



Article

Maintenance Negative Pressure Ventilation Improves Survival in COPD Patients with Exercise Desaturation

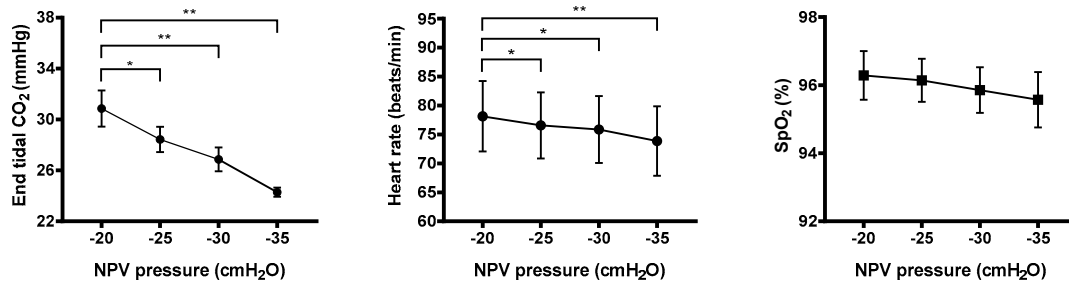


Figure S1. EtCO₂ and heart rate significantly decreased, and SpO₂ maintained over 90% during the NPV titration process. * $p < 0.05$, ** $p < 0.01$ was compared to the pressure level of -20 cmH₂O.

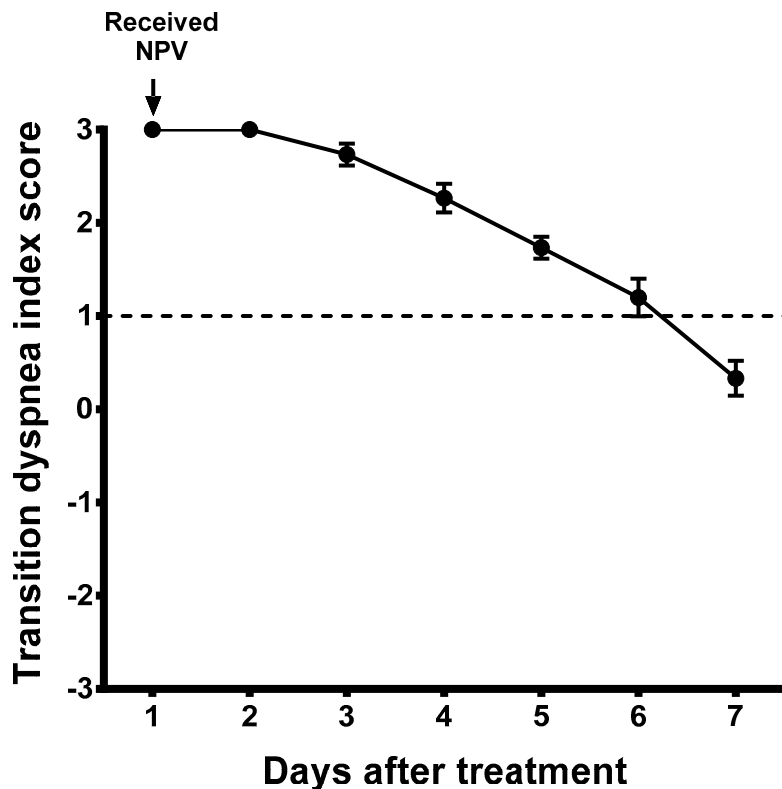


Figure S2. Transition dyspnea index score was evaluated by the day after patients underwent negative pressure ventilation (NPV) for 60 minutes. The response of NPV confirmed a 1-unit change in the TDI score as being clinically important.

Table S1. Mortality risks during 8 years in the four groups adjusted by confounders.

Variables	3 year	P value	5 year	p value	8 year	p value
	HR(95%CI)		HR(95%CI)		HR(95%CI)	
NPV-ND	1		1		1	
NPV-D	9 (1-70)	0.0431	5 (1-12)	0.0014	3 (2-7)	0.0022
Non-NPV-D	11 (1-88)	0.0255	5 (2-14)	0.0004	4 (2-9)	0.0002
Non-NPV -ND	6 (0.7-49)	0.0943	2 (0.8-6)	0.1149	3 (1-5)	0.0171

Adjusted risk compared to NPV-ND group. HR: hazard ratio. NPV: negative pressure ventilation, D: desaturation, ND: non-desaturation.

Table S2. Regression coefficients for the mixed-model repeated-measure models for FEV₁ and FEV₁ %.

Solution for Fixed Effects: forced expiratory volume in one second (FEV₁)						
Effect	Group	Estimate	Standard error	DF	t value	p value
Intercept		1356.200	6405.530	337	0.21	0.833
time		-0.360	0.648	336	-0.56	0.579
group	Non-NPV + D	-404.740	8736.490	1804	-0.05	0.963
group	Non-NPV + ND	-157.610	8924.580	1804	-0.02	0.986
group	NPV + D	-404.900	8976.560	1804	-0.05	0.964
group	NPV + ND	0	.	.	.	.
time*group	Non-NPV + D	-1.890	0.741	1804	-2.55	0.0109
time*group	Non-NPV + ND	-1.396	0.727	1804	-1.92	0.0549
time*group	NPV + D	-0.137	0.738	1804	-0.19	0.8529
time*group	NPV + ND	0	.	.	.	.
time*time		-0.013	0.007	1804	-1.86	0.0636
Solution for Fixed Effects: forced expiratory volume in one second (FEV₁ %)						
Effect	Group	Estimate	Standard error	DF	t value	p value
Intercept		62.082	2.279	337	27.24	<.0001
time		0.132	0.038	336	3.49	0.0006
group	Non-NPV + D	-18.190	3.113	1804	-5.84	<.0001
group	Non-NPV + ND	-6.624	3.165	1804	-2.09	0.0365
group	NPV + D	-18.688	3.191	1804	-5.86	<.0001
group	NPV + ND	0	.	.	.	.
time*group	Non-NPV + D	-0.107	0.041	1804	-2.61	0.0091
time*group	Non-NPV + ND	-0.124	0.039	1804	-3.16	0.0016
time*group	NPV + D	-0.030	0.040	1804	-0.74	0.4566
time*group	NPV + ND	0	.	.	.	.
time*time		-0.002	0.000	1804	-5.52	<.0001

NPV: negative pressure ventilation, D: desaturation, ND: non-desaturation.

Table S3. Regression coefