

# Acute Lung Injury Associated with Blood Transfusion in a Hysterectomy Patient: A Case Report

Mykyta Bielinskyi<sup>1,2\*</sup> , Marian-Andrii Halandzhii<sup>1</sup> , Yurii Dashchenko<sup>1</sup> ,  
Nataliia Chaplynska<sup>1,3</sup> 

## Abstract

This case report presents a case of transfusion-related acute lung injury (TRALI) in a 50-year-old female patient who underwent total hysterectomy due to multiple fibromyomas. The patient developed dyspnea, heart palpitations, and fatigue postoperatively, with SpO<sub>2</sub> dropping to 61%. Despite initially suspecting pulmonary embolism, the normal D-dimer level and characteristic changes observed on X-ray facilitated the diagnosis of TRALI. The patient was successfully treated with oxygen supplementation, intravenous corticosteroids, and thromboembolism prophylaxis, resulting in complete recovery. This case underscores the importance of considering TRALI in the differential diagnosis when patients exhibit respiratory distress following transfusion.

## Keywords

TRALI; Erythrocyte Mass Transfusion; Dyspnea; Total Hysterectomy

<sup>1</sup>COMFORT-HEALTH LLC, Ivano-Frankivsk, Ukraine

<sup>2</sup>Department of Internal Medicine No 2 and Nursing, Ivano-Frankivsk National Medical University, Ivano-Frankivsk, Ukraine

<sup>3</sup>Department of Therapy and Family Medicine of Postdiploma Education, Ivano-Frankivsk National Medical University, Ivano-Frankivsk, Ukraine

\*Corresponding author: mbelinskyi@ifnmu.edu.ua



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Yurii Dashchenko, Nataliia Chaplynska, 2024

## Introduction

Transfusion-related acute lung injury (TRALI) is a severe and potentially fatal complication associated with blood transfusion. It is characterized by the sudden onset of hypoxia and non-cardiogenic pulmonary edema, typically occurring within six hours of a transfusion [1]. Despite its severity, TRALI is often underdiagnosed and underreported due to its non-specific symptoms, such as dyspnea, hypotension, fever, and cyanosis. The lack of specific diagnostic tests further complicates the identification of TRALI, rendering it a significant challenge in transfusion medicine [2].

This case report **aimed** to shed light on a unique presentation of TRALI following erythrocyte mass transfusion in a patient undergoing total hysterectomy, emphasizing the significance of including TRALI in the list of differ-

ential diagnoses when patients present with respiratory distress following transfusion.

## Case Report

### Patient Information

A 50-year-old woman was admitted to the hospital for elective total hysterectomy due to multiple fibromyomas. The patient had a history of anemia with a hemoglobin level of 78 g/l, which necessitated a transfusion of 676 ml erythrocyte mass the day before surgery. She had experienced one uneventful pregnancy previously, with no history of heart or lung diseases. Her blood type was B (III), Rh-factor positive. The patient had no significant family history of hematological or immunological disorders, and there were no relevant psychosocial factors that could have contributed to her condition. Upon admission, her primary concern was the discomfort and symptoms caused by the fibromyomas. The patient had no previous history of blood transfusion, and there were no records of any adverse reactions to transfusions in the past.

### Publication history:

Received: June 12, 2023

Revisions Requested: August 11, 2023

Revision Received: January 10, 2024

Accepted: January 15, 2024

Published Online: March 23, 2024

## Clinical Findings

Post-operatively, the patient developed signs of respiratory distress. She complained of dyspnea, heart palpitations, and fatigue, which were absent before surgery. Her oxygen saturation, as measured by pulse oximetry (SpO<sub>2</sub>), was found to be significantly low at 61%, indicating severe hypoxemia. Physical examination revealed increased respiratory rate, accessory muscle use for breathing, and diminished breath sounds on auscultation. These clinical findings raised concerns regarding a significant postoperative complication.

## Timeline

- **Day 1.** The patient received a transfusion of 676 ml erythrocyte mass due to her low hemoglobin level. She tolerated the transfusion well, with no immediate adverse reactions.
- **Day 2.** The patient underwent total hysterectomy under general anesthesia with endotracheal intubation, with a total duration of 4 hours and 34 minutes. The procedure proceeded without complications. However, in the postoperative period, she developed dyspnea, heart palpitations, and fatigue. Her SpO<sub>2</sub> was measured at 61%, significantly below the normal range.
- **Day 3.** Considering the patient's symptoms following the recent transfusion, a chest X-ray was performed, revealing characteristic changes indicative of TRALI. The diagnosis of TRALI was made based on the clinical presentation and radiological findings. Treatment was promptly initiated, encompassing oxygen supplementation, intravenous corticosteroids, and thromboembolism prophylaxis with enoxaparin.
- **Day 6.** After three days of treatment, the patient showed significant improvement. Her SpO<sub>2</sub> increased to 97% without requiring supplemental oxygen. Considering her stable condition and improvement, the patient was discharged from the hospital.

