When to cross the bridge over troubled water?

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The American musical duo of Paul Simon and Art Garfunkel received 5 Grammy Awards in 1971 for their now-classic song “Bridge Over Troubled Water,” including Song of the Year and Album of the Year. The song was influenced by the gospel music to which Simon was listening at the time, especially that of the Swan Silvertones. The name of Simon & Garfunkel’s title track was inspired by a line from the gospel group’s song “Mary Don’t You Weep”: “I’ll be your bridge over deep water, if you trust in my name.”

Extracorporeal membrane oxygenation (ECMO) provides mechanical support to patients with hemodynamic instability from right heart failure or respiratory insufficiency with hypoxia and/or hypercarbia. The use of ECMO to bridge the troubled waiting period until lung transplantation has been controversial for a long time because of its rate of complications and poor outcomes. It was considered by some to be a contraindication, as it raises ethical concerns about organ waste.

Recent improvements in technology, such as hollow-fiber oxygenators, dual-lumen cannulas, levitated centrifugal pumps, and heparin-bonded circuits, have all contributed to safer use of ECMO, with decreases in thrombosis, plasma leaks, hemolysis, and bleeding, and improved mobilization and even ambulation of patients in the intensive-care unit.¹ A number of experienced lung transplantation centers in the United States and Europe^{2,3} have recently reported good midterm to long-term outcomes in patients undergoing transplantation after being on ECMO, indicating that its use as a bridge should be reconsidered.

The article by Hayanga and colleagues⁴ represents the largest reported series so far on the use of ECMO as a bridge to lung transplantation in the United States. In all, 119 (1.0%) patients, from 2000 to 2011, were included from a

total of 12,458 lung transplant recipients with complete information available in the national registry. These numbers show that over a period of 12 years, <10 ECMO cases on average were reported to this registry per year.

Outcomes in recipients were compared among 4 periods, of 3 years each. Most of these patients were bridged in the later part of the study: 67 of 119 (56.3%) during the period 2009-2011, versus only 4 of 119 (3.4%) during the period 2000-2002. This rise reflects the increasing confidence in this new technology with fewer complications over the years.

After the implementation of the lung allocation score, sicker individuals with higher scores, such as patients with pulmonary fibrosis, cystic fibrosis, or pulmonary arterial hypertension are more likely to undergo transplantation while being on ECMO compared with patients with chronic obstructive pulmonary disease. However, being on ECMO does not yet affect the total lung allocation score. Median (interquartile range) waiting time for patients bridged on ECMO was 23 days (7-117 days) versus 111 days (31-321 days) in stable recipients.

One-year survival in ECMO-bridged patients was significantly lower than survival in the non-ECMO group, in each time period, but the percentage of survivors increased in each period. Predictors of 1-year mortality in ECMO patients were: being aged >35 years, having cystic fibrosis or a lung-related diagnosis other than chronic obstructive pulmonary disease, pulmonary fibrosis, or cystic fibrosis. The risk of renal failure after transplantation for dialysis-dependent patients was higher in ECMO patients, but it decreased over the course of the time periods (hazard ratio [95% CI], 11.10 [2.40-51.40] in the period 2003-2005 vs 3.31 [1.66-6.58] in the period 2009-2011).

This report⁴ is the only publication to date on this large clinical series on lung transplant recipients bridged on ECMO. The findings clearly demonstrate that with improved technology and increased experience over time, the transplantation community is becoming more successful in managing these critical patients. However, this study does not provide any information on ECMO patients who did not survive the waiting period, or those who were successfully weaned from ECMO that were not reported to the transplant registry.

Moreover, the study suffers from its retrospective design, with data collected from a small group of experienced transplant institutions across the nation over a period of 12 years. No information was available to

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compare the outcomes of patients bridged on ECMO who have respiratory insufficiency with hypoxia and/or hypercarbia, versus hemodynamic instability from right heart failure. Of even more interest would be the long-term outcomes in patients who survived the first year after the transplant, and whether long-term survival is affected by chronic allograft dysfunction differently in the 2 groups. Nevertheless, the authors are to be acknowledged for their analysis of the largest series on ECMO-bridged patients so far.

This article⁴ confirms that modern ECMO has become a safer method to support the life of transplant candidates who otherwise would not survive the waiting period. The article, however, cannot answer the remaining question of how to select patients that are likely to survive on ECMO until the transplant.⁵ Further international collaboration is needed to set up a prospective registry on ECMO patients, if we want to improve the quality of our data and find predictors of survival.⁶

Such predictors will improve the basis for selecting candidates and determining whether they should attempt to cross the bridge over troubled water.

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