independent risk factor for mortality. Interestingly, in a series from Leuven, when LLTx was performed on patients with stable cystic fibrosis, no difference in mortality was found between LLTx and standard LTx groups.[9]

Overall, the Toronto experience reaffirms that LLTx is an important option for patients of small stature who would otherwise languish on the waiting list, and recognizing the challenges involved, this should be performed by experienced centers.

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Commentary: Lobar lung transplantation: Trick or treat-(ment)

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CENTRAL MESSAGE

Deceased LLTX is a valuable tool to expand the possibilities of transplantation and to overcome the scarcity of small donor lungs.

In the paper "Deceased-Donor Lobar Lung Transplant: A Successful Strategy for Small-Sized Recipients," Campo-Cañaveral de la Cruz and colleagues[1] report about their institutional experience with lobar lung transplantation (LLTX) and suggest it as a valuable option to overcome especially the scarcity of small donor organs. In fact, although LLTX has been described already for many years,[2] it has never achieved a wide acceptance by the majority of transplant centers. For this reason, the authors of the current article deserve credit for bringing this important topic to our attention.

LLTX is a clearly much more challenging technique, compared with standard "whole" lung transplantation. To safely apply this technique, it requires both considerable experience in lung transplantation and at the same time solid familiarity with handling and all technical aspects of lung surgery. This explains why this procedure should be performed only in high-volume centers. A number of

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factors contribute to the potential greater risk that can result when single lobes are used for transplantation. One of them is an increased risk for primary graft dysfunction, which mainly results from overflow of the first lung (lobe). The authors in their paper point this out and demonstrate the advantages and the importance of the use of intraoperative and eventually prophylactically prolonged extracorporeal membrane oxygenation[3] in this setting. Furthermore, adequate size matching in deceased LLTX is clearly more demanding because a lobe that is expected to have the right volume by simple mathematical calculation of its predicted volume will not necessarily have the right dimensions and shape that then would fit into a small chest. This makes a substantial difference to living related LLTX, where the possibility to adequately plan the procedure with various different imaging investigations ahead allows a better prediction of the congruence of lung and chest.

The implication of deceased LLTX into a transplant program, on the other hand, significantly expands the possibilities to use lungs of almost any size for transplantation. There are different levels to downsize a donor lung, starting from simple segmental resection in the area of the middle lobe and/or the lingula or "shaving" of the apical parts, combining transplantation of one whole lung on one side with the use of only a lobe on the contralateral side, and finally bilateral implantation of lobes on both sides.

When thinking about the possible indications for LLTX, 3 different scenarios arise:

- To use one remaining lobe whenever the other lobe does not qualify for transplantation on noninfectious grounds. The decision for this is usually taken during the harvesting procedure, but it has also been demonstrated that the quality of a single lobe can be evaluated as well during ex vivo lung perfusion.[4]
- To significantly downsize a donor lung in presence of an unexpectedly large donor organ. Most likely the combination of whole lung on one side and lobe only on the other side will be used in this situation, anticipating the shifting of the mediastinum to the lobar side.
- To use 2 lobes for an urgent recipient with small chest diameters. The data presented by the Toronto group, with a high percentage of their patients being bridged to transplantation, especially support this last indication. This, at the same time, is an explanation for the slightly greater early mortality rate, which results from a much sicker patient group, and not by the method itself.

The initial stimulus for the use of single lobes for transplantation came from the proponents of living related lung transplantation. Especially, the group of Hiroshi Date has brought this field forward to excellence.[5] Although the need for use of living donor lungs has significantly diminished, at least in the western world, it might be time to implement the technique of deceased lobar transplantation in a more frequent scale. It therefore becomes clear that deceased LLTX represents a valuable form of treatment, rather than an artistic surgical trick.

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