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Case Report

Intrahospital Transport of a Critically Ill Patient on Extracorporeal Membrane Oxygenation Support with Severe Acute Respiratory Distress Syndrome due to COVID-19

COVID-19'a Bağlı Ağır Akut Solunum Sıkıntısı Sendromlu Ekstrakorporeal Membran Oksijenasyon Desteğindeki Kritik Bir Hastanın Hastane İçi Transferi

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ABSTRACT

Patients who do not respond to conventional mechanical ventilation (MV) support for respiratory failure due to the Coronavirus disease-19 may require the support of extracorporeal membrane oxygenation (ECMO). Intrahospital transportation of critically ill patients under MV and ECMO support carries potential risks that could be life-threatening. A structured process performed by a professional team plays a vital role in improving patient safety during transportation of the patient. In this presentation, we aim to share our experiences during the intrahospital transportation of a patient on ECMO support with appropriate equipment and a team of experienced personel.

Keywords: Extracorporeal membrane oxygenation, intrahospital transport, computed tomography scan, intensive care unit, Coronavirus disease-2019

ÖZ

Konvansiyonel mekanik ventilasyon (MV) desteğine yanıt vermeyen, Koronavirüs hastalığı-2019'a bağlı solunum yetmezliği olan hastalar, ekstrakorporeal membran oksijenasyonu (ECMO) desteğine ihtiyaç duyabilir. MV ve ECMO desteği altındaki kritik hastaların hastane içi nakli yaşamı tehdit eden birçok potansiyel riske sahiptir. Uygun ekipman ve deneyimli personelden oluşan bir ekip tarafından gerçekleştirilen yapılandırılmış bir süreç, hastanın nakli sırasında hasta güvenliğinin artırılmasında hayati bir rol oynar. Bu sunumda, ECMO desteğinde olan bir hastamızın hastane içi transportunda sırasındaki deneyimlerimizi paylaşmayı amaçladık.

Anahtar Kelimeler: Ekstrakorporeal membran oksijenasyonu, hastane içi nakil, bilgisayarlı tomografi taraması, yoğun bakım ünitesi, Koronavirüs hastalığı-2019

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INTRODUCTION

Extracorporeal life support treatment like extracorporeal membrane oxygenation (ECMO) is recommended for the treatment of patients with severe acute respiratory distress syndrome (ARDS) and Coronavirus disease-2019 (COVID-19) (1).

ARDS, related to COVID-19, may be a life-threatening problem in patients if it is not treated early and effectively. Therefore, salvage treatments such as ECMO come to mind for patients with severe ARDS induced by the COVID-19. ECMO still has a major role and is recommended in the treatment of COVID-19 related ARDS in intensive care units (ICUs) (1,2).

Intrahospital transport of critically ill patients with ECMO support from ICU to hospital facilities such as imaging (radiology and cardiac catheterization) units and operating room has many potential risks, including respiratory compromise, hemodynamic instability, equipment failure, and hypothermia, and it needs effective teamwork (3).

In particular, critically ill patients followed-up in the ICU especially those with ECMO support, should be transported by an experienced multidisciplinary team with a minimum risk.

In this presentation, we aim to share our experience of transporting a patient with ECMO support after being attached with COVID-19 to the radiological imaging unit (3).

CASE REPORT

A 43-year-old male patient who had no previous disease was admitted to our emergency department with the complaints of fever and cough. On admission, his computed tomography scan showed an appearance of bilateral ground glass suggestive of viral pneumonia, and started on prophylactic medication having hydroxychloroquine sulfate, azithromycin, and oseltamivir for five days. The first polymerase chain reaction (PCR) test from nasopharangeal swab was confirmed to be positive for severe acute respiratory syndrome caused by Coronavirus-2. By the second day of the treatment, as his condition worsened, he was intubated and was shifted to our ICU. Following the initiation of COVID therapy, the patient was taken to the prone position intermittently under high settings of mechanical ventilation (MV). Despite of all the treatments, the patient could not keep the saturation at a sufficient level, and CO_2 retention continued to increase. Despite the implementation of all treatment strategies with a P/F ratio <100, they were not sufficient to prevent the progression of severe ARDS due to the viral pneumonia.

On the 15th day of hospitalization, due to severe hypoxia and severe metabolic and respiratory acidosis, veno-venous ECMO was planned for the patient. Continuous renal replacement therapy was started on the patient, who developed an acute renal failure. Due to hemodynamic instability, inotropic support was started. He was sedated with midazolam and fentanyl.

Since the ECMO treatment applied to the patient was insufficient in healing the lungs, lung transplantation was indicated, and he had to be transferred to the radiology unit-1 floor below the ICU for detailed radiological imaging. The transport of the patient to the radiological unit lasted for 40 minutes.

On the 22nd day his control, PCR test was negative. In addition, second and third control PCR tests were negative.

We planned to transfer the patient with ECMO support to the radiology unit.