## Diagnostic Assessment

The patient's post-operative symptoms of dyspnea, heart palpitations, and fatigue, along with a significant drop in SpO<sub>2</sub> to 61%, raised immediate concerns regarding a severe respiratory complication. Considering the recent surgery, pulmonary embolism was initially considered as a potential

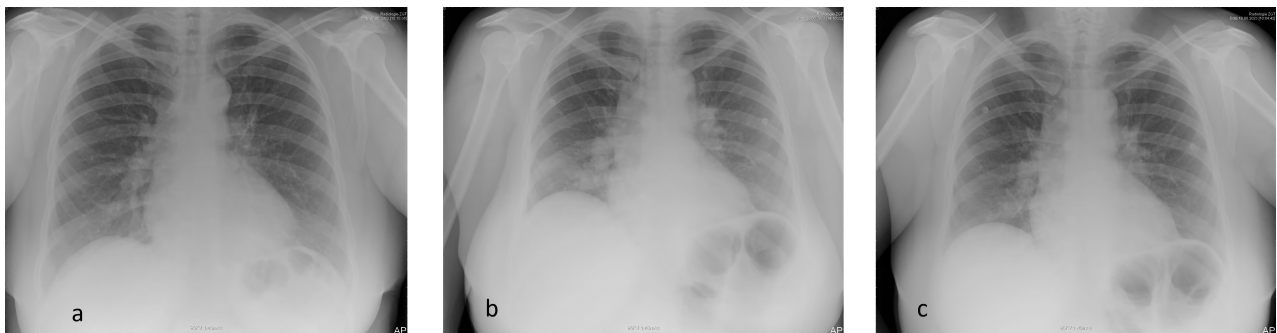
cause. Pulmonary embolism is a common and potentially life-threatening complication following surgery, particularly in patients with risk factors such as advanced age, prolonged immobilization, or a history of venous thromboembolism.

To investigate this possibility, a D-dimer test was conducted. D-dimer, a byproduct of fibrin degradation, is often elevated when there is substantial clot formation and breakdown in the body, as observed in pulmonary embolism cases. However, the patient's D-dimer levels were found to be within the normal range (0.34 mcg/ml), effectively ruling out pulmonary embolism. The patient's electrocardiogram (ECG) and echocardiographic findings were also within normal range, showing no typical indicators of pulmonary embolism such as SI-Q3 pattern on ECG or McConnell's sign on echocardiography. Due to the need for oxygen supplementation, transporting the patient for chest computed tomography (CT) was deemed unfeasible.

Considering the patient's recent transfusion and the onset of symptoms, the possibility of TRALI was considered. TRALI is the leading cause of transfusion-related mortality, characterized by acute hypoxemia and non-cardiogenic pulmonary edema occurring within six hours following transfusion. A chest X-ray was performed, revealing characteristic changes consistent with TRALI, including bilateral infiltrates and evidence of pulmonary edema (Fig. 1). The diagnosis of TRALI was made based on the clinical presentation, recent transfusion history, radiological findings, and the exclusion of alternative etiologies for the observed symptoms.

## Therapeutic Intervention

Upon confirming the diagnosis of TRALI, the patient was promptly treated with oxygen supplementation to alleviate hypoxemia. Intravenous corticosteroids were administered to reduce inflammation in the lungs. Additionally, thromboembolism prophylaxis with enoxaparin was initiated to prevent potential thromboembolic complications, considering the patient's recent surgery and immobility. This treatment approach was based on the current understanding of TRALI management, which primarily involves supportive care and addressing the underlying cause [3].



**Figure 1.** Chest X-rays: a) chest X-ray on the day of surgery (no abnormal changes); b) chest X-ray on the day after surgery (diffuse and bilateral irregular reticulonodular infiltrates); c) chest X-ray on the day of discharge (regression of the infiltrates).

## Follow-up and Outcomes

The patient responded well to the treatment regimen. After three days of receiving oxygen supplementation, corticosteroid therapy, and thromboembolism prophylaxis, her SpO<sub>2</sub> improved to 97%, obviating the necessity for continued oxygen supplementation. This marked improvement in her oxygen saturation indicated a significant resolution of pulmonary edema associated with TRALI. Throughout her treatment, the patient did not experience any adverse or unexpected events, and she reported tolerating the therapeutic interventions well. The patient adhered to the treatment regimen and follow-up appointments, demonstrating her commitment to recovery.

