin level and granulocyte count (Figure 1). A leukemia relapse was suspected and a bone marrow aspirate was performed. It showed hypoplasia with an absence of erythroid precursors. The maintenance treatment was interrupted; supportive therapy with red cell transfusions and a single i.v. IgG dose caused complete hematological recovery in 4 weeks.

Patient serum samples collected during the febrile phase and 1 and 5 months later were tested using several techniques to diagnose B19 parvovirus infection. The results, which are summarized in Table 1, showed:

1) the presence of anti-B19 antibodies by

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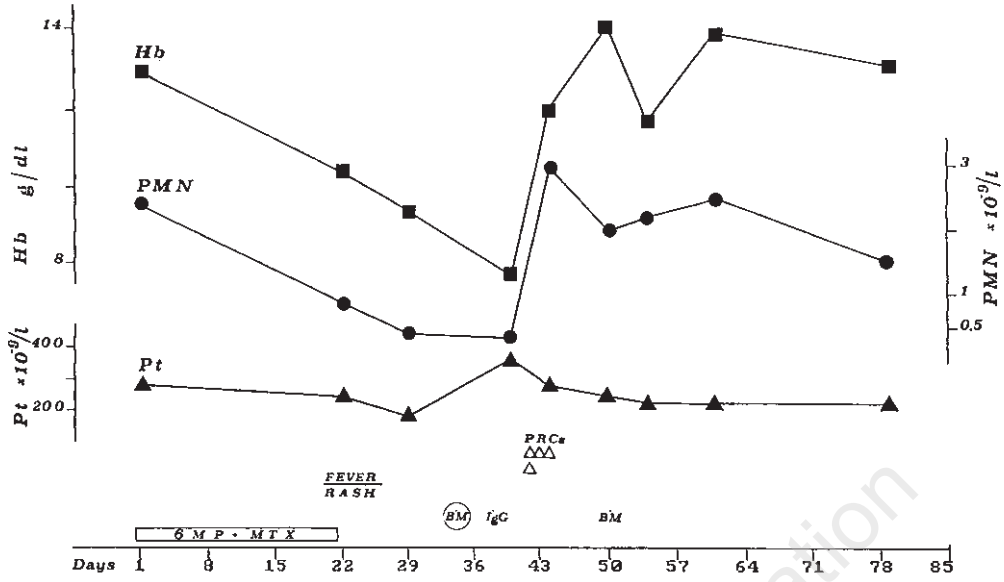

Figure 1. Hematological data during the hypoplastic episode. BM: bone marrow aspirate; Ig: i.v. IgG administration; PRCs: packed RBC transfusion.

immunoelectroosmophoresis (IEOP);[4]

2) the presence of anti-B19 IgG by capture radioimmunoassay (RIA), in the absence of specific IgM;[4]

3) the absence of viral antigens at levels detectable by IEOP;

4) weak positivity for viral DNA by dot-blot hybridization (DBH)[5] and strong positivity by nested polymerase chain reaction (PCR)[6] (Figure 2) of the sample taken during the febrile phase; this was no longer detected in subsequent samples.

Discussion

Erythroblastopenia due to B19 infection has already been reported in a few children with ALL[7,8] and, more recently, in adult ALL patients.[9,10]

Owing to the peculiar tropism of this virus, the erythroid lineage is most affected. However, neutropenia and thrombocytopenia are also frequently reported; this effect is probably due to B19 infection of non-permissive cells, which may be damaged by non-structural viral proteins.[11]

Both immunological impairment and altered hemopoiesis contribute to the peculiar clinical picture of this disease association. Chemotherapy-related impaired immune response may prolong bone marrow cell infection. It may also alter the pattern of serological diagnostic tests, thus requiring sensitive methods for viral DNA detection. As for the clinical aspects,

Table 1. Serological studies.

	7.8.89 *(febrile phase)*	*8.22.89* *(+1 month)*	*11.27.89* *(+5 months)*
B19 antibodies			
– IEOP	pos	pos	pos
– IgM-RIA	neg	neg	neg
– IgG-RIA	pos	pos	pos
B19 antigens (IEOP)	neg	neg	neg
B19 DNA			
– DOT BLOT	+	neg	neg
– PCR	+++	neg	neg

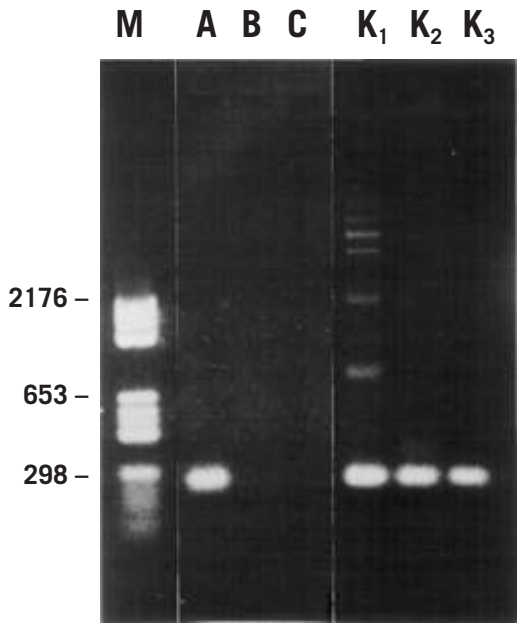

Figure 2. Agarose gel of PCR-amplified viral DNA from patient's serum. M: molecular weight markers (bp); A, B, C: patient's serum drawn on 7.8.89, 8.22.89, 11.27.89; K_1, K_2, K_3: various dilutions of a control serum, positive for B19 parvovirus DNA (10^{-1}, 10^{-7}, 10^{-8}, respectively).

reduced bone marrow compensatory capacity due to chemotherapy may contribute to the intense cytopenia. It is also possible that, because of the immunological impairment, B19 virus reinfection or reactivation may occur, as the antibody pattern of the case reported here might suggest.

B19 infection should be suspected in leukemic patients in remission when an unexplained cytopenia follows an acute febrile illness. Immunoglobulin infusion may prevent the persistence of viral infection in immunocompromised patients, thus favoring hematological reconstitution.

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