

Association of Pre-intubation Non-invasive Mechanical Ventilation and the Hospital Mortality of Critically Ill COVID-19 Patients Received Extracorporeal Membrane Oxygenation (ECMO) Support: A Retrospective Cohort Study

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Keywords: COVID-19, ECMO, Mechanical ventilation, Non-invasive, Pre-intubation.

Introduction: Decision-making is crucial for optimal patient management, particularly for individuals with life-threatening respiratory failure. This includes an appropriate selection for patients requiring ECMO support with a favorable outcome. The length of noninvasive mechanical ventilation (NIV) duration prior to the commencement of ECMO therapy may influence patient outcomes. The overwhelmed institutions during the COVID-19 pandemic and the associated limited mechanical ventilator capacity obligate healthcare providers to overuse the NIV with maximum settings for a longer course before intubation than we used to do before the pandemic. Uncertainly, NIV duration is thought to be associated with mortality risk in those with life-threatening respiratory failure. A clinically relevant threshold exists for estimating the maximal time for NIV that indicates poor outcome; therefore, there is an urgent need for more high-quality research to understand the risk of antecedent NIV time pre-ECMO on patient outcome. **Objective:** This study aims to determine the association between the length of pre-intubation non-invasive mechanical ventilation and hospital mortality following ECMO support. **Methodology:** A retrospective, observational study of patients who received ECMO in King Saud Medical City between 1 January 2020 and 1 October 2022. The cohort includes all patients who received ECMO and were admitted to the ICU. Patients were divided according to the use of NIV before ECMO into two groups: patients who received NIV before intubation and those who never received it before intubation. **Outcomes:** The primary outcome is hospital mortality, while the secondary outcomes include ICU length of stay and ventilator-free days (VFD). Additionally, we explored hospital mortality if NIV was used for three or less days compared to more than 3 days. **Results:** 61 patients were included, the mean age was 39.7 ± 12.6, and 43 (70.5%) males. 37 patients received NIV before ECMO for a different course duration, while 24 were immediately intubated upon hospitalization. Both groups were comparable demographically presented in Table 1. In the NIV group, 20 patients died (54.1%) compared to 14 (58.3%) in the immediate intubation group. No statistically significant difference in mortality (95% CI: -20% to 30%; *p* = 0.7). ICU LOS for the NIV and Intubation groups were 36.5 ± 25.5 and 35.7 ± 27.6, respectively, with no significant difference (95% CI: -14.5 to 13; 0.7). The NIV group had a longer VFD of 10.9 ± 17.3 compared to 7 ± 15.1 for the intubation group with no statistical significance (95% CI: -12.7 to 4.8; 0.4). (Table 2). In a subgroup analysis of the NIV group, 27 patients received NIV for 3 or less days, out of which 15 patients died (56%), whereas 10 patients received NIV for more

Table 1: Characteristics of patients receiving NIV compared to those who did not

Variable	All (n = 61)	NIV (n = 37)	Immediate Intubation (n = 24)	95% CI of difference; p-value
Age (years) mean ± SD	39.7 ± 12.6	41.1 ± 12.2	37.5 ± 13.1	-10.1 to 3.1; 0.3
NIV Duration (days) mean ± SD	2.7 ± 5.3	4.5 ± 6.3	0	
Males: n (%)	43 (70.5)	26 (70.3)	17 (70.8)	-0.2 to 0.2; 0.9
DM: n (%)	37 (60.7)	26 (70.3)	11 (45.8)	-0.5 to 0; 0.05
HTN: n (%)	30 (49.2)	23 (62.2)	7 (29.2)	-0.5 to -0.1; 0.007
APACHE (ICU Admission) mean ± SD	55.5 ± 27.4	51.8 ± 27.3	61.2 ± 27.1	-5 to 23.7; 0.2

Table 2: Outcomes of patients receiving NIV compared to those who did not

Variables	All (n = 61)	NIV (n = 37)	Immediate Intubation (n = 24)	95% CI of difference; p-value
Tracheostomy: n (%)	17 (27.9)	9 (24.3)	8 (33.3)	-0.1 to 0.3; 0.5
Hospital Mortality (n, %)	34 (55.7)	20 (54.1)	14 (58.3)	-0.2 to 0.3; 0.7
ICU LOS mean ± SD	36.1 ± 26.1	36.5 ± 25.5	35.7 ± 27.6	-14.5 to 13; 0.7
Hospital LOS mean ± SD	43 ± 29	44.5 ± 25.8	40.7 ± 33.8	-19.2 to 11.4; 0.2
Ventilator free days mean ± SD	9.4 ± 16.5	10.9 ± 17.3	7 ± 15.1	-12.7 to 4.8; 0.4

Table 3: Subgroup analysis of patients who receive NIV with different outcomes related to NIV days

	One day	Three days	Five days
Equal or less	19/34 (56%)	29/51 (57%)	30/55 (55%)
More than	15/27 (56%)	5/10 (50%)	4/6 (67%)
p-value	-20 to 30%; 0.9	-27 to 41%; 0.7	-52 to 28%; 0.5

than 3 days, out of which 5 patients died (50%). No statistical significance was observed (95% CI: -31% to 42%; *p* = 0.8). (Table 3). **Conclusion:** Days on NIMV prior to endotracheal intubation should be cautiously discussed on selecting COVID-19 patients for ECMO support until high-quality research exists enough to have a solid conclusion.

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Severe ARDS in a Kyphoscoliosis Patient and Application of VV – V ECMO – A Case Report

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Keywords: ARDS, ECMO, Kyphoscoliosis.

Introduction: VV ECMO established itself as one of the final therapeutic options in cases of severe ARDS, where conventional therapies fail. The Pandemic of Swine flu and COVID-19 allowed ICU physicians worldwide to be familiar with the benefits of extracorporeal Life Support ECLS. Despite acquaintance with ECMO, its usage and literature are scarce in patients of kyphoscoliosis who have altered anatomy and compromised pulmonary reserves, which poses unique challenges during ECMO run. **Case presentation:** We present a case report of 35 yr old male with kyphoscoliosis since birth with no other comorbidities presented with severe ARDS secondary to H1N1 pneumonia requiring extracorporeal therapy for severe hypoxemia despite three days of conventional mechanical ventilation and prone position. Initially, he was started on VV ECMO, which required him to convert to VV-V ECMO to overcome flow disturbances, cannula malposition, and proper drainage. During the course of therapy, to overcome bleeding from the tracheostomy site, ECMO was managed without anticoagulation, reintubation of the patient, and requiring circuit change in view of oxygenator failure were other challenges faced. We were able to prone patients even on ECMO with all precautions taken. After 23 days of ECMO run patient was successfully weaned, with an overall stay of 29 days in the ICU. **Conclusion:** Overall, there is a limited experience and literature on challenges faced during extracorporeal therapy in patients with spine deformities. In our case, anatomical challenges were surpassed by placing properly sized cannulas with the help of fluoroscopy guidance and ultrasonography. Physiological challenges because of reduced pulmonary reserves, like difficult weaning, are known, which was not a big hurdle in our case. Overall, the experience is not as scary as we were at the beginning of ECMO.

A Novel Approach to ECMO Troubleshooting (Hypoxia) Management Utilizing Two ECMO Circuits in Parallel, A Case Report

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Keywords: Anticoagulation, ECMO, Point of care anticoagulation.

Introduction: The improvements in ECMO management last decade were in response to the innovation and breakthrough of ECMO material biocompatibility and miniaturization; however, there is a lack of high-quality ECMO research to support and look for the best management approaches. Troubleshooting, particularly patient hypoxia while on ECMO, the most common one that algorithmically necessitated management escalation till reaching to insertion of another cannula to increase the pump flow, which, if failed, probably may lose the patient if he did not tolerate hypoxia or develop brain insult from prolonged hypoxia herein, we present a challenging case that failed to be managed with all previously mentioned approaches and how.



