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Case Report

A Case Report on Acute Hemolytic Allergic Reactions Associated With Blood Transfusion in Tertiary Care Hospital

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Abstract

This case included a 39-year-old male who complained of fever, impaired vision, and a left nasopharyngeal hemorrhage upon arriving at the medical OPD. After having received multiple successful blood transfusions while in the hospital and being diagnosed with sickle cell anemia, the patient was transfused red blood cells following which he developed an acute transfusion reaction. The doctor is currently looking into the cause of the response further. This situation warrants the need to keep abreast of the potential side effects of the transfusion of blood components against any purported advantages.

Keywords- Haemovigilance, sickle cell anemia, Acute hemolytic transfusion reaction (AHTR)

Introduction

Haemovigilance is a methodical technique for reporting, identifying, monitoring, as well as investigating, and evaluating adverse effects and reactions associated with transfusion of blood as well as manufactured blood products. Haemovigilance is essential for monitoring quality control in a blood system which allows for preventive and corrective actions, which further helps in the continuous development of safety and quality of blood products along with transfusion procedure. A national centralized hemovigilance program was launched on 10th December 2012, for ensuring patient safety and advancing public health with one of the objectives of this program being to monitor the adverse effects associated with the transfusion of blood and blood products. The National Coordination Centre for the haemovigilance program is located at the National Institute of Biological Sciences, Noida (NIB). [1,2]

The Haemovigilance Programme of India (HvPI) was founded under the aegis of the governing body of the Pharmacovigilance Programme of India (PvPI). The main objective for the HvPI was: (i) to monitor transfusion reactions; (ii) to impart knowledge to healthcare professionals; (iii) to advise recommendation based on the best available evidence (evidence-based); (iv) to

regularly follow-up with the guidelines of Central Drugs Standard Control Organization (CDSCO) regarding the regulatory decision that are safety-related; (v) to disseminate research findings with all stakeholders; and (vi) to establish links on the national and international level. [3]

Modern blood transfusions are highly safe compared to many medical and surgical procedures, yet fatalities and serious morbidity still happen sometimes. Many avoidable significant adverse events are caused by mistakes in the identification of patients, blood samples, and blood components. One blood sample in 1300 pretransfusion blood samples is collected from the incorrect patient, and one unit in 13,000 blood component units is transfused to the incorrect patient (which might lead to negative outcomes). [4]

Although serious acute transfusion responses are frequently unanticipated, poor transfusion decisions put patients at undue risk. The UK SHOT (Serious Hazards of Transfusion) system (SHOT) reported 252 instances of "incorrect blood component transfused" in its 2012 Annual Report (each underpinned by 100 near misses). There were 145 instances of "avoidable, delayed, or under-transfusion" and 10 ABO-incompatible transfusions (all caused by clinical mistakes). Nine transfusion-related fatalities (six from transfusion-associated circulatory overload) and 134 serious morbidity cases were recorded (most often following acute transfusion reactions).

However, a hemolytic response that takes place within 24 hours after the initiating transfusion is typically regarded as an AHTR (Acute hemolytic transfusion reaction). An AHTR is characterized by the fast destruction of RBCs right after a transfusion. The majority of reported reactions involve red blood cells (RBCs), acute hemolytic transfusion reactions are caused by antibodies on RBCs found in the plasma of other blood components like platelets or plasma-derived products have significantly been associated with producing AHTRs. AHTRs cause serologic abnormalities and clinical events. [5]

