
Inter-hospital transport of severe acute respiratory distress syndrome on extracorporeal membrane oxygenation: Extracorporeal membrane oxygenation retrieval

Sir,

Acute respiratory distress syndrome (ARDS) is a common and devastating complication after H_1N_1 infection.^[1] Despite advanced mechanical ventilation support, some patients develop refractory hypoxemia and/or hypercarbia leading to morbidity and mortality. Prone ventilation may improve oxygenation and outcomes.^[2] Nevertheless, some patients remain hypoxemic despite prone ventilation or may have contraindications to it. These patients can possibly benefit from rescue therapies such as extracorporeal membrane oxygenation (ECMO). However, it is available only at few centers in Delhi. Most of these patients are unfit for inter-hospital transport on conventional treatment to an ECMO center, thus limits the access to this rescue therapy. ECMO retrieval allows safe mobilization of these patients to ECMO center and improves chances of survival. We report a case of ECMO retrieval in Delhi, India, of a patient with severe ARDS to a Tertiary Care Centre.

A 62-year-old male was admitted to Medical Intensive Care Unit (ICU) of another hospital with bilateral pneumonia and acute hypoxemic respiratory failure.

He is a known case of type two diabetes mellitus, on oral hypoglycemic agents. He was well until 10 days before the admission, when he developed dry cough and breathlessness. His symptoms worsened a day prior to ICU admission.

On admission to medical ICU, he was in severe respiratory distress. He was breathing at the rate of 35/min and required 10 l/min of oxygen to keep his SpO_2 around 90%. His pulse rate was 110/min, with blood pressure of 130/70 mmHg. He was febrile up to 38.5°C. He had bilateral crepts in chest and rest of the systemic examination was unremarkable. His chest X-ray (CXR) revealed bilateral nonhomogenous infiltrates. Pneumonia screening including H_1N_1 influenza was sent, and he was empirically started on piperacillin + tazobactam, clarithromycin, and oseltamivir. He was also started IV methylprednisolone 80 mg/day.

His hypoxemia worsened over the next day; initially, he was put on noninvasive ventilation, but after few hours,

he required intubation and mechanical ventilation. After this, he was initiated on fentanyl and midazolam infusion along with atracurium infusion. His SpO_2 remained around 85% despite FiO_2 of 1 and positive end-expiratory pressure (PEEP) up to 14 cm H_2O . In view of refractory hypoxemia, he was put on prone position ventilation, which initially improved SpO_2 to 92%, but over the next few hours, his SpO_2 again dropped to 82%. His arterial blood gas done on the above ventilator settings had PaO_2/FiO_2 ratio 60, pH of 7.29, and $PaCO_2$ of 50 mmHg. ECMO was offered as a possible therapeutic option, and a reference was sent to our team for possible transfer to ECMO center.

ECMO team reached the reference hospital within 2 h of generating the call. After clinical assessment, it was decided to proceed with ECMO retrieval. Bedside venovenous, ECMO was installed with 28 F access cannulae in the right femoral vein and 21 F return cannulae in the right internal jugular vein via percutaneous approach [Figure 1]. The procedure was completed satisfactorily without any complications. Once on ECMO support, his SpO_2 improved to 98%. He was transported in ambulance via road on ECMO support and mechanical ventilation to our hospital.

The patient was admitted in ECMO ICU at our hospital, and his ventilator support was changed to rest lung ventilation. Laboratory investigations were unremarkable except bronchoalveolar lavage and nasopharyngeal swab for H_1N_1 influenza came positive. He received oseltamivir for a total of 10 days. His lung compliance started improving in the 2nd week of ECMO support with CXR clearing [Figure 2]. On day 16 at our center, his ECMO support weaned off successfully. He was discharged from our hospital on day 43.

Patients with severe ARDS having refractory hypoxemia despite high PEEP and FiO_2 on mechanical ventilation are at a high risk of dying. The risk of death in these patients may range from 50% to 80% depending on the PaO_2/FiO_2 ratio and/or Murray score.^[3]

Limited interventions have demonstrated mortality benefit in severe ARDS. First, lung protective ventilation using

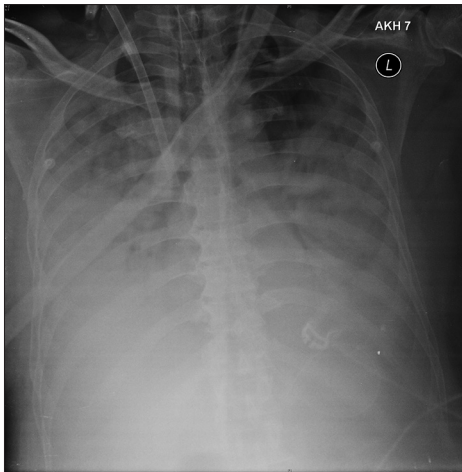


Figure 1: Chest X-ray at the time of extracorporeal membrane oxygenation insertion

low tidal volumes.^[4] Second, prone ventilation, which is known to improve oxygenation for years, has recently demonstrated outcome benefits.^[2] Last but not the least, ECMO is evolving as another promising therapy. Studies have demonstrated survival benefits without disability at 6 months on comparison to conventional management.^[5,6] Rest lung ventilation by keeping Pplat <25 mmHg and low FiO₂ along with the systemic support of ECMO reduces the possibility of ventilator-associated lung injury and possibly help in lung recovery.

Patients of severe ARDS with potential reversible respiratory failure when transported to ECMO center provide them a better chance to survive.^[7,8] Ideally, they should be transported to ECMO center before they become critically unstable. However, some of these patients rapidly develop severe hypoxemia, which may increase the risk of morbidity and mortality during transport.^[9] Development of ECMO retrieval teams may help in safe transport to tertiary center and salvaging these patients.^[10] Most countries have well established ECMO retrieval services, which may lead by an intensivist, anesthetist, or surgeon along with ICU nurse and perfusionist. Intensivist lead models are more rapid and cost effective.^[11]

Our ECMO services were established in late 2013. Since then, we are successfully providing ECMO services at our center and providing ECMO retrievals in Delhi National capital region (NCR) region. We did not have any complication in initiating ECMO at another center or during the transport. However, it goes without saying meticulous planning; trained staff, and teamwork remains an integral component of such endeavor.

Developing ECMO retrieval services helps safe transport of critically unwell patients with severe respiratory failure and enhances their chances of survival.

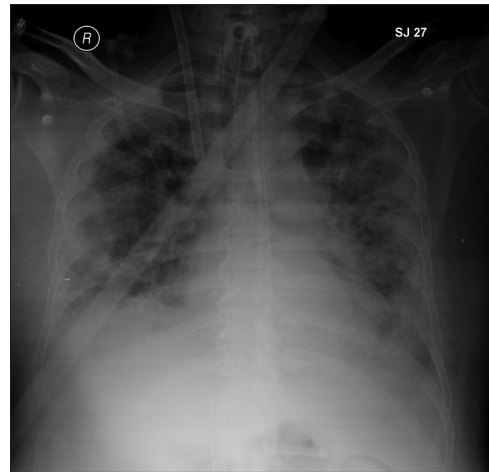


Figure 2: Chest X-ray during resolution of pneumonia on extracorporeal membrane oxygenation

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Conflicts of interest

There are no conflicts of interest.

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