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Extracorporeal membrane oxygenation (ECMO) in patients with hypoplastic left heart syndrome: a retrospective cohort study

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INTRODUCTION: Extracorporeal membrane oxygenation (ECMO) has been used with increasing frequency to support pediatric patients after repair or palliation of congenital heart disease. 10-12% of the newborns undergoing Norwood procedure require advanced circulatory support. The purpose of this study was to report our experience with functional single ventricle patients who were supported by ECMO after Norwood surgery.

METHODS: In this retrospective cohort study, we enrolled patients with hypoplastic left heart syndrome (HLHS) who required ECMO support after a Norwood operation between July 2015 and June 2018. We evaluated demographic variables (age, weight, sex, presence of aortic atresia, presence of mitral atresia, ascending aorta diameter, and atrial septal defect diameter) and ECMO-related variables (local of ECMO initiation, indication and time under support). Then, findings were compared between survivors and nonsurvivors.

RESULTS: A total of 21 patients were included in the present study. The median age of patients was 4 days (range, 2-69), the median weight was 3000g (range, 2600-3800), and 52.4% of patients were male. Aortic atresia was present in 52.4% of patients while mitral atresia in 47.6%. For 19% of patients, ECMO was initiated in the operation room (OR); for all other patients, in the intensive care unit (ICU). Indications for ECMO installation included cardiac arrest (57.1%), low cardiac output state (LCOS) (38.1%) and arrhythmia (4.8%). The median time under ECMO support was 8 days (range, 3-44) and the median follow-up time was 35 days (range, 4-917). Overall survival during the follow-up time of the study was 31.3% and none of the independent variables related to patients' demographics differed between survivors and nonsurvivors. All patients submitted to ECMO support above 9 days died and the survival rate for patients submitted to ECMO due to cardiac arrest (CA) was 12.5%, while it reached 53.3% for those undergoing ECMO for other reasons than CA (Log-rank test, $p=0.05$).

CONCLUSION: Although ECMO has been increasingly used to support patients with HLHS after stage 1 palliation, the mortality associated with the procedure is still high. Early identification and management of LCOS, before it progresses to cardiac arrest might reduce the mortality until hospital discharge.