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Comment: Excessive Dynamic Airway Collapse and Lung Transplantation

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To the Editor

I read with great interest the paper by Lehr et al discussing Excessive Dynamic Airway Collapse (EDC) and its implication for lung transplantation¹. The authors conclude that the presence of EDC should not preclude patients from lung transplantation (LTx). The authors argue that in their experience, LTx has shown to overcome tracheal and proximal bronchial dysfunction due to EDC. Lehr et al point out that despite the persistent structural abnormality of the proximal airways following LTx, there is a remarkable improvement in the post-transplant flow-volume loop. The authors interpret that as caused by the improvement of EDC following LTx. The authors postulate that this improvement is due to reduction in the intrathoracic pressure due to distal small airway obstruction after implantation of healthy lung allografts.

I agree with assessment that the presence of EDC should not preclude patients from LTx, however want to expand on the observation, that despite the persistent structural abnormality of the proximal airways following LTx the post-transplant flow volume loop and pulmonary function tests can normalize. We have previously reported this observation in a patient with tracheomegaly and tracheo-bronchomalacia from Mounier-Kuhn, who received a bilateral-LTx, figure 1². In our patient the flow-volume-loop in the early post-transplant period showed normal expiratory flows at each lung volume (figure 2A). However on all post-transplant bronchoscopies near complete end-expiratory airway collapse in the native distal trachea and main bronchi persisted and was evident during each procedure (figure 2B). This suggested that the patient's structurally abnormal central airways, with EDC, had no independent effect on post-transplant expiratory flow during forced expiration. Maximum expiratory flow occurs when compression of airways causes flow-limiting segments to form in the airways^{2,3}. Flow-limiting segments generally occur in airways that are well upstream

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(closer to the alveoli) from the trachea and mainstem bronchi^{2,3}. Flow-limiting segments are like waterfalls because they separate the airway into upstream and downstream segments, and changes in pressure in the downstream segment do not affect flow from the upstream segment^{2,3}. Consistent with our observation², tracheobronchomalacia was not found to be the flow-limiting segment and there was no correlation between the FEV₁ and central airway collapse^{4,5}.

These observations suggest that EDC, although often visually striking, does not always have an independent effect on lung function (either pre- or post-transplant)². However, I would like to point out that structurally abnormal central airways can be a risk factor for infectious complications in the short-term and the long-term following a LTx, which has important implications for the post-LTx follow up of these patients^{2,6,7}.

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Figure 1. Three-dimensional reconstruction of central airways. (A) Pre-transplant. (B) Post-transplant showing central airways with native trachea, proximal mainstem bronchi parachuting into transplanted allograft mainstem bronchi. Reproduced with permission from².

Figure 2.

(A) Pre-transplant flow-volume loop, showing low peak flow and biphasic morphology, where maximal expiratory flow declined rapidly after a sharp peak. After transplant, the flow-volume loop shows a normal pattern. (B) Post-transplant bronchoscopic view of mainstem bronchi during end-expiration showing end expiratory dynamic collapse of right mainstem bronchus and left mainstem bronchus. Reproduced with permission from².