

Role of Extracorporeal membrane oxygenation (ECMO) in covid patients, its bleeding Complications. Associations with Retroperitoneal haematoma

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Abstract:

Summary: ECMO is the form of extracorporeal life support (ECMO- Extra corporeal membrane oxygenation) that combines therapies to reduce the amount of ventilation required with mechanical ventilators. It is a direct extension from cardiopulmonary bypass and heart lung machines, and includes other devices such as dialysis, continuous hemofiltration and ventricular assist devices. Common side effects of ECMO include 20-30% Bleeding/haematoma, tenderness and guarding in abdomen and drop in hemoglobin. Five COVID patients on ECMO were followed up prospectively with regular vitals and lab parameters monitoring, drugs requirements with ECMO, screening with ultrasound, CT scan of chest, abdomen and need for intervention/evacuation of haematoma versus those who do not need it. Survey was done for approximately 100 days. Five COVID patients on ECMO were followed up prospectively with regular vitals and lab parameters monitoring, drugs requirements with ECMO, screening with ultrasound, CT scan of chest, abdomen and need for intervention/evacuation of haematoma versus those who do not need it. Survey was done for approximately 100 days. ECMO is a lifesaving alternative to mechanical ventilators for COVID patients, but there is no evidence that it leads to a better outcome than conventional therapy. The most important components of ECMO are the tubing/pipes, the blood pump, and the connections and divisions. Regular monitoring of hemoglobin, ACT, APTT, sweep gas, FiO₂ and platelet count is required, and in case of heparin resistance/HIT switch to BIVALIRUDIN or AGRATROBAN should be made earliest. Evacuation of Haematoma is required if the size is increasing, and if there is drop in hemoglobin or active bleed, embolise the bleeder and transfusions should be done.

Keywords: ECMO, ILD, Retro-peritoneal Hematoma, COVID, ARDS

Case Description:

Case no-1: A covid patient with ARDS (acute respiratory distress syndrome) and cardiac arrest – was put on VAV ECMO (Veno veno arterial Extra corporeal membrane oxygenation) on 18/5, patient was stabilized. Soon after that decannulation was done on 14/7. He developed femoral artery pseudoaneurysm with right inguinal region hematoma. exploration was done and saphenous vein interposition graft was placed between common femoral and superficial femoral artery. Wound was found infected with morganella. Patient was discharged and again admitted.

Case no-2: A patient was having post covid and was on VV ECMO (Veno venous Extra corporeal membrane oxygenation) on day 49 of ECMO developed retroperitoneal hematoma with no active bleeding. Patient was stable, no intervention was done for him. Patient's lung condition significantly improved. Patient was discharged.

Case no-3: Covid patient with ARDS on VV ECMO on day 33 of ECMO developed left retroperitoneal hematoma, hematoma was progressively increasing in size so evacuation of hematoma was done. however, after 20 days again retroperitoneal, psoas and extraperitoneal hematoma developed, patient was explored, given massive blood transfusion, switched to VAV ECMO. patient died due to MODS, septic shock, CAPA and klebsiella bacteraemia.

Case no-4: Covid and ILD (Interstitial lung disease) patient on VV ECMO- developed multiple retroperitoneal hematoma on day 8 of ECMO. patient was intubated due to severe hypoxaemia, planned for lung transplant, but died before it could be done due to severe ARDS.

Case no-5: ILD patient awaiting lung transplant on VV ECMO- awaiting lung transplant developed hematoma in right psoas and right paracolic gutter on 10th day. No intervention was done. Patient was given blood transfusion and maintained on ECMO. patient was discharged post lung transplant.

Discussion:

In the present day Scenario of patient with severe COVID ARDS; Murray score worsening has stressed on the need of mechanical ventilation. ECMO is the form of extracorporeal life support [2]. It is not a treatment. It's a direct extension from cardiopulmonary bypass and heart lung machine used in cardiac surgery. It includes other devices such as dialysis, continuous hemofiltration and ventricular assist devices. ECMO is an alternative to mechanical ventilation (causing less damage to lungs with positive pressure). It combines therapies which removes carbon dioxide, to reduce amount of ventilation required with mechanical ventilators. The mixing of the gas and blood causes multiple disruptions to the blood homeostasis, the development of heparin/anticoagulation circumvented this obstacle.

