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Case Presentation

Transfusion-Related Acute Lung Injury Following Lumbar Degenerated Kyphoscoliosis Surgery: A Case Report

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Abstract

Introduction: Transfusion-Related Acute Lung Injury (TRALI) is a syndrome characterized by acute respiratory distress following transfusion. Mortality rates of 5-25% have been reported. Although spine surgery is a risk factor for TRALI, few reports have described TRALI after degenerative kyphoscoliosis surgery. We describe an important case of TRALI following degenerative kyphoscoliosis surgery.

Case Presentation: A 48-year-old Japanese female with degenerative kyphoscoliosis underwent surgical treatment. Extreme lateral interbody fusion from a left-sided retroperitoneal approach and posterior instrumentation was performed. Although 800 g of autologous blood was prepared preoperatively and Cell Saver was used for intraoperative blood salvage, a total of two units of leuko reduced red cell concentrate and two units of fresh frozen plasma were infused. Five hours after transfusion, the patient reported pulmonary distress, and peripheral capillary oxygen saturation was under 60%. Steroid and diuretics were ineffective, and the patient required mechanical ventilation. Mechanical support was continued for 4 days, with gradual recovery to baseline pulmonary function.

Conclusion: A case of TRALI following kyphoscoliosis surgery was successfully treated with mechanical ventilation. We strongly recommend sufficient preoperative preparation of autologous blood, and using Cell Saver for intraoperative blood salvage to minimize autologous transfusion when planning lumbar degenerated kyphoscoliosis surgery.

Keywords: Transfusion-related acute lung injury; Transfusion-associated circulatory overload; Transfusion; Lumbar degenerated kyphoscoliosis; Spinal surgery

Abbreviations

TRALI: Transfusion-Related Acute Lung Injury; RBC: Red Blood Cells; FFP: Fresh Frozen Plasma; WBC: White Blood Cell Count; ESR: Westergren Erythrocyte Sedimentation Rate; CRP: C-Reactive Protein; MRI: Magnetic Resonance Imaging; CT: Computed Tomography; TACO: Transfusion-Associated Circulatory Overload; SSI: Surgical Site Infection; XLIF: Extreme Lateral Interbody Fusion

Introduction

Transfusion-Related Acute Lung Injury (TRALI) is a syndrome characterized by acute respiratory distress following transfusion. Mortality rates of 5-25% have been reported [1-4]. Although spine surgery is a risk factor for TRALI [5,6], few reports have described TRALI after degenerative kyphoscoliosis surgery. We describe a very important case of TRALI following degenerative lumbar kyphoscoliosis surgery.

Case Presentation

A 48-year-old Japanese female with degenerative kyphoscoliosis (Figure 1) underwent anterior spinal fusion from L2 to L5, and posterior spinal fusion from T9 to the pelvis. Preoperatively, 800 g of autologous blood was prepared, and Cell Saver was used for intraoperative blood salvage. Extreme lateral interbody fusion (XLIF; NuVasive Inc., SanDiego, CA, USA) of L2-3, 3-4, and 4-5 from a left-sided retroperitoneal approach and posterior instrumentation from T9 to the pelvis with L5-S lumbar interbody fusion was achieved. The operation lasted 6 h and estimated blood loss during surgery was 1800 g. The patient had no past history of note. Prophylactic antibiotics were given preoperatively, and every 3 h thereafter. Postoperatively, hemoglobin was 6.6 g/dl and hematocrit was 20.1%, and a total of two units of leuko reduced Red Blood Cells (RBC) and two units of Fresh Frozen Plasma (FFP) were infused 1 h after the end of surgery in the intensive care unit. Five hours after transfusion, the patient complained of pulmonary distress, and she became acutely tachycardic (heart rate, 120 beats/min), hypoxic (peripheral capillary oxygen saturation on 3 L oxygen by nasal cannula, 60%) and hypotensive (systolic blood pressure, approx. 70 mmHg). Chest radiography revealed extensive bilateral areas of consolidation in the middle and upper lobes of the lung and bilateral pleural effusions (Figure 2). Because steroids and diuretics did not improve respiratory distress and chest radiography 12 h after surgery revealed extensive

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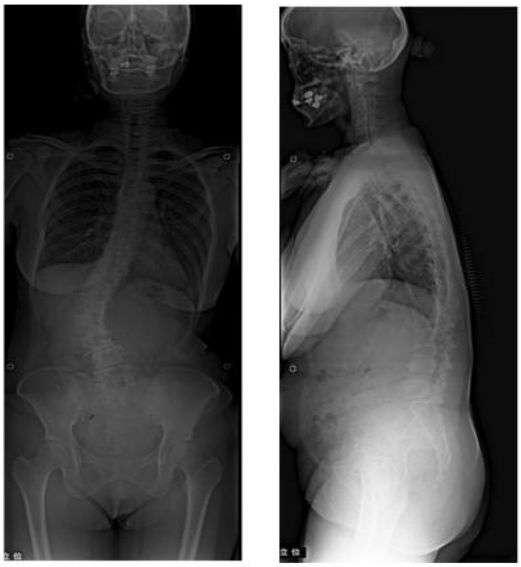

Fig. 1a Fig. 1b

Figure 1: Preoperative anterior-posterior (a) and lateral (b) radiographs show lumbar degenerative kyphoscoliosis.

