

## ECMO in children post cardiac surgery-opportunity for redress

To the Editor,

As more complex surgery for congenital heart disease (CHD) is being performed at many centers worldwide and mechanical circulatory support for pediatric patients has become more readily available, there has been a marked increase in extracorporeal membrane oxygenation (ECMO) use for cardiac support after surgical repair (1). Excluding myocardial failure from cardiomyopathy, the major indications for ECMO are extracorporeal CPR, low cardiac output syndrome (LCOS), desaturation despite maximal inotropic and respiratory support, and failure to separate from CPB. While mortality rates of children on ECMO understandably remain high, in critically ill post-operative patients with complex CHD, ECMO allows for a thorough evaluation of surgical repair, searching for residual lesions or suboptimal outcome causing adverse hemodynamic impact, and detection of significant lesions preoperatively undiagnosed (2-5). Unfortunately, the diagnostic role of echocardiography in patients on ECMO is very limited because of minimal pulsatility of the ventricle, presence of large cannula, and poor echocardiographic windows (6). Currently, cardiac catheterization remains the principal diagnostic modality (7, 8). Detecting these lesions provides the opportunity to address them through surgical revision or increasingly through interventional techniques, raising the chances for successful weaning and eventual survival to hospital discharge. If one were to argue the place of the high cost and technology-intensive intervention of ECMO in a relatively resource-strained healthcare environment, this would be an area where it is most beneficial. Aggarwal et al. (6) reported an incidence of 28% for hemodynamically significant lesions requiring re-operation or re-intervention in post-pediatric cardiac surgery patients receiving ECMO support, with most of them having LCOS as indication. In an earlier study by Charturvedi (7), the incidence was reported as 15%, although the study patients included only those with two-ventricle circulation.

Despite the significant challenges of catheterization in pediatric patients on ECMO due to procedural complexity, ongoing anticoagulation, and the presence of large cannulae in situ, published series have shown that the procedure can be safely performed with a low risk of complications while providing new information that significantly impacts management strategy (6, 8, 9). The emphasis initially has been on surgical revision to address these residual lesions, but with increasing experience and reported safety, interventional procedures such as stenting of stenosed vessels and outflow tracts have increasingly become integral to catheterization (8-10).

In this issue, Güzeltaş et al. (11) retrospectively reported their

experience of performing cardiac catheterization in 16 patients who were on ECMO post cardiac surgery over nearly 5 years. Interventional procedures were performed in eight patients. Four patients proceeded to undergo surgical revision following diagnostic catheterization, and one other patient underwent surgery after presumably an unsuccessful interventional procedure. All five patients were successfully weaned off ECMO.

The interventional procedures in the eight patients were stenting of branch pulmonary arteries, RVOT, and modified Blalock-Taussig and balloon angioplasty of pulmonary arteries. Four patients received combinations of two of the above procedures.

There were no major complications, and remarkably, 12 patients (75%) were successfully weaned off ECMO, although two did not survive to discharge. However, three of the patients who received interventional procedures did not survive. Unfortunately, details of diagnosis, procedure, and days on ECMO before catheterization are not available. The wide range of ECMO on days before procedure (1–11 days) indicate that some of the procedures were performed too late or that they were unsuccessful, leading to continued deterioration and death.

This is a welcome contribution to the literature, especially one coming from a large-volume nonwestern institution, affirming that cardiac catheterization including interventions can be safely performed with low procedural complications, leading to improved overall outcome. More experience and performing catheterization and interventions within the first 2–3 days of ECMO would further improve successful weaning and survival.

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