Fig. 1: C-Xray post initiation of the two ECMO circuits

Case presentation: 25-year-old male, morbid obese male, weight 130 kg, height 170 cm (Body Mass Index [BMI] 45 kg/m², known epilepsy, presented to the emergency department due to burn 30% of involved upper limbs, head, and neck, with inhalation injury and worsening respiratory distress. On initial aggressive fluid resuscitation, developed hypoxia on oxygen and non-invasive positive pressure ventilation with a decrease of the level of conscience. He was endotracheally intubated, placed on lung protective mechanical ventilation with a fraction of inspired oxygen [FiO₂] of 100%, and admitted to the intensive care unit (ICU) on 25/08/2021. He was on a high ventilator setting and had severe refractory hypoxia saturation of 60%, partial pressure of oxygen to fraction inspired oxygen ratio (Pao₂:Fio₂ 52mmhg), so the team decided to support the patient on V-V ECMO. Successful ECMO cannulation on 29/08/2021 with access cannula on left femoral vein (23fr) and return on IJV (21fr). Unfortunately, hypoxia improved; however, Oxygen saturation remained low and the best Pao₂:FIO₂ on the maximum setting and excluding all possible causes of hypoxia on ECMO and membrane oxygenator efficiently worked, and pump flow reached 6L/min and controlled cardiac output, Hemoglobin Hb optimized to 11.4 d/l adding another oxygenator to the circuit was ignored due to possible hemolysis and patient condition cannot tolerate and planned to add new another ECMO circuit with new pump and console to run concurrently with the old. Eventually, a triple venous closed circuit (V-V-V ECMO) setup initiated with two different venous site access (left and (right femoral 21fr. cannula) veins) drained blood by two different pumps and passing it into the right Internal Jugular vein cannulate with 25 fr. Cannula called dual or parallel ECMO run. Both pumps' RPM (round per minute) adjusted equally to the two circuits. Patient hypoxia improved, and oxygen saturation picked up above 90% while lowered mechanical ventilator setting was adjusted to the lowest. (ABG: Ph 7.43, Pco₂ 39.8 Po₂ 70.2, SPO₂ 93%). Eight days later, we succeeded in weaning one of the ECMO circuits and explant one of the access cannulas with preserving patient oxygen saturation. During ICU post-weaning of one of the circuits, the patient course was further challenged with severe recurrent, hardly controlled, ventilator-associated pneumonia VAP with MDRO infection and severe septic shock required vasopressors; a blood culture showed candida Auris covered with antifungal treatment, Also, the patient developed AKI and require multiple

sessions of dialysis. The oxygenator was changed 5 times during the run, and the patient eventually tolerated the weaning trial of sweep gas, and hemodynamics improved on low mechanical ventilator support. The patient completed an 80-day ECMO run and successfully decannulated; a few days later discharged from the ICU and eventually from the hospital in good general condition. **Conclusion:** We reported a rare successful feasible approach to ECMO troubleshooting management with very few reported cases or case series in the literature; however, further high-quality research is required to support this finding.

Combined VV-ECMO and Independent Lung Ventilation for Hydatid Cyst – Case Report

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Keywords: ECMO, Hydatid cyst, Independent lung ventilation, One-lung ventilation.

Background: Independent lung ventilation is an infrequently used ventilation strategy in an intensive care unit. It can benefit unique, selective patients, such as those with unilateral pulmonary pathology. Independent lung ventilation allows for the individual separation of each lung and isolates each lung content, thus preventing lung content from reaching the other lung. Theoretically, it may help avoid spilling of content in the non-diseased lung and thus maintaining healthy lungs and providing adequate oxygenation. In addition, it allows for targeted interventions. Here in, we report a case of an adult female with a unilateral hydatid cyst requiring venovenous extracorporeal membrane oxygenation ECMO who showed improvement in the non-diseased lung after the application of independent lung ventilation. **Case presentation:** 21 years old female patient of Arabic origin who is known as asthmatic. Presented with complaints of shortness of breath and cough for 10 days. Her initial chest x-ray was highly suspicious of a hydatid cyst. (Fig. 1)

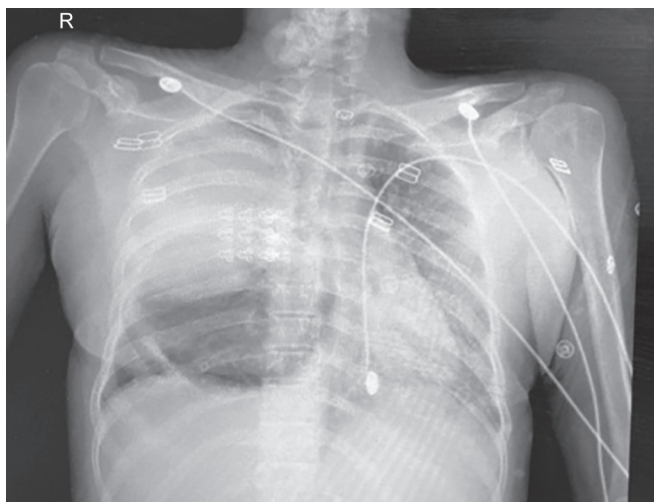


Fig. 1: Chest x-ray on admission

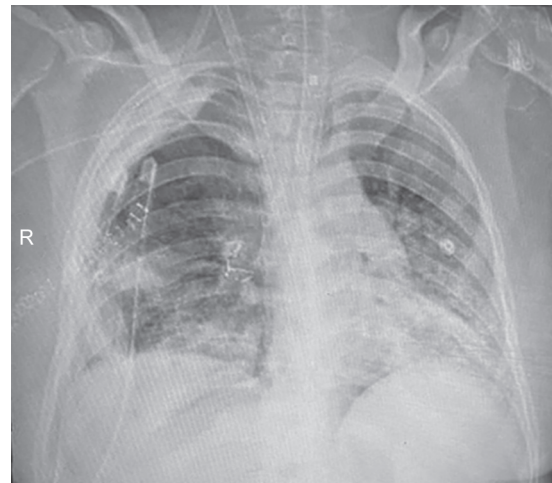


Fig. 2: Chest x-ray 4th postoperative

Due to rapid deterioration respiratory-wise, she was intubated and mechanically ventilated four days following her ICU admission, then supported by VV ECMO a day later. Chest surgeons were involved in her management and confirmed the diagnosis of the Hydatid cyst. On the second day of ECMO, we proceeded to independent lung ventilation in order to protect the left lung. She underwent a right middle lobectomy while on ECMO and gradually showed substantial improvement in ventilator parameters and chest x-ray (Fig. 2). Unfortunately, as we planned her weaning and extubation, she started to deteriorate again, and the bronchoscopy showed accumulated blood clots in the right lung and leakage of pathological tissue to the left lung. Eventually, she succumbed to her illness and died 45 days postoperatively. **Discussion:** Hydatid cysts can present in a single lung. Thus, intensivists aim toward preventing further spilling of content to the other lung to maintain adequate oxygenation and ventilation and prevent secondary damage until definitive surgical management can be provided, including pneumonectomy/lobectomy; this strategy presents a challenge to intensivists as different lungs has different compliance and driving pressure requiring different ventilator settings. ECMO can overcome this issue by directly delivering oxygen to the circulation bypassing the capillary-alveolar membrane. This was the case in our patient, who initially improved by applying an independent lung ventilation strategy. However, this strategy can be used as a bridge until definitive management of the pathological lung is achieved. **Conclusion:** Independent lung ventilation and ECMO may temporarily be beneficial in managing single lung pathology until definitive management of the pathology is achieved.

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Fulminant Myocarditis

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Keywords: Fulminant Myocarditis, IV.Ig, Inotropes, Milrinone, VA ECMO.