## Discussion

Despite its severity, TRALI is often underdiagnosed and underreported due to its non-specific symptoms, such as dyspnea, hypotension, fever, and cyanosis [4]. The absence of specific diagnostic testing adds complexity to identifying TRALI, posing a significant challenge in the realm of transfusion medicine [2, 5].

In a study by Sivakaanthan *et al.*, all instances of passively reported TRALI cases in Queensland, Australia, over a 20-year period were examined. TRALI was found to be a rare event, occurring at a rate of 48 cases per 130,000 transfused units [6].

The pathogenesis of TRALI has been described as a two-hit theory. The first “hit” involves recipient factors such as sepsis, which primes neutrophils to adhere to the pulmonary vascular endothelium. The second “hit” occurs during transfusion, activating neutrophils and causing endothelial damage. TRALI is categorized as antibody-mediated or non-antibody mediated, based on the second hit. Non-antibody TRALI may result from biological response modifiers in transfused products, while antibody-mediated TRALI involves antibodies targeting recipient antigens such as anti-human leukocyte antigen (HLA) or anti-human neutrophil antigen (HNA) antibodies [7].

This case report presents an instance of TRALI in a patient who underwent total hysterectomy and received an erythrocyte mass transfusion. The patient’s postoperative symptoms of dyspnea, heart palpitations, and fatigue, along with a significant drop in SpO<sub>2</sub> to 61%, raised immediate concerns regarding a severe respiratory complication. Considering the recent surgery, pulmonary embolism was initially suspected as a potential cause. However, the normal D-dimer levels and characteristic changes on X-ray were crucial in diagnosing TRALI.

The diagnosis of TRALI in this case underscores the significance of including this condition in the list of potential diagnoses when patients exhibit respiratory distress following transfusion. In addition, it highlights the importance of comprehensive diagnostic testing in such cases, as the symptoms of TRALI can be non-specific and resemble other conditions such as pulmonary embolism or transfusion-associated circulatory overload (TACO) [8].

The patient’s successful recovery following treatment with oxygen supplementation, corticosteroids, and thromboembolism prophylaxis underscores the effectiveness of

this treatment regimen in managing TRALI. This case adds to the growing body of evidence supporting these interventions in the treatment of TRALI [5].

However, it is important to note the limitations in diagnosing TRALI, including the lack of specific diagnostic tests and the need to exclude other causes of acute lung injury. Further research is needed to develop more specific and sensitive diagnostic tools for TRALI [9].

Recent studies have provided valuable insights into the mechanisms of TRALI, which have implications for its diagnosis and management [10]. For instance, it has been suggested that TRALI may be triggered by the interaction between donor antibodies and recipient leukocytes, leading to the activation of the recipient’s neutrophils and the release of inflammatory mediators [4]. This understanding of the pathophysiology of TRALI could potentially guide the development of more targeted therapeutic interventions.

Moreover, the management of TRALI has evolved over the years, with an increasing emphasis on preventive strategies. These include the use of male-predominant plasma and the implementation of more stringent donor screening procedures to reduce the risk of TRALI [11]. These preventive measures, along with the therapeutic interventions used in this case, represent important strategies in the management of TRALI.

Although the use of steroids in the treatment of TRALI remains controversial, several studies have highlighted their efficacy [12, 13]. In our case, we observed excellent compliance with treatment, wherein the administration of steroids played a pivotal role in the patient’s improvement due to their anti-inflammatory effects and impact on the immune system.

## Patient Perspective

From the patient’s perspective, the sudden onset of respiratory distress following surgery was a distressing experience. However, she reported feeling significantly better following the treatment, with a noticeable improvement in her breathing and overall well-being. The patient expressed gratitude for the prompt and effective care she received, which significantly alleviated her symptoms and improved her quality of life. She expressed relief at having recovered from the distressing post-operative symptoms and was eager to resume her normal life.

## Conclusions

This case report highlights the importance of considering TRALI in the differential diagnosis of patients presenting with respiratory distress following transfusion. It underscores the need for comprehensive diagnostic testing and the effectiveness of supportive care in managing TRALI.

## Ethical Statement & Informed Consent

The study was conducted according to the WMA Declaration of Helsinki - Ethical Principles for Medical Research Involving Human Subjects. The patient gave informed consent.

### Data Availability

Primary data are available upon reasonable request to any applicant.

### Conflict of Interest

The authors declare that they have no conflicts of interest.

### Financial Disclosure

This research did not receive any specific grant from funding agencies in the public, commercial, or non-for-profit sectors.

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