Aplastic Crisis Induced by Human Parvovirus B19 Infection in a Previously Healthy Adult Male

Fan Li
Binzhou Medical University
Jinying Cheng
Binzhou Medical University
Linlin Liu
Binzhou Medical University
Guofeng Ding (funli314266813@163.com)
Binzhou Medical University

Case Report

Keywords: Human Parvovirus B19, Epstein Barr virus, Hereditary Spherocytosis, Aplastic Crisis

Posted Date: June 25th, 2020

DOI: https://doi.org/10.21203/rs.3.rs-37784/v1

Abstract

Background: Human parvovirus B19 (B19 V) induced aplastic crisis is very rare and in this paper, we describe a healthy adult male suddenly developed acute aplastic crisis induced by B19 V was found to have hereditary spherocytosis (HS).

Case presentation: A 31-year-old male presented with fever, general fatigue and dizziness. The complete blood counts showed severe anemia. Folate levels, glucose-6-phosphate dehydrogenase levels, the direct Coombs' test and osmotic fragility tests were all normal. And B19 V infection was proven both by the detection of B19 V DNA using PCR and the presence of B19 V IgM by serology and the patient improved following six units of packed red blood cells and antiviral treatment.

Conclusions: This is the first report to describe a case with B19 V, EBV and CMV co-infection diagnosed in a patient with HS in China and DNA test of B19 V is recommended in acute aplastic crisis diseases.

Background

Human Parvovirus B19 is an important pathogen, which is linked to a variety of clinical manifestations, such as erythema infectiosum, nonimmune hydrops fetalis, and acute arthritis and reactive arthropathy [1]. The association between aplastic crisis and human parvovirus B19 infection is previously described in patients with HS, although much less frequently. However, most of the affected patients were children or adolescents who had already been documented prior to aplastic crisis. To the best of our knowledge, this is the first report in China that describes a healthy adult male with aplastic crisis presenting initially with HS. Here, we report the rare case in order to provide new data on the clinical diagnosis and treatment of this disease.

Case Presentation

A 31-year-old male was admitted to our hospital with the complaint of fever. The patient's condition was normal until 10 days before admission, when he experienced flu-like symptoms such as fever, general fatigue and dizziness. Asymptomatic gallstones were diagnosed at the age of 23, and his two sons aged 3 and 11 years, were diagnosed with HS within one month after developing a fever. He had not received any transfusions. On admission to our hospital, his vital signs were normal except for a body temperature of 38 °C. His skin and conjunctiva were pale and icteric, and the low margin of the spleen was palpable at 2 cm from the costal margin. No skin rash or lymphadenopathy was observed and other physical findings were normal. Laboratory studies revealed a red blood cell (RBC) count of 1.4×10^{12}/L, hemoglobin (Hb) of 44 g/L, reticulocytes of 0.9%, hematocrit (Hct) of 8.4%, mean corpuscular volume of 86 fl, mean corpuscular hemoglobin concentration of 36%, white blood cell (WBC) count of 4.8×10^{9}/L, and a platelet count of 215×10^{9}/L. The relevant hematological indices are shown in Table I. His peripheral blood smear, bone marrow smear were almost normal. The capsid antigen IgG for Epstein-Barr virus (EBV) was 334 U/ml and the quantification was 2.38E + 003 copy/ml; antibody IgM for Cytomegalovirus (CMV) was

62.70 U/ml. Liver function tests showed that total bilirubin was 38.8 μmol/L, direct bilirubin 7.2 μmol/L, indirect bilirubin 31.6 μmol/L, serum ferritin was 1154.00 ng/ml, and vitamin B12 was 158.20 pg/ml. Glucose-6-phosphate dehydrogenase levels, the direct antiglobulin (Coombs) test and osmotic fragility tests were all normal. Polymerase chain reaction (PCR) was performed to detect B19 V DNA in peripheral blood and enzyme-linked immunosorbent assay (ELISA) was conducted to detect IgM antibodies, and the results were all positive. In addition, the detection of genetic globular membrane protein defects in the ANK1 gene found a code shift mutation in 8p11.21. On follow-up, he received packed red cell transfusion and empirical antibiotic therapy with cefoperazone sulbactam, alkalization, hydration, antiviral treatment with ganciclovir, folic acid supplementation and vitamin B12. Eight days later, his hemoglobin increased to 72 g/L. The patient was clinically well and hematologically stable.