Introduction: Fulminant myocarditis occurs as an inflammatory response to an initial myocardial insult. Its rapid and deadly progression calls for prompt diagnosis with aggressive treatment measures. Demonstrating its excellent recovery potential has led to the increasing use of mechanical circulatory support. ECMO should be considered earlier in these patients as it can lead to rapid hemodynamic collapse.

Case presentation: A 5-year-old Kid brought a fever, cold & cough for three days, followed by difficulty breathing; shown to an outside physician who found gallop & referred them for management of myocarditis. In our facility Patient had signs suggestive of cardiogenic shock. Chest x-ray showed cardiomegaly, Abnormal ST waves; ECHO showed EF 40% with left ventricular dysfunction, very high troponin T (>900), Rising lactate, low Scvo₂, CRP 0.5mg/dl, COVID PCR, H1N1PCR, tropical infection workup & blood culture-negative s/o fulminant Myocarditis. The patient was treated with fluids, HFNC support, IVIG, IV methylprednisolone, Dobutamine, adrenaline, calcium, vitamin D & other supplements (Thiamine, carnitine & B12). Despite maximum medical management in the first 48 hr, lactate kept rising, scvo₂<60%, MAP<45, oliguria with rising creatinine, inotropic score >20, EF<20, VTi<7. Peripheral bifemoral VA ECMO has been done, right femoral venous cannulation size 18F & left femoral arterial cannulation size 12 F, DPS 5F. Euroset pediatric circuit size with a pediatric oxygenator. The patient started on VA ECMO with the partial flow, titrated with scvo₂ & lactates. Heparin is used for anticoagulation. After five days of the ECMO run, as markers for cardiac recovery were seen, the patient was weaned, trialed off & decannulated on day 6th of the ECMO run. ECMO run done for six days. The patient was successfully extubated on day 9th of ventilation & discharged on 21 days of hospital stay. **Conclusion:** Prompt diagnosis & timely ECMO support in fulminant myocarditis, along with medical treatment, could prevent lethal outcomes.

Adenovirus Organizing Pneumonia Responding to Pulse Steroids and V-V ECMO Therapy – A Case Report

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Keywords: Adenovirus, Organizing pneumonia, Steroids, V-V ECMO. **Background:** Adenovirus pneumonia in children may lead to severe lung damage, bronchiectasis, fibrosing organizing pneumonia and severe ARDS. We present ECMO for a child as lifesaving and a bridge to the healing of his severe organizing pneumonia on pulse steroid therapy. **Purpose:** To report the use of V-V ECMO and pulse steroids therapy in a child with adeno viral organizing pneumonia. **Case presentation:** A 4-year-old boy presented with severe respiratory distress secondary to adenovirus pneumonia



Fig. 1: Dual-lumen cannula in RIJ vein

and was admitted to the PICU treated with conventional ventilation, then HFVO and NO, complicated with bilateral pneumothoraxes and because of persistent hypoxemia was commenced on VV ECMO for three days, in addition to pulse steroids 30 mg/kg methylprednisolone. The right internal jugular vein was cannulated by an adult intensivist with a Dual-lumen Avalon cannula size 23 Fr. He showed a dramatic response and decannulated and extubated to HFNC without respiratory or neurological sequelae.

Conclusion: Veno-venous ECMO should be started early in the course of the disease before more lung damage from mechanical ventilation or HFVO and give the lungs a chance to heal as soon as possible.

The Use of HFVO in VV ECMO in Infants with ARDS to Overcome Femoral Cannula Shattering

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Background: VV ECMO in pediatrics is a lifesaving procedure that is being more recently used, especially in cases of respiratory failure with persistent hypoxemia and failure of conventional and high-frequency ventilation. Complications such as bleeding, clot formation, infection and mechanical obstruction of the ECMO circuit may happen. **Objective:** To describe the benefit of high-frequency ventilation oscillation (HFVO) use with VV ECMO in a case of shattering and low ECMO flow. **Case presentation:** A 5-month-old, 5 kg weight baby developed ARDS secondary to human metapneumovirus. He was treated with mechanical ventilation and then HFVO with iNO, but his hypoxemia persisted. Then he was started on VV ECMO with a right femoral vein cannula for drainage and a right internal jugular vein cannula for return (Fig.1). He developed shattering phenomena and reduction in the ECMO flow, after which he was converted from conventional MV to HFVO and noticed the disappearance of shattering and improvement of the drainage of ECMO flow. **Conclusions:** The use of HFVO with VV ECMO helps to solve the problem of shattering and improvement in the drainage flow in VV ECMO.

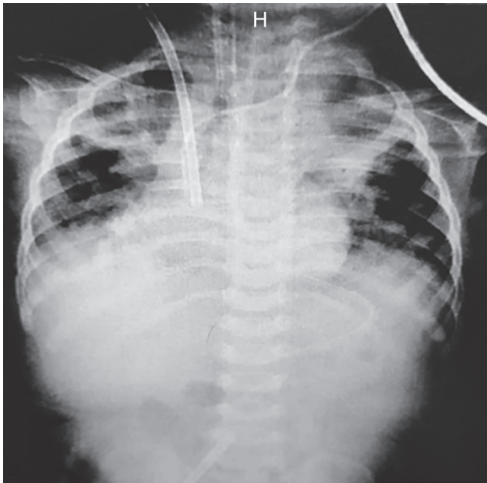


Fig. 1: Right femoral cannula(drainage), right internal jugular cannula for return

Neurodevelopmental Outcome in Children Undergoing Extracorporeal Membrane Oxygenation ECMO

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Introduction: Extracorporeal membrane oxygenation (ECMO) is a well-established life support technique for cardiopulmonary failure. But the procedure is not without complications. As many as 15–36% of ECMO patients suffer neurologic injury surrounding their ECMO course, including hypoxic-ischemic injury, thromboembolic stroke, and intracranial hemorrhage. Acute neurologic injury during ECMO is associated with an 89% increase in the risk of mortality, and neurologic disability among survivors has been reported at a rate of 10–60%. **Objective:** We aimed to study the neurodevelopmental outcomes in pediatric patients undergoing extracorporeal membrane oxygenation (ECMO). **Methodology:** This is a 7-year of a retrospective study from 2015–2022 in KIMS Health, Trivandrum which is a Quaternary care center in south Kerala. Data including patient demographics, indication for ECMO, type and days of ECMO support, complications and neurodevelopmental status at discharge and latest follow-up was recorded from the electronic medical record. Neurodevelopmental status was determined through the Pediatric Overall Performance Category (PCPC). **Results:** Total 14 children were included in the study. Among 14 children, 9 survived. Among the 5 children who

died, one child had massive intra-cerebral bleeding. Another 14-year-old boy who was on VA ECMO developed critical illness polyneuropathy. Among the 9 patients who survived 8 patients had GCS 15/15 on discharge, and One child had myopathy. We did a follow and found that among the 7 school-going children, 6 were back to school at 6 months follow-up. One child had a learning disability. Two toddlers’ development assessment was appropriate for age at 3 months follow-up. **Conclusion:** Neurological complications are not uncommon during ECMO therapy. Even though the literature shows neurological complications can be very high, our data shows that with timely intervention and multidisciplinary care, children can have excellent neurological outcomes.

Extracorporeal Membrane Oxygenation in Pregnant Women: Case Series

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Keywords: ARDS, COVID-19, ECMO, Peripartum, Pregnancy.

Introduction: Extracorporeal membrane oxygenation (ECMO) is a supportive treatment that provides circulatory and ventilatory support as a bridge to organ recovery. Extracorporeal life support (ECLS) has expanded to include unique populations such as peripartum women. Extracorporeal membrane oxygenation (ECMO) has seen increasing use for critically ill pregnant and postpartum patients over the past decade. Increasing evidence supports the ECMO use as a bridge to babies throughout pregnancy and attests to its favorable outcomes. These case series aim to report maternal and fetal complications and outcomes associated with peripartum ECMO. **Methodology:** A descriptive analysis of 7 patients as a case series who required ECMO support in pregnancy and postpartum at KSMC, Riyadh, Saudi Arabia, between January 2020 and January 2022. **Result:** Our case series includes seven patients with a median age of 35 years (24–42 years), five of them are pregnant at the time of ECMO, and two are postpartum. Two were in the second trimester, and three were in the third trimester. All patients were COVID-19 positive, and all patients had ARDS. In addition, six patients received venovenous ECMO support, and one required VA ECMO due to cardiogenic shock.