There are three types of ECMO: VENO VENOUS ECMO, VENO ARTERIAL ECMO, VENO-VENO ARTERIAL ECMO. [1] In our hospital VA type is used. Requirements are trained Doctors and staffs. which include ECMO specialist, ECMO coordinator, ECMO director, perfusionist and transfer team.

The transfer team does the work of follow up CT, Ultrasound. For accessing to the theatres. Regular Testing and daily monitoring include CBC, ABGA, blood flow rate(L/min). pump motor speed (revolution /min) transmembrane gradient, APTT; ACT, Temperature, water bath cannula and Sweep gas flow rate (L/min) COMMON side effects of ECHMO: 20-30 percent Bleeding /haematoma. Alarming signs include – tenderness and guarding in abdomen and drop in hemoglobin.

The role of ECMO in covid patients. Its association with retroperitoneal Haematoma's /any haematoma, [4]and the interventions/treatment given to prevent them. [3] This case series involves five COVID patients on ECMO. They were followed up prospectively with regular vitals and lab parameters monitoring, drugs requirements with ECMO. Screening with ultrasound, CT scan of chest, abdomen (if retroperitoneal haematoma occurs) and need for intervention/evacuation of haematoma versus those who do not need it. Outcome and survival rate of ECMO. Survey was done for approximately 100 days.

When proven successful and reasonably affordable techniques including proning, neuromuscular blockade, and lung-protective breathing have been tried and failed, Silver Heinsen et al. advise that ECMO should be taken into consideration. In addition, they recommend using complex prediction models to support expert judgement and other initial algorithms. They also recommend hiring perfusionists as "ECMO specialists" and implementing a programme led by allied health workers and nurses to ambulate patients on VV ECMO. Lastly, it is suggested to use high-fidelity simulation programmes to promote cooperation and cut down on the time needed for ECMO administration.

Conclusion:

- ECMO is a lifesaving alternative to mechanical ventilators for COVID patients. However, there was no evidence in comparative studies that using ECMO led to the better outcome than the conventional therapy.
- Its association with haematoma is multifactorial, which include use of Heparin, mobilization during physiotherapy, and the intrinsic circuit itself. (Components of ECMO).
- The different type of component of ECMO which needs to be modified to decrease the chances of bleeding are as follows: The most important TUBING/PIPES: length should be short and they should be coated with biocompatible material and heparin and should be transparent. There should be side port for blood sampling. The blood pump: these days only centrifugal pump is used because it causes less haemolysis and requires less anticoagulation.
- Connections and divisions are areas of blood turbulence, increasing haemolysis and thrombus formation. Hence careful monitoring with multidisciplinary team is required.
- Regular monitoring of hemoglobin, ACT, APTT, sweep gas; FiO₂ and platelet count is required and to have regular imaging follow ups. In case of heparin resistance /HIIT switch to BIVALRUDIN or AGRATROBAN. Clinical suspicion should be made earliest.
- Evacuation of Haematoma is required if the size of Haematoma is increasing based on USG, CT Abdomen contrast follow ups. If there is drop in hemoglobin or active bleed than embolise the bleeder. [5] If no active bleed/ contrast extravasation- blood transfusions to patient should be done. Transient termination of heparin is required at that time.

