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CASE REPORT

Incompatible Blood Transfusion as a Result of a Well-Known Human Error; a Case Report

Mohammadreza Shahmohammadi[1], Firoozeh Madadi[2], Faranak Behnaz[3]*

1. Functional Neurosurgery Research Center, Shohada Tajrish Comprehensive Neurosurgical Center of Excellence, Shahid Beheshti University of Medical Sciences, Tehran, Iran.

2. Department of Anesthesiology, School of Medicine, Ayatollah Taleghani Hospital, Shahid Beheshti University of Medical Sciences, Tehran, Iran.

3. Department of Anesthesiology, School of Medicine, Shohada-e-Tajrish Hospital, Shahid Beheshti University of Medical Sciences, Tehran, Iran.

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Abstract: Blood product transfusion is a double-edged sword; it can be lifesaving in many circumstances, yet life-threatening serious complications may occur. Although transfusion-related reactions have decreased over the years as a result of hemovigilance networks all over the world, human errors still remain an important concern. In this case report, we describe a patient undergoing elective spinal surgery who received an incompatible blood product. Then we will describe measures to mitigate such errors.

Keywords: Autologous blood transfusion; Transfusion reaction; Blood group incompatibility

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1. Introduction

Transfusion of blood and blood products are known to be lifesaving in many circumstances; however, life-threatening serious reactions may happen (1). Transfusion reactions can be classified into acute (within 24 hours of transfusion) or late-occurring reactions. Acute Hemolytic Transfusion Reactions (AHTRs) resulting from ABO-incompatible transfusions are one of the most dangerous Acute Transfusion Reactions (ATRs) and remain a main cause of transfusion-related mortality (2, 3). Thus, they must be best avoided, and in case of occurrence, it is important that these reactions are precisely reported (4,5). AHTRs present with a wide spectrum of signs and symptoms (6). These reactions occur within minutes up to 24 hours after initiation of transfusion (6,7). The main cause of immunologic AHTR is the destruction of incompatible transfused RBCs, either intravascular or in the liver and spleen (8, 9). The prevalence of AHTRs has been estimated to be around 1 in 70,000 transfusions (9). Fortunately, the incidence of hemolytic reactions is decreasing through systematic strategies which have aimed to reduce human errors in the chain of transfusion (10).

Hemovigilance systems have been set up with the goal of improving patient safety in blood transfusion. Iranian National Hemovigilance System (INHS) was established in 2009, initially as a pilot plan in 50 hospitals which later became mandatory countrywide for all hospitals in 2012. According to INHS reports, from 2014 to 2018, the overall rate of transfusion reactions was 0.14%. AHTR was responsible for 5.69% of all reported reactions (6). Herein we present a human error in blood transfusion and discuss the possible measures to mitigate such errors.

2. Case presentation

The patient was a 68-year-old man scheduled for Posterior Spinal Fusion (PSF) surgery due to spinal canal stenosis. He had a history of type 2 diabetes mellitus for the last 15 years. The patient was anesthetized on the day of surgery and surgery was done at the level of L1 to S1 vertebrae. Anesthesiologist prescribed 1 unit of iso-group, iso-Rh, crossmatched packed cell during surgery due to the ongoing bleeding exceeding the maximum allowed blood loss. Bleeding was estimated to be 900 ml before being surgically controlled.

Unfortunately, the nurse anesthetist transfused an incom-

***Corresponding Author:** Faranak Behnaz; Department of Anesthesiology, Shohada-e-Tajrish Hospital, Shahrdari Street, Tajrish Square, Tehran, Iran. E-mail: faranak.behnaz@gmail.com, https://orcid.org/0000-0003-2856-3975.

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Table 1: Patient's laboratory data before surgery and during the administration

Parameter	Normal range	Before surgery	Just after transfusion	1 days after surgery	5 days after surgery
WBC ($10^3/mm^3$)	4- 11	7.9	14.9	12.3	10.6
Hemoglobulin (g/dL)	13- 16	13.8	8.4	10.5	8.6
Hematocrit (%)	34- 47	38.7	25.4	29.9	25.5
Platelet ($10^3/mm^3$)	150- 450	163	126	193	160
Creatinine (mg/dL)	0.5-1.5	1.03	0.87	1.16	0.77
LDH (U/L)	230- 480	N/A	997	873	790
Fibrinogen (mg/ dL)	150- 350	N/A	134	181	313
FDP (mcg/mL)	Up to 3	N/A	6.2	>35	N/A

Abbreviations: WBC: White Blood Cells; LDH: Lactated Dehydrogenase; N/A: Not Assigned; FDP: Fibrin Degradation Product

patible packed cell belonging to another patient in the operating room. Just after termination of the transfusion, the nurse anesthetist realized the incompatibility and informed the anesthesiologist and surgeon.

