Bronchoscopic Lung Volume Reduction (BLVR) in Advanced COPD

Interventional pulmonologists at the Penn Lung Center are performing bronchoscopic lung volume reduction (BLVR) for select patients with advanced chronic obstructive pulmonary disease (COPD).

Since the completion of the National Emphysema Treatment Trial (NETT), perspectives on the treatment of severe COPD have evolved dramatically in the United States. NETT compared the efficacy of lung volume reduction surgery (LVRS) plus medical management to medical management alone in more than 1,200 patients with severe emphysema. Both arms of the study involved pulmonary rehabilitation.

Among the important findings of NETT was that LVRS affords a substantial improvement in quality of life by comparison to optimal medical therapy in persons with predominantly upper-lobe emphysema and low baseline exercise capacity.

Despite these benefits, LVRS, is limited by strict patient selection criteria, cost, and safety concerns, including postoperative stroke and persistent air leak.

A number of innovations have emerged in recent years to both increase access to Effective Therapies for severe COPD and improve upon the limitations of LVRS. Among these is bronchoscopic lung volume reduction (BLVR), a relatively new nonsurgical procedure available at the Penn Lung Center for patients with COPD who meet certain criteria.

BLVR uses implantable implantable, endobronchial, one-way valves to prevent re-inflation once air has escaped a targeted lobe. In a fully occluded lobe, this will precipitate intentional deflation, leading to a reduction in air trapping and hyperinflation.

Endobronchial valves have been shown, at 12 months following treatment, to improve dyspnea, exercise tolerance and quality of life in patients who undergo the procedure.

Patients cannot have had prior LVRS on the target lobe, significant resting hypoxemia, or pulmonary hypertension, and must be non-smoking, among other qualifications for endobronchial valve implantation.

For questions about evaluation for nonsurgical lung volume reduction for the treatment of advanced COPD, or to schedule a time to connect with the Penn Interventional Pulmonary service, please contact Gloria Foreman at **215.662.3202.**

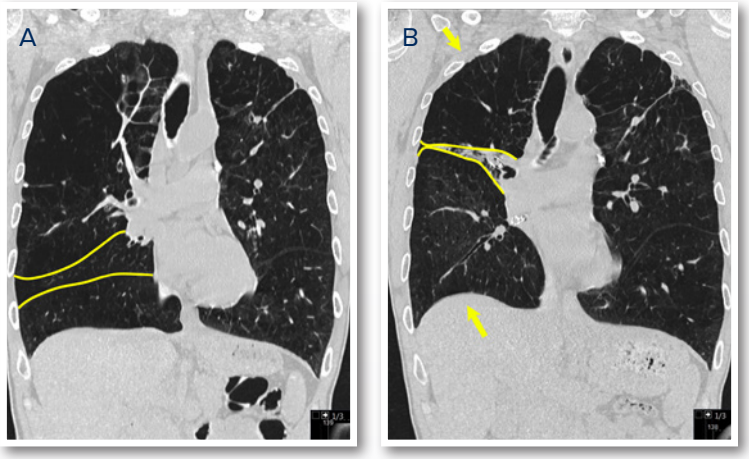

Figure 1: Coronal view of the right lung prior to therapy (A) and significant reduction of the right upper lobe volume (upper arrow), complete deflation of the right middle lobe, and return of the diaphgram to a more natural configuration (lower arrow) following BLVR (B).

CASE STUDY

Mr. G, a 60-year-old man, was referred to the Interventional Pulmonology section of the Penn Lung Center for the treatment of advanced COPD due to alpha-1 antitrypsin deficiency. Mr. G's past medical history was otherwise unremarkable.

Mr. G described progressive dyspnea over several years, and reported that the need to wear supplemental oxygen had confined him to the first floor of his house. Having previously completed pulmonary rehabilitation, he was now on maximal medical therapy, and was concerned about the risks of surgical lung volume reduction.

His breathing tests demonstrated severe COPD with an FEV1 of 0.82L (23% of predicted), severe hyperinflation (TLC of 9.14L, 126% of predicted) and severe air trapping (RV 5.71L, 224% of predicted). On a 6-minute walk test (6MWTD) he was able to walk 276 meters. His CT scan showed severe emphysema in the right upper and middle lobes with an intact major fissure suggesting the absence of collateral ventilation, and that he would likely benefit from endobronchial valves.

At bronchoscopy, the absence of collateral ventilation to the right middle lobe and right upper lobe was confirmed. A total of 7 endobronchial valves were deployed in these targeted lobes.

Mr. G was monitored for complications over 4 days in the hospital and recovered well. CT scans following his procedure demonstrated substantial reduction of right lung volume and return of the diaphragm to a more natural shape (Figure 1B). At his follow-up 1 month later he noted marked improvement in his dyspnea and was now using the stairs without difficulty. Repeat spirometry noted an improvement of over 500mL to 1.4L.

On his 2 month follow-up, Mr. G was no longer wearing oxygen, and notably improved in mood. At his 6MWD, he was able to walked 390 meters, a 43% improvement over his pre-procedure performance.

FREQUENTLY ASKED QUESTIONS

Q: Who are the best patients for bronchoscopic lung volume reduction?
A: The best patients for this procedure are those with severe COPD with severe hyperinflation and air trapping. The PFT criteria are: 15%<FEV<45%, TLC > 100% and RV > 150%.

Q: What studies are needed to assess for candidacy?
A: To screen for eligibility, recent full PFTs, a 6MWD and a high-resolution, non-contrast CT scan (1mm) are needed. Additional testing can be completed locally after we speak to the patient about the procedure.

Q: What is the incidence of pneumothorax?
A: The incidence is 20-25% within the first 4 to 5 days. Chest tube placement can typically be removed after 1 to 2 days. Prolonged airleaks may occur, necessitating the removal of one or more valves.

Q: Do the valves stay in if the patient is feeling better or can they be removed?
A: The valves are designed to remain in place indefinitely and removing them would reverse their beneficial effects. However, if patients do not benefit from them, or if problems arise, the valves can be removed with no permanent impact.

Q: Do the valves ever need to be adjusted?
A: There is a possibility that valves would need to be readjusted either because they migrate, shift or malfunction. The likelihood of valve adjustment in the post-market data is currently about 10-15% over 2 years.

Q: What has been the experience for most patients to date with this treatment?
A: To predict who may experience a substantial benefit, Penn Lung Center specialists consider the degree of hyperinflation/air trapping, the degree of heterogeneity of lung destruction, and fissure completeness. Our patient experience parallels that seen in the clinical trials where patients with more air trapping and more heterogenous disease tend to have the best results.

From the clinical trials, using those trial criteria, patients with heterogeneous disease typically experience improvements in 6MWD of close to 100 yards with improvements in FEV1 of 100-200cc. The results in patients with homogenous disease are typically more modest.

Q: Which should my patient with severe COPD receive: endobronchial valves, surgical lung volume reduction, or a lung transplant?
A: At Penn Medicine, all patients referred for BLVR or LVRS are discussed in a multidisciplinary committee meeting to assess optimal treatment strategies for advanced care, including potential referral to transplant. This is then discussed with the patient and referring pulmonologist for a joint decision. Patients evaluated by the lung transplant team who might benefit from BLVR are also internally referred to the valve program for assessment.

FACULTY TEAM

The Penn Lung Center is among the oldest and most advanced providers of interventional pulmonology in the nation. Penn interventional pulmonologists work collaboratively with referring primary care physicians and specialists in pulmonary medicine, thoracic surgery, and transplant to design treatment plans around the patient's individual needs.

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