Abbreviations and Acronyms

ARDS	Acute respiratory distress syndrome
ECMO	Extra corporeal membrane oxygenation
ILD	Interstitial lung disease
VVECMO	Veno venous Extra corporeal membrane oxygenation
VA ECMO	Veno arterial Extra corporeal membrane oxygenation
VAV ECMO	Veno veno arterial Extra corporeal membrane oxygenation

Conflict of Interest: NIL

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Figures

Figure 1- HRCT-Scan of chest in a Known case of Covid with ARDS on ECMO: Patient 1

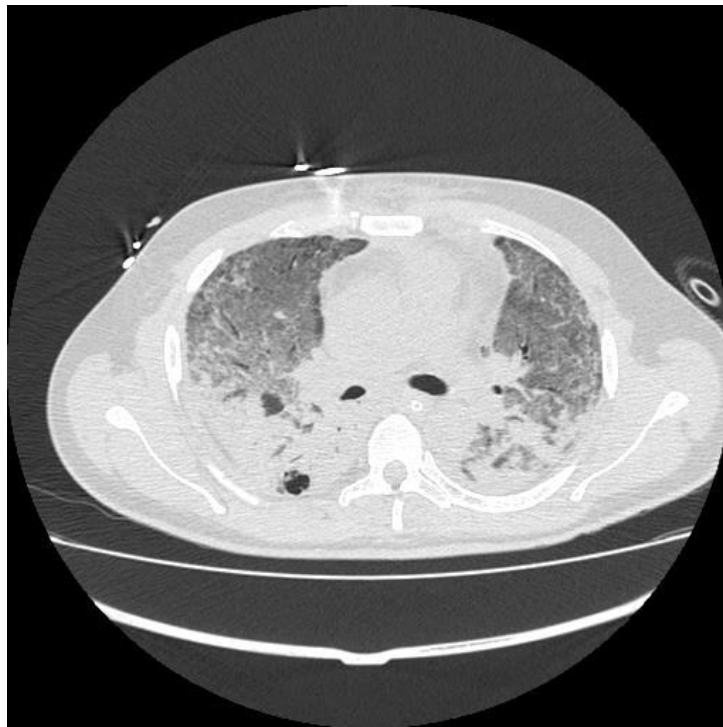


Figure 2- Showing right inguinal and pelvic region hematoma on CECT abdomen found to have femoral artery pseudoaneurysm at the site of cannulation

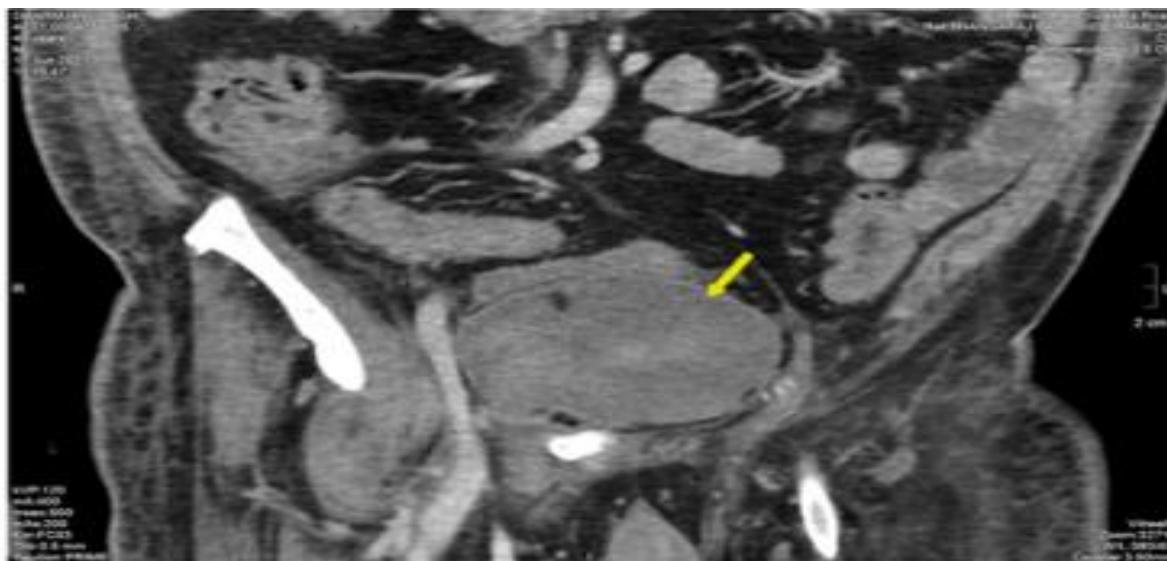


Figure 3- HRCT-Scan of chest in a Known case of Covid with ARDS on ECMO: Patient 2



