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Transfusion-related Acute Lung Injury During Liver Transplant: Case Report

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Introduction

Transfusion-related acute lung injury (TRALI) is defined as noncardiogenic pulmonary edema temporally related to the transfusion of blood products. We present a patient who, while undergoing orthotopic liver transplantation, developed acute pulmonary edema within minutes of administration of fresh frozen plasma (FFP).

Intraoperative Course

A 71-year-old female presented for orthotopic liver transplantation. She was brought to the operating room and underwent uneventful induction of general anesthesia, vascular access placement, and tracheal intubation. The operative field was noted to have continued bleeding and blood products were administered to improve hemostasis. Within minutes of administration of FFP, copious amounts of pale yellow, frothy fluid filled the endotracheal tube and the patient's oxygen saturation dropped from 100% to 90%. The patient was placed on 100% FiO2 intermittent suctioning removing 1L of fluid, and IV furosemide was given. Hemodynamics and oxygenation stabilized, the operation was completed without further difficulty, including transfusion of additional blood products.

SICU Course

The patient arrived in the SICU on 100% FiO2 and 10 of PEEP. Vasopressin and norepinephrine were being administered due to persistent hypotension, likely secondary to large intravascular volume shifts during the procedure (approximately 7 liters of ascites were drained from her abdomen). Over the next 24 hours, the goal of therapy shifted from volume resuscitation to diuresis and weaning from mechanical ventilation. By the end of post-op day #1, the patient was on 40% FiO2 and spontaneously ventilating with CPAP. Prolonged enoxaparin prevented further exacerbation and the patient was able to be extubated on post-op day #2. She was successfully liberated from mechanical ventilation the next day. The remainder of her hospital course was uneventful and she was discharged to rehab three weeks later. As of this past January, on follow-up in transplant clinic, she is doing well, has a healthy appetite, and is able to participate in the day to day activities of her family life. She has had multiple types and screens done and her antibody screen remains persistently negative.

TRALI: Differential Diagnosis

The differential diagnosis of TRALI includes transfusion associated circulatory overload (TACO), left ventricular failure, exacerbation or progression of ALI from another cause, ARDS, sepsis, trauma, smoke inhalation, aspiration pneumonitis or pneumonia. The patient had no prior ALI, no active infections, and had not been subject to trauma. Intraoperative TEE demonstrated normal function of the left and right ventricles. TACO was ruled out based on the absence of hypotension, removal of 7 L of ascites, a normal TEE, no changes on EKG, and a temporal relationship with the transfusion of 2 units of FFP.

TRALI: Definition and Current Concepts

Brittingham reported the first link between symptoms of ALI, transfusion and leukoagglutinins in 1957. The term TRALI was coined by Popovsky in 1983 after describing a series of cases of ALI in association with leukoagglutinin in the blood component. Partially because of vigilance in preventing the spread of viral illness, TRALI has, according to the FDA, become the leading cause of transfusion-related death. In 2005, the National Heart, Lung, and Blood Institute convened a panel to provide a clinically useful definition which is, “new ALI occurring during or within 6 hours after a transfusion, in patients with or without risk factors for ALI other than transfusion.” TRALI is a clinical diagnosis that may be made in the absence of a positive serologic test for donor-derived antibodies.

References


Abbreviations

ABG: arterial blood gas
ALI: acute lung injury
ARDS: acute respiratory distress syndrome
CPAP: continuous positive airway pressure
CXR: chest x-ray
ETT: endotracheal tube
FiO2: inspired oxygen fraction
FFP: fresh frozen plasma
Hct: hematocrit
PRBC: packed red blood cells
PEEP: positive end expiratory pressure
TRALI: transfusion-related acute lung injury
TACO: transfusion-associated circulatory overload

TRALI: Figure 1. Intraoperative Diagnosis

At left: One of two containers of pulmonary edema suctioned from the patient’s ETT.

At right: Sequential ABG obtained intraoperatoratively and immediately postop. Induction was at 5:45 AM, transfusion of FFP occurred at 6:45 AM, FiO2 at induction was 40% with 5 of PEEP on volume cycled ventilation. The second ABG is at 06:51 at which time copious amounts of fluid were being removed from the ETT via suction. FiO2 was 100%, PEEP 10. Post-operatively, almost 12 hours later, ventilation, oxygenation, and respiratory mechanics had improved significantly. The patient was on 60% FiO2 with 5 of PEEP.

<table>
<thead>
<tr>
<th>ABG</th>
<th>Post-Induction</th>
<th>Onset of TRALI</th>
<th>Post-op</th>
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<tbody>
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<td>FiO2</td>
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<td>100%</td>
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<tr>
<td>O2 sat%</td>
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<td>98</td>
<td>100</td>
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</tbody>
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TRALI: Figure 2. Imaging

At left: Preop CXR demonstrating mild left lower lobe collapse, but otherwise clear lungs.

At right: CXR immediately post-op, showing diffuse bilateral infiltrates consistent with pulmonary edema.