

October 2015 Phoenix Pulmonary Journal Club: Lung Volume Reduction

The October 2015 pulmonary journal club focused on the review of older studies evaluating lung volume reduction surgery and how this has transitioned toward the development of non-surgical modes of lung volume reduction. The physiology behind dyspnea in chronic obstructive pulmonary disease (COPD) is a complex process. One of the proposed mechanisms has been hyperinflation associated with air trapping. In the mid 1990s studies by Cooper and Peterson (1) offered a promising approach in which lung volume reduction (LVR) could improve ventilatory mechanics and improve dyspnea. As the procedure gained more popularity, additional larger scale trials were performed to support its validity.

We reviewed 2 studies looking at lung volume reduction. The first was "The Effect of Lung Volume Reduction Surgery In Patients With Severe Emphysema" (2) . This was a smaller, randomized controlled trial (RCT) that looked at 2 groups of 24 patients. One group received LVR while the other received medical therapy. The primary outcome was mortality at 6 months and change in FEV1. The study did not show any mortality benefit but showed there was an increase in FEV1 of 150 ml by 6 months in the surgical group whereas the medical group showed no improvement. We reviewed a larger subsequent study, "A Randomized Trial Comparing Lung Volume Reduction Surgery with Medical Therapy for Severe Emphysema", a RCT that included 1218 patients divided into 2 groups of 608 pts (surgical) and 610 pts (medical) (3). The primary outcome was mortality at 2 years and exercise capacity. The results showed that there was no overall mortality benefit, but there was an overall increase in exercise capacity. A subgroup analysis showed that patients that had poor baseline exercise tolerance and upper lobe predominant emphysema did the best with lower mortality rate and increased exercise capacity. This study was useful in defining a subset of patients most likely to benefit from LVR surgery.

The cost, expertise and risk of complications associated with lung volume reduction surgery led to expanding the physiology of reducing lung volumes via nonsurgical approaches. The use of one way endobronchial valves in allowing air to leave bronchial segments to promote lung volume reduction via atelectasis has been explored for over a decade. Our group was involved in the earlier trials which evaluated efficacy and safety of endobronchial valves (4) . The results from our experience did not show that the endobronchial valves reduced lung volumes.

A subsequent study, "A Randomized Study of Endobronchial Valves for Advanced Emphysema" was reviewed (5). This was a large RCT that divided a total of 321 pts in a 2:1 format to 2 groups of 220 patients that received endobronchial valves pts and 101 patients that received medical treatment. The primary outcome was change in FEV1 and distance in 6 minute walk test. The placement of endobronchial valves was via bronchoscopy was guided based on emphysema seen on CT of the chest. The large majority of valves were placed in either right upper lobe (52%) or left upper lobe (14%). The study did show a mild increase in FEV1 of 4.3% in the patients treated with endobronchial valves and also resulted in an increase in 6 min walk distance of 9.3 m.

However, patients receiving the endobronchial valves also noted higher rates of hemoptysis and COPD exacerbations. The reason for less than optimal results has been explained by the persistence of hyperinflation through collateral ventilation.

The physiologic basis why lung volume reduction may work in COPD remains the same. The surgical resection of apical emphysematous regions may be of some benefit in patients with apical emphysema and decreased exercise tolerance. The role of volume reduction via use of endobronchial valves may become useful if subsequent studies show that collateral ventilation does not lead to persistent hyperinflation and the reduction in volumes shows a sustained increase in FEV1 and 6 min walk test.

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References

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