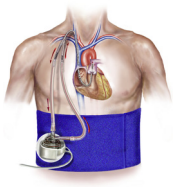
Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.



MECHANICAL VENTILATION: A NECESSARY EVIL?

To the Editor:

The avoidance of ventilator-associated lung injury has been a hallmark of acute respiratory distress syndrome management for the past 50 years.[1] Although recent clinical trials have failed to establish the superiority of mechanical circulatory support over mechanical ventilation in these patients,[2] extracorporeal membrane oxygenation (ECMO) has traditionally been reserved for refractory cases and most often performed through femoral cannulation.

With a surgical volume of over 80 cases, our program has one of the largest experiences with the Protek Duo right ventricular assist device cannula (LivaNova, London, United Kingdom). Percutaneous cannulation via the right internal jugular vein allows for full right ventricular and pulmonary support in which blood is withdrawn from the right atrium, oxygenated, and returned directly to the pulmonary artery (Figure 1). As with other disruptive transcatheter technologies, the skill set required for procedural success exists at the intersection of interventional cardiology and cardiac surgery. A collaborative approach between these disciplines was critical during our initial 10 implants and can effectively negate the risks of inexperience.

Early in our experience, we observed that right ventricular dysfunction was frequently attributed to distributive shock.[3] Recognizing that acute respiratory distress syndrome in the context of COVID-19 frequently leads to increasing pressor requirements and progression to multiple organ dysfunction syndrome, we hypothesized that early intervention with a percutaneous right ventricular assist device/ECMO approach might improve outcomes in these patients. In 9 consecutive patients, we have not had any secondary organ failure, with only 1 mortality. Pressor requirements have been eliminated with this approach, and our practice has been to extubate while on ECMO support to facilitate rehabilitation and avoid ongoing barotrauma. At the time of this submission, 6 of the patients have been decannulated. Although all the patients met Extracorporeal Life Support Organization criteria for support, attempts were made to intervene at the time of intubation to minimize the adverse effects of mechanical ventilation.

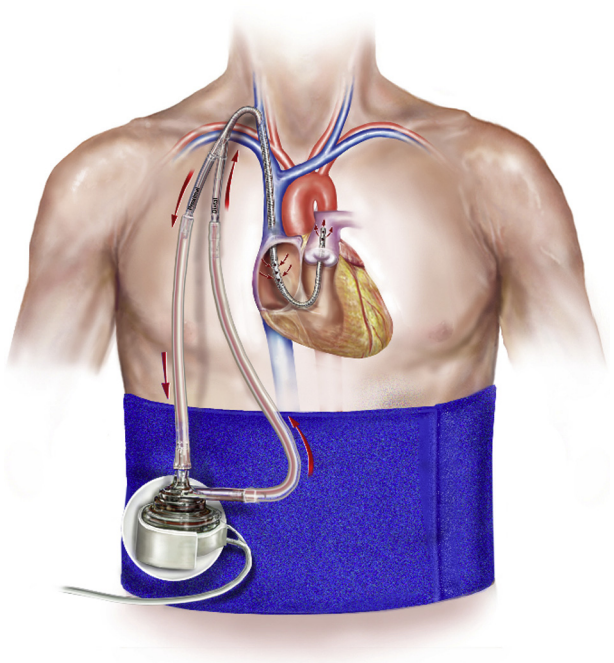


FIGURE 1. The LivaNova TandemLife Protek Duo catheter is inserted via the right internal jugular vein and placed into the main pulmonary artery.

Cost considerations weigh heavily on the decision to proceed with any form of mechanical circulatory support, and the pandemic-induced economic uncertainty facing hospitals has only added to the complexity of these decisions. Charges for a 9-day hospital stay in 1 of our patients totaled $224,718. Although supply chain limitations would likely impair the widespread adoption of this approach, the current spoke-hub model for ECMO referral potentially could mitigate many of the economic disparities between hospitals.

Anecdotal evidence should always be viewed with a degree of skepticism, and our team is currently preparing for a multicenter prospective randomized clinical trial to evaluate the merits of this approach compared with conventional management strategies. Nevertheless, cardiothoracic surgeons who are asked to cannulate a patient for COVID-19 in the setting of increasing pressor requirements or secondary organ failure should carefully evaluate the potential for right ventricular dysfunction as a contributor.

David L. Joyce, MD, MBA
Department of Surgery
Medical College of Wisconsin
Hub for Collaborative Medicine
Wauwatosa, Wis

The Editor welcomes submissions for possible publication in the Letters to the Editor section that consist of commentary on an article published in the Journal or other relevant issues. Authors should: • Include no more than 500 words of text, three authors, and five references. • Type with double-spacing. • See http://jtcs.ctsnetjournals.org/misc/ifora.shtml for detailed submission instructions. • Submit the letter electronically via jtcvs.editorialmanager.com. Letters commenting on an article published in the JTCVS will be considered if they are received within 6 weeks of the time the article was published. Authors of the article being commented on will be given an opportunity of offer a timely response (2 weeks) to the letter. Authors of letters will be notified that the letter has been received. Unpublished letters cannot be returned.