Case description

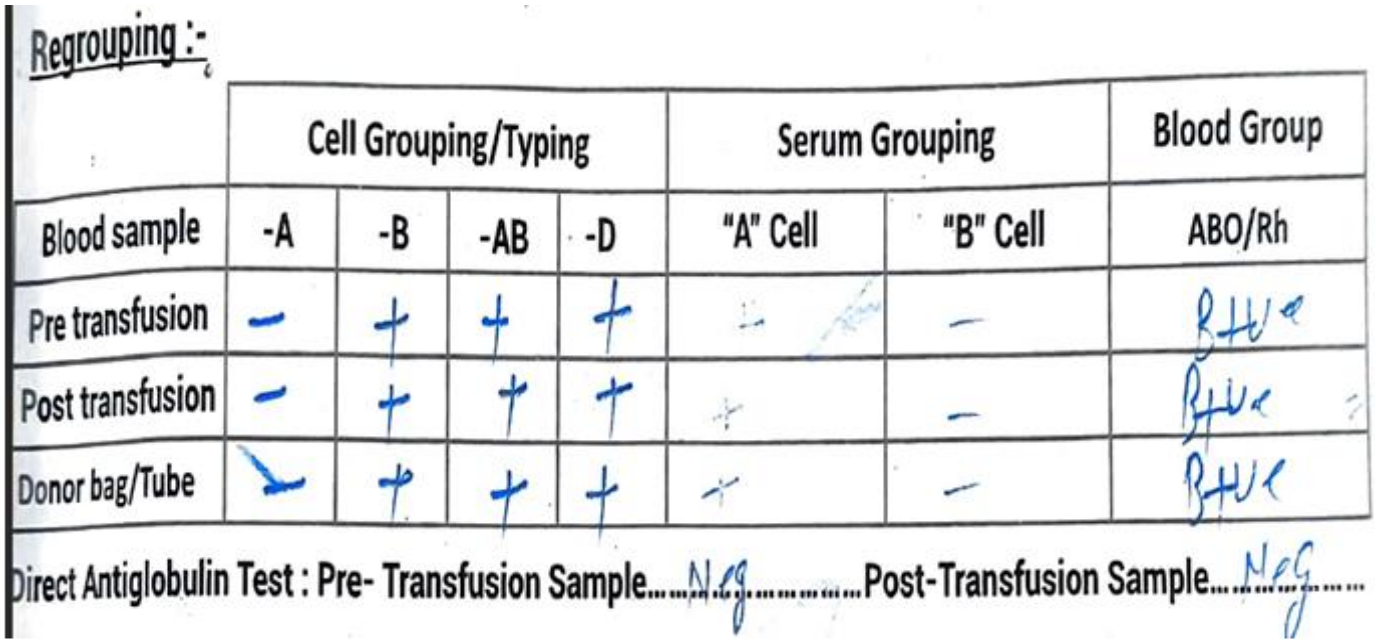
A 39-year-old male patient arrived at the medical OPD with the primary symptoms of a fever lasting three to four days, widespread weakness lasting one week, and blurred vision lasting six months. After testing and inspection, the patient was found to have hyperbilirubinemia (4.2 mg/dL), pterygium in both eyes and sickle cell anemia. He had already undergone many blood transfusions while hospitalized, had a finger amputated ten years prior, and underwent a septoplasty on his left nostril in 2019.

His laboratory results indicated a decline in haemoglobin to 6.7 gm/dL, thrombocytopenia with a value of 1.35 lakh/cum3, leucocytosis with a WBC of 12400 cells/cum, reticulocyte count was 20.1%, the sickling test was positive and contrast-enhanced CT scan of abdominal show moderate hepatosplenomegaly with subtly altered echotexture and heterogeneously hypoechoic irregular areas throughout spleen - suspicious for sickle cell anemia. even though he was vitally and clinically stable. Cross-matching and blood grouping were performed. He received a negative direct COOMBS test and antibody screen; his blood type was B positive.

He received a total of 4 units of packed RBC, but during the transfusion of the second unit, the patient suddenly developed epistaxis, abdominal pain, a febrile episode with chills, and itchy rashes as reported by the incharge and the patient himself. The transfusion was stopped at that point, and an assessment of the patient's airways, breathing, and circulatory system was started along with various other vitals. On further recording of the label and the blood component bag, no discrepancy was observed. The patient immediately started therapies including intravenous saline, injections of hydrocortisone (1 ampoule), paracetamol (100 ml), 500 mg of tranexamic acid, and chlorpheniramine (1 ampoule). All medication is given as STAT.

Standard investigations were conducted, which included a complete blood count, liver function test and renal function tests, and tests for

hemolysis. Since the fever persisted, the involved sample/unit was sent back to the laboratory for further investigations which included compatibility testing, and a repeat red cell antibody test was performed which is shown below in Figure 1. The blood bag was sent for bacterial culture. The findings of the tests are summarised in Table 1. The serological testing between the patient and the suspected donor red cells was found after repeat compatibility testing, there was no incompatibility detected. Repeated antibody screening came up empty. On the culture, there was no bacterial growth. There were a few biochemical indicators of hemolysis, but not to the extent that would be anticipated in an acute hemolytic transfusion response.



