

# Lung Volume Reduction Surgery Prior to Lung Transplantation: A Propensity-Matched Analysis

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## Introduction

- Lung volume reduction surgery (LVRS) is a therapeutic option in the treatment of chronic obstructive pulmonary disease (COPD)
- COPD is the most common indication for lung transplantation (LTx).
- LVRS prior to LTx is controversial. Single institution studies report contradicting results, with some reporting increased risk of bleeding/mortality, and others reporting no difference in outcomes.
- The impact of undergoing LVRS prior to LTx on outcomes after LTx is unclear.

## Objectives

- We aimed to assess the impact of LVRS on outcomes after lung transplantation using a national transplant registry.
- We hypothesize that patients who undergo LVRS prior to lung transplantation are at increased risk of mortality after lung transplantation.

## Methods and Results

- The United Network of Organ Sharing (UNOS) database was used to identify all adult (>18 years), first-time lung transplant recipients from May 2005 to March 2017 with a diagnosis of COPD.
  - 4,905 patients included in study
    - 4,679 (95.3%) had no prior thoracic surgery
    - 107 (2.2%) had LVRS prior to lung transplant
    - 119 (2.5%) had unknown prior thoracic surgery
- One-to-one propensity matching was used to match patients with prior LVRS to patients with no prior thoracic surgery, based on Lung Allocation Score (LAS), sex, age, race, FEV1, BMI, and functional status. Nearest neighbor without replacement and a caliper of 0.05 was used.
  - 212 matches generated (106 LVRS and 106 non-LVRS)
- Primary exposure was LVRS prior to lung transplant
- Primary outcome was graft survival (death or re-transplantation due to graft failure)
- Multivariate Cox proportional hazards modeling used to analyze outcomes
- Unadjusted Kaplan Meier survival curves used to compare median survival

## Results (Cont.)

### Baseline Patient Characteristics

- Propensity matching successfully matched patients on the specified criteria.
- Notable differences in baseline characteristics included recipient and donor bilirubin levels.
- Recipient and donor total bilirubin demonstrated univariate association with our primary outcome, and thus were adjusted for in our multivariate model

Characteristic	LVRS+LT (n=106)	LT alone (n=106)	p Value
<b>Recipient Characteristics</b>			
Age at Transplant: mean (SD)	60.6 (6.7)	60.5(6.7)	0.903
Male: N (%)	70 (66.0%)	69 (65.1%)	0.885
Ethnicity: N (%)			0.364
Caucasian	97 (91.5%)	95 (89.6%)	
African American	9 (8.5%)	9 (8.5%)	
Other (including Asian, mixed race, Native American)	0 (0%)	2 (1.9%)	
BMI: mean (SD)	24.3 (4.2)	24.2 (4.4)	0.868
Lung Allocation Score: mean (SD)	36.3 (10.1)	36.6 (10.7)	0.826
Total Bilirubin (mg/dL): mean (SD)	<b>0.49 (0.2)</b>	<b>0.81 (1.8)</b>	<b>0.044</b>
FEV1 at Transplant: mean (SD)	24.6 (13.9)	27.8 (19.3)	0.173
Average Functional Capacity at Transplant: Median (IQR)	60% (40%-70%)	50% (40%-60%)	0.628
<b>Donor Characteristics</b>			
Age: mean (SD)	35.5 (14.5)	35.5 (13.9)	0.985
Total Bilirubin (mg/dL): mean (SD)	<b>0.85 (0.64)</b>	<b>1.1 (1.08)</b>	<b>0.050</b>

Characteristic	Hazard Ratio	p Value	95% CI
LVRS	1.69	0.014	1.11-2.56
Male Sex	0.88	0.551	0.58-1.34
LAS	1	0.957	0.98-1.02
<b>Race</b>			
White	REF		
African American/Black	1.05	0.904	0.49-2.23
Functional Status	0.99	0.016	0.97-0.99
Age	1.02	0.287	0.99-1.05
BMI	1.02	0.42	0.97-1.07
Donor Bilirubin	0.77	0.121	0.55-1.07
Recipient Bilirubin	1.01	0.943	0.87-1.16
<b>CMV Status</b>			
Donor (-) to Recipient (-)	REF		
Donor (-) to Recipient (+)	0.61	0.184	0.29-1.27
Donor (+) to Recipient (+)	1.04	0.908	0.56-1.90
Donor (+) to Recipient (-)	0.73	0.368	0.37-1.44
Donor (+) to Recipient (Unknown)	0.23	0.056	0.05-1.04
Donor and Recipient status Unknown	0.7	0.401	0.31-1.61
Single Lung Transplant	0.73	0.168	0.47-1.14

### Cox Proportional Hazards Modeling

LVRS prior to lung transplant is associated with increased mortality after lung transplant.