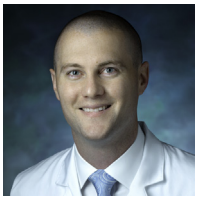
The author reported no conflicts of interest.

The *Journal* policy requires editors and reviewers to disclose conflicts of interest and to decline handling or reviewing manuscripts for which they may have a conflict of interest. The editors and reviewers of this article have no conflicts of interest.

References

1. Thompson BT, Chambers RC, Liu KD. Acute respiratory distress syndrome. *N Engl J Med*. 2017;377:1904-5.
2. Combes A, Hajage D, Capellier G, Demoule A, Lavoue S, Guervilly C, et al. Extracorporeal membrane oxygenation for severe acute respiratory distress syndrome. *N Engl J Med*. 2018;378:1965-75.
3. Badu B, Cain MT, Durham LA III, Joyce LD, Sundararajan S, Gaglianello N, et al. A dual-lumen percutaneous cannula for managing refractory right ventricular failure. *ASAIO J*. 2020;66:915-21.

https://doi.org/10.1016/j.jtcvs.2020.06.130



REPLY: SPLITTING OVER LUMPING IN MECHANICAL SUPPORT FOR ACUTE RESPIRATORY DISTRESS SYNDROME

Reply to the Editor:

Amid the present pandemic, clinical researchers are once again confronted with the challenge posed by patients with acute respiratory distress syndrome (ARDS). As of this writing, more than 2.6 million people in the United States have been diagnosed and 127,000 have died as a result of severe acute respiratory syndrome coronavirus 2, the virus that causes coronavirus 2019 (COVID-19).[1] Although hospitalization rates are difficult to track, models forecast admissions to potentially crest at about 15,000 per day domestically,[2] with a significant percentage of those patients requiring mechanical ventilation due to ARDS. It is often said that adversity breeds innovation and given both the volume and acuity of the moment, opportunity for advancement in our understanding of the management of this vexing disease is undeniable.

In this context, the letter by Joyce[3] introduces a provocative, if not potentially visionary, approach to the treatment of ARDS. The letter summarizes the experience at the Medical College of Wisconsin, where multidisciplinary teams are utilizing the transcatheter Protek Duo Right Ventricular Assist Device (LivaNova PLC, Houston, Tex) to not only support the right ventricle, which is commonly implicated when hemodynamic instability results, but also as a means to facilitate extubation, avoiding the known harmful effects of mechanical ventilation in this population. The rationale for the approach has merit and early results among 9 consecutive patients are compelling.

The inherent hypothesis of the piece was nonetheless striking in its generality, namely that offloading the right ventricle will mitigate cardiopulmonary compromise. Although this mechanism may contribute to the clinical dilemma,[4] our understanding of COVID-19 is ever-evolving. Some have proposed that the pulmonary effects may be represented by multiple phenotypes that respond differently to hallmark lung-protective ventilation strategies.[5-7] Furthermore, ARDS has a wide spectrum of presentations and severity.[8] Concomitant neurologic impairment, multiorgan dysfunction, and coagulopathy are wide ranging and unpredictable. When considering the care of COVID-19 patients, teams should guard against the impulse to cast generalizations and assign interventions in broad swaths. Rather, this disease calls for the development of precise definitions and inclusion criteria to properly classify patients and assign therapies.

It is encouraging to read that the team in Wisconsin is preparing to conduct a multicenter prospective trial, and the devil of such study remains in the details. Recall that extracorporeal membrane oxygenation (ECMO) for ARDS—although theoretically ideal as a tool to avoid positive pressure ventilation and ensure lung rest and recovery—remains controversial, in part due to the challenges of conducting appropriate clinical trials. Promising early results suggesting improved mortality with ECMO for ARDS were criticized due to inconsistencies in care among control patients.[9] Unfortunately, a more recent study with improved standardization could not recreate this mortality benefit, potentially the result of high crossover due to the use of ECMO for rescue therapy.[10] Put simply, the management of ARDS is complicated and study of ECMO is messy. Although the solution will almost certainly be the result of splitting rather than lumping, centers with adequate resources and expertise are encouraged to leverage this moment to translate innovative anecdotes into new standards of care.

Michael C. Grant, MD
Department of Anesthesiology and Critical Care Medicine
The Johns Hopkins Medical Institutions
Baltimore, Md
Armstrong Institute for Patient Safety and Quality
The Johns Hopkins Medical Institutions
Baltimore, Md

References

1. Johns Hopkins Coronavirus Resource Center. COVID-19 map; . Available at: https://coronavirus.jhu.edu/map.html. Accessed July 1, 2020.
2. Centers for Disease Control and Prevention. Coronavirus disease 2019 (COVID-19); . Available at: https://www.cdc.gov/coronavirus/2019-ncov/cases-updates/hospitalizations-forecasts.html. Accessed July 1, 2020.
3. Joyce DL. Mechanical ventilation: a necessary evil? *J Thorac Cardiovasc Surg*. 2021;161:e213-4.
4. Osman D, Monnet X, Castelain V, Anguel N, Warszawski J, Teboul JL, et al. Incidence and prognostic value of right ventricular failure in acute respiratory distress syndrome. *Intensive Care Med*. 2009;35:69-76.