

A Child with Rapid-onset Respiratory Distress after Chemotherapy, Lung Irradiation, General Anaesthesia, and Blood Transfusion

A 5-year 11-month-old male with recurrent nephroblastoma was admitted for insertion of a totally implanted central venous device under general anaesthesia. The malignancy involved both kidneys when he was 12 months old and complete remission was attained after chemotherapy and surgery. Seven months ago, he was diagnosed to have intra-abdominal relapse with bilateral, multiple lung metastases. Five months into treatment with chemotherapy (etoposide and ifosfamide), abdominal and lung irradiation (total dose to the lungs, 12 Gy), he achieved a second complete remission. A central venous device was deemed necessary because of difficulty in venous access. Because of anaemia (haemoglobin, 7.8 g/dL) and thrombocytopenia (platelet, $19 \times 10^9/L$), group-matched leuko-reduced apheresis platelet was transfused just prior to the commencement of the procedure. Right after the surgery, the transfusion of a matched unit of red cell was commenced. In total, 600 mL (30 mL/kg) of blood products were transfused over a period of 5 hours. At 2-hours postoperatively, the child was noticed to have mild tachypnoea (35 breaths/minute). The physical examination did not reveal any signs of consolidations in the lungs or fluid overload, and no hypoxaemia on transcutaneous oximetry. However, the condition deteriorated within the next hour with increasing respiratory distress and failure to maintain oxygen saturations above 93% without oxygen supplement. He was then admitted into intensive care and required nasal continuous positive airway pressure for respiratory support. A chest radiograph was obtained and the fluoroscopic film during the central venous access device insertion was retrieved for comparison (Fig. 1).

What was the most likely diagnosis?

- A. Transfusion-related acute lung injury
- B. Volume overload
- C. Acute atelectasis
- D. Radiation-induced pneumonitis
- E. Pneumocystis jiroveci pneumonia

Discussion

Transfusion-related acute lung injury (TRALI) is an uncommon but perhaps under-recognised complication

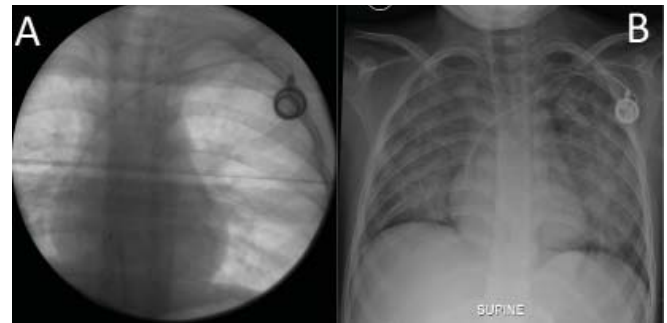


Fig. 1. Slides showing the investigative outcomes of the patient. At A, fluoroscopic image during the insertion of the implanted central venous device showing normal lung markings. At B, chest roetgenograph at 3-hours postoperatively showing bilateral lung infiltrates and a normal sized cardiac silhouette.

after blood transfusion. However, it is the leading cause of fatal complications after transfusion therapy. The exact pathogenetic mechanisms are still unclear but the non-cardiogenic pulmonary oedema is believed to be the result of cytokines released from activated neutrophils trapped in the pulmonary micro-circulation. In the majority of cases, antibodies against the human leukocyte antigens or the neutrophils present in the donor plasma are responsible for the neutrophil activation.^{1,2}

Treatment of TRALI is largely supportive and some patients may require mechanical ventilation. The case mortality rates have been reported to be 5% to 10%.² The child described in the report had a complete recovery with a normal chest radiograph 72 hours later. Pre-emptive treatment with broad spectrum antibiotic was discontinued after 24 hours when a normal procalcitonin level was found. The occurrence of TRALI may be prevented by exclusion of donors harbouring human leukocyte antibodies from blood products of high plasma content. Hence, the recognition and reporting of incidents of TRALI is an important issue in national haemovigilance.¹

The diagnosis of TRALI remains clinical, with onset of acute respiratory distress within 6 hours of transfusion being the hallmark of the condition. Although TRALI can occur in otherwise healthy individuals, patients who are septic, requiring intensive care, or undergoing treatment

Answer: A

for malignancies are at higher risk of developing TRALI. The medical literature concerning TRALI in children is scarce. In 2014, the Canadian Blood Service reported a series of 17 cases of paediatric TRALI over a period of 11 years,³ which is by far the largest series of paediatric cases of TRALI. A bimodal distribution is noted with 5 neonates and 11 adolescents above the age of 14 years. The mortality rate is 5.9%. Under-recognition of the occurrence of TRALI in children is likely the reason for the unusual age distribution among the cases.

The present case illustrates how a diagnosis of TRALI can be potentially distracted in a child with pre-existing medical and surgical problems. Malignant disease in the lungs, toxicities of lung irradiation, cardiac toxicities from chemotherapy, opportunistic infections, surgical and anaesthetic complications need to be considered in the paediatric oncology patient who presents with acute respiratory distress. However, a normal radiograph immediately prior to the incident, the characteristic clinical and radiologic course, and the rapid resolution on supportive care make TRALI the most probable diagnosis in this case.

REFERENCES

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