INTRODUCTION

In 1994, an innovative procedure to treat severe emphysema—Lung Volume Reduction Surgery (LVRS)—was first implemented. This new surgical treatment is based upon the rediscovery of research conducted by Dr. Otto Brantigan (1) during the 1950s and on the recent work of Dr. Joel Cooper (2). These reports have been published in the wake of renewed interest in LVRS for the treatment of end-stage emphysema. It is felt that the benefit of LVRS lies in its ability to restore normal respiratory mechanics and improve elastic recoil of the remaining lung tissue in this group of patients. The result is an improvement in the FEV1 and functional capacity, as well as a reduction in the PCO2, and requirement for supplemental oxygen (2).

SUGGESTED INDICATIONS (3)

1. Diffuse bullous and nonbulous emphysema graded as severe and with heterogeneous distribution at the high resolution CT scan.
2. Dyspnea score 3
3. No clinically significant sputum production, clinically significant bronchiectasis, or asthma.
4. Severe obstructive ventilatory defect (FEV1: 40%, RV 180%, TLC 120%).
5. Age 75 years
6. No unstable angina or ventricular arrhythmia
7. Peak systolic pulmonary artery pressure 50 mmHg at the echocardiography
8. Paco: 55 mmHg
9. DLCO 20% predicted
10. ASA score 3
11. Body mass index range: 18-29
12. No comorbid condition that would significantly increase operative risk.
13. No neoplastic disease with life expectancy 12 months.
14. No previous pleurdesis or thoracotomy in the more affected hemithorax
15. Abstinence from smoking for at least 4 months

SURGICAL TECHNIQUE

Video assisted thoracoscopic approach (4)
• Epidural catheter to facilitate intraoperative anesthesia and postoperative pain management
• Double lumen endotracheal tube
• Three to five ports through the seventh or eight intercostals space at the mid to posterior axillary line
• Endostapler resection
• Buttressing the staple line with bovine pericardial strips or collagen
• Reducing the volume of the lung by 25%
• Chest tubes that placed on–10cmH2O suction
• No pleural abrasion or pleurectomy

Median Sternotomy approach (5)
• Epidural catheter to facilitate intraoperative anesthesia and postoperative pain management
• Double lumen endotracheal tube
• The worse lung is done first
• A continuous staple line
• 20-30% reduction of the volume of each lung
• Avoidance of excessive removal, that has the potential for leaving postoperative air spaces and prolonged air leaks
• Pleural tent in order to reduce air space
• Reinforcement of the staple line with bovine pericardial strips

Postoperative management (5)
• Careful invasive monitoring
• Early extubation
• Active respiratory care
• Early mobilization
• Bronchodilator drugs
• Adequate pain control

COMMENT

Although unanswered questions remain, scores of observational studies and several small, randomized...
clinical trials offers that LVRS is a safe and effective palliation for a relatively well-defined subset of patients with advanced emphysema. However in the United States of America, Medicare and other insurers stopped reimbursement for the procedure. Subsequently, two multicenter studies on LVRS, the National Emphysema Treatment Trial (NETT) and the Overholt-BlueCross Emphysema Surgery Trial (OBEST), were initiated with the requirement that the procedure would not be paid for outside these trials. When LVRS was compared with medical management, at 2 years LVRS was associated with a higher FEV₁ and at least equivalent survival. However, the actuarial mortality rate approached 30% at 3 years, and this fact raises question whether this procedure offers any survival advantage to patients with end-stage emphysema (6).

Several conclusions can be drawn from systematic review of the current data (3,4,6,7,8):

1. The use of staple excision of selected areas of lung appeared to be more efficacious than any type of laser ablation.
2. There is insufficient evidence to show preference for median sternotomy or video-assisted thoracotomy, as the safer and more efficacious procedure.
3. Buttressing the staple line significantly shortens the duration of air leaks and drainage time.
4. Contrary to previous reports, survival after bilateral LVRS was not superior to that after unilateral LVRS even though the former group appeared to have a lower risk preoperatively because of younger age, higher arterial oxygen tension, more advantageous anatomy, and better functional status.
5. Operative mortality in different centers varied widely but most surgeons reported between 5% and 8%.
6. Forced expiratory volume in 1 second peaks within 6 months postoperatively following LVRS. The subsequent decline is most rapid in the first year and slows down in succeeding years.
7. In highly selected patients with emphysema LVRS is deemed an acceptable treatment. To fully evaluate the safety and efficacy of LVRS, outcomes beyond 2 years must be included. The results of prospective randomized trials between best medical management and LVRS, now in progress, are essential before a final assessment can be made.
8. Post-operative rehabilitation plays a crucial role in determining the extent of improvement. However, at this time, it is impossible to predict how much clinical improvement each patient will have, how soon the improvement will occur, or how long the improvement will last.
9. Because of the shortage of the donor pool, in appropriate candidates LVRS bridged the time to lung transplantation without significantly increasing post-transplant mortality and morbidity.

REFERENCES