Transfusion Information

[Transfusion-Related Acute Lung Injury]

Transfusion-related acute lung injury (TRALI) is a serious adverse reaction to transfusion, which is characterized by dyspnea due to acute noncardiogenic pulmonary edema within several hours after transfusion. TRALI was the leading cause of death among transfusion fatality reports from 2007 to 2011 in the United States.1 If an acute respiratory distress occurs after initiating transfusion, stop the transfusion immediately, take a chest X-ray and start respiratory support including mechanical ventilation.

The pathophysiology of TRALI was defined in the 1980s.2 The Japanese Red Cross Society has included TRALI as a serious adverse reaction in the package insert of blood and blood components for transfusion since 1998.

The differential diagnosis for TRALI includes acute respiratory distress syndrome (ARDS) due to causes other than transfusion, pneumonia, aspiration, sepsis, cardiogenic pulmonary edema, or pulmonary edema caused by excessive infusion/transfusion.

TRALI and possible TRALI

1. TRALI Criteria
   a. Acute Lung Injury (ALI)
      i. Acute onset
      ii. Hypoxemia
         \[ \text{PaO}_2/\text{FiO}_2 \leq 300, \text{SpO}_2 < 90\% \text{ (room air), or other clinical evidence of hypoxemia} \]
      iii. Bilateral infiltrates on frontal chest radiograph
      iv. No evidence of left atrial hypertension (circulatory overload)
   b. No preexisting ALI before transfusion
   c. During or within 6 hours of transfusion
   d. No temporal relationship to an alternative risk factor for ALI*

2. possible TRALI
   a. ALI
   b. No preexisting ALI before transfusion
   c. During or within 6 hours of transfusion
   d. A clear temporal relationship to an alternative risk factor for ALI*

*Risk factors for ALI

Direct lung injury
- Aspiration, pneumonia, toxic inhalation, lung contusion, and near drowning

Indirect lung injury
- Severe sepsis, shock, multiple trauma, burn injury, acute pancreatitis, cardiopulmonary bypass, and drug overdose

Observation/laboratory testing for the diagnosis of TRALI

- Chest radiography
- Chest auscultation
- Blood gas analysis (partial pressure of oxygen in arterial blood), oxygen saturation
- Central venous pressure (CVP)
- Vital signs
Etiology

The cause of TRALI is speculated as follows. First, the neutrophils are activated by the antigen-antibody reaction between anti-leukocyte antibodies (anti-HLA and anti-neutrophil) contained in the blood component and either the patient’s leukocytes or pulmonary capillary endothelial cells. Second, the activated neutrophils damage the pulmonary capillaries. It has also been revealed that bioactive substances such as bioactive lipids in the blood component, as well as patient predisposition (sepsis, liver disease, alcoholism, etc.), are also involved in the pathogenesis of TRALI.

Number of case reports in Japan

The suspected TRALI cases reported from medical institutions to Japanese Red Cross Society from 2004 to 2012 were evaluated according to the diagnostic criteria, and as a result, 309 cases of TRALI (including possible TRALI) were identified. The seventeen cases of these were considered as fatal TRALI.

Treatment

When a sudden respiratory distress occurs after initiating transfusion, stop the transfusion immediately (establish secure intravenous access) and start respiratory supportive care.

- **Respiratory supportive care**
  - Oxygen supplantmental therapy
    (Mechanical ventilation may be necessary, in some cases.)

- **Medication**
  - Corticosteroid
    (Often administered mainly to improve enhanced vascular permeability; however, there is no evidence that it is effective.)
  - Vasopressor
    (Administered in severe cases with hypotenion)

*It has also been reported that use of diuretics is not only ineffective, but also harmful because there is no hypervolemia in TRALI.*

References

1) Fatalities Reported to FDA Following Blood Collection and Transfusion Annual Summary for Fiscal Year 2011.
3) Transfusion Information 0403-82, JRCS, 2004

In cases of suspected TRALI, please notify the medical representatives of your local JRC blood center immediately. Please provide the bags of the products used, the recipient’s pre- and post-transfusion samples, information concerning laboratory testing, and chest radiographs before/after adverse reactions, etc., for the investigation/identification of the cause.

Online Haemovigilance Information for Healthcare Professionals

URL: http://www.jrc.or.jp/mr/english/

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* For more information, please contact the medical representatives of your local JRC blood center.