Table 1: descriptive analysis of COVID-19 pregnant ladies during ECMO

	Age	Gestational age	ICU LOS	Hospital LOS	ECMO days	NIV Before Intubation	MV days	Mother's Outcome	Baby's Outcome	DM	HTN
Case 1	28	30 weeks	28	103	10	yes	17	Alive	Alive	No	No
Case 2	36	27 weeks	17	21	12	yes	17	Alive	Alive	No	No
Case 3	24	27 weeks	55	73	11	yes	12	Alive	Alive	No	No
Case 4	42	23 weeks	23	23	6	no	11	Alive	Alive	No	No
Case 5	41	23 weeks	53	60	8	no	19	Alive	Alive	Yes	Yes
Case 6	32	Post CS	15	43	11	yes	13	Alive	Died 27w	Yes	Yes
Case 7	35	Post CS	16	25	48	no	51	Alive	Alive	No	No

All patients were successfully decannulated from ECMO; however, the required days of ECMO range from 6–48 days. Two of the five pregnant patients delivered usually, and three underwent cesarean sections. All newborns are alive post-delivery. All mothers survived home discharge with their babies except one who developed Intra uterine fetal death and spontaneously aborted in ICU. **Conclusion:** Our case series demonstrates a promising outcome for pregnant ladies with severe ARDS and preserving pregnancy in experienced ECMO centers.

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Successful Venovenous ECMO in a Post-CPR Pediatric Patient with ARDS and Bilateral Pneumothorax

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Keywords: ARDS, CPR, Venovenous ECMO.

Case presentation: A 12years boy was admitted with fever, dry cough for three days and breathlessness; the 1st day was managed in pediatric IPD and discharged on the 7th day. On the next day, the patient was readmitted with breathlessness and shifted to ICU in view of hypoxic with arterial oxygen tension (PaO₂) of 58mm Hg on 15L/min of oxygen via mask with a reservoir, requiring non-invasive positive pressure mode of ventilation to maintain arterial oxygen saturation. HRCT thorax showed diffuse bilateral ground glass opacities with extensive consolidation, RT-PCR for COVID-19 positive. The patient received empirical antibiotics and steroids for two days, but there was no improvement in respiratory status, and he was hooked to mechanical ventilator support with intubation. Unfortunately, he developed bilateral pneumothorax on the 5th day, managed with bilateral intercostal drains. On the 7th day, the patient developed refractory hypoxemia with high settings mechanical ventilation; ABG analysis showed persistent hypoxemia (PaO₂ of 48mm Hg, PaCO₂ 79, Ph7.1, lactate 3) on 100% fraction of inspired oxygen (FiO₂) with positive end-expiratory pressure (PEEP) of 12 cm H₂O on prone position. On the 8th day, the patient had a cardiac arrest (ROSC was achieved after 3 minutes of CPR) due to hemodynamically stable and refractory hypoxemia with respiratory acidosis (Pao₂–33, Paco₂ 98, Ph 7, lactate 7) decision was made to treat the patient with venous-venous ECMO. He was subsequently initiated with a circuit flow of 1.2L/min and sweep gas of 4.0L/min of oxygen (FiO₂ of 100%, 3000RPM) with lung protective ventilation and antibiotics based on the cultures’ result. On day 13th, the patient was shifted to KIMS Hospitals Secunderabad on ECMO by aviation for a lung transplant. The patient was weaned successfully after 2 months from ECMO and discharged after 80 days of admission without lung transplantation. **Conclusion:** To the best of our

knowledge, this is the first pediatric case report in the country with the successful use of VV-ECMO for bilateral pneumothorax with post-CPR survivor from refractory ARDS.

ECMO Oxygenator Changeout During the COVID-19 Pandemic

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Keywords: COVID-19, ECMO, Oxygenator.

Background: This retrospective study focuses on the critical issue of ECMO oxygenator change-out during the COVID-19 pandemic. The study also presented the single institution’s experience and protocol for managing ECMO patients during the pandemic. **Objectives:** We aimed to emphasize the team’s effort, along with other healthcare service providers, to run 29 ECMO simultaneously. **Results:** The study involved a robust large cohort of 180 ECMO patients. The oxygenator was changed once in 23 patients and multiple times in 6 patients. We analyzed the reasons for the oxygenator and circuit change and evaluated the health criteria used to assess the performance of the oxygenator. **Discussion:** The results of this research provide a better understanding of the challenges faced in managing ECMO during the pandemic and the importance of monitoring oxygenator health and following established protocols for optimal patient care. **Conclusion:** The findings are significant for the healthcare industry, as they provide valuable insights into managing ECMO during the COVID-19 pandemic and highlight the importance of continuous monitoring and improvement of oxygenator criteria and protocols.

Problems Faced During VV ECMO of Dengue Patient with Severe ARDS: A Case Report

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Keywords: ARDS, Dengue, ECMO.

Case presentation: A 21-year-old male patient with no history of chronic illness presented with chief complaints of High-grade fever with chills and rigor for 10 days, Breathlessness for 1 day, and altered behavior for 1 day. On examination, BP –120/70, PR –128/min, CVS – S1S2 present, chest - B/L crepts, GCS E3M5V3, Pupil B/L constricted, RR 35/min SpO₂ 70% without oxygen. The patient was diagnosed case of dengue fever and presented with severe ARDS. The patient was intubated and lung protective ventilation was initiated. Initial investigations suggest abnormal liver functions and raised Ferritin (40,000). The patient received immunoglobulin and steroids, keeping Hemophagocytic lymphohistiocytosis as the cause. Liver enzymes improved and the patient showed some signs of improvement. On day 4 patient started de-saturating and did not improve even after proning for 3 hours. A call for VV-ECMO was taken. After starting VV ECMO, ventilatory paraments were decreased to rest lung settings. Heparin was an anticoagulant used and the dose was titrated to maintain an activated clotting time



of 180 to 220. up till Day 8 on ECMO, the patient was doing good in terms of clinical and laboratory parameters. After day 8 serum bilirubin started increasing at 17 mg/dl (direct bilirubin 11 mg/dl). At presentation total bilirubin was 3 mg/dl (direct bilirubin 1.7mg/dl). Although the bilirubin was raised, the SGOP/SGPT and ALP were not that raised, and INR was also normal. Screening for other hepatotropic viruses was negative. The drainage cannula position was not obstructing hepatic veins. The patient was not accepting enteral nutrition because of paralytic ileus, so intravenous amino acids were given. The patient developed hypertensive episodes, which were treated by intravenous labetalol. Till day 8 patient's GCS after giving a sedation break was E2 M5 VT, but pupils were pinpoint bilaterally. On day 8, pupils became dilated & fixed bilaterally and GCS became E1M1VT. Heparin was stopped, and ECMO flow was increased, keeping Intracranial haemorrhage as the possible cause. EEG was done, suggesting a deep comatose state with prominent delta wave activity. Post tracheostomy, there was deterioration in lung parameters also bleeding from the tracheostomy site, so a bronchoscopy was done and blood clots were removed. Ventilatory parameters improved post-bronchoscopy. The patient was gradually weaning from VV- ECMO and decannulated. MRI brain with contrast was suggestive of global cerebral ischemia, acute infarct in pons and medulla, and bilateral anterior cerebral and posterior cerebral arteries did not show post-contrast opacification. An apnea test was done, which was positive. The patient developed 2nd sepsis and septic shock on day four post-decannulation, after which the patient deteriorated and expired on day 28. **Discussion:** Possible reasons for the patient's deterioration. We could not do imaging prior to ECMO due to the unstable condition of the patient. Was the dose of anticoagulation inappropriate, leading to thrombosis of cerebral vessels? The liver that was already compromised may further deteriorate during ECMO. Coagulopathy can lead to pulmonary haemorrhage which can further lead to delayed weaning. Persistent paralytic ileus was unexplainable. **Conclusion:** The case of Dengue fever represents a challenge of ECMO management.

