

Online Data Supplement

Effect of Lung Volume Reduction Surgery on Mean Inspiratory Pressure in Advanced Emphysema

Rachel N. Criner MD, Daohai Yu PhD, Michael R. Jacobs PharmD, Gerard J. Criner MD

Table S1. Percentage Differences in Maximum Inspiratory Pressure From Baseline to Visit Time for Gender^a

Visit (months)	LVRS	Medical	<i>p</i> -value ^b
6			
Male	14.9±33.8 (<i>n</i> =280)	-1.9±24.8 (<i>n</i> =288)	<0.0001
Female	19.3±38.0 (<i>n</i> =209)	5.9±35.1 (<i>n</i> =150)	0.0003
12			
Male	17.9±41.0 (<i>n</i> =238)	0.4±24.7 (<i>n</i> =231)	<0.0001
Female	22.3±43.9 (<i>n</i> =182)	8.1±35.6 (<i>n</i> =131)	0.0048
24			
Male	14.5±40.2 (<i>n</i> =202)	-0.5±27.9 (<i>n</i> =190)	0.0001
Female	19.6±36.0 (<i>n</i> =149)	4.4±36.4 (<i>n</i> =96)	0.0001
36			
Male	10.4±37.6 (<i>n</i> =124)	1.0±27.2 (<i>n</i> =105)	0.0575
Female	17.7±35.5 (<i>n</i> =96)	1.1±31.0 (<i>n</i> =62)	0.0026

Definition of abbreviation: LVRS = lung volume reduction surgery

^aValues are number of participants (*n*) or mean±SD, unless otherwise indicated.

^b*p*-values were calculated using the Wilcoxon rank-sum test. The *p*-values were not adjusted for age, body mass index, emphysema lobe predominance, exercise capacity, and risk categorization.

Table S2. Percentage Differences in Maximum Inspiratory Pressure from Baseline to Visit Time for Age Group^a

Visit (months)	LVRS	Medical	<i>p</i>-value^b
6			
Less than 60-years-old	17.4±36.8 (<i>n</i> =243)	0.7±33.2 (<i>n</i> =196)	<0.0001
60- to < 65-years-old	15.7±36.4 (<i>n</i> =77)	1.9±25.0 (<i>n</i> =76)	0.0168
65- to 70-years-old	16.4±34.4 (<i>n</i> =155)	-0.6±25.0 (<i>n</i> =157)	0.0001
12			
Less than 60-years-old	19.3±45.4 (<i>n</i> =210)	5.2±31.8 (<i>n</i> =157)	0.0014
60- to < 65-years-old	23.4±43.1 (<i>n</i> =67)	-1.3±27.2 (<i>n</i> =62)	0.0004
65- to 70-years-old	19.5±37.7 (<i>n</i> =132)	2.9±27.7 (<i>n</i> =138)	0.0002
24			
Less than 60-years-old	16.8±42.5 (<i>n</i> =175)	0.9±30.7 (<i>n</i> =114)	0.0002
60- to < 65-years-old	10.8±36.7 (<i>n</i> =55)	2.3±32.6 (<i>n</i> =60)	0.1550
65- to 70-years-old	19.7±33.5 (<i>n</i> =113)	0.2±31.0 (<i>n</i> =106)	<0.0001
36			
Less than 60-years-old	13.0±37.6 (<i>n</i> =114)	2.2±30.5 (<i>n</i> =63)	0.0207
60- to < 65-years-old	9.6±37.0 (<i>n</i> =36)	1.3±26.9 (<i>n</i> =40)	0.6029
65- to 70-years-old	16.3±36.0 (<i>n</i> =68)	-0.1±28.2 (<i>n</i> =63)	0.0074

Definition of abbreviation: LVRS = lung volume reduction surgery

^aValues are number of participants (*n*) or mean±SD, unless otherwise indicated.

^b*p*-values were calculated using the Wilcoxon rank-sum test. The *p*-values were not adjusted for age, body mass index, emphysema lobe predominance, exercise capacity, and risk categorization.

Table S3. Difference in Percentage Change of LVRS Compared to Medical Arm at Each Time Point from Baseline for BMI

Visit (months)	LVRS (n)	Medical (n)	Difference ± standard error	p-value ^a	95% CI
6					
Less than 25 kg/m ²	254	208	+13.5 ± 3.2	<0.0001	7.2-19.8
25 kg/m ² or greater	211	217	+16.7 ± 3.5	<0.0001	9.9-23.5
12					
Less than 25 kg/m ²	216	172	+18.3 ± 3.6	<0.0001	11.1-25.4
25 kg/m ² or greater	184	178	+14.5 ± 3.9	0.0002	6.8-22.2
24					
Less than 25 kg/m ²	178	130	+14.8 ± 4.1	0.0003	6.7-23.0
25 kg/m ² or greater	156	146	+9.2 ± 4.3	0.0337	0.7-17.7
36					
Less than 25 kg/m ²	111	76	+10.7 ± 4.8	0.0243	1.4-20.1
25 kg/m ² or greater	99	83	+11.0 ± 4.9	0.0245	1.4-20.6

Definition of abbreviation: LVRS = lung volume reduction surgery

^ap-value adjusted for age, body mass index, emphysema lobe predominance, exercise capacity, and risk categorization. Adjusted p-values were calculated using the mixed-effects model for percent difference of mean inspiratory pressure, comparing between treatment groups by gender and visit time.

Table S4. Percentage Differences in Maximum Inspiratory Pressure from Baseline to Visit Time for Body Mass Index Subgroup^a

Visit (months)	LVRS	Medical	<i>p</i> -value ^b
6			
Less than 25 kg/m ²	18.3±36.8 (<i>n</i> =254)	2.0±27.0 (<i>n</i> =208)	<0.0001
25 kg/m ² or greater	15.2±33.3 (<i>n</i> =211)	-0.4±31.0 (<i>n</i> =217)	<0.0001
12			
Less than 25 kg/m ²	21.9±41.9 (<i>n</i> =216)	2.0±25.4 (<i>n</i> =172)	<0.0001
25 kg/m ² or greater	17.1±41.0 (<i>n</i> =184)	3.9±32.9 (<i>n</i> =178)	0.0009
24			
Less than 25 kg/m ²	19.2±37.7 (<i>n</i> =178)	2.1±26.6 (<i>n</i> =130)	<0.0001
25 kg/m ² or greater	13.0±37.9 (<i>n</i> =156)	-0.1±34.5 (<i>n</i> =146)	0.0002
36			
Less than 25 kg/m ²	12.7±37.3 (<i>n</i> =111)	-0.3±25.9 (<i>n</i> =76)	0.0067
25 kg/m ² or greater	15.1±37.5 (<i>n</i> =99)	2.2±31.8 (<i>n</i> =83)	0.0230

Definition of abbreviation: LVRS = lung volume reduction surgery

^aValues are number of subjects (*n*) or mean±SD, unless otherwise indicated.

^b*p*-values were calculated using the Wilcoxon rank-sum test. The *p*-values were not adjusted for age, body mass index, emphysema lobe predominance, exercise capacity, and risk categorization.

Table S5. Percentage Differences in Maximum Inspiratory Pressure From Baseline to Visit Time for Emphysema Distribution and Exercise Capacity^{ab}

