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Case Report

Allergic transfusion reaction caused by the shrimp allergen of donor blood: A case report

Lingbao Gao^{a,1}, Yayun Sha^{b,1}, Keyu Yuan^c, Liu Ling^d, Dongqin Ai^a, Huang Ying^a, Chen Xiu^d, Hailin Peng^d, Yabao Chen^{d,*}, Zhu Li^{a,*}^a Blood Bank, Jiangsu Taizhou People's Hospital, Taizhou 225300, China^b Division of Infectious Diseases, Jiangsu Taizhou People's Hospital, Taizhou 225300, China^c Taizhou Blood Center, Taizhou 225300, China^d Clinical Laboratory, Jiangsu Taizhou People's Hospital, Taizhou 225300, China

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ABSTRACT

Objective: The purpose of this report is to analyze the cause of allergic transfusion reaction. **Methods:** The methods of immunoblot and immunonephelometry were applied to detect the levels of the immunoglobulins of IgA (Immunoglobulin A) and IgE (Immunoglobulin E) and the level of sIgE (specific Immunoglobulin E) to shrimp allergen both in the patient's pre and post transfusion blood samples, respectively.

Results: After transfusion, The level of sIgE to shrimp showed "increase" corresponding to the concentration of 0.70–3.5 IU/ml.

Conclusion: The allergic transfusion reaction was very likely caused by passive transfer of shrimp antigen to the patient allergic to shrimp.

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1. Introduction

Allergic transfusion reactions (ATRs) are the most common transfusion reactions, accounting for approximately 1–3% of all blood transfusions [1]. Most reactions are mild and are usually associated with urticaria, edema, occasional dizziness, and headache that may occur anytime during the transfusion or immediately after transfusion. Typically, severe allergic reactions include angioedema, dyspnea and shock [2]. ATRs can be caused by the passive transfer of specific antibody to a transfusion recipient and subsequent allergen exposure or the development in a transfusion recipient of antibody specific to blood composition of donor [3]. The risk of immediate-type allergic

reactions elicited by passive transfusion of plasma protein antibodies appears to be very low [4]. The latter one is the main reason and several reports on ATRs due to passive transfer of allergens from donors have emerged recently [5–7]. However, ATRs involve in complex pathogenesis and reasons that produce a challenge for diagnosis. New reports on the reasons of ATRs are always required. Here, we reported a case of ATR also belonging to the latter one which was most likely caused by transfusing plasma containing antigen for shrimp to the recipient allergic to shrimp.

2. Case report

A 64 year-old male was admitted to the Taizhou people's hospital affiliated to Medical College of Jiangsu University because of swelling, pain, deformity and bleeding for an hour after trauma of left leg, ankle and foot. Then he was diagnosed with severe crush injury of left leg, ankle and foot associated with vascular injury, open and comminuted fracture of lower parts of left tibia and fibula, left

* Corresponding authors. Address: Blood Bank, Jiangsu Taizhou People's Hospital, Yingchun Road, Taizhou City, Jiangsu Province 225300, China. Tel.: +86 0523 86361536; fax: +86 0523 86361408.

E-mail address: lizhullzh@hotmail.com (Z. Li).

¹ Lingbao Gao and Keyu Yuan should be the co-first author.

talus and left calcaneus, left ankle open fractures, tibial and peroneal nerve lesions, serious skin and soft tissue rolling necrosis of left leg and ankle, severe left ankle and foot crush injury with partial necrosis, and head trauma. During the course of the disease, there were no symptoms of convulsions, chest congestion, palpitations, abdominal distension, abdominal pain, hematuria and melena in this case. The past history of this patient did not include hypertension and diabetes, infectious diseases such as hepatitis, tuberculosis and typhoid, and food or drugs allergy such as penicillin. Meanwhile, he did not experience hemoptysis, chest congestion, palpitations, precordial pain, abdominal pain, diarrhea, frequent urination, dysuria, skin and mucous membranes purpura, insomnia, drowsiness, joint swelling and pain, and movement disorders. He did not contact with affected areas, and toxic or radioactive substances. History of vaccination was not detailed. Besides, he was a vegetarian without the habits of smoking and drinking.

The HBsAg, HBsAb, HBeAg, HBeAb HbcAb, syphilis antibody, HCV antibody, HIV antibody, urine, feces, blood cytology, blood type and biochemical immunization programs were examined preoperatively. After the ideal combined spinal-epidural anesthesia, surgery was performed and went well with less bleeding and the patient's vital signs were stable. But edema of the head and face and body itch occurred in patient after plasma transfusion which was considered as a plasma allergic reaction. The patient was admitted to the ICU for monitoring postoperatively.

Transfusion reaction was analyzed as below: The hemolytic transfusion reaction did not occur; The edema of head and face and body itch occurred after plasma transfusion rather than anesthesia, so it was more likely to be an allergic transfusion reaction; Considering that the patient did not have the history of blood transfusion and he had the habit of vegetarian diet, we ruled out the possibility of anaphylactoid reaction and suspected his itself was a kind of allergic constitution; The allergic reaction was diagnosed to be acute urticaria with facial edema [8], and the grade was mild [9].

According to the above analysis we took the following measures: Firstly, the blood was drawn from the patient for detection of allergen and immunoglobulin which were also performed with the preoperatively reserved blood. Secondly, desensitization treatment was applied for the patient immediately by intravenous injection of 20 ml 10% calcium gluconate injection.