The patient was taken to the radiology unit in his ICU unit bed. The hall monitorization continued during transport (preferable oxygen saturation, electrocardiography, invasive arterial pressure, central venous pressure).

According to the routine protocols of our clinic, some rules to be followed during patient transport have been introduced, and a transfer checklist has been developed in line with these rules. Transport was done by specialized staffs like a perfusionist (ECMO coordinator and also team leader for the transport), intensive care specialist, an anesthesiologist, perfusionist, two specialized intensive care nurse, and personnel. According to this, the patient transport form is filled by the intensive care specialist doctor and nurse, and the necessary information for the patient transport is collected before the patient is transported to the radiology unit. The intensive care specialist doctor and nurse, together, made sure that the transport monitor, patient bed, mechanical ventilator, and other equipment are ready for transport and fill in the necessary places in the transfer form. Transport ventilator settings are adjusted by the intensive care doctor, ensuring that the patient is safely connected to the transport ventilator. The fixed monitor of the patient was used for the transfer. There was no interruption in the patient's monitoring. It was ensured that the infusion systems were operational (Figure 1).

The transport procedure of the patient lasted for 40 minutes with no complications. The patient was carried to the ICU safely. After arriving at the ICU, the control blood gas sample was normal. The patient's hemodynamics remained stable throughout the transport. There were no complications in the transport process, in the radiology unit, and the ICU.

Figure 1. Monitorization of the patient during transport. Full monitoring has continued during transport

After transport, the patient was taken to the ICU in a stable condition.

The patient's written informed consent was obtained for the publication of the case report (clinical details and images) concerning his family.

DISCUSSION

Intrahospital transport of critically ill patients, especially with ECMO support has many potential risks (4). In this report, we aimed to evaluate the problems we experienced during the transport and the precautions taken to minimize these problems and improve quality/safety of the transport with the benefit of protocols carried out in our clinic to provide patients with the least error by the multidisciplinary professional staff. According to our experience, structured multidisciplinary handover process for transfer of patient was associated with improved information transfer, reduced postoperative complications and errors, more consistent and thorough information exchange, and improved compliance with the process measures (e.g., efficiency in equipment and monitoring line transfer) with provider satisfaction.

Intrahospital transport of patients with ECMO is crucial. If necessary precautions are not taken, it may lead to fatal complications. There are a lot of risks that may lead to serious and lethal complications during the transfer of critically ill patients on ECMO, including MV, ECMO support with cannulas placed in the main blood vessels, and multiple infusion pumps that require multiple long tubes (5-7).

Despite all the precautions taken by the experienced team, the transport of all critically ill patients is a very risky process. Publications are reporting that the complication rate may reach up to 70% if the necessary precautions are not taken (8). The fact that critical patients have multiple system dysfunction and minor physiological changes leads to serious morbidity, and mortality increases the importance of the process.

Hemodynamic deterioration is one of the most common problems (9,10). Since these patients mostly consist of the patient group receiving MV support, respiratory problems (protrusion of the intubation tube, non-ventilation of the patient, lack of aeration due to plugs caused by the secretions, etc.) come to the first (8-12). In these patients, the fact that hemodynamic support treatments are not interrupted, and the immediate elimination of the technical problems that occur in providing this is one of the most important factors in reducing the complications (9-12). During our transport, we did not see any hemodynamic instability.

Apart from these, technical and equipment problems may also be observed during transport. Preservation of surgical drains, instruments, and lines used in the drug infusion, and monitoring lines, which are important in patient follow-up, and early detection and prevention of related complications require a careful and experienced transport team. We transported our patient with a portable transport ventilator. Before transport, our intensive care specialist has checked the ventilator settings, arranged them, and got ready for the patient. Respiratory events can also be seen during the intrahospital transports (13).

The intrahospital transport of critically ill patients is a very risky process despite all the precautions taken by the experienced team (14). First, with the developing technological and medical opportunities, the life expectancy of the patients with the chronic diseases has increased, and the rate of operation has increased. ICUs cannot meet this need due to the patient group with a low bed capacity and a long hospital stay. In the retrospective review we conducted in our clinic, with the effective use of postoperative ICUs, the operations of this risky patient group are performed without further complications and delay, and the waiting time for the operation in the hospital will be reduced (11-15).

Structured multidisciplinary handover process for transfer of the patients was associated with an improvement in information transfer, reduction in postoperative complications, and errors.

Implementation of a structured handover process is associated with an improvement in information transfer, a decrease in specific complications (16).

ETHICS

Informed Consent: The patient's written informed consent was obtained for the publication of the case report (clinical details and images) concerning his family.

Authorship Contributions

Surgical and Medical Practices: G.O.H., D.A., Concept: G.O.H., A.G.Z., C.K., B.I.E., D.A., Design: G.O.H., A.G.Z., C.K., B.I.E., D.A., Data Collection or Processing: G.O.H., A.G.Z., D.A., Analysis or Interpretation: G.O.H., D.A., Literature Search: G.O.H., A.G.Z., D.A., Writing: A.G.Z., D.A.

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