



Emphysema sufferers breathe easier

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Technology: Lung-reduction surgery for emphysema

Use: Lung-volume-reduction surgery (LVRS) has been advocated for the treatment of breathless patients who have emphysema with marked lung hyperinflation. When up to 30% of the diseased lung is surgically removed patients report a decrease in dyspnea and significant improvement in their quality of life. There are 2 proposals to explain why the procedure works. The first is that the surgical removal of diseased, hyperinflated lung improves chest mechanics by returning the diaphragm and chest wall to a more normal position. Although there is less lung in the chest the improved ventilation of the remaining lung more than compensates for the loss and makes breathing easier.¹ The second is that elasticity within the lung is increased when the remaining lung expands to occupy the space in the hemithorax created by the resection. The airways are thereby held open during expiration (i.e., dynamic airway collapse is reduced) and there is less resistance to airflow.^{2,3}

History: In an early report of 56 patients who underwent LVRS between 1950 and 1960 Brantigan and colleagues¹ concluded that the surgery reduced shortness of breath due to emphysema. However, with a mortality rate of 20% and an uncertain mechanism of action the findings were greeted with scepticism, and the procedure was not widely accepted. In 1995 Cooper and colleagues,⁴ using improved perioperative, intraoperative and anaesthetic techniques developed in a lung transplantation program, demonstrated that LVRS could be carried out with a substantially reduced mortality rate.

Promise: Sustained benefit 2 years⁵ and 5 years⁶ after surgery has now been demonstrated. A recent Canadian study also reported a low mortality rate, improved pulmonary function and improved quality of life following surgery.⁷ The magnitude of clinical improvement in pulmonary function (30%–50% increase in forced expiratory volume in 1 second) has not been demonstrated previously with any other treatment.

Problems: Although LVRS offers substantial potential benefit there is also considerable risk involved. Recent case series^{5,7} report a mortality rate of 3.5%–8% and morbidity of up to 20%, including a prolonged intensive care stay on life support. The randomized clinical trials presently underway will help to determine the effectiveness of LVRS and identify the best candidates for the procedure.

Prospects: In the multicentre randomized controlled trial underway in Canada to assess the efficacy of LVRS 12 major centres hope to enroll 350 patients over the 5-year period. Quality-of-life, physiologic and economic outcomes will be evaluated in a 2-year follow-up. This groundbreaking Canadian trial will yield important information for clinicians and health care professionals.

Other multicentre studies underway include a large randomized controlled trial in the United States to compare the outcome of the best medical management to that of LVRS and a national registry established in Australia to evaluate the safety and impact of LVRS on pulmonary function.

Much has been learned about the surgical management of advanced emphysema. Indications for thoracic surgery are broader than ever before, and more people can now be offered a surgical option with better outcomes. LVRS can reduce patients' dyspnea and improve their quality of life, and it appears to be a reasonably safe and feasible procedure.

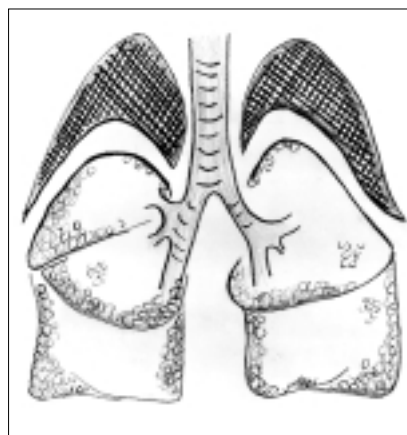
However, randomized controlled trials are required to adequately assess how much of a role LVRS will play in the care and treatment of patients with emphysema in the future.

Competing interests: None declared.

References

1. Brantigan OC, Kress MB, Mueller EA. The surgical approach to emphysema. *Dis Chest* 1961;39:485-99.
2. Ingenito EP, Evans RB, Loring SH, Kaczka DW, Rodenhouse JD, Body SC, et al. Relation between preoperative inspiratory lung resistance and the outcome of lung-volume-reduction surgery for emphysema. *N Engl J Med* 1998;338(17):1181-5.
3. Scuirba FC, Rogers RM, Keenan RJ, Skivka WA, Gorcsan J, Ferson PF, et al. Improvement in pulmonary function and elastic recoil after lung reduction surgery for diffuse emphysema. *N Engl J Med* 1996;334:1095-9.
4. Cooper JD, Trulock EP, Triantafillou AN, Patterson GA, Pohl MS, Deloney PA, et al. Bilateral pneumectomy (volume reduction) for chronic obstructive pulmonary disease. *J Thorac Cardiovasc Surg* 1995;109(1):106-19.
5. Cooper JD, Patterson GA, Sundareshan RS, Trulock EP, Yusen RD, Pohl MS, et al. Results of 150 consecutive bilateral lung volume reduction procedures in patients with severe emphysema. *J Thorac Cardiovasc Surg* 1996;112(5):1331-8.
6. Cooper JD, Lefrak SS. Lung-reduction surgery: 5 years on. *Lancet* 1999;353(Suppl 1):S126-7.
7. Miller JD, Malthaner R, Goldsmith CH, Cox G, Higgins D, Stubbing DG, et al. Lung volume reduction surgery for emphysema and the Canadian Lung Volume Reduction Surgery (CLVR) Project. *Can Respir J* 1999;6(1):26-32.
8. The Canadian Lung Volume Reduction homepage. Available: www.CLVR.org (accessed 1999 Sept 29).

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Schematic representation of bilateral resection of the apical portions (hatched areas) of emphysematous lungs.