INTRODUCTION

Like other members of the Herpesviridae family, Human Cytomegalovirus (HCMV) can remain latent in some blood cells (B and T lymphocytes, polymorphonuclear leukocytes). CMV infection is endemic and ubiquitous, affecting 40-80% of the population in industrialized countries and almost all the population in developing countries. In some categories of patients (immunocompromized patients, organ and bone marrow recipients, cancer (oncologic) patients, patients with AIDS) CMV acts as an opportunistic pathogen, causing multi-organ involvement (lungs, liver, intestine, central nervous system, etc.) with high mortality rates (up to 60-80% without antiviral treatment). Serologically negative organ recipients can contract the infection from an organ from a CMV-positive donor. As regards blood transfusions, theoretically blood from any seropositive donor can transmit the infection, as it contains cells carrying the latent infection: the risk of infection is not affected by the volume of transfused blood and the number of donors. In transfused seronegative children, the probability of contracting the infection is 50% if the donor is CMV-seropositive.

The use of seronegative blood for transfusions to seronegative patients is used as a means of prevention; however, the limited availability of blood from seronegative donors for use with high-risk patients has led to an increasing interest in the development of methods to eliminate the infectivity of blood from seropositive donors.

The effectiveness of leukodepletion (bedside, laboratory and pre-storage filtration) is now widely documented, and reduces the number of white blood cells present in the blood components from 3 to 5 log10 (99.9%).

In clinical terms, leukodepletion not only prevents and reduces the risk of viral reactivation/transmission in the recipient but is also effective in preventing febrile non-HLA-related acute transfusion reactions, frequent platelet refractoriness and acute graft-versus-host reaction (GVHD), above all in immunosuppressed patients.

This study describes the available scientific literature since 1996, when the first reports of CMV infection in transfused children were published. In the period of study from 1st January 2013 to 30th April 2014 we analyzed:

1. A total of 167,441 samples (136,770 donations of blood and blood components, 20,061 annual controls of periodic donors and 10,606 controls of willing donors) to screen for specific class anti-CMV IgM antibodies using CMIA and ECLIA immunometric assay methods.

A total of 53,807 samples (donations of blood and blood components and annual controls of seropositive donors) to screen for specific class anti-CMV IgG antibodies using the CMIA immunometric assay method.

2. Doubt or positive samples were re-tested with the LIAISON® XL system (DiaSorin Saluggia - Italy). 9% of the samples were tested, in the LIAISON® XL CMV II IgM test and 10% of the samples with LIAISON® XL CMV II IgG (DiaSorin Italy).

MATERIALS AND METHODS

Since January 1996 at the Central Regional Virology Laboratory and Molecular Biology of Ancona Hospital (Regional Department of Transfusion Medicine), serological screening has been in place to research specific anti-CMV IgM and IgG antibodies in the donated blood units.

The serological screening protocol includes:

- screening for anti-CMV IgM and IgG in candidate donors attending one of our donor centers for the first time, for serological screening for the virus;

- screening for anti-CMV IgM and IgG in periodic CMV-negative donors, on each donation, to highlight any seroconversion, leading to the elimination of the blood unit and the temporary suspension of the donor;

- screening only for anti-CMV IgM in periodic donors already testing positive for IgG, on each donation, to highlight any recurrent or reactivated infection.

RESULTS

None of the acceptance and donation consent forms (required under Ministerial Decree - D.M. of 3rd March 2005) completed by the periodic donors who were CMV-IgM positive reported any symptoms.

The 134 confirmed CMV-IgM positive blood and blood component donations corresponded to:

1. 118 units of blood from seropositive periodic donors (with previous IgM-CMV control negative) and with a primary infection in progress (Tab 1);

2. 47 units of blood from periodic donors with previous CMV-IgG-CMV control positive and therefore with viral reactivation or reinfestation (Tab 2).

The 134 confirmed CMV-IgM positive blood and blood component donations corresponded to:

- 118 units of blood from seropositive periodic donors (with previous IgG-CMV control negative) and therefore with a primary infection in progress (Tab 1); and

- 47 units of blood from periodic donors with previous CMV-IgG-CMV control positive and therefore with viral reactivation or reinfestation (Tab 2).

These percentages match the estimates described in literature for the Italian population, in which approximately 30% of healthy people in the same age group (18-60) results CMV seronegative.

REASONS FOR THE CHOICE

Patients at risk of CMV infection are frequent in our Department of Transfusion Medicine, which operates within a large health care facility with Specialized Hospitals (Cardiology, Pediatric) and specialist departments (Pediatric Blood Cancer, Cancer, Hematology, Infectious Diseases, Hepatology Surgery for Transplant Recipients, Dialysis, Gynecology, etc.).

Moreover, the choice of using serological screening is due to the following reasons:

- availability of highly automated seroimmunological and molecular screening facilities, with interfacing between the automatic systems and the laboratory computer system (LIS);

- presence of qualified staff;

- low cost of immunoassays compared to the high cost of leukodepletion filters.

CONCLUSIONS

Two approaches have been found to be particularly effective in preventing the transmission of the CMV infection through transfusion: the first is based on the administration of units of leukocyte-depleted blood and blood components using leukodepletion filters, which are of proven efficacy but rather costly. The approach we chose involves the selection of donors by serological screening to test for anti-CMV antibodies, in order to prevent transmission of the infection to groups of recipients at risk (immunocompromized patients, cancer patients, organ recipients, children, newborns, CMV-negative pregnant women) who suffer more frequently and more seriously from complications caused by the CMV infection than immunocompetent recipients.

For Cytomegalovirus serological screening in blood donors.

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REFERENCES