Immediately, conservative management, including hydration with 1 liter of normal saline, urine alkalization with 100 ml of sodium bicarbonate, and injection of 20 mg of Lasix was performed. Blood and urine samples were drawn and sent to the blood bank for further analysis. Temperature and hemodynamic parameters, including blood pressure, heart rate, and saturation remained within the normal limits; however, the patient's urine became hematuric. Lab analysis revealed signs of lysis, although both direct and indirect Coombs tests were negative. The patient was extubated and recovered full consciousness at the end of surgery and was admitted to the intensive care unit for close observation. The patient did not develop chills, fever, chest discomfort, dyspnea, or any other symptoms after anesthesia and during the hospital stay and was discharged with no complaints.

The laboratory data immediately after transfusion and subsequently during admission revealed increased lactate dehydrogenase (LDH) to 997 U/L, which decreased slowly during the next days (Table 1). Fibrin degradation product (FDP) and fibrinogen were also abnormally low, 6.2 microg/ml and 134 mg/dL, respectively, which normalized the day after surgery. Fortunately, renal function remained intact, and aside from initial hematuria, there were no other abnormalities in this regard. A transient rise in aspartate aminotransferase (up to 40 U/L) was observed, and there were no abnormalities in bilirubin and other liver function tests.

3. Discussion

Transfusion reactions are defined as complications resulting from blood product transfusions. These reactions can be classified according to onset (acute vs. chronic), etiology (noninfectious vs. infectious or immune vs. nonimmune), and signs (febrile vs. nonfebrile). AHTRs are acute noninfectious complications which can occur during the transfusion or within the next 24 hours. AHTRs commonly happen due to transfusion of incompatible red blood cells (7, 10-12).

Storch et al. investigated the etiology of ABO-incompatible transfusion reactions reported by the Food and Drug Agency during 2000-2019. 72.5% of the reaction errors were caused by clinical services errors, while 27.5% were errors of transfusion services (9). Verification or identification error is the one we confronted in our case, meaning that the patient's identity and blood product specifications were not compared and confirmed in the operating room before initiating the transfusion. Other common errors include administration errors and documentation errors (9, 13, 14).

When a transfusion reaction is suspected, transfusion must be stopped immediately, even if still in process. Then patient's identity must be confirmed by checking the patient's wrist label, blood components, and paper works. Samples must be collected and sent back to the blood bank along with the blood product for further evaluation. Management of AHTRs are usually supportive, including aggressive hydration to maintain urine output > 1ml/kg/h (7, 15).

The case we present was treated as mentioned above. However, prevention remains the most important aspect of transfusion reaction management. If our nurse anesthetist had followed guidelines, this reaction would have never occurred. Hemovigilance systems have been developed in many countries, namely: the USA, UK, France, and Iran. The aim of these surveillance systems is to improve patient safety in cases of transfusion (7, 16).

DeVries and colleagues suggested 6 strategies for the reduction of mortality attributable to transfusions; The selected following guidances can help mitigate AHTRs: 1. Avoidance of unnecessary transfusions, which can be achieved by adherence to transfusion guidelines, 2. augmenting patient identification process by the addition of automated information systems, and 3. preventing RBC alloantibody formation if multiple transfusions are anticipated (16).

It should also be kept in mind that blood transfusion errors cause a great legal problem for medical personnel, and the management and investigation of serious adverse reactions pose a great challenge (17).

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4. Conclusion

By taking strict measures to avoid human errors, transfusion-related complications can be easily prevented. Continuous and regular education programs with the goal of improving the knowledge and attitude of the staff involved in the blood transfusion chain may further improve the transfusion practice and ensure patient safety.

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By taking strict measures to avoid human errors, transfusion-related complications can be easily prevented. Continuous and regular education programs with the goal of improving the knowledge and attitude of the staff involved in the blood transfusion chain may further improve the transfusion practice and ensure patient safety.

6. Declarations

6.1. Acknowledgments

Authors would like to express their gratitude to all nursing staff who were involved in the patient's care.

6.2. Conflict of interest

The authors declare no conflict of interest in this study.

6.3. Funding and supports

This study was conducted without any financial support.

6.4. Authors' contributions

M.S. and F.B. as neurosurgeon and anesthesiologist of the patient developed the idea of reporting the case and collected the data. F.M. wrote the draft.

6.5. Ethical statement

The study protocol was approved by the Ethics committee of Shahid Beheshti University of Medical Sciences.

6.6. Informed consent

The patient provided written consent about reporting his data.

6.7. Using artificial intelligence chatbots statement

Artificial intelligence chatbots were not used in any part of the development of this paper.

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