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Commentary: Seeing is believing: Addressing the technical challenges of preclinical models for lung transplantation

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CENTRAL MESSAGE

A posterior approach to performing lung transplantation in a mouse model is a technical alternative that potentially offers key advantages in preclinical lung transplant research.

Preclinical research in lung transplantation has been and continues to be critical for the evolution of innovative treatments that have positively impacted patients' lives over the years. This type of research relies significantly on small animal models,[1] which have been the backbone for studies related to immunology, ischemia–reperfusion, and other key investigational efforts.[2] While these models have withstood the test of time, the level of skill required and the learning curve are remarkable and a major hurdle to adoption.

In the laboratory, often, the technical aspects of conducting these experiments leave experimental success highly contingent on the quality and experience of the laboratory surgeon. In fact, the entire viability of a laboratory or section of a laboratory may depend on its microsurgeon! As thoracic surgeons with research training, we understand that transitioning from clinical practice to small animal models is difficult. For instance, others prefer to have a well-trained person committed to these complex procedures for the advantage of the consistency and predictability of a highly trained microsurgeon. It takes time to learn, and it is costly to reproduce this model successfully—it is all in the technical details. Knowledge translation in basic science research can be complex and expensive and may only occur when the microsurgical model is mastered. No model, no mission.

In this article, Zhao and colleagues[3] propose an interesting approach to facilitate this technically demanding procedure by simply performing the transplant using a posterior approach. Same procedure, but different view. The methodology described by the authors is of value for every laboratory surgical group interested learning and mastering this technique, where the reader will find a step-by-step approach to performing the transplantation. To compare their approaches (anterior vs posterior), the authors evaluated the time required to perform the steps in the procedure, gas exchange at 24 hours, airway dynamics, histology, and radiology findings. One of the interesting points of the approach is that a single surgeon experienced in microsurgery (which facilitates the learning process) performed all the cases described, alternating approaches each day. It certainly raises the potential paradox of how translatable the data are when performed by an expert microsurgeon. However, there is validity to the comparison when one contemplates the consistency of a single surgeon performing the experiments. The authors concluded that their posterior approach seems less complicated and less time-consuming in the management of hilar structures, resulting in fewer postoperative complications.

Analyzing their results, they found equivalent success rates for both procedures. At the same time, recipient

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operation and back table time were shorter in the posterior group, without differences in warm ischemic time. This points to the fact that these discrepancies were more likely due to the management of hilar structures before implantation and potentially from minor troubleshooting immediately after implantation. While "difficulty" is a subjective definition, we believe that the message that the authors aim to send becomes clear by watching the videos. The exposure seems better, allowing easier management of hilar structures, and using a microvessel clamp for hilar occlusion enables more "length" for the surgeon. This approach also has the potential benefit of less vessel compression and minimizing the risk of thrombosis postoperatively in these "at-risk" vessels. Even though these differences highlighted showed statistical significance, one wonders the implications for clinical translation. This is not to diminish the overall impact in small animal models, where minutes can be critical.

The central aspect that illustrates the hypothesis that the authors aim to prove is the images and the videos sell the paper. This is very millennial and may not have been the case years ago, speaking to the strength of this journal for supporting these types of media. The posterior approach appears to be more straightforward and reproducible, considering the exposure generated in a challenging small animal model with this simple maneuver. Seeing is believing.

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