Veno-venous extracorporeal membrane oxygenation for patient with a history of open cholecystectomy and acute respiratory distress syndrome caused by coinfection of avian influenza A (H7N9) and Epstein-Barr virus

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To the Editor: Most patients infected with avian influenza A (H7N9) rapidly develop progressive pneumonia and acute respiratory distress syndrome (ARDS), a heterogeneous disorder that is refractory to conventional mechanical ventilation. Most H7N9 patients also have underlying disease such as chronic obstructive pulmonary disease, hypertension, diabetes mellitus, and heart diseases, and are more susceptible to coinfections.[1] For these patients with such serious complications, extracorporeal membrane oxygenation (ECMO) support can be adopted as a feasible life-saving therapy.[2] Here, we present our successful experience with ECMO utilized in a patient with ARDS and also with H7N9 and Epstein-Barr virus (EBV) infection.

A 59-year-old Chinese female farmer, with a history of hypertension, was transferred to the intensive care unit of Sun Yat-Sen University Affiliated Zhongshan Hospital on February 11, 2018. The patient was reported with a history of poultry exposure recently and received a cholecystectomy 20 years ago by her family members. On admission, veno-venous ECMO (VV-ECMO) was initiated (18F cannula was inserted into right jugular vein and left femoral vein, respectively) and throat swab and bronchoalveolar lavage fluid (BALF) were collected. Although the rapid diagnostic test for throat swab showed negative for Flu A and Flu B, H7N9 and Epstein-Barr viral RNA was detected by Real-time polymerase chain reaction (RT-PCR) in the BALF (1.84×10^6 copies/mL for H7N9 and 3.92×10^5 copies/mL for EBV).

After being admitted to the intensive care unit, the patient was given comprehensive treatments, including intravenous antibiotics, high-dose of oseltamivir (150 mg twice a day for 18 days intravenously) and peramivir (300 mg/d for 18 days intravenously), continuous veno-venous hemofiltration, immunoglobulin (10 g/d), blood transfusion, gastric protection, and noninvasive ventilatory and VV-ECMO support [Table 1]. BALF samples were routinely collected and tested for the common respiratory viruses by RT-PCR. The H7N9 and Epstein-Barr viral RNA were detected until February 19. After 13 days of extracorporeal life support, our patient successfully weaned from VV-ECMO. The pulmonary computed tomography showed inflammation relief on March 10 and the mechanical ventilation was removed on March 18. She was transferred to the general ward on April 8 and discharged from the hospital on May 22.

There are more and more evidence supporting ECMO as life-saving treatment for adults with respiratory failure.[3] However, ECMO is a costly intervention that may carry the risk of serious side effects such as major bleeding and infection. As heparin must be applied during the ECMO support, the D-Dimer, prothrombin time, activated partial thromboplastin time, and platelet were monitored in our patient. Infection is another side effect of ECMO support. Four days after hospitalization, multidrug-resistant *Acinetobacter baumannii*, a potentially deadly and common nosocomial pathogen, was detected in the BAL fluid, sputum, and bloodstream of this patient. Fortunately, we

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Table 1: Parameters of ventilator and ECMO and some laboratory results.

Variables	Feb 11 (1st day)	Feb 14 (4th day)	Feb 17 (7th day)	Feb 21 (11th day)	Feb 22 (12th day)
Vital signs					
T (°C)	36.0	38.1	36.0	37.2	36.5
HR (beats/min)	64	60	57	93	90
BP (mmHg)	120/63	110/62	123/67	105/49	128/60
MV mode	PCV-SIMV	PCV-SIMV	PCV-SIMV	SIMV	CPAP
PEEP (cmH_2O)	10	12	10	10	10
FiO_2 (%)	70	90	80	80	70
SpO_2 (%)	96	99	100	100	100
pH	7.46	7.48	7.48	–	7.42
PaO_2 (mmHg)	78	123	122	–	111
$PaCO_2$ (mmHg)	30.3	33.7	30.7	–	37.1
Pump speed (r/min)	3030	3150	2800	2500	2300
Blood flow (L/min)	3.5	3.0	3.0	3.0	2.4
Oxygen flux (L/min)	3.0	3.5	2.8	2.6	3.0
PCT (ng/mL)	0.29	0.20	0.36	0.85	0.81
CRP (mg/L)	203.4	82.7	–	213.8	283.0
PLT ($\times 10^9$/L)	–	90	150	67	95
APTT (s)	125.7	35.3	37.5	46.8	44.1

"–": Not available on this day; APTT: Activated partial thromboplastin time; BP: Blood pressure; CPAP: Continuous positive airway pressure; CRP: C-reactive protein; ECMO: Extracorporeal membrane oxygenation; FiO_2: Fraction of inspired oxygen; HR: Heart rate; MV: Mechanical ventilation; Normal pH value: 7.35–7.45; $PaCO_2$: Partial pressure of carbon dioxide in arterial blood; PaO_2: Partial pressure of oxygen in arterial blood; PCT: Procalcitonin; PCV: Pressure control ventilation; PEEP: Positive End Expiratory Pressure; PLT: Platelet; SIMV: Synchronized intermittent mandatory ventilation; SpO_2: Oxygen Saturation (normal value > 95%); T: Body temperature. 1 cmH_2O = 0.098 kPa; 1 mmHg=0.133 kPa.

discovered and prevented the progress of infection in time. It is recommended that a multidisciplinary team, involving critical care and infectious diseases experts, is very critical to define whether ECMO is an adequate therapy for the patients with ARDS.[4]

In short, our successful treatment of patients with severe H7N9 infection should be credited to the early application of ECMO support and important ventilation adjustment as well as other comprehensive treatments according to the patient's condition. Retrospective analysis of comprehensive treatment of our patient provided a reliable reference to the treatment of ARDS caused by H7N9 and EBV.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient has given her consent for her images and other clinical information to be reported in the article. The patient understands that her name and initial will not be published and due efforts will be made to conceal the identity of the patient, although anonymity cannot be guaranteed.

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Conflicts of interest

None.

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