Figure 4: Patient 2- developed Psoas and quadratus lumborum hematoma on 30th day ECMO



Figure 5: HRCT-Scan of chest in a Known case of Covid with ARDS on ECMO: Patient 3

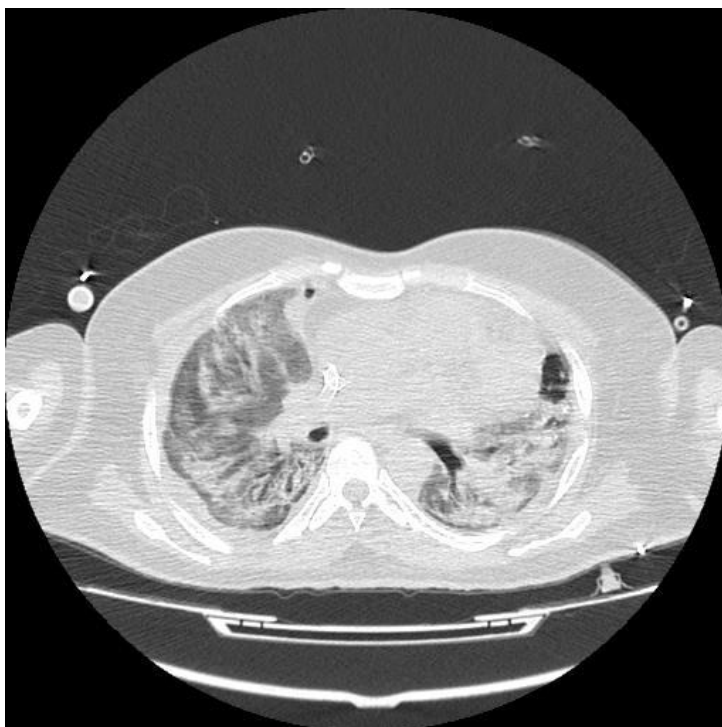


Figure 6: Patient-3 developed left retro-peritoneal hematoma and PSOAS hematoma on 33rd day of ECMO

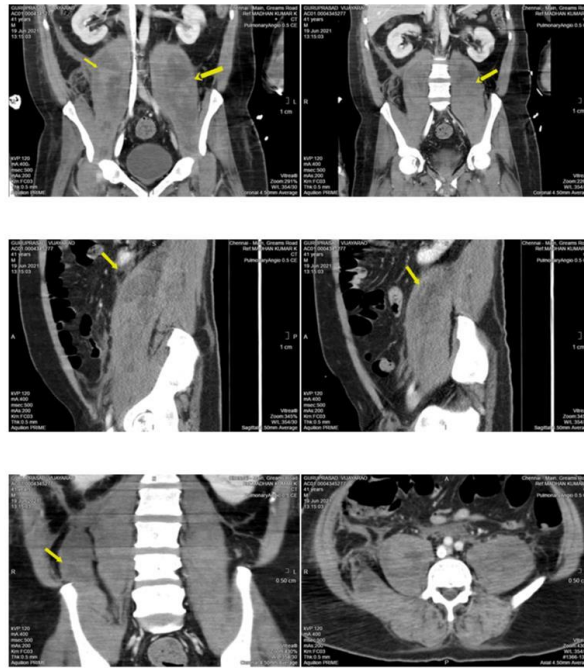


Figure 7: Patient-4 With worsening ARDS and pneumomediastinum.

