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LETTER

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The limitations of extracorporeal membrane oxygenation as a bridge to allogeneic hematopoietic stem cell transplantation

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Allogeneic hematopoietic stem cell transplantation (HSCT) has successfully rescued patients with hematological malignancies and bone marrow failure. Whenever complicated by severe infection and respiratory failure before HSCT or engraftment, extracorporeal membrane oxygenation (ECMO) as the bridge is attractive, so that subsequent neutrophil engraftment will control bacterial infection [1]. Here, we report a 27-year-old male patient who received ECMO immediately after allogeneic HSCT, and suffered from recurrent bacterial infections in spite of neutrophil engraftment. The patient had the diagnosis of acute myeloid leukemia, and received allogeneic HSCT from a matched unrelated donor. The conditioning regimen was myeloablative and consisted of busfulan and cyclophosphamide. Unfortunately, febrile neutropenia with sepsis developed 3 days before HSCT, and his condition deteriorated subsequently with shock, respiratory, and renal failure on the day before HSCT. In addition to vasopressors, endotracheal intubation with ventilator support was established. With the stabilization of his status and complete restoration of consciousness, he received peripheral blood HSCs after a comprehensive discussion with the family members. However, one episode of pulseless ventricular tachycardia developed during the completion of HSC transfusion, but he was successfully rescued. Following discussion about the risks and benefits, venoarterial ECMO was initiated for both cardiac and respiratory support 4 h after the completion of HSC transfusion, as shown in Fig. 1. In addition, hemofiltration was initiated at the same time to compensate for his poor renal function. The activated clotting times were maintained between 160 and 180 s, and blood transfusions were frequently administered to maintain the hematocrit over 30 % and platelet counts over 10,000/μl for ensuring adequate oxygen transport and preventing hemorrhagic complication, respectively. Granulocyte colony stimulating factor was administered to promote neutrophil engraftment and several antibiotics were administered to control bacteremia due to *Escherichia coli* and candidemia. Hypoxemia was gradually corrected and the left ventricular function was improved, as revealed by the cardiac echograms obtained during follow-up. An absolute neutrophil count of 868/μl was noted on day 8 after transplantation and a complete donor chimera for DNA of bone marrow cells. ECMO was discontinued on day 10 (Fig. 1). However, several episodes of bacteremia due to multi-drug-resistant *Klebsiella pneumoniae* were noted thereafter, with subsequent septic shock (Fig. 1). Furthermore, the patient did not regain consciousness after the discontinuation of sedation, and his brain CT scan revealed hypoxic encephalopathy and intracerebral hemorrhage over the right frontal and left basal ganglion. The condition of the patient deteriorated severely and he died on the 26th day after transplantation.

According to the observations of ours and several pediatric patients with ECMO given before HSCT [1] or engraftment [2, 3], the procedure of ECMO did not impair stem cell engraftment. However, our patient and the one reported by Di Nardo et al. [1] both died from

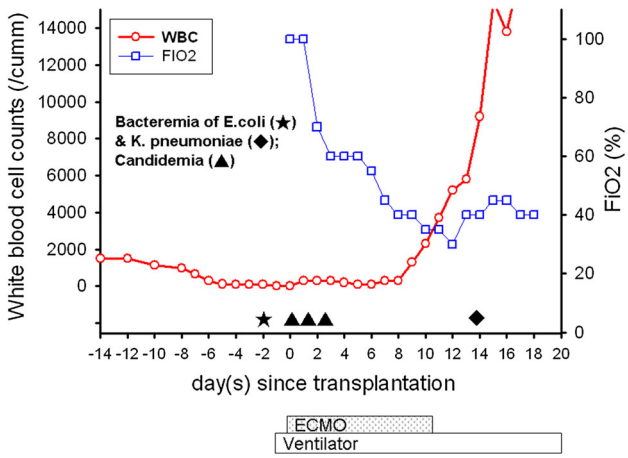

Fig. 1 Serial changes of white blood cell (WBC) counts and fraction of inspired oxygen (FiO_2) supplied by ventilator through the application of HSCT and ECMO support. The patient was intubated 1 day before transplantation and received ECMO support 4 h after allogeneic HSCT. With gradual neutrophil recovery, ECMO was discontinued on day 10 after HSCT. Several episodes of bacteremia and candidemia developed through the whole course. The patient finally died of multiorgan failure on day 26 after HSCT

infections. Similarly, for pediatric patients receiving ECMO after engraftment, the majority died from pre-existing infection [4, 5]. We highlight the high risk of severe infection with ECMO as a bridge to HSCT or engraftment in adults.

Conflicts of interest None.

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