Visit (months)	LVRS	Medical	<i>p</i> -value ^c
6			
Non-upper, low exercise	14.6±36.7 (<i>n</i> =63)	4.5±33.4 (<i>n</i> =43)	0.1225
Non-upper, high exercise	11.9±30.9 (<i>n</i> =89)	-5.5±24.1 (<i>n</i> =90)	0.0005
Upper lobe, low exercise	25.8±40.8 (<i>n</i> =121)	8.8±38.1 (<i>n</i> =97)	0.0010
Upper lobe, high exercise	14.5±33.4 (<i>n</i> =175)	0.2±23.3 (<i>n</i> =169)	0.0001
High risk	13.3±33.8 (<i>n</i> =41)	-5.7±26.3 (<i>n</i> =39)	0.0127
12			
Non-upper, low exercise	14.5±33.9 (<i>n</i> =50)	8.2±27.6 (<i>n</i> =36)	0.5031
Non-upper, high exercise	16.1±44.6 (<i>n</i> =75)	5.2±24.9 (<i>n</i> =73)	0.2112
Upper lobe, low exercise	27.2±52.8 (<i>n</i> =105)	5.2±37.0 (<i>n</i> =69)	0.0009
Upper lobe, high exercise	20.0±37.0 (<i>n</i> =153)	2.5±28.4 (<i>n</i> =150)	<0.0001
High risk	13.0±32.7 (<i>n</i> =37)	-8.1±24.6 (<i>n</i> =34)	0.0147
24			
Non-upper, low exercise	19.1±35.7 (<i>n</i> =40)	2.3±39.5 (<i>n</i> =23)	0.0115
Non-upper, high exercise	10.1±34.0 (<i>n</i> =67)	-1.4±29.8 (<i>n</i> =66)	0.0188
Upper lobe, low exercise	20.0±36.8 (<i>n</i> =90)	1.4±30.1 (<i>n</i> =53)	0.0025
Upper lobe, high exercise	16.8±42.4 (<i>n</i> =132)	0.9±29.2 (<i>n</i> =120)	0.0005
High risk	17.3±39.5 (<i>n</i> =22)	8.4±36.9 (<i>n</i> =24)	0.4096
36			
Non-upper, low exercise	11.6±24.5 (<i>n</i> =21)	-1.7±36.5 (<i>n</i> =13)	0.0958
Non-upper, high exercise	9.6±40.3 (<i>n</i> =38)	-2.9±26.2 (<i>n</i> =36)	0.1597
Upper lobe, low exercise	20.2±45.9 (<i>n</i> =59)	8.0±35.0 (<i>n</i> =23)	0.4267
Upper lobe, high exercise	12.7±31.1 (<i>n</i> =83)	1.0±27.2 (<i>n</i> =83)	0.0054
High risk	6.8±31.9 (<i>n</i> =19)	3.6±23.8 (<i>n</i> =12)	0.9192

Definition of abbreviation: LVRS = lung volume reduction surgery, non-upper = non-upper lobe predominant emphysema, upper lobe = upper lobe predominant emphysema, low exercise = low exercise capacity, high exercise = high exercise capacity

^aValues are number of participants (*n*) or mean±SD, unless otherwise indicated.

^bThe National Emphysema Treatment Trial characterized participants as either predominantly non-upper lobe emphysema or upper lobe emphysema based on a baseline computerized tomography scan read by each center's radiologist.^{S1} Predominantly non-upper lobe emphysema consisted of emphysematous patterns that were diffuse, predominantly lower lobe, or

predominantly distributed in superior segments of lower lobes. Participants were categorized as either high exercise capacity if they had a maximum workload greater than 40% for their gender at baseline or low exercise capacity if their maximum workload was 40% or less.^{S1} Forty percent or less corresponded to a maximum workload of less than 25 watts for females and less than 40 watts for males. As defined by the NETT, high risk criteria included subjects with a $FEV_1 \leq 20\%$ of predicted value and either homogenous emphysema or a carbon monoxide diffusing capacity that was 20 percent or less of predicted value at baseline.^{S1} Subjects not meeting these criteria at baseline were deemed non-high risk and further categorized by emphysema lobe predominance and exercise capacity.

χ^2 -values were calculated using the Wilcoxon rank-sum test. The p -values were not adjusted for age, body mass index, emphysema lobe predominance, exercise capacity, and risk categorization.

References

S1. National Emphysema Treatment Trial Research Group. A randomized trial comparing lung-volume-reduction surgery with medical therapy for severe emphysema. *N Engl J Med*. 2003;348:2059-2073. doi: <https://doi.org/10.1056/NEJMoa030287>