EDITORIAL COMMENT

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Post-cardiotomy ECMO: time for hope or time for despair?

Post-cardiotomy Low Cardiac Output Syndrome (LOCS) is a very severe life threatening situation that is responsible for a significant portion of cardiac surgery mortality, not to mention morbidity. It is defined by a reduced cardiac output that is not sufficient to offer enough oxygenation and ventilation to the tissues. It is estimated to happen in 1 -10%% of cardiac surgeries, and also consumes very significant clinical resources. With standard medical therapy, estimated mortality of LCOS ranges from 2% to historically higher values of 38% in the most severe patients. In the cases of LOCS which are refractory to medical therapy and aortic counterpulsation balloon (IABP), Extra Corporeal Membrane Oxygenation (ECMO) is one of the final therapeutic options. We know from personal experience that mortality in theses patients, in the absence of ECMO, exceeeds 90% of cases. So, an obvious need for further mechanical support exists.

In this number of Revista Portuguesa de Cirurgia Cardiotorácica e Vascular, we offer two different Portuguese experiences of patients treated with ECMO in the setting of Post cardiotomy refractory LCOS. Gouveia et al. document their experience at Centro Hospitalar Universitário de São João, in Porto, which was started in 2007, but due to initial disappoiting results, was abandoned up until more recently. This Hospital Center is renowned for it´s extensive use of non post-cardiotomy ECMO, and post-cardiac surgery patients have reaped some of the benefits of non surgical ECMO patients. After bleeding is controlled post surgery, the patients are transferred to a general ICU were ECMO is carried out until decannulation, more prolonged mechanical assistance, or death. Survival to discharge was 38,5% and one year survival was 25%, in patients unable to be weaned from cardiopulmonary bypass and who would have died a few hours after the index surgery.

We can also read Silva *et al.*'s experience, who publish their results with post-cardiotomy ECMO patients in Hospital de Santa Marta, Centro Hospitalar Universitário Lisboa Central. This experience also shows satisfactory results, with a survival to discharge of 18% in adult patients. In this study, cannulation was more often central, and bleeding occurred in 45% of patients. No lower limb ischemia was documented. Survival to discharge and at one year was 18% in adult patients.

So, are post-cardiotomy ECMO outcomes dismal, bad, acceptable, or a reason to keep hoping and fighting for better? Should we forget about this technique, or keep using it and improving it? We know that contemporary results, when compared to historical ones, show that survival to discharge after post-cardiotomy ECMO has not inproved, but the answer to this less than joyful finding is that we keep operating on sicker and sicker patients, and results of refractory LOCS patients who didn´t receive ECMO are known to all.

ECMO has also undergone technical refinings in the last 11 years, that are nothing short of a revolution; this has been obtained through a constant effort of monitoring, improvement, and education from professional societies such as ELSO and medical professionals.

In the specific case of post-cardiotomy ECMO patients, vascular access depends on the operator´s choice. On one hand post-sternotomy patients have a previous central vascular access, but bleeding and infection may complicate recovery. On the other, peripheral arterial disease is a common comorbidity of cardiac patients, and lower limb ischemia is a fearsome complication. Antegrade femural perfusion may help diminish lower limb ischemia but it is not always straightforward to obtain, and appropriate thin cannulas may not be readily available.

Starting a post-cardiotomy ECMO program is always beset with difficulties and frequently initial results are dispiriting. We should remember that any patient with refractory LCOS will probably not survive more than a few hours, and also remember that putative ECMO patients who end up not receiving this therapy and end up not surviving would at least have had a chance, even if it is a 10

or 20% chance. We should all continue striving for better, even if survival to discharge is lower than we wished, since the alternative, not fighting for refractory LCOS patients, means death. These usual initial experiences will in the future undoubtedly give way to better results, since there is a lot of room for improvement in the acute mechanical support field. Further ways to improve results are related to a definite choice between cannulation placement (central or peripheral), ways to deal with lower limb ischemia (determining, in the acute setting, if any femural artery is better suited for large-bore cannulation), using antegrade perfusion of lower limbs in a timely and safe fashion, and utilizing vascular access automatic suturing devices to prevent groin hematoma. Another situation that could definitely be improved is the left ventricle unloading strategy - none, IABP, or intra-cardiac unloading such as Impella, atrial septostomy, and other modalities. None is currently believed to be vastly superior to others, but in most post--cardiotomy ECMO patients IABP still offers the best compromise between invasiveness and efficacy.

Anticoagulation regimes and renal replacement therapy are two other aspects that will continue to be researched and that will be fine-tuned in the next years, improving short-term results.

If the patient survives to decannulation, a long road ahead still awaits him. Intra-hospital mortality after decannulation is still very significant, and neurological and infectious complications are very frequent and very frequently severe. A long period of rehabilitation is needed, both in the ward and as an ambulatory patient, and long-term quality of life after surviving ECMO is still unsatisfactory.

After hospital discharge, long term mortality varies; in these papers, at one year mortality seems to be stable, but at 5 years it is significantly low. Despite seemingly disheartening, we should remember this very low survival concerns patients would not survive more than a few hours after the surgery, and have gone on to return home for a few more years.

We believe that ECMO is an invaluable tool to manage LCOS patients, and all moderate and large sized cardiac surgery departments should have this technique to offer these patients. We also believe that improving results of this very specialized technique should be an obligation, and improvement starts at outcome measuring and reporting. In this fashion, these patients who otherwise be dead have an opportunity to survive and return home. Continuous monitoring and improvement will allow even more of theses patients to return home and live more years.

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