Venovenous ECMO in a 10-year-old Girl with ARDS, Cannulation with Double Lumen Cannula Inserted by Pediatric Intensivist

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Background: Extracorporeal membrane oxygenation (ECMO) is increasingly used as a rescue therapy for refractory hypoxemia in ARDS patients. Extracorporeal membrane oxygenation (ECMO) support for severe adenoviral infection has been reported since the early days of ECMO use. This is a description of a successful double-lumen cannulation in a child done by a pediatric intensivist.

Purpose: To describe vv ECMO experience and double lumen cannulation in a young girl done in our PICU. **Case presentation:** This is a case report of a 10-year-old girl with Marfan's syndrome, ARDS secondary to Adeno viral pneumonia received MV, then HFO for 6 days, after which she was started on vv ECMO because of persistent hypoxemia. A double Lumen cannula size 31 Fr. (Figs. 1 and 2) Was inserted by a pediatric intensivist under ultrasound and ECHO heart guidance using percutaneous Seldinger's technique. She was decannulated after ten days of ECMO. She underwent a tracheostomy due to muscle weakness. She developed right internal



Fig. 1: Double lumen Avalon cannula in right internal jugula vein



Fig. 2: Post decannulation CXR with right pneumothorax

jugular vein thrombus after decannulation and was started on low molecular weight heparin. **Conclusion:** The study opened the door for using the percutaneous cannulation technique in PICU by pediatric intensivists with low complications.

The Use of V-V ECMO in an Infant with Human Metapneumovirus Pneumonia and ARDS

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Keywords: ARDS, Metapneumovirus, Pneumonia, V-V ECMO.

Background: Extracorporeal membrane oxygenation (ECMO) is a life-saving modality to support respiratory and cardiac failure patients. Recently noticed the emergence of aggressive human metapneumovirus in infants. The use of ECMO was life-saving and successful via bilateral internal jugular vein cannulation. We reported a case of V-V ECMO use in infants below 1 year of age. **Purpose:** To describe the successful use of both internal jugular veins for cannulation.



Fig. 1: RIJ vein a drainage cannula & LIJ vein as a return one

Case presentation: Ex pre-term infant 27 weeks' gestation age and corrected age 6 months with bronchopulmonary dysplasia. Admitted to PICU with acute bronchiolitis secondary to human metapneumovirus. He developed ARDS and persistent hypoxemia despite maximum ventilator support with HFVO and NiO; he was commenced on ECMO with cannulation of Rt. Internal Jugular vein for drainage and Lt. internal Jugular vein for return. After four days of ECMO support, he was extubated and then decannulated successfully to High Flow Nasal Cannula HFNC and lung healing from the primary disease was noted. He was discharged home without respiratory or neurological sequelae. **Discussion:** Venovenous ECMO use in this infant was lifesaving, and decannulation after four days was successful. The use of V-V ECMO on these small infants needs a special cannula and expertise in cannulation technique, which was successfully done with the percutaneous technique by the pediatric intensivist (Fig.1), which opened the door for more cases to be treated with ECMO. There is a need for a pediatric ECMO center in Kuwait where babies with respiratory failure not responding to conventional therapy and reaching maximum support will benefit from this technology to survive the respiratory illness and give the lungs a chance to heal and normalize pulmonary function. **Conclusions:** Successful ECMO for the first infant with human metapneumovirus respiratory failure to be treated with ECMO in Kuwait.

ECMO – The Saviour of Reversible Toxic Myocarditis – A Case Report

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Introduction: VA ECMO has become the saviour for severe myocarditis when the underlying cause is reversible, such as viral or toxin. We reported a case of toxic myocarditis secondary to aluminium phosphide poisoning, which recovered with the support of VA ECMO. Interestingly, we initiated ECMO while the patient was awake. **Case description:** A 52-year-old lady was brought to us with cardiogenic shock and metabolic acidosis after consuming two tablets of aluminum phosphide. VA ECMO was initiated for the patient while he was on room air within 6 hours of

poison intake. Within the next few hours, the patient had malignant arrhythmias. Simultaneously, ECMO support maintained tissue perfusion and lactate levels decreased within 3 hours of ECMO initiation. 48 hours, she developed pulmonary edema due to severe myocardial depression. She was put on invasive positive-pressure ventilation. 72 hours, the myocardium showed signs of recovery. She was gradually weaned off and decannulated successfully after 84 hours of ECMO support and extubated the next day. The patient was discharged on day seven without any complications. **Discussion:** Aluminium phosphide ingestion is associated with high mortality. This compound is frequently used as a rodenticide and fumigant for grain storage. The phosphine gas released after ingestion of this compound inhibits cytochrome oxidase, interferes with cellular respiration, and causes oxidative stress. It causes myocardial toxicity, metabolic acidosis, shock, and multiorgan dysfunction syndrome (MODS). No specific antidote is available for this compound; VA ECMO has become the mainstay of supportive care in managing aluminum phosphide poisoning. The key to recovery is the early initiation of ECLS before the onset of MODS. In recent years, initiating VA ECMO in awake patients has become widely accepted, which might, theoretically, reduce the rate of hospital-acquired infections, the burden on healthcare personnel and patient comfort. **Conclusion:** VA ECMO is a feasible lifesaving modality for severe myocarditis when the underlying cause is reversible, such as viral or toxins.

Extracorporeal Membrane Oxygenation in COVID-19 – Indian Scenario

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Keywords: COVID-19, ECMO.

Introduction: Extracorporeal membrane oxygenation (ECMO) is used as rescue therapy when lung-protective ventilation fails to achieve adequate gas exchange in severe acute respiratory distress syndrome (ARDS). Initial reports during the first wave of the COVID-19 pandemic suggested a high mortality rate of patients on ECMO. However, later evidence suggested that the clinical efficacy, outcome and complications were comparable in the patients treated with ECMO in COVID-19-related ARDS and non-COVID-19 ARDS. We intend to study the clinical characteristics and outcome of ECMO in COVID-19 ARDS in the Indian scenario. **Methods:** It was a single-center retrospective cohort study done at Medica Superspeciality Hospital, Kolkata, from June 2020 to May 2021. Data from patients treated with ECMO for COVID-19 ARDS were compiled and analyzed. **Results:** Total cases of COVID-19 treated with ECMO were 79 (M:F=71:8). Mean age of the male was 45 ± 2.5 years, while the female was 41 ± 3.8 years, with 15% of cases morbidly obese. The mean duration of intubation to ECMO initiation was 54 ± 18 hours. Twenty-five percent of cases were prone, and 2 cases received awake ECMO. Prolonged ECMO (more than 14 days) was observed in 60% of cases. The mean duration of the patient on ECMO was 17 ± 5.2 days. Sepsis (65%) was the commonest complication. Fifty percent of patients were discharged home, while 5% were still on ECMO. **Limitations:** The study was retrospective, so patient selection criteria for ECMO were not stringent. Also, 38% of patients were retrieved from

different centers for ECMO therapy to our hospital. Hence, the duration of intubation to ECMO support initiation could not be protocolized. As a single-center study of a functional ECMO unit with 7 years of experience, it cannot be generalized to the pan-India scenario. **Conclusions:** Our study showed better survival of COVID-19 patients on ECMO than those reported during the first wave. However, the survival rate reported in western literature (37%) is better than our study (50%), which might be because the major bulk of patients (38%) were retrieved from various centers for ECMO, the probable bias of delay in initiation of therapy could not be denied.