Figure 2: Anterior-posterior radiograph at 6 h postoperatively shows extensive bilateral areas of consolidation in the middle and upper lobes of the lung.

bilateral areas of consolidation in the whole lobes (Figure 3), she required mechanical ventilation. Antibiotics and sivelestat sodium hydrate were applied and the patient recovered gradually. Mechanical support was continued for 4 days. The patient subsequently recovered baseline pulmonary function and was discharged in an ambulatory state.

Discussion

TRALI is defined as the new onset of acute lung injury occurring within 6 h of blood product transfusion, as indicated by the presence of hypoxemia and bilateral infiltrates on frontal chest radiography, in the absence of circulatory overload [5-7]. TRALI is the number one cause of transfusion-related fatalities reported to the Food and Drug

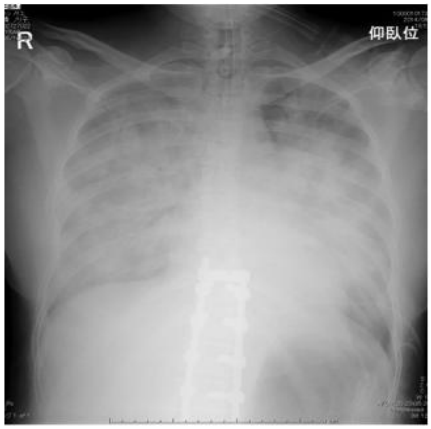

Figure 3: Anterior-posterior radiograph at 12 h postoperatively shows increased consolidation.

Administration [8]. Mortality rates of 5-25% have been reported [1-4]. The estimated incidence of TRALI is 1:5000 transfusions [1,2]. Sanchez reported the risk for TRALI increased with each unit of whole blood transfused [9].

Differential diagnoses of acute lung injury after transfusion include Transfusion-Associated Circulatory Overload (TACO), cardiogenic edema, allergic and anaphylactic transfusion reactions, and sepsis due to transfusion of bacterially contaminated blood products [10]. TRALI may be distinguished from TACO and cardiogenic pulmonary edema by the clinical response to diuretics. Although sepsis should be considered when clinical features such as hypotension and fever are noted in a patient after surgery [10], it is very difficult to distinguish from TRALI, because some patients after spine surgery have such symptoms. Anti-bacterial agents should be considered until sufficient recovery of condition is obtained.

Radiographic findings demonstrate bilateral pulmonary infiltrates. Because such findings closely resemble those of fluid overload and/or cardiac failure, differentiation should be based on clinical findings.

Treatment for TRALI depends on the condition of the patient. If the condition is mild, supplemental oxygen alone will be sufficient. However, if the condition of the patient is serious, aggressive respiratory support, supplemental oxygen and mechanical ventilation will be needed [3]. As in our case, corticosteroids and diuretics are not effective [4]. Even with aggressive treatment, the mortality rate from TRALI is 5-25% [4].

Recipient risk factors were chronic alcohol abuse, shock, higher peak airway pressure while being mechanically ventilated, current smoking, positive fluid balance, and spine surgery [5,6]. Transfusion risk factors were receipt of plasma or whole blood from female donors [5,6]. Dunbar described the association between transfusion of maternal blood products and TRALI in pediatric patients undergoing anterior and/or posterior spinal surgery [11]. Patients undergoing spinal surgery frequently demonstrate evidence of acute lung injury [12] and may be at increased risk of TRALI [9]. Spine surgery for degenerative kyphoscoliosis often needs blood transfusions to compensate for marked blood loss. Blood auto transfusion offers numerous advantages over allogenic blood transfusion. Autologous

Fig. 4a Fig. 4b

Figure 4: Anterior-posterior (a) and lateral (b) radiographs at 2 months postoperatively show T9-pelvis pedicle screw instrumentation.

blood donations can reduce the need for homologous transfusions, and strengthen immune ability [13]. We strongly recommend preoperative preparation of autologous blood, and the use of Cell Saver for intraoperative blood salvage.

Many exposures have been applied for degenerative kyphoscoliosis. Posterior correction and instrumentation is the most common. However, for good correction, posterior lumbar interbody fusion or corpectomy are necessary. Interbody fusion or corpectomy can lead to unexpected blood loss. We achieved XLIF and posterior instrumentation. XLIF has several advantages including smaller incisions, decreased operative time and blood loss [14]. Although our patient subsequently needed autologous transfusion, this exposure was expected to reduce blood loss [15]. More technical efforts are needed to reduce intraoperative blood loss.

When the patient complained of pulmonary distress within 6 hours of transfusion, aggressive respiratory support with supplemental oxygen and mechanical ventilation should be considered.

Conclusion

A case of TRALI following kyphoscoliosis surgery was successfully treated with mechanical ventilation. We strongly recommend preoperative preparation of autologous blood, and the use of Cell Saver for intraoperative blood salvage to minimize autologous transfusion.

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