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# Extracorporeal Cardiopulmonary Life Support: The Experience With ECMO in Chile

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ECMO (extracorporeal membrane oxygenation) is an increasingly common system of extracorporeal life support in catastrophic pulmonary failure, acute heart failure and resuscitation. ECMO allows the heart and/or lungs time to rest and heal, providing opportunity for recovery. Technological advances have made ECMO devices smaller, less invasive, and easier to use. Chile has implemented this technology in different hospitals, with results comparable to international registries.

Although ECMO therapy in adult patients was incorporated several decades ago in Chile, this practice was scarce and limited to a few centres with a small number of annual cases. Therefore during the 2009 H1N1 pandemic the results of its use were disappointing. In a study we found that overall survival was 75% of those treated with High-Frequency Oscillatory Ventilation (HFOV) and only 40% of those treated by ECMO (Ugarte et al. 2010). At that time we believed that implementation of this complex technique should be reserved for well-trained and experienced centres, and we showed that transport of patients needing ECMO used to be technically impossible, even after hours working at the bedside with the ventilator, sedation, and relaxation parameters (Ugarte et al. 2010).

Now, a few years afterwards, ECMO centres have increased fourfold. Units with wellestablished ECMO programmes have a lower threshold for ECMO. Extracorporeal membrane oxygenation also necessitates high-risk transports to specialised centres, when retrieval on ECMO is not

possible. Now when the candidate to be submitted is too unstable to be transported to a hospital with ECMO, cannulation in site allows the stabilisation and transfer to a facility with well-established ECMO programmes for extracorporeal oxygenation. In a recent study in 2013, performed in three ICUs in the same centre, we showed that, during the study period, of the 351 patients admitted to the three ICUs, 150 of them required mechanical ventilation, 26 HFOV, and 5 patients received ECMO. We documented an overall survival of 80%, with 5.5 days in ECMO (Ceballos et al. 2013). A study of an ECMO transport programme now reported an overall survival in the ECMO group of 64%, with 7.7 (+ 5.9) days on ECMO, and 29.7 (+ 26.2) days of ICU length of stay (Diaz 2011). These results are both comparable to the Extracorporeal Life Support Organization (ELSO) registry reports [http://www.elsonet.org].

On the other hand the first Chilean neonatal / paediatric ECMO programme was started 11 years ago. When comparing the period before and after the establishment of this programme of ECMO in Chile, it was found that the survival of the total group of infants with severe respiratory failure (Oxygenation Index > 25) increased significantly from 75% (75/100) in the pre-ECMO period to 91% (67/74) in the ECMO period (Kattan et al. 2013). During the ECMO period, 70% of these patients with severe respiratory failure were rescued with nitric oxide and / or high frequency oscillatory ventilation (HFOV), while 30% did not improve, and 76% of these received ECMO (Kattan et al. 2013).

A recent study of 51 paediatric patients connected to ECMO between May 2003 and August 2013 (39 respiratory, 12 cardiac) showed positive overall outcomes: 74% of respiratory ECMO and 83% of Cardiac ECMO survived ECLS (Castillo et al. 2014), similar to the international literature.

Currently Chile has eight centres with ECMO programmes for both adults and paediatric patients. Two centres are in the public health sector and six in private hospitals, and all are geographically located at the centre of the country. According to the records of the ELSO, throughout the rest of Latin America there are nine centres with ECMO programmes: four centres in Argentina, three in Brazil, one in Colombia, and one centre in Mexico (Extracorporeal Life Support Organization). In recent years Chile has increased transport of patients to receive this therapy. Controversy still persists over the use of ECMO in countries with limited resources, and now health authorities, together with scientific societies, are looking to establish a network of management of these patients with well-defined indications, and protocols of referral and management. Veno-venous ECMO represents a significant escalation of support rather than a mere substitution for lung protective ventilation, and careful patient selection is key to its success.

Despite some evidence of it being cost-effective, authorities and experts are concerned that running the service in several nearby centres outside a pandemic context may lead to inadequate exposure, infrequent training opportunities, and questionable costeffectiveness. Centralising ECMO services to ICUs with well-established ECMO programmes may improve results and cost-effectiveness, especially when the actual requirement for ECMO outside the influenza pandemics itself is expected to be low (1-2 cases per million population annually) (ECMO Expert Group 2010). Pending further evidence, ECMO may have to be considered, and early referrals may be made to an ECMO-equipped centre for patients with severe acute respiratory failure, where no contraindications exist. This, by itself, may improve outcomes, as demonstrated in the CESAR study (Peek et al. 2009). We hope that these new ECMO referral centres, associated with better network management, will impact positively on the survival of patients with respiratory or cardiac failure, and increase the availability of this expensive therapy in the future to a greater number of patients in our country. The ECMO therapy, now more broadly called “extracorporeal life support” (ECLS) therapy is currently available in Chile, with proven benefits in the short and long term. The Chilean experience shows that it is possible to progressively incorporate it with success in the practice of critical care in developing countries, but it needs to be implemented in high-complexity centres, with well trained personnel and with a high level of commitment.

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