ECMO for Polytrauma Patients: A Blessing in Disguise or a Trail of Fiction?

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Keywords: ADRS, ECMO, Polytrauma.

Background: Venovenous extracorporeal membrane oxygenation (VV ECMO) for polytrauma patients has widely increased in the last decade. Earlier, polytrauma and ECMO did not mix; it was one of the main contraindications to patient selection, owing to the risk of bleeding and the therapeutic anticoagulation used during the ECMO run. However, the renaissance on ECMO material became more compatible with patient blood, allowing ECMO run-off heparin. This pushes the boundaries of ECMO use, opens new frontiers, and increases the pool of patients who may benefit from this super-advanced form of life support. We aimed to evaluate the outcomes of a group of polytrauma patients who received ECMO in a tertiary hospital. **Methods:** All patients were admitted to King Saud Medical City ECMO center from 1 June 2020 to 01 January 2022. We stratified patients according to primary diagnosis into 2 groups Non-trauma ECMO and trauma ECMO groups. Propensity score matching (1:2) was done between the two groups; then we compared the matched groups for the primary outcome of in-hospital mortality. **Results:** The total number of patients included in this study was 61 unmatched trauma and non-trauma, 53 to 8 patients, respectively. Post-matching trauma to non-trauma 8 to 16 patients. The mean age 37.5(±16.7) to 62.5 (±16.7), p-value 0.6. No significant difference between in-hospital mortality of matched trauma to non-trauma patients (3, (37.5%): 10, (62.5%), p-value 0.2), matched trauma patients, mean ECMO days 24.6 (±25.4) to 36.7 (±32.3) respectively, Trauma patients stayed at the hospital, ICU much more days than non-trauma patients and higher ventilator-free days VFD. (Table 1). **Conclusion:** ECMO use in trauma patients was previously thought to be harmful; however, our study is underpowered and suggests that ECMO may play a role in reducing hospital mortality comparable to ECMO use in non-trauma patients of the same severity with no adverse effects. More high-quality research is needed for a larger number of patients.

Table 1: Demographics and outcomes of matched trauma and non-trauma patients.

Variable	Trauma (n = 8)	Non-Trauma (n = 16)	95% CI of difference; p-value
Age (years) Mean ± SD	37.5 ± 16.7	41.2 ± 14	-11.3 to 18.7; 0.6
Sex: Males n (%)	7 (87.5%)	15 (93.75%)	-32 to 20; 0.6
DM: n (%)	2 (25%)	6 (37.5%)	-25.7 to 50.7; 0.5
HTN: n (%)	2 (25%)	6 (37.5%)	-25.7 to 50.7; 0.5
BMI (kg/m ²) Mean ± SD	34 ± 8	33 ± 7	-8.2 to 6.3; 0.8
Hospital Mortality: n (%)	3 (37.5%)	10 (62.5%)	-16.1 to 66.1; 0.2
Hospital LOS (day) Mean ± SD	67.6 ± 43.4	43.4 ± 29.4	-62.1 to 13.8; 0.2
ICU LOS (days) Mean ± SD	53.8 ± 31	39.8 ± 29.6	-42.5 to 14.7; 0.3
VFD (days) Mean ± SD	12.3 ± 15.8	5.75 ± 9.6	-21.4 to 8.3; 0.3
ECMO Days Mean ± SD	24.6 ± 25.4	36.7 ± 32.3	-15 to 39; 0.4

Combined Use of VA-ECMO and Impella (ECpella) in Patients with Acute Coronary Syndrome and Cardiogenic Shock (ACS-CS)

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Keywords: ACS, CS, ECpella, Impella, VA ECMO.

Introduction: In a patient with cardiogenic shock (CS), VA-ECMO maintains end-organ perfusion; however, it may increase left ventricle (LV) afterload, increasing wall stress and oxygen demand of the LV, leading to myocardial ischemia and, ultimately, impairing CS recovery. The term “ECpella” refers to Impella and VA-ECMO support in cardiopulmonary resuscitation (CS) to provide optimal hemodynamic support while reducing LV afterload and unloading the LV. In this case, we will describe how ECpella was used to successfully manage a patient who presented with CS during percutaneous coronary intervention PCI due to Acute Coronary Syndrome ACS. **Case presentation:** The patient was a 33-year-old Filipino male with known HTN who presented to the emergency department with late presentation anterior ST-segment elevation myocardial infarction STEMI; the patient was conscious, oriented, and HD hemodynamically stable; the ECG revealed anterior ST-segment elevation and positive troponin results; and the transthoracic/cardiac ECHO revealed left ventricular hypertrophy, mitral regurgitation (MR), and EFs of 40–45%. A coronary angiogram showed triple vascular disease. Cardiac MRI showed MI involving the right coronary artery (RCA), left anterior descending LAD, and left circumflex LCX (EF 26%). Percutaneous coronary intervention PCI was performed on the RCA, LAD, and LCX; inotropes (noradrenaline,

adrenaline, and dopamine) were started at the maximum dose, and the decision was made to support him on VA ECMO in addition to Impella. Day 1 HD unstable on 3 inotropes, patient intubated on F_{iO_2} :80% PEEP: 8mmHg, troponin 4.1, developed AKI, DIC, liver dysfunction, radiological chest X-ray: bilateral infiltration. On day 3, showed improvement, patient on 3 inotropes decreased adrenaline dose to 0.07mcg/Kg/min with HD stable, F_{iO_2} : 40% PEEP: 8 mmHg, troponin 2.1, showed little improvement in coagulation profile and lactate 3.4 mmol/L. On day 4, there was a significant improvement; the patient was on 2 inotropes, normal lactate 1.1 mmol/L, improved liver function, then decided to remove Impella. On day 6, patient HD was stable without inotropes, low setting mechanical ventilation MV, chest X-ray normal, normal lactate, liver function, and coagulation profile. ECHO showed LV moderate dilatation, EF: 20–25%, VTI:13.4 cm, and stroke volume: 39 ml; compared to the previous study, there was an improvement in LV EF, and eventually, the decision was taken to remove VA ECMO. On day 10 patient extubated on dexmedetomidine for agitation, he was HD stable on nasal canula 2L. On day 13, discharged from ICU to the ward. On day 16 patient was discharged home. **Conclusion:** Combined VA ECMO and Impella (ECPella) in patients with CS were associated may improve survival and patient outcome. We advocate early unloading guided by echocardiographic and hemodynamic monitoring.

Rapid Establishment of ECMO Program During the COVID-19 Pandemic

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Introduction: Extracorporeal membrane oxygenation (ECMO) is a modality used in the management of patients with refractory cardiogenic shock or acute respiratory failure. During 2020, the world suffering from Covid 19 pandemic, so a number of cases and centers offering adult extracorporeal membrane oxygenation (ECMO) has risen. **Objective:** Analysis of our experience. **Methodology:** We rapidly develop and implement an organized ECMO program at King Khalid hospital as an Adhoc support. The program provided care for patients within the ICU from March 2020 till now. It started with preparing policies and strategies followed by training of a multidisciplinary team of doctors, nurses, RT specialists and perfusionists then starting the service with continuous training and improvement including workshops, hands-on training and lectures. Also, we had great support from the MOH ECMO team for training and supervision. Finally, we became an ELSO center being the 4th center in Saudi Arabia and designated this year as a silver-level center by ELSO. **Results:** Eighty-five patients were treated with venovenous and veno arterial ECMO with survival to decannulation of 75% and survival to intensive care unit discharge of 55%. All these patients are initiated and managed by our ECMO team; we have 20 cases of retrieval, in which we used air, ground, or both. Complications: included hemothorax in 6 patients, heparin-induced thrombocytopenia in three patients, oxygenator failure in 3 cases, oozing from cannulation sites in 10 cases, oral cavity bleeding in 4 cases, from tracheostomy site in another four and renal impairment or failure represented in 39% of cases. **Conclusion:** The results suggest that a rapidly developed ECMO program can provide safe services and provide outcomes similar to those in the existing literature. Key components are an institutional commitment,

a physician champion, dedicated leadership, a multidisciplinary team and organized training.

