Case Report

Transfusion-related acute lung injury in multiple traumatized patients

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Abstract

Background: Many of the multiple traumatized patients who refer to the hospital need transfusion. Transfusion-related acute lung injury (TRALI) is a serious clinical syndrome associated with the transfusion of plasma-containing blood components. In the article, we present a case of TRALI following transfusion of packed red blood cells

Case Presentation: A 24 year old male referred to Shahid Beheshti Hospital due to multiple trauma with left femoral and humerus fractures. Due to severe anemia he received 3 units of packed red blood cells. The symptoms of TRALI began 2 hours after transfusion. He was transferred to intensive care unit (ICU) due to metabolic acidosis and severe hypoxia. The TRALI was confirmed after ruling out the other probable pulmonary diseases. He recovered and was discharged.

Conclusion: Transfusion related acute lung injury should be considered in any case receiving transfusion of plasma containing blood components.

Keywords: Transfusion, Lung injury, TRALI, Transfusion, Multiple traumas, Hazard.

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Many of the patients admitted to the hospital due to multiple trauma need transfusion. Allogeneic blood transfusion can be viewed as a form of temporary transplantation. Transfusion introduces a multitude of foreign antigens and living cells into the recipient that will persist for a variable time (1). Transfusion-related acute lung injury (TRALI) is a serious blood transfusion complication. TRALI was first reported in the 1950's with the initial case series in 1966 and its fatality was reported to the U.S. Food and Drug Administration Center for Biological Evaluation and Research in 1992 (2-5). TRALI is defined as an acute onset of bilateral infiltrates and hypoxemia in the absence of increased left arterial pressure. It is the leading cause of transfusion-related fatalities and occurs approximately one in every 5000 transfusions with mortality of 6-9% (6-8).

Although TRALI is typically associated with plasma components such as platelets and fresh frozen plasma, some cases have been reported with packed red blood cells (PRBC) since there was some residual plasma in it (9). It seems that certain patient groups may be significantly at higher risk (10). In this study was present a case of transfusion- related acute lung injury following transfusion of packed red blood cells.

Case presentation

A 24 year-old male multiple traumatized patient with left femur and humerus fractures suffered from severe respiratory compromise several hours after packed red blood cell transfusion. The symptoms typically began 2 hours after packed red blood cell (PRBC) transfusion in the ward and fully manifested within 6 hours of the second packed red blood cell (PRBC) transfusion in the intensive care unit (ICU).

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There was not any positive finding in his past medical history, review of systems and family history. The patient's vital signs were stable accompanied with tachypnea, tachycardia and mild fever (HR: 130/min, RR: 32 beats/min, T: 38.2ºC) after first PRBC transfusion. The patient was transferred to the ICU with probable diagnosis of pulmonary emboli. In the ICU, he received second PRBC due to his anemia (Hb: 7.4 mg/dl).

His vital signs became worse and unstable and the serial arterial blood gas of our patient showed metabolic acidosis accompanied with severe hypoxia (PH: 7.26, PCO_2:28, HCO_3:14, PO_2:68, PaO_2:72-78%, Na: 145, K: 4.8, Hb: 7.2 mg/dl). He had a marked respiratory reaction, associated with bilateral pulmonary infiltrates in the chest x-ray. Radiographs were patchy in the first hours following transfusion with progression of the alveolar and interstitial infiltrates, such that there was a 'whiteout' of the entire lung (figure 1).

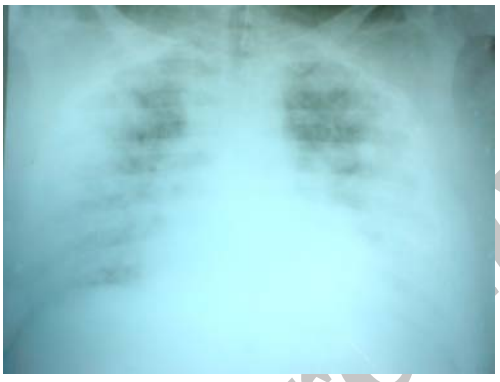

Figure 1. 6 hours after transfusion

Orotracheal intubation after a deep sedation was done. We prescribed ventilator support according to lung protection strategies (Mode: ACMV, Vt: 4-5 ml/kg, RR: 25-28 cycle/min, PEEP: 14-18 CmH_2o, I/E:1/1.2, FiO_2:100%) accompanied with muscle relaxant and propofol infusion for 72 hours. Central venous line from internal jugular vein prepared for the patient and its pressure was measured (CVP≤ 12 CmH_2O). In ECHO, there was no evidence of fluid overload or heart failure. The diagnosis of TRALI is based primarily upon clinical signs and symptoms, not laboratory findings and there is no single test for this condition (11). Although, in this patient radiological findings tend to be even more remarkable than physical findings (figure 2). We confirmed transfusion-related acute lung injury by excluding other probable diagnoses in our checklist like, pulmonary emboli, pneumonia, congestive heart failure, myocardial infarction, aspiration pneumonia and renal failure and sepsis.