Regrouping :-

	Cell Grouping/Typing				Serum Grouping		Blood Group
Blood sample	-A	-B	-AB	-D	"A" Cell	"B" Cell	ABO/Rh
Pre transfusion	−	+	+	+		−	B+ve
Post transfusion	−	+	+	+	+	−	B+ve
Donor bag/Tube		+	+	+	+	−	B+ve

Direct Antiglobulin Test : Pre- Transfusion Sample.....N.C.....Post-Transfusion Sample.....N.C.....

Figure 1: - Cross-matching and blood grouping Test Result

Table 1. Results of blood test after reaction

Parameter	Value
Haemoglobin	6.7 gm/dL
Total leukocyte count	13140 Cells/cum³
Platelets	1.03 Lac/ Cum
Mean cell volume	70.7 fl
Reticulocytes count	20.1%
Alanine transaminase	145.0 IU/L
Aspartate transaminase	233.0 IU/L
Direct Coombs test	Negative
Sickling test	Positive
Blood group	B+
Antibody status	No red cell antibodies detected

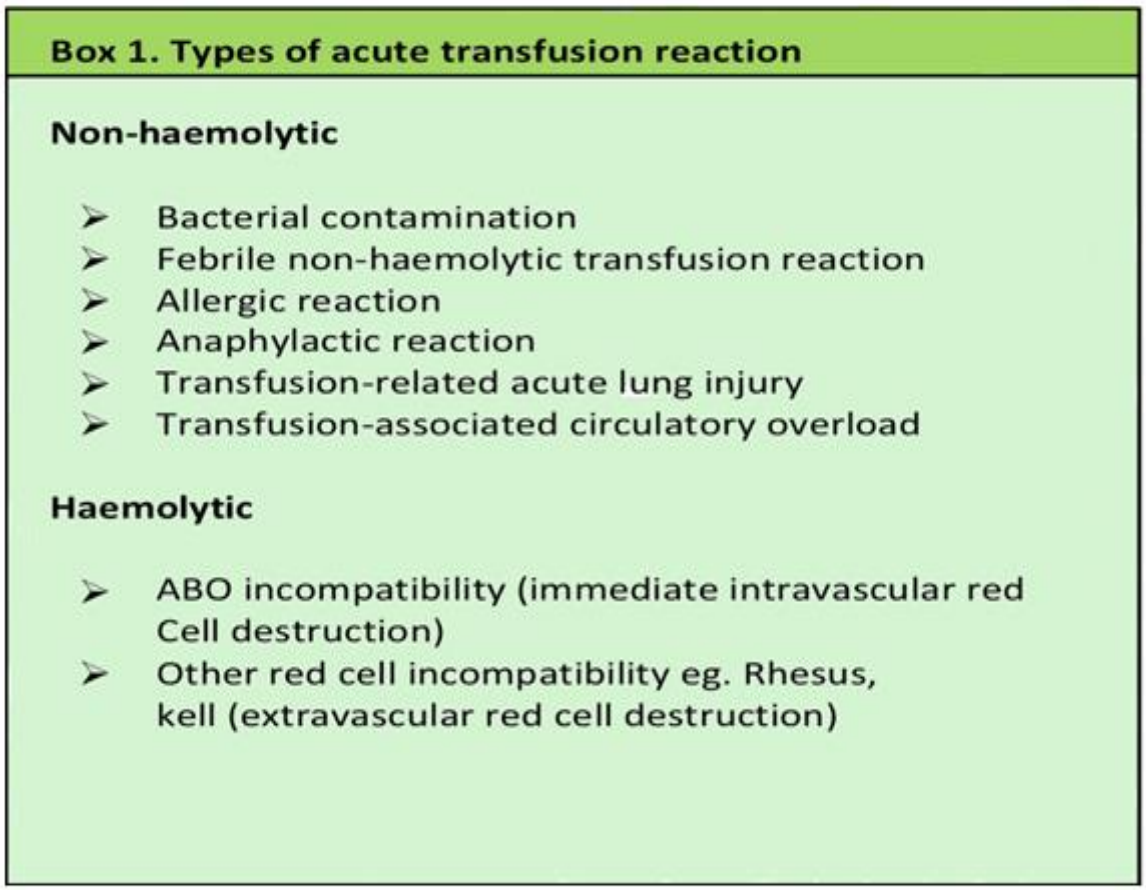
Discussion

Acute hemolytic transfusion reactions (AHTRs) take place when transfused RBC antigens attach to recipient antibodies that have already been produced, forming an antigen-antibody complex. The complement cascade is triggered by the complex formation, which results in intravascular hemolysis. ABO incompatibility is the primary cause of severe responses known as AHTRs. This happens when there is a mismatch between the plasma of the recipient and transfused RBC antigens are incompatible (e.g., group A RBCs into a recipient who has 'group O' RBCs), or, rarely, when the transfused plasma carries antibodies against the antigens of the recipient's RBC (e.g., 'group O' plasma into group A recipient).

The classic symptoms and signs of a severe acute hemolytic reaction that occurs right away or shortly after receiving incompatible blood are warmth along the vein into which the blood is being infused, intense lower back pain, nausea, dyspnoea, substernal tightness, hypotension, tachycardia, hemoglobinemia, jaundice, circulatory collapse, and hemoglobinuria. About 50% of the time, it is deadly, either from hemolytic shock, acute renal insufficiency, or intravascular coagulation-related bleeding. Sometimes the symptoms are clinically inadequately exhibited, leaving merely a fever and/or chills as the sole possible findings, or they are covered up by the symptoms of the underlying condition, making the response go unnoticed. [7]

Since then, class- or subclass-specific anti-IgA antibodies in the recipient reacting against IgA in the transfused blood, passive transfer of IgE antibodies from the donor to the recipient, pre-existing IgE or IgG antibodies in the recipient reacting with allergens or proteins in the transfused blood (e.g., drugs or chemicals (ethylene oxide), plastics, albumin, haptoglobin, and complement components), and Although the link between the cause and effect is not always clear, IgE or anti-IgA antibodies are frequently implicated in severe allergic or anaphylactic responses [8,9]. In this instance, laboratory analysis and research suggest that an allergy is responsible for this response, suggesting that IgE antibodies may be implicated. This can be explained by the IgE antibody reaction, which makes friable cells vulnerable to spontaneous lysis. [10]