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Extracorporeal Membrane Oxygenation for Severe Viral Myocarditis: A Bridge to Recovery and Decision

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Introduction: Myocarditis is a rare complication of viral respiratory infections with very high short-term mortality. We report a previously healthy young patient who presented with severe, rapidly progressive viral myocarditis, which improved after five days of support with VA-ECMO without mechanical ventilation. **Case report:** A 48-year lady presented with fever and hypoxia with cardiogenic shock (LVEF 18–20%), for which she was initiated on inotropes and IABP support, despite which she had clinical and metabolic worsening. On presenting to us, she was in shock (Systolic BP 60 mmHg) on Norepinephrine at 0.2 ug/kg/min and Vasopressin at 1 U/hour. Echocardiography showed global hypokinesia (LVEF 10–12%). She had severe metabolic acidosis (pH 7.28, Lac 5.2, BE –11.6) with troponin-T of 1.65 ng/ml and BNP of 3240 pg/ml. Renal/hepatic functions were normal. A possible acute coronary event was ruled out with normal coronary angiography. In view of refractory shock, she was initiated on VA ECMO with left femoral vascular access under local anesthesia. After initiation of ECMO, norepinephrine was tapered to a target SBP of 90 mmHg. Gradual improvement in LVEF was noted to 45 % by the fifth day. ECMO support was gradually tapered and decannulation was done on day 6. She maintained normal blood pressure and oxygenation and was successfully discharged. **Discussion:** Severe viral myocarditis is associated with a fatality rate of 25% with a median of 9.9 days to spontaneous recovery. Mortality is due to refractory cardiogenic shock and multiorgan dysfunction and ECMO provides support during this period and prevents end organ damage. **Conclusions:** ECMO provides a valuable bridge to recovery in diseases with reversible myocardial dysfunction and allows time to recover before the onset of irreversible organ damage. Increasing awareness of the use of ECMO will enable more patients to receive this valuable treatment modality.

ECMO as a Lifesaving Modality in Near-Fatal Asthma, Najran Experience

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Introduction: The use of extracorporeal membrane oxygenation (ECMO) in cases of near-fatal asthma has increased, but the benefits

of this therapy have yet to be fully investigated. However, its use in severe asthma is limited to case reports or a case series. **Objective:** To analyze our experience implementing VV ECMO as a lifesaving modality in near-fatal asthma. **Methodology:** A retrospective study of near-fatal asthma patients who received VV ECMO in the emergency department, King Khalid hospital, Najran between 1st January 2022 and 1st December 2022. **Results:** In this study, we analyze five cases of patients with bronchial asthma who were presented to the emergency department with severe fatal asthma. Three patients presented with severe hypercapnia and severe respiratory acidosis and intubation was done in ER; two developed cardiac arrest while managing asthma. The time of arrest was between 2 and 4 min. While the other two patients were arrested in the emergency department and CPR was done, ROSC was obtained in 5 and 18 min, respectively. Vigorous asthma management in the form of muscle relaxant, sedation, PRVC ventilation and aggressive therapy for bronchial asthma was started for all five patients, but their condition was worsening, and no improvement was obtained. ECMO consultation was done in the emergency department and VV ECMO was started for those patients. Fem-jag configuration was used with gradual correction of hypercapnia, and normalization of ABG was obtained later with continuity of conventional asthma treatment. The mean time of the ECMO run was 128.3 hours. Four patients were extubated before ECMO decannulation while one patient decannulated while on a ventilator. Ventilator settings were significantly improved after ECMO initiation in all patients. Weaning of ECMO was successful in all five patients and four patients were discharged home. One patient with prolonged cardiac arrest before initiation developed irreversible brain damage and died later in ICU. **Conclusion:** ECMO is lifesaving in patients with severe fatal bronchial asthma for whom conventional therapy failed, and it is associated with a good outcome, however, bigger studies should be performed.

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Lifesaving Starts with BLS and Ends with ECPR

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Introduction: The incidence of unexpected cardiac arrest is high, in-hospital and out-of-hospital, respectively. ECPR is emerging as a modality to improve prognosis by augmenting perfusion to vital end-organs by utilizing extracorporeal membrane oxygenation (ECMO) during conventional CPR and stabilizing the patient. **Objective:** Case report analysis. **Methodology:** Case report of a patient who survived after 45 minutes of cardiac arrest with whom all modalities of life support were used in King Khalid hospital, Najran, Saudi Arabia. **Results:** 24 years old male developed cardiac arrest after choking while sitting with his friends. Immediately they started CPR using BLS protocol while the ambulance was called. The patient was transferred to a primary health care center where he was intubated and ACLS started while transporting him to our hospital. The patient was received in the emergency department after 15 min

with a systole. CPR was continued for another 10 min, during which he developed VT, to which DC shock was used twice. ROSC was obtained with instability in hemodynamics and severe hypotension in spite use of maximum inotropes. ECMO consultation was done, and VA ECMO was started within 30 minutes of ROSC. Patients' hemodynamics were improved in the next hours with gradual withdrawal of inotropes. After 24 hours, the patient was of inotropes, and full investigations were done, which revealed frequent PVCs, post-cardiac arrest stunning and moderate brain edema. Within the next three days, the patient's condition improved, ejection fraction was improved, brain edema subsided, and he regained full consciousness. Extubation was done and on the fourth day and a day later, the patient was decannulated. The patient was discharged home on the 10th day in good general condition and referred to EPS clinic for follow-up. **Conclusion:** ECPR can improve survival and decrease hospital mortality, but this should be preceded by good CPR started from BLS and ACLS.

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Incidence and Outcome of Neurological Complications in H1N1 Respiratory Failure Patients on ECMO: A Retrospective Study

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Introduction: H1N1 respiratory failure is a severe condition that can lead to acute respiratory distress syndrome (ARDS). Extracorporeal membrane oxygenation (ECMO) is a life-saving therapy for patients with severe ARDS. However, ECMO can also cause neurological complications, impacting patient outcomes. Respiratory extracorporeal membrane oxygenation (ECMO) is well established, and its popularity has increased during the coronavirus disease 2019 (COVID-19) time. The efficacy of ECMO has been proved in refractory respiratory failure with varied etiology. More than 85,000 respiratory ECMO cases (neonatal, pediatric, adult) registered as per Extracorporeal Life support Organization (ELSO) statistics April 2022 report, with survived to discharge or transfer ranging from 58 to 73%. Early initiation of ECMO is usually associated with shorter ECMO runs and better outcomes. Many patient factors have been associated with mortality while on ECMO. **Objective:** The aim of this study is to investigate the incidence and types of neurological complications in H1N1 respiratory failure patients receiving ECMO and to evaluate the impact of these complications on patient outcomes. **Methodology:** We conducted a retrospective chart review of all H1N1 respiratory failure patients who received ECMO at our institution between January 2010 and December 2021. Patients with pre-existing neurological conditions were excluded from the study. We collected data on patient demographics, comorbidities, ECMO parameters, and neurological complications. We also evaluated the impact of neurological complications on patient outcomes, including mortality, length

of stay, and functional status at discharge. The primary outcome goal was a survivor and discharged home versus non-survivor, while the secondary goal was the number of ECMO days and incidence of neurological complications. The statistical analysis was done for the primary outcome, and incidences of neurological complications and the p-value were obtained using the chi-squared method. **Results:** A total of 256 patients with respiratory failure were treated with ECMO during the specified period by the Riddhi Vinayak Multispecialty Hospital ECMO team. Data analysis of 251 patients (5 patients were transferred for a lung transplant, hence not included in the study) was done. Out of which 36 patients were from H1N1 respiratory failure cases, out of which nine patients had neurological complications. As anticipated, neurological complications were relatively common in H1N1 respiratory failure patients receiving ECMO. As also expected, these complications had a negative impact on patient outcomes, including increased mortality, longer length of stay, and worse functional status at discharge. **Conclusion:** This study provides important insights into the incidence and impact of neurological complications in H1N1 respiratory failure patients receiving ECMO. Healthcare providers should be aware of these complications and implement strategies to minimize their occurrence. Further studies are needed to identify effective prevention and treatment strategies for ECMO-related neurological complications in H1N1 respiratory failure patients. Authors recommend early initiation of ECMO for mortality and morbidity benefits.