After recovery from TRALI, the patient was prepared for orthopedic surgery. Transfusion could not be avoided during the operation. In spite of the recommendations, (PRBC) was transfused to the patient, and then he showed the evidence of TRALI and was admitted to the ICU again. Although our patient was discharged from the hospital without any permanent sequelae, we considered a cumulative effect in the pathogenesis of TRALI.

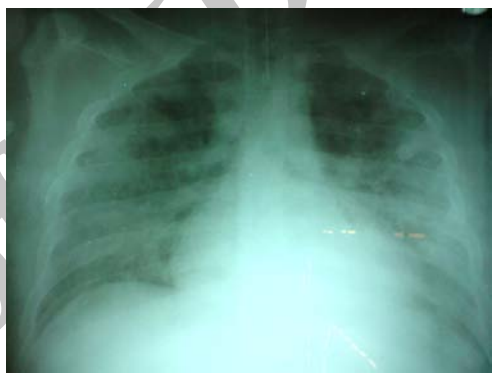

Figure 2. 48 hours after treatment

Discussion

TRALI is an adverse life-threatening event of transfusion, which has an increasing incidence, even though it is probably underdiagnosed and underreported (10, 12, 13). A sudden onset of respiratory distress within 6 hours of transfusion requires that two important noninfectious complications of blood transfusion be evaluated. These two conditions are circulatory overload from rapid or massive transfusion and an immune-mediated acute lung injury resulting from transfusion of plasma-containing products (14, 15). Although, some studies have investigated lower acceptable limits for transfusion triggers, as RBC transfusion does not consistently improve tissue oxygen consumption in critically ill patients and there are no clear evidence-based guidelines on the lower limits of acceptable hemoglobin or hematocrit levels, especially in multiple traumatized patients or perioperative period, because of potential risk of TRALI in this high risk group, lower transfusion targets are being advocated (16, 17).

Treatment in TRALI is supportive and conservative. More than 70% of patients will require mechanical

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ventilation because of the development of frothy secretions or diffuse alveolar hemorrhage, hypoxemia, and the observation of diffuse bilateral infiltrates on portable chest x-ray film. In about 80% of the affected patients; like our patient, pulmonary infiltrates appear at the time of the reaction and will be resolved within 96 hours. Diuretic is not indicated and the role of steroids is unproven (14, 18).

TRALI presentation after packed red blood cell transfusion is a rare event because it is typically associated with plasma components such as fresh frozen plasma. TRALI is indeed PMN-mediated and has similar pulmonary findings to acute lung injury and acute respiratory distress syndrome. The pathogenesis of TRALI is not completely understood. Leukocyte antibodies in donor plasma have been implicated in most cases with antibodies directed at human leukocyte antigen (HLA) class I, HLA class II or neutrophil-specific antigens, particularly HNA-3a; in addition, activation of pulmonary endothelium is important in the development of TRALI. A two-hit hypothesis has been suggested wherein the pre-existing pulmonary pathology (the first-hit) leads to the localization of neutrophils to the pulmonary microvasculature (13, 14). The second hit occurs when the aforementioned antibodies are transfused and attached and the activated neutrophils lead to the release of cytokines and vasoactive substances that induce non-cardiac pulmonary edema (14, 19).

In this case, trauma was the first hit as a precipitating factor and we consider transfusion as second hit. This challenging unusual presentation of TRALI in a multiple traumatized patient after packed red blood cell transfusion and recurrence in clinical features after transfusion during surgery accompanied with difficulty in diagnosis confirmation, intensive care management and patients' ventilation support represented valid work and there were few publications or presentations in this field.

Susceptibility to suffering from TRALI in specific patients is predictable (10, 20). Prospective studies are required to properly identify patients who are at risk for developing TRALI. In conclusion, transfusion related acute lung injury should be considered in any case receiving transfusion of plasma containing blood components

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Conflict of Interest: There was no conflict of interest.

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