

## [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.<sup>1)</sup>

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.

## Transfusion-Related Acute Lung Injury (TRALI)

The pathophysiology of TRALI was defined in the 1980s.<sup>2)</sup> 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.

### [PRECAUTIONS]

#### 3. Adverse Reactions and Infections

##### 1) Serious adverse reactions and infections

##### Dyspnea and transfusion-related acute lung injury (TRALI)

Wheezing, hypoxemia, cyanosis, pulmonary edema, TRALI, etc. may occur during or after transfusion. Especially, TRALI is a respiratory distress accompanied by acute onset pulmonary edema, hypoxemia, tachycardia, hypotension, cyanosis, and dyspnea during or within 6 hours of transfusion, and may lead to death. If these symptoms occur, stop the transfusion immediately, and take appropriate care such as oxygen administration and mechanical ventilation.

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  
PaO<sub>2</sub>/FiO<sub>2</sub> ≤ 300, SpO<sub>2</sub> < 90% (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\*

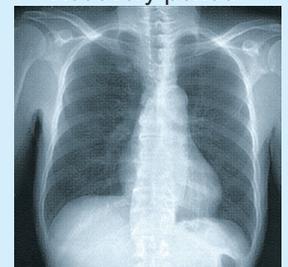
### 2. possible TRALI

- 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\*

At onset



Recovery period



Transfusion Information 0403-82<sup>3)</sup>

### \*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

Transfusion 44:1774-1789, 2004<sup>4)</sup>

## 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

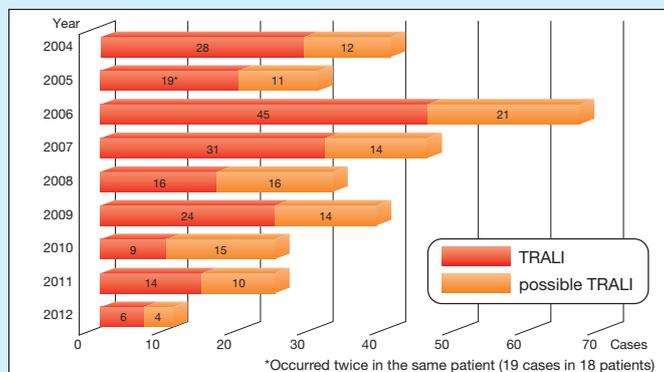
## Etiology

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.<sup>5)</sup>

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.<sup>6)7)</sup>

## 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 supplemental 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 hypotension)



\*It has also been reported that use of diuretics is not only ineffective, but also harmful because there is no hypervolemia in TRALI.<sup>8)</sup>

## References

- 1) Fatalities Reported to FDA Following Blood Collection and Transfusion Annual Summary for Fiscal Year 2011.
- 2) Popovsky MA et al. Transfusion-related acute lung injury associated with passive transfer of antileukocyte antibodies. *Am Rev Respir Dis* 128: 185-189, 1983.
- 3) Transfusion Information 0403-82, JRCS, 2004
- 4) Kleinmann S et al. Towards an understanding of transfusion-related acute lung injury: Statement of a consensus panel. *Transfusion* 44: 1774-1789, 2004.
- 5) Popovsky MA. Transfusion-Related Acute Lung Injury (TRALI). *Transfusion Reactions* 4th Ed (ed. by Popovsky MA). AABB Press, Bethesda, 2012, pp191-215.
- 6) Gajic O et al. Transfusion-related acute lung injury in the critically ill. *Am J Respir Crit Care Med* 176: 886-891, 2007.
- 7) Toy P et al. Transfusion-related acute lung injury: incidence and risk factors. *Blood* 119: 1757-67, 2012.
- 8) Levy GJ et al. Transfusion-associated noncardiogenic pulmonary edema. Report of a case and a warning regarding treatment. *Transfusion* 26: 278-281, 1986.

**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.