Laboratory investigations included in vitro sIgE detection and immunoglobulin detection. The method of immunoblot was used to detect the shrimp allergen-sIgE based on the Allergy screen Test System (MEDIWISS Analytic GmbH, Germany) and Allergy Screen Test Kit (K-M120827, Germany). Detection of IgA and IgE were performed through the method of immunonephelometry with specific protein analyzer (Siemens Bnprosc, Germany) and corresponding reagents (IgA, 153168E; IgE, 169650A). The results of laboratory investigations were characterized as below. Generally, the cutoff value of sIgE is 0.35 IU/ml that the reference range for normal person is 0–0.35 IU/ml. Different levels of sIgE are corresponding to different ranks (Table 1). The result is positive only if the grade was not less than 1. The levels of IgE and

IgA in blood sample before transfusion were 122 IU/ml and 3.42 g/L, respectively. Immunoblot analysis revealed that the level of sIgE to shrimp was “low” and the corresponding concentration was 0.35–0.70 IU/ml (Fig. 1A). After transfusion, the level of IgE was gone up to 366 IU/ml but the level of IgA was 3.65 g/L being almost constant. The level of sIgE to shrimp showed “increase” corresponding to the concentration of 0.70–3.5 IU/ml (Fig. 1B).

3. Discussion

Any adverse reactions resulted by transfusion of blood, blood components or blood products are classified as transfusion reactions. Non-hemolytic transfusion reactions are the most common type of transfusion reactions and include transfusion-related acute lung injury (TRALI), transfusion associated circulatory overload (TACO), allergic transfusion reaction (ATR), febrile transfusion reaction, post-transfusion purpura and transfusion associated graft versus host disease, in which ATR occurs most frequently [4]. Furthermore, the incidence of ATR ranks second among all transfusion reactions in China, only behind the febrile non-hemolytic transfusion reaction [10]. ATRs belong to a clinical syndrome that usually lack effective detection methods. In China there are also few reports on detecting the reason of ATR. Here, we reported a case of ATR which was very likely caused by transfusing plasma containing antigen for shrimp to the recipient allergic to shrimp.

Some plasma proteins such as IgA can cause the occurrence of ATR [11]. IgA-mediated transfusion reactions mostly occur in those who are IgA-deficient (serum IgA < 0.5 mg/l) and in whom there are detectable serum class-specific IgA antibodies [4]. However, the reactions elicited by IgA-deficient usually do not occur and anaphylaxis appears to be relatively rare [12]. And in our report, the IgA level of the patient was 3.42 g/L which was more than 0.5 mg/l, so it was nearly impossible that IgA-deficient was the reason for this case of ATR.

In our report, IgE level of the patient had tripled, from 122 IU/ml to 366 IU/ml after transfusion. It was very likely a case of IgE-mediated transfusion reaction. As for the high concentration of IgE in the patient's blood sample post-transfusion, we can consider that the patient accepted foreign antigen stimulation. Substantial amounts of food antigens are absorbed into the blood circulation in a digested form but retain a certain molecular size and antigenicity [13] that can result IgE-mediated allergic reaction. The patient in this report was a vegetarian due to his religion and had never eaten shrimp from his memory. Meanwhile,

Table 1

The rank standard of sIgE.

Concentration of sIgE (IU/ml)	Rank	Represent
<0.35	0	None
0.35–0.70	1	Low
0.70–3.5	2	Increase
3.5–17.5	3	Significant increase
17.5–50	4	High
50–100	5	Higher
>100	6	Extremely high

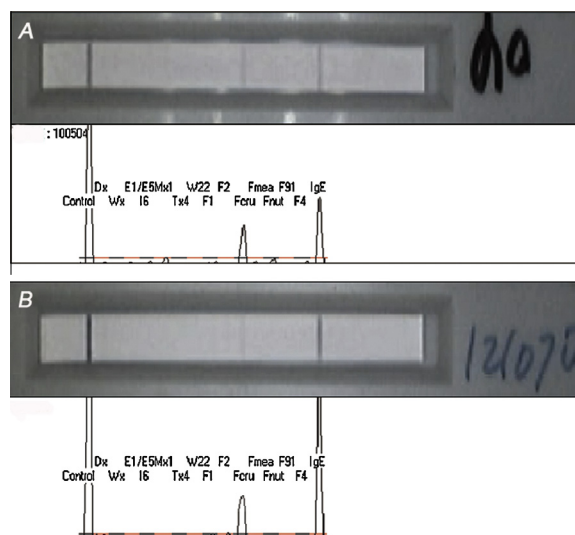


Fig. 1. Immunoblot analysis of sIgE to shrimp in the blood samples of the patient before (A) and after (B) transfusion. Counting from left, the first band indicates control sample and the third band indicates the test sample.

we learned that the donor who was identified through blood bags coding ate a lot of shrimp at the night before donating blood. Shrimp containing multiple allergen molecules is one of the most common causes of allergic reactions [14,15]. So shrimp allergen was regarded as particularly suspect and we detected sIgE to shrimp by the method of immunoblot, the result of which showed an increase of sIgE level after transfusion. We highly suspected that this case of ATR was caused by transfusing plasma containing antigen for shrimp to the recipient who had an allergen to the shrimp.

Our report provided a new case of ATR and suggested that sufficient information on diet and medication use of blood donors are required to prevent similar incidents occurring in susceptible individuals.

Authorship

- (1) concept and design of the study, or acquisition and analysis of data: Lingbao Gao, Yayun Sha, Dongqin Ai, Chen xiu, Zhu li.

- (2) drafting the article or revising it critically for important intellectual content: Lingbao Gao, Yayun Sha, Keyu Yuan, Liu ling, Huang ying, Chen xiu, Hailin Peng.
- (3) final approval of the version to be submitted: Liu ling, Huang ying, Yabao Chen.

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