**University of
Zurich**^{UZH}

**Zurich Open Repository and
Archive**

University of Zurich
University Library
Strickhofstrasse 39
CH-8057 Zurich
www.zora.uzh.ch

Year: 2020

First report about a successful ECLS implantation and subsequent helicopter transfer of a super obese patient with a BMI of 78 kg/m²

Balcova, Jana ; Nagaraj, Naveen G ; Maggiorini, Marco ; Albrecht, Roland ; Wilhelm, Markus J ;
Maisano, Francesco ; Reser, Diana

Abstract: Our tertiary center provides 24/7 ECMO implantation and transport service nationwide. In 2018, 150 ECLS/ECMO were implanted, and 40 patients were transported on ECLS/ECMO. In this report, we describe a successful veno-arterial ECLS implantation in a super obese (BMI 78 kg/m²) 50-year-old female patient at a primary care hospital with subsequent helicopter transfer to our tertiary center.

DOI: <https://doi.org/10.1007/s11748-020-01358-7>

Posted at the Zurich Open Repository and Archive, University of Zurich

ZORA URL: <https://doi.org/10.5167/uzh-187925>

Journal Article

Accepted Version

Originally published at:

Balcova, Jana; Nagaraj, Naveen G; Maggiorini, Marco; Albrecht, Roland; Wilhelm, Markus J; Maisano, Francesco; Reser, Diana (2020). First report about a successful ECLS implantation and subsequent helicopter transfer of a super obese patient with a BMI of 78 kg/m². *General Thoracic and Cardiovascular Surgery*, 68(12):1506-1508.

DOI: <https://doi.org/10.1007/s11748-020-01358-7>

First report about a successful ECLS implantation and subsequent helicopter transfer of a super obese patient with a BMI of 78kg/m²

Authors:

- **Corresponding author:** Jana Balcova, MUDr., Resident, Departement Cardiac Surgery, University Hospital Zürich, Rämistrasse 100, 8091 Zürich, +41779229814, jana.balcova@usz.ch
- Naveen G. Nagaraj, Cardiotechnic, University Hospital Zurich, naveengaddehosur.nagaraj@usz.ch
- Marco Maggiorini, Prof. Dr.med., Chief of service, Departement of Cardiology, University Hospital Zurich, marco.maggiorini@usz.ch
- Roland Albrecht, Dr.med., Attending physician, Kantonsspital St.Gallen, roland.albrecht@kssg.ch
- Markus J. Wilhelm, Prof. Dr.med., Attending Cardiac Surgeon, Departement Cardiac Surgery, University Hospital Zurich, markus.wilhelm@usz.ch
- Francesco Maisano, Prof. Dr.med., Chief of Departement Cardiac Surgery, University Hospital Zurich, francesco.maisano@usz.ch
- Diana Reser, PD, Dr.med., Attending Cardiac Surgeon, Departement Cardiac Surgery, University Hospital Zurich, diana.reser@usz.ch

Article word count: 1525 (incl. title page, references)

Figures: 2

Abstract

Our tertiary center provides 24/7 ECMO implantation and transport service nationwide. In 2018, 150 ECLS/ECMO were implanted, and 40 patients were transported on ECLS/ECMO. In this report, we describe a successful veno-arterial ECLS implantation in a super obese (BMI 78 kg/m²) 50-year-old female patient at a primary care hospital with subsequent helicopter transfer to our tertiary center.

Introduction:

ECMO programs are limited to highly specialized tertiary centers. Therefore we have established a “hub and spoke” model for a national ECMO on call service: since primary care hospitals are not able to perform ECLS/ECMO implantation, our on call implant and transport service is able to reach the primary care hospitals quickly and provide safe transport back to our tertiary center. Several authors, including ourselves, have reported a very low on-transport mortality of patients transported on ECLS/ECMO, and a similar overall mortality compared to patients receiving an ECLS/ECMO at the ECMO center (1-4). We have established our 24/7 implantation/transport service seven years ago with annually increasing numbers (1). Here, we report the ECLS implantation and subsequent helicopter transport of the heaviest patient in our entire cohort.

Case presentation

A 50-year-old woman with massive progressive dyspnea was admitted to the emergency room of a peripheral hospital. She reported recurring fever of 40°C in the past 2 months, cough and a pre-syncope on the day of admission. For several months, she was unable to walk long distances and was super obese with a BMI of 78 kg/m² (height of 1.6m and weight of 200 kg) and arterial hypertension. She did not take any medication at home. At the time of admission,

blood pressure was 50/30mmHg, pulse rate 100/Min, and oxygen saturation 94% under 15L oxygen. Bedside echocardiography revealed a massive dilation of the right ventricle with D-Shaping. Since D-Dimers were positive, pulmonary embolism was suspected, for which a thrombolytic therapy was induced. A computer tomography could not be performed because of the massive weight of the patient. The patient rapidly developed cardiogenic shock due to acute right heart failure. Inotropic treatment was initiated but was unable to maintain stable hemodynamics despite high doses of catecholamines. Therefore, the primary care hospital contacted our center and requested va-ECLS as bridge to recovery. One hour after the initial request, our team reached the patient in the primary care hospital. Due to the BMI of 78kg/m², our team as well as the local team were preparing for special circumstances. It was decided to perform a cut-down in the OR with the aid of the local vascular surgeons because percutaneous cannulation would have been impossible due to the insufficient length of the puncture needles. Her excess abdominal and thigh tissue was secured with duct tape to ensure good exposure of her right groin (Figure 1A). After application of local anesthesia, a 15cm longitudinal incision was performed in the right groin. The femoral vessels could be nicely exposed. Cannulation was performed with Seldinger technique. A 25F venous cannula was inserted in the common femoral vein and its tip placed in the right atrium with the aid of transthoracic echocardiography. A 19F cannula was placed in the common femoral artery and a 8F cannula into the superficial femoral artery for distal limb perfusion. The wound was closed and the cannulas attached safely to the patient using sutures and silicone pads to avoid displacement during transport (Figure 1B). After connecting the cannulas with the ECLS tubing, a sufficient ECLS flow of 5 liters could be established with subsequent reduction of catecholamines.

