

Survival benefit of endobronchial valves: Is it just mechanical?

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The clinical question

Do patients who have a clinical response to EBV treatment by either pulmonary function, exercise capacity, health-related quality of life, and/or radiography have a survival benefit over non-responders?

AABIP Take home message

This study suggests that improvement of exercise capacity and health-related quality of life post-EBV treatment is associated with a survival benefit, rather than improvement in lung function and reduction in hyperinflation alone. Future studies investigating the benefits of post-EBV exercise programs are required.

Background

Bronchoscopic lung volume reduction (BLVR) with endobronchial valves (EBV) is a less-invasive alternative approach to lung volume reduction surgery (LVRS) for select patients with severe COPD and hyperinflation. This method utilizes one-way valves implanted into a target lobe that results in lobar deflation and atelectasis of diseased lung, allowing for improved ventilation of healthier lung, less air trapping, and improved diaphragm function.

Several randomized controlled trials have demonstrated that EBV treatment improves pulmonary function, exercise capacity, and health-related quality of life. While LVRS has a survival benefit in patients with upper lobe emphysema and low exercise capacity, the survival benefits of EBVs are less clear.



Current data suggests that EBV treatment has a survival benefit only in those patients who achieve complete lobar atelectasis. However, some patients with partial lobar atelectasis may demonstrate a response to EBVs with improved pulmonary function and/or exercise capacity. Studies investigating the survival benefit of EBV treatment in patients who demonstrate a response by pulmonary function, exercise capacity, and/or health-related quality of life are lacking.

Study Design

Type of study: Single-center, retrospective observational cohort study

N: 428

Study groups: All patients who underwent bronchoscopic lung volume reduction (BLVR) using endobronchial valves (EBV) were categorized into two groups:

- Responders, based on minimal importance differences in FEV1, RV, RV/TLC, 6-minute walk distance (6MWD), St. George's Respiratory Questionnaire (SGRQ), target lobe volume reduction (TLVR), and complete lobar atelectasis
- Non-responders

Settings: Single academic center in The Netherlands (University Medical Center Groningen)

Enrollment & Treatment Period: June 2008 through December 2020

Follow up: 6-weeks and 1-year post-treatment

Primary outcome: Not explicitly stated. Study looked at overall survival and predictors of survival.

Interventions:

No interventions in this study.

- For overall survival, the authors used the Kaplan-Meier method, which included all patients treated in the study period (even if EBVs removed or underwent LVRS or transplant)
- For predictors of survival, a univariate Cox proportional hazard analysis on predetermined potential predictors of survival and potential confounders was performed. Those variables with significance less than 0.20 were then included in a multivariate analysis

Population

Inclusion and exclusion criteria: All patients who underwent BLVR using EBV from June 2008 through December 2020, many of whom were treated in clinical trials. Inclusion and exclusion criteria were dependent upon the clinical trial or local practice.

Baseline Characteristics:

- 68% female
- Mean age – 61 +/- 8
- BMI – 24 +/- 3.7
- BODE index – 5.6 +/- 1.5

- FEV1 (% predicted) – 26 +/- 8
- RV (% predicted) – 254 +/- 50
- RV/TLC (%) – 64 +/- 8
- DLCO (% predicted) – 38 +/- 12

- 6MWD (m) – 327 +/- 97
- mMRC – 3
- SGRQ – 57.5 +/- 12.6

- Target lobe inspiratory volume (ml) – 1890 +/- 628
- Target lobe emphysema score (%) – 49 +/- 10

Outcomes



- Median overall survival time after treatment was 8.2 years (95% CI 6.7-10)
- 44% of patients achieved complete lobar atelectasis (determined by quantitative CT analysis), 93% patients achieved relative target lobe reduction
- Only 6MWD and SGRQ responders had a survival benefit (HR 0.54, 95% CI 0.3-0.94, p=.03 and HR 0.5, 95% CI .28-.89, p=.02 respectively)
- Patients who achieved complete lobar atelectasis or had a response by target lobe volume reduction or RV did not have a survival benefit

Commentary

Study strengths

- First study to look at EBV responders by lung function, exercise capacity, and quality of life
- Large cohort with relatively high follow-up rate

Study Limitations

- Single center study in Netherlands which may limit generalizability to other patient populations
- Includes patients over a 12-year time-period with some patients only having 1-year follow-up before analysis
- Includes patients who subsequently underwent LVRS or lung transplantation, however authors note this number was low
- Study results differ from prior study of 449 patients which demonstrated survival benefit in patients who achieved complete lobar atelectasis (Gompelmann 2019). Authors suggest this may be due to their higher rates of complete lobar atelectasis and use of quantitative CT-analysis to determine collateral ventilation and response

Funding

None

Suggested reading

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4. Garner J, Kemp SV, Toma TP, Hansell DM, Polkey MI, Shah PL, Hopkinson NS. Survival after Endobronchial Valve Placement for Emphysema: A 10-Year Follow-up Study. *Am J Respir Crit Care Med*. 2016 Aug 15;194(4):519-21. doi: 10.1164/rccm.201604-0852LE. PMID: 27525462; PMCID: PMC5003334.

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