A simplified equation for risk assessment in mechanical circulatory support

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Calculating the impact of pulmonary function abnormalities in patients with congestive heart failure has confounded surgeons since the introduction of mechanical circulatory support. Students of history will recall that in the case of Dr Barney Clark, the world's first human recipient of a permanent total artificial heart, "dyspnea and fatigability occurring 6 years before admission had initially been attributed to chronic obstructive pulmonary disease alone."¹ Subsequent clinical deterioration later unmasked the extent of his cardiac dysfunction as a contributor to his symptoms. In their retrospective review of 310 patients treated with continuous-flow left ventricular assist devices (LVADs) published in this issue of the *Journal*, Bedzra and colleagues² make a persuasive argument that abnormal pulmonary function test (PFT) results should not be the sole contraindication to LVAD therapy.

As noted by Bedzra and colleagues,² the predictive value of PFTs in the broader population of cardiac surgery patients has been described in several studies^{3,4} and indeed is one of the components of the Society of Thoracic Surgeons risk score.⁵ Recent work by Ivanov and associates,⁶ however, has questioned the added benefit of individual PFT measurements as part the mathematical formula used to calculate risk. In advanced heart failure, the well-described effect of pulmonary congestion on spirometry data⁷ produces even greater uncertainty when it comes to correlating preoperative findings with outcomes after mechanical unloading. Chest compliance and hypoventilation likely play an important role in postoperative respiratory performance, and these may not be entirely accounted for with routine PFTs. It may very well be that factors such as diaphragmatic movement, respiratory muscle strength, and P_{aCO_2} on room air will more reliably exclude pulmonary insufficiency from the equation when selecting patients for LVAD or other mechanical circulatory support device placement.

Despite their limitations in predicting mortality, PFT results may play an important role in formulating the optimal

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Central Message

Pulmonary function testing, although limited in ability to predict mortality after left ventricular assist device implantation, may play an important role in defining the optimal surgical approach.

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surgical approach. The video that accompanies the article of Bedzra and colleagues² shows them elegantly implanting a HeartWare LVAD (Medtronic Corporation, Minneapolis, Minn). This less-invasive transthoracic insertion has gained favor in many centers, including my own, as a strategy for reducing length of hospital stay for these patients.⁸ Given that the results of the manufacturer-sponsored "HVAD LATERAL" trial⁹ have yet to be published, any discussion related to the risks and benefits of this technique remains speculative. Nevertheless, extreme caution seems reasonable when proposing an insertion through a thoracotomy for patients with impaired lung function. It bears mentioning that in the study of Bedzra and colleagues,² all devices were implanted through a full median sternotomy.

Although a precise mathematical formula for integrating pulmonary and cardiac variables in mortality predictions for advanced heart failure remains elusive, the findings of Bedzra and colleagues² provide a compelling justification for a more aggressive approach to selecting patients with impaired pulmonary function for surgery.

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