After the first challenge, the successful implantation of the ECLS, the second challenge had to be faced: transporting the patient to our tertiary center. The patient was transferred to the helicopter stretcher with the aid of ten people. Loading into the helicopter and the flight were

uneventful. The patient arrived safely at our tertiary center after a flight of 15 minutes (Figure 2).

Following admission to the intensive care unit, ultrasound revealed an acute thrombosis of the left popliteal vein as suspected origin of the pulmonary embolism. Due to the anticoagulation under ECLS (unfractionated heparin with an activating clotting time between 150 and 180 seconds) occasional epistaxis and hemoptysis occurred which could be managed conservatively. After an episode of a peracute oxygen desaturation during mobilization in the ICU, respiratory function worsened without recovery (low pO₂ and high pCO₂). Therefore, the ECLS was upgraded to a veno-venous/arterial ECLS/ECMO on day 8. Downgrade to veno-venous ECMO could be performed 3 days later after TTE confirmed a good right heart function, followed by veno-venous ECMO explantation after two more weeks after full respiratory recovery. The anticoagulation regime was then changed in accordance with the guidelines to oral anticoagulants (warfarin). The groin wound was treated with negative pressure wound therapy to avoid infection. One month after admission, the hemodynamically stable patient was discharged from the intensive care unit and transferred back to the primary care hospital. After another 42 days and completion of the negative pressure wound therapy on the normal ward, the patient was discharged to a rehabilitation facility.

Discussion and Conclusion

This is the first report of a helicopter transport of a super obese patient with a BMI of 78 kg/m² on ECLS.

In Switzerland, the Swiss air rescue service “REGA” provides the fastest, safest and most frequent transport and rescue of patients throughout the country. They can reach every location within 15 minutes, which makes aircrafts redundant. Usually big military helicopters

have to be used for heavy weight transport because the standard helicopter transfer allows a maximal patient weight of 150kg only. Therefore, the “REGA” has developed a heavy goods transport helicopter with a maximum of 400kg patient weight.

The key points for a successful transport are the planning and the performance of the implant, which could ultimately be performed safely according to our internal Standard Operation Procedure protocol for patient transports on ECLS/ECMO. We usually implant percutaneously but we have adopted a no-compromise policy to perform a cut down in obese patients to avoid lesions of the groin vessels due to failed puncture. Our experience shows that the transport is the least challenging part because it is performed by an expert team of the REGA (1). The only complications during this patient’s course on ECLS were occasional bleeding incidences, such as epistaxis and hemoptysis.

There is only one report about transport of morbidly and super obese patients on ECLS/ECMO (5). As shown in this study, obesity was not a risk factor for in-hospital mortality, independently from its degree. All super obese patients could be weaned from ECLS/ECMO, five patients survived to hospital discharge.

According to the literature and the experience of many surgeons, extreme obesity is often considered a contraindication for ECLS implant. We believe that this case report shows that surgeons should not fear to implant an ECLS in patients with this huge size, because it can be performed safely by experienced staff of a specialized center. We would like to show the community that these patients can be saved with good outcomes and they should not be precluded from ECLS implant and transport, because that might be their only chance for survival.

Keywords: extracorporeal membrane oxygenation, super obesity, helicopter transfer

Conflict of interest statement and source of funding: No financial support and no other potential conflict of interest relevant to this article was reported.

References

1. Wilhelm, Markus J., Inderbitzin DT, Reser D, et al. "Outcome of inter-hospital transfer of patients on extracorporeal membrane oxygenation in Switzerland." *Swiss medical weekly* 149.1516 (2019).
2. Broman LM, Frenckner B. Transportation of Critically Ill Patients on Extracorporeal Membrane Oxygenation. *Front Pediatr.* 2016;4:63. doi:. <http://dx.doi.org/10.3389/fped.2016.00063> PubMed
3. Biscotti M, Agerstrand C, Abrams D, Ginsburg M, Sonett J, Mongero L, et al. One Hundred Transports on Extracorporeal Support to an Extracorporeal Membrane Oxygenation Center. *Ann Thorac Surg.* 2015;100(1):34–9, discussion 39–40. doi:. <http://dx.doi.org/10.1016/j.athoracsur.2015.02.037> PubMed
4. Bryner B, Cooley E, Copenhaver W, Brierley K, Teman N, Landis D, et al. Two decades' experience with interfacility transport on extracorporeal membrane oxygenation. *Ann Thorac Surg.* 2014;98(4):1363–70. doi:. <http://dx.doi.org/10.1016/j.athoracsur.2014.06.025> PubMed
5. Salna, Michael, et al. "Morbid obesity is not a contraindication to transport on extracorporeal support." *European Journal of Cardio-Thoracic Surgery* 53.4 (2018): 793-798.

Figure 1A: Preop setting: the excess abdominal tissue is secured with duct tape to allow exposure of the right groin. 1B: Postop setting: femoro-femoral ECLS in the right groin: arterial cannula with distal perfusion on the left, venous cannula on the right

Figure 2: Transporting the patient to the ICU of our tertiary center after the helicopter flight with our perfusionist carrying the mobile ECLS