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Morbidly obese with severe ARDS: ECMO or no ECMO?

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Background: Obesity, defined according to body mass index ($BMI > 30 \text{ kg/m}^2$), is an increasing problem in the world's population. The proportion of extremely obese patients ($BMI > 40 \text{ kg/m}^2$) in intensive care units varies between 2.8 and 6.8%.¹ A BMI higher than 40 kg/m^2 seems to be associated with an increased risk of developing acute respiratory distress syndrome (ARDS) along with greater morbidity, length of stay, and duration of mechanical ventilation in the intensive care unit (ICU).² The use of veno-venous extracorporeal membrane oxygenation (ECMO) has reemerged as an option for acute respiratory distress syndrome (ARDS) refractory to conventional support.³ In addition to cannulation difficulty, morbid obesity can pose a significant challenge to obtaining sufficient circuit flow, indexed to either weight or body surface area (BSA), required to sustain lung rest and recovery.⁴ Owing to this hypothetical obstacle, there remains significant hesitancy in many centers to offer ECMO support to this patient population. However, Zachary N and his colleague in 2015 proved the efficacy of veno-venous ECMO in this patient population.⁵

Methods: In King Fahd Jeddah ECMO center, Patients requiring ECMO for ARDS between April 2014 and May 2016 were reviewed retrospectively with institutional review board approval. Demographics, ECMO variables, and outcomes were assessed.

Obesity, morbid obesity, and super obesity were defined as a body mass index (BMI) greater than 30 kg/m^2 , greater than 40 kg/m^2 , and greater than 50 kg/m^2 , respectively.

Results: Forty-nine patients (36M/13F) with ARDS were placed on ECMO during the study period. Fifteen were obese with a BMI of 32.7 kg/m^2 (interquartile range [IQR]: $31.6 - 34.9 \text{ kg/m}^2$). Four were morbidly obese with a BMI of 46 kg/m^2 (IQR: $43.5 - 48.5 \text{ kg/m}^2$). Nine were super morbidly obese with a BMI of 59 kg/m^2 (IQR: $54.5 - 69.5 \text{ kg/m}^2$). Pre-ECMO

mechanical ventilator support and indices of disease severity were similar between the three groups, as were the cannulation strategy and the duration of ECMO support. The 90-day survival rate was 71% (20/28) in patients with a BMI more than 30 kg/m² compared with 42% (9/21) in the non-obese group. Subgroup analysis showed improved survival in morbidly obese patients as 75% (3/4), and super morbidly obese patients as 88.8% (8/9). There were four bleeding complications, two in each morbidly and super morbidly obese group.

Conclusions: ECMO in obese patients is feasible and life-saving. Therefore, a percutaneous cannulation remains feasible. The goals of the ECMO therapy include early spontaneous breathing, tracheotomy, rapid reduction of sedation, and adequate analgesia.

Keywords: morbid obesity, ARDS, veno-venous ECMO support, hypoxemia during VV ECMO

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