Due to the passive transfusion of immunoglobulin E (IgE) antibodies from allergic donors, reactions following a blood transfusion may be allergic in nature. One of the most common adverse transfusion responses (ATR) is an allergic transfusion reaction (ATR) carried on by the transfusion of plasma. Severe allergic reactions may potentially put the patient's life in jeopardy. ATR is now mostly avoided and managed by medication prevention and symptomatic therapy; preventative techniques such as in vitro trials are still lacking. Histamine is one of the primary mediators of IgE-mediated allergic responses, and studies have indicated that mast cells and basophils are the primary effector cells of allergic reactions. Acute transfusion response was looked at concerning the patient are summarised in Box 1. [6]



Conclusion:

An AHTRS response is a severe, possibly fatal, acute systemic reaction with a variety of processes, clinical manifestations, and intensity that is spurred on by the abrupt release of mediators into the body's circulatory system by mast cells and basophils. An individual who is prone to AHTR will experience a hypersensitive reaction that is mediated by immunological systems.

The analysis of AHTR is deduced from pathological results and clinical evidence, we deduce that the AHTR reaction as a result of hypersensitivity caused by systemic mastocytosis was the most probable cause of this transfusion reaction seen in the patient. Acute care settings, cleansed blood products, pre-treatment with corticosteroids and antihistamines, and cautious management of future transfusions were chosen by the clinical team to treat the patient as a result of this diagnosis. [11]

The key benefaction of this fascinating case report is the description of acute hemolytic transfusion reaction brought on by unknown mechanisms following transfusions which is quite uncommon. It also explains why antibodies produced by transfusion-experienced individuals are primarily what trigger allergic transfusion reactions. Pretransfusion testing for serum Immunoglobulin Levels (IgE and IgG) in certain circumstances is helpful with premedication, cleaned blood products, and the use of anti-IgE therapy for a safe blood transfusion. [12] Our patient had a transfusion response 0.082 times per 1,000. The most prevalent transfusion response was an allergic reaction, followed by a febrile acute hemolytic reaction. Setting up a hemovigilance system is necessary for conducting rigorous evaluations of blood transfusion occurrences.

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