



Brief report

Anaphylactoid transfusion reactions associated with a positively charged white-cell reduction filter: A case report

Michinori Funato *, Hideo Kaneko, Michio Ozeki, Kaori Kanda,
Toshiyuki Fukao, Naomi Kondo

Department of Pediatrics, Gifu University Graduate School of Medicine, Yanagido 1-1, Gifu 501-1194, Japan

Abstract

The effectiveness of a white-cell reduction filter to deplete contaminated leucocytes in preventing the harmful effects of transfusion is evident. However, several complications associated with a white-cell reduction filter have been identified. We report the first case of anaphylactoid reactions caused by a white-cell reduction filter with a positively charged surface. © 2008 Elsevier Ltd. All rights reserved.

1. Introduction

In 1990 Tielemans et al. described a life-threatening anaphylactoid reaction occurring within the very first minutes of hemodialysis using polyacrylonitrile (AN69) capillary dialyzers in three patients receiving angiotensin-converting enzyme (ACE) inhibitors [1]. In 1992 Olbricht et al. also described a similar anaphylactoid reaction due to low-density lipoprotein (LDL)-apheresis with dextran sulphate adsorption in patients receiving ACE inhibitors [2]. These anaphylactoid reactions were thought to be due to a bradykinin formation cascade, activated by using negatively charged white-cell reduction filters [3]. So far, several anaphylactoid reactions associated with white-cell reduction filters have been reported. However, anaphylactoid reactions associ-

ated with white-cell reduction filters having a positively charged surface have not been reported previously. Herein, we describe the first case of anaphylactoid reactions caused by a white-cell reduction filter with a positively charged surface in this paper.

2. Case report

A boy with recurrent anaplastic ependymoma of the brain was on chemotherapy at seven years of age. He had a pollen allergy. His father was Japanese and his mother was Filipino. At three years of age, he was found to have a brain tumor and received a complete surgical resection. At that time, he was not given a blood transfusion. Four years later, brain computed tomography (CT) showed a 6×5 cm mass lesion in the left frontal horn, which meant a recurrence of anaplastic ependymoma. He was subsequently treated by a total excision of the tumor. Postoperatively, he received radiation ther-

* Corresponding author. Tel.: +81 58 2306386; fax: +81 58 2306387.

E-mail address: mfunato@mac.com (M. Funato).

apy (a total of 30 Gy), stereotactic radiosurgery (SRS) (a total of 12 Gy) and four courses of multi-agent chemotherapy consisting of vincristine, etoposide, cyclophosphamide and cisplatin.

He required some transfusions of red blood cells, platelets and fresh frozen plasma for the side effects of bone marrow suppression during the treatment (Table 1). There was no trouble during the first and second transfusions of packed red blood cells and fresh frozen plasma, respectively. However, after starting infusion of leukocyte-poor red cells, which were filtered with a positively charged white-cell reduction filter (Sepacell RZ-2 filter, Asahi Med, Japan), as a third transfusion, he immediately developed a skin rash of the trunk, hypotension, blurred eyesight and unconsciousness. No stridor or dyspnea was observed. The transfusion was stopped and he was rescued by fluid resuscitation, epinephrine and hydrocortisone. We thought his reaction was allergic, associated with the transfusion. In the next infusion, washed red blood cells were used and nothing happened. In the fifth transfusion, we gave him prophylactic antihistamines and infused leukocyte-poor red cells, and similar anaphylactoid symptoms occurred immediately. His symptoms were resolved in several minutes by medical treatment. Subsequent transfusions of washed red blood cells or a platelet concentration were done without any problem.

3. Discussion

A transfusion of allogeneic cellular blood products is associated occasionally with adverse reactions and other complications, including febrile nonhemolytic transfusion reactions (FNHTR), graft-versus-host disease (GVHD), and immunomodulation and transmission of infectious agents, despite careful donor selection and extensive testing [4]. The use of

a white-cell reduction filter to deplete contaminated leucocytes is effective in reducing those harmful effects of transfusion, particularly alloimmunization and cytomegalovirus infection [5]. However, several complications associated with a white-cell reduction filter have been described. Herein, we have reported a rare case of anaphylactoid reactions associated with a white-cell reduction filter having a positively charged surface in a 7-year-old boy.

We thought his symptoms were caused by something related to the positive charge on the membrane. The leukocyte-poor red cells were made from washed red blood cells by passing them through a positively charged white-cell reduction filter at The Japan Red Cross. This patient only developed anaphylactoid symptoms twice when the former but not the latter was transfused. In addition, his clinical symptoms were very similar to anaphylactoid reactions during transfusion associated with a negatively charged white-cell reduction filter, which was reported in previous literature [6]. The possibility of other causes is unlikely, because his antibodies against HLA, IgA, haptoglobin, C4, C9, ceruloplasmin, and anti-alpha-2-microglobulin were all negative when examined at The Japan Red Cross Central Blood Center. In addition, this patient had a mild increase in his peripheral eosinophil count ($0.603 \times 10^9/L$) for allergic constitution and normal immunoglobulin G, A, M and E concentrations (1149 mg/dl, 175 mg/dl, 178 mg/dl and 150 IU/L, respectively).

Iwama examined the effect of temperature on bradykinin generation during the use of white-cell reduction filters. In this assay, a positively charged filter did not generate bradykinin at any temperature. However, a negatively charged one generated a lot of bradykinin when warm blood (37 °C) was used but did not when cool blood (4 °C) was used [7]. In our patient, The Japan Red Cross prepared

Table 1
All courses of transfusion in this patient during the treatment

No.	Blood product	Anaphylactoid reaction	A positively white-cell reduction filter	Prophylactic agent
1	Packed red blood cells	–	–	–
2	Fresh frozen plasma	–	–	–
3	Leukocyte-poor red cells	+	+	–
4	Washed red blood cells	–	–	–
5	Leukocyte-poor red cells	+	+	+
6	Platelet concentration	–	–	+
7	Washed red blood cells	–	–	+
8	Washed red blood cells	–	–	+
9	Washed red blood cells	–	–	+
10	Platelet concentration	–	–	+
11	Washed red blood cells	–	–	+

leukocyte-poor red cells at 4 °C and kept them at 4 °C. Then a blood transfusion was done at room temperature. Hence, bradykinin was not likely to cause any symptoms in our patient.

This case of anaphylactoid transfusion reactions associated with a positively charged white-cell reduction filter may be attributed to the fact that such reactions are not related to the charge on the membrane, but to a hypersensitivity reaction against something made by filtration through a white-cell reduction filter. In this respect, further work needs to be undertaken on the exact molecular nature of this reaction.

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