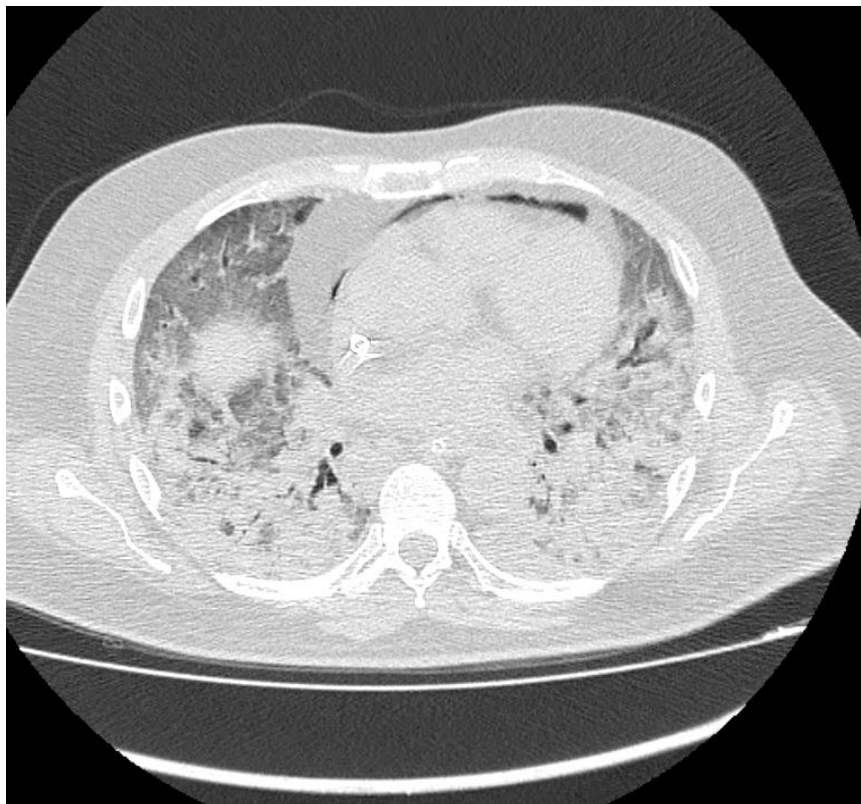


Figure 8: Patient 4- on ECMO developed multiple thickwalled collections in psoas, quadratus lumborum, with haemorrhage.

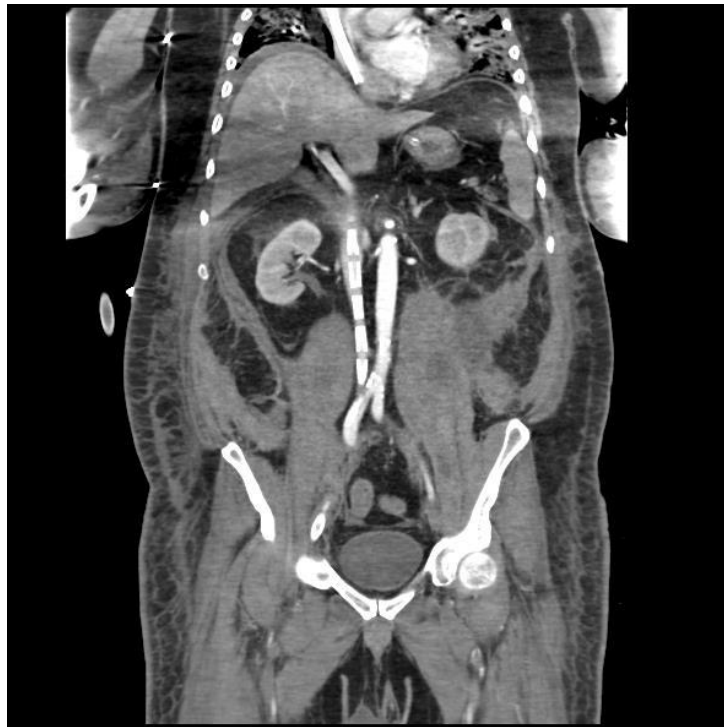


Figure 9: ILD patient -5 awaiting lung transplant on VV ECMO



Figure 10: Patient 5 developed right psoas and iliacus hematoma on the 10th day of ECMO