Discussion

The patient described had previously been healthy, and his two sons were found to have HS within one month. Combining his medical history and family history, it is highly suspected that HS is complicated. Finally, genetic testing was performed to confirm the diagnosis. The patient had positive IgM serology for B19 V, EBV and CMV. EBV viral capsid antigen IgG was positive suggesting previous EBV exposure. Thus, it can be concluded that the patient had B19 V infection which resulted in acute aplastic anemia following infection with EBV and CMV. His condition finally improved after anti-infection and anti-virus treatment, in addition to blood transfusion. His hemoglobin level increased to 118 g/L on his last visit.

Human parvovirus B19 is a small, single-stranded DNA virus and was the first human virus identified to be a member of the parvovirus genus[2]. The virus displays remarkable tropism for human erythroid progenitor cells. In immunocompromised hosts unable to neutralize the antibody, B19 V replicates in erythrocyte precursors efficiently and preferentially, and this infection may persist and lead to pure red cell anemia and other comorbidities[3]. It has been estimated that the peak incidence of infection occurs in children between the ages of 6 and 14 years[4]. EBV infection also seems to share the same mechanism as B19 V in inducing bone marrow aplasia, but at present the clinical effect of an infection sustained by both viruses is unknown and there are no reports to suggest that CMV is associated with aplastic crisis or HS[5]. Humoral immunity is the main defense in B19 V infection. Individuals infected with B19 V can produce specific antibodies, initially IgM and then IgG, and IgG can persist lifelong and protect against re-infection[6]. ELISA is the most widely used diagnostic technique. And the earliest and most sensitive diagnostic method available is PCR, which can identify B19 V DNA in bone marrow aspirates or blood samples[7]. The combined treatment of immunoglobulin infusion and symptomatic treatments including blood transfusion is effective in neutralizing B19 V and improving anemia, especially pure red cell aplastic anemia as reported previously[8]. In this case, infection with B19 V was confirmed both by the detection of B19 V DNA using PCR and the presence of B19 V IgM by serology and the patient improved following antiviral treatment and erythrocyte infusion.

There have been several case reports of B19 V infection in patients with HS, but this is not frequently described and most of these cases were children or adolescents[9–11]. Yujin Kobayashi reviewed this

infection in a series of adult patients. In his study, a total of 19 reports were included involving 22 cases between 1984 and 2010, only 6 patients were male, and all patients were young aged between 18 and 43 years[12]. The only case of B19 V, EBV and CMV co-infection documented to date describes twins with previously unidentified HS[13]. To our knowledge, this is the first report to describe a case with B19 V, EBV and CMV co-infection diagnosed in an adult male patient with HS in China. The infection only produced transient pure red cell aplastic anemia and the reason why there was no additive effect of the three viruses on the patient's aplastic crisis is still unclear. We report this case in order to provide new data on the clinical diagnosis and treatment of this rare disease.

Conclusions

The clinical importance of this report is that in the case of unexplained severe anemia and jaundice, one should consider underlying hemolytic anemias mostly HS complicated by B19 V aplastic crisis.

Declarations

Ethical Approval and Consent to participate

Ethics approval was obtained from Binzhou Medical University Affiliated Hospital. Written informed consent to participate in the study from the patient was obtained.

Consent for publication

Written informed consent for publication from the patient was obtained.

Availability of data and materials

Data relating to this study are contained and presented in this document. Other materials are available from the corresponding authors on reasonable reques.

Competing interests

The authors have no conflicts of interest.

Funding

Not applicable.

Authors' contributions

FL conducted the literature review and wrote the draft. JYC and LLL collected clinical data. GFD conceived the study and revised the manuscript. The author read and approved the final manuscript.

Acknowledgements

Not applicable.

Authors' information

[1]Department of Infectious Disease，Binzhou Medical University Affiliated Hospital， Binzhou, 256603, China.

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Tables

Table I Hematological data

Date	Hemoglobin (g/L)	Red blood cell count ($\times 10^{12}$/L)	White blood cell count ($\times 10^{9}$/L)	Platelets ($\times 10^{9}$/L)
05 Nov.19	44	1.4	4.8	215
06 Nov.19	36	1.2	3.7	180
07 Nov.19	47	1.5	6.2	134
09 Nov.19	39	1.3	13.8	298
11 Nov.19	61	2.1	7.6	261
13 Nov.19	72	2.5	4.8	211