## Conclusion

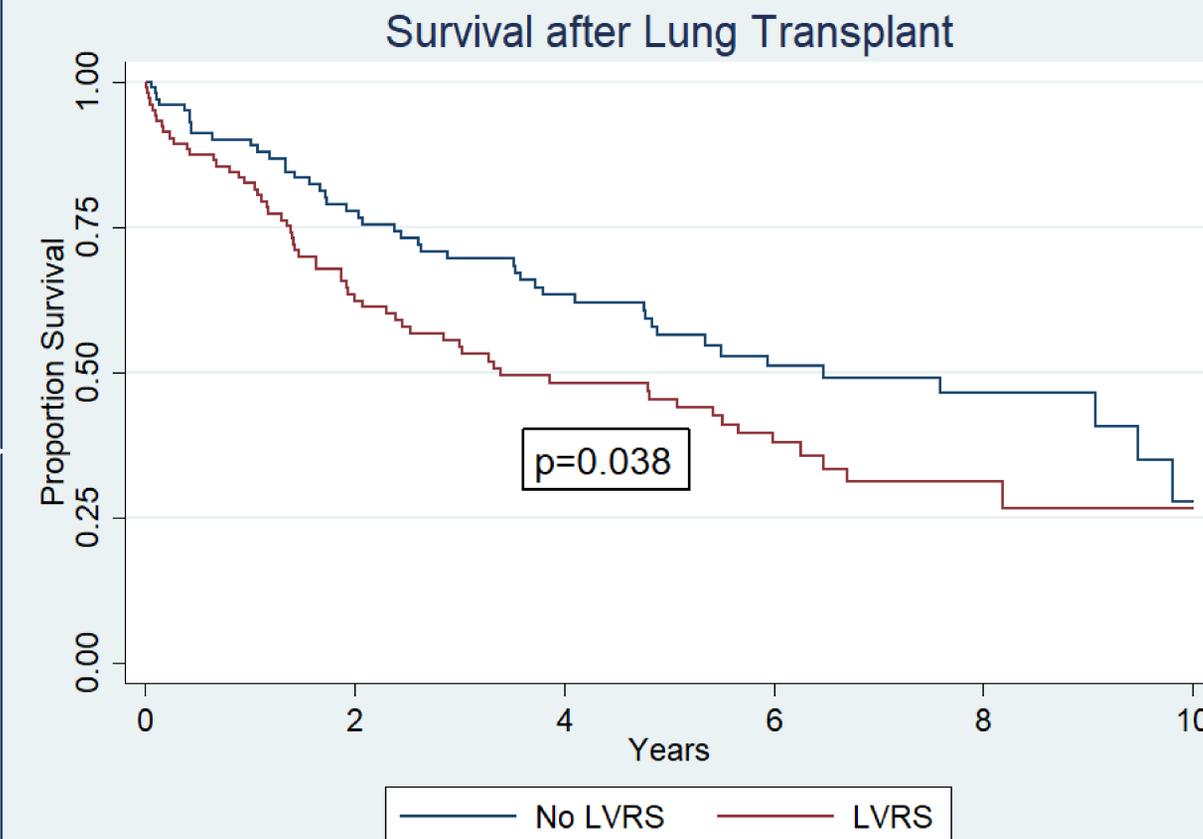
- This is the largest multi-institutional study to date of LVRS prior to LT
- We showed that contrary to numerous previous analyses, LVRS is significantly associated with increased risk of graft failure after LT
- Median graft survival is significantly longer in patients who underwent LT alone, without prior LVRS
- Institutions should carefully consider patients who are candidates for LVRS who may eventually need LT.

## References

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### Kaplan Meier Survival Analysis of LVRS Prior to Lung Transplant vs. Lung Transplant alone

Median graft survival is significantly different between groups (3.4 years versus 6.5 years, favoring LT alone, p=0.0338)