ECMO as a Life Saving Modality in Near Fatal Asthma, Najran Experience

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Introduction: The use of extracorporeal membrane oxygenation (ECMO) in cases of near-fatal asthma has increased, but the benefits of this therapy have yet to be fully investigated. (1) However, its use in severe asthma is limited to case reports or a case series. **Objective:** To analyze our experience of implementing VV ECMO as a life saving modality in near fatal asthma. **Methodology:** A retrospective study of near fatal asthma patients received VV ECMO in emergency department, King Khalid hospital, Najran between 1st January 2022 and 1st December 2022. **Results:** In this study we analyze five cases of patients of bronchial asthma were presented to emergency department in severe fatal asthma. Three patients were presented with severe hypercapnia and severe respiratory acidosis and intubation was done in ER, two of them developed cardiac arrest during their management of asthma. time of arrest was between 2 and 4 min. While other 2 patients were brought arrested to the emergency department and CPR was done for them ROSC was obtained in 5 and 18 min respectively. Vigorous asthma management in the form of muscle relaxant, sedation, PRVC ventilation and aggressive therapy for bronchial asthma was started for all 5 patients, but their condition was worsening, and no improvement obtained. ECMO consultation was done in emergency department and VV ECMO was started for those patients. Fem-jag configuration was used with gradual correction gradual correction of hypercapnia, normalization of ABG obtained later with continuity of conventional asthma treatment. Mean time of ECMO run was 128.3 hours. 4 patients extubated before ECMO decannulation while one patient decannulated while on ventilator. Ventilator settings were significantly improved after ECMO initiation in all patients.

Weaning of ECMO was successful in all 5 patients and 4 patients were discharged home. One patient with prolonged cardiac arrest before initiation developed irreversible brain damage and died later in ICU. **Conclusion:** ECMO a life saving in patients with severe fatal bronchial asthma whom conventional therapy failed, and it is associated with good outcome, however bigger studies should be performed.

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Life Saving Starts with BLS and Ends with ECPR

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Introduction: The incidence of unexpected cardiac arrest is high, with in-hospital and out-of-hospital respectively. (ECPR) is emerging as a modality to improve prognosis by augmenting perfusion to vital end-organs by utilizing extracorporeal membrane oxygenation (ECMO) during conventional CPR and stabilizing the patient. **Objective:** Case report analysis. **Methodology:** Case report of a one patient survived after 45 minutes of cardiac arrest with whom all modalities of life support were used in King Khalid hospital, Najran, Saudi Arabia. **Results:** 24 years old male developed cardiac arrest after choking while sitting with his friends. Immediately they started CPR using BLS protocol while ambulance was called. Patient was transferred to primary health care center in which he was intubated and ACLS started while transporting the patient to our hospital. Patient received in emergency department after 15 min with a systole. CPR was continued for another 10 min in which he developed VT to which DC shock was used twice then ROSC was obtained with instability in hemodynamics and severe hypotension in spite use of maximum inotropes. ECMO consultation was done, and VA ECMO was started within 30 minutes of ROSC. Patients hemodynamics were improved in the next hours with gradual withdrawal of inotropes. After 24 hours patient was off inotropes, full investigations were done which revealed frequent PVCs, post cardiac arrest stunning and moderate brain oedema. Within the next 3 days, patient condition was improved, ejection fraction was improved, brain oedema subsided and he regained full consciousness. Extubation was done and on the fourth day and day later patient was decannulated. Patient was discharged home in the 10th day with good general condition and referred to EPS clinic for follow up. **Conclusion:** ECPR can improve survival and decrease hospital mortality, but this should be preceded by good CPR started from BLS and ACLS.

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Rapid Establishment of ECMO Program During the COVID-19 Pandemic

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Introduction: Extracorporeal membrane oxygenation (ECMO) is modality used in the management of patients with refractory cardiogenic shock or acute respiratory failure. During 2020, the world suffers from Covid 19 pandemic so number of cases and centers offering adult extracorporeal membrane oxygenation (ECMO) has risen. **Objective:** Analysis of our experience. **Methodology:** We rapidly develop and implement an organized ECMO program at King Khalid hospital as an adhoc support. The program provided care for patients within the ICU from March 2020 till now. It started with preparing policies and strategies followed by training of multidisciplinary team of doctors, nurses, RT specialists and perfusionist then starting the service with continuous training and improvement including workshops, hands on training and lectures. Also, we had a great support from MOH ECMO team for training and supervision. Finally, we became an ELSO center being the 4th center in Saudi Arabia and designated this year as a silver level center by ELSO. **Results:** 85 patients were treated with both veno-venous and veno arterial ECMO with a survival to decannulation of 75% and survival to intensive care unit discharge of 55%. All these patients are initiated and managed by our ECMO team, we have 20 cases of retrieval, in which we used air, ground or both. Complications: included hemothorax in 6 patients, heparin induced thrombocytopenia in three patients, oxygenator failure in 3 cases, oozing from cannulation sites in 10 cases, oral cavity bleeding in 4 cases, from tracheostomy site in another four and renal impairment or failure represented in 39% of cases. **Conclusion:** The results suggest that a rapidly developed ECMO program can provide safe services and provide outcomes similar to those in the existing literature. Key components are an institutional commitment, a physician champion, dedicated leadership, multidisciplinary team and organized training.

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Never Lose Hope, The Battle Will Be Won: Two Consecutive Runs of Venovenous ECMO in a Young Female with Severe COVID-19 ARDS

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We report case of 31 years old previously healthy lady, referred to our tertiary care center with severe covid 19 infection and rapidly progressive respiratory failure. Despite adequate mechanical ventilation, she kept on deteriorating (PF RATIO 55, PCO₂ 60), VV ECMO was initiated with 19th F right IJV – return cannula and 25 F right femoral - drainage cannula. Initiation and first month of ECMO run were smooth. In the 2nd month, she developed prolonged ECMO run complications like hospital-acquired multidrug-resistant pneumonia and bacteremia (*Acinetobacter*, *Stenotrophomonas maltophilia*), managed by higher antibiotics. Minimal cannula site and peri tracheostomy oozing occurred, managed with compressive dressings and reduction in ACT targets. Gradually she was generating around 300 ml Tidal volume with satisfactory ABGs on minimal ECMO support (flow - 1.5-liter, SWEEP gas - 1 liter). On 54th day, after a successful 24-hour trial off, she was decannulated. Unfortunately, next day she become tachypneic, hypoxic, and ABG suggestive of hypercarbia of 110, a PF ratio of 60 on the control mode of ventilation. After expert ECMO stalwart opinion, VV ECMO was reintroduced. During 2nd run, we faced difficult challenges like critical illness neuropathy, managed with IVIG and ECMO circuit-related hemolysis, managed with multiple blood transfusions, and changed of entire circuit with its components. On 22nd day, ECMO was gradually weaned off. Finally, patient was discharged on 130th day of hospital stay with big smile on her face with minimal O₂ support. We conclude case of two consecutive runs of VV ECMO and the complications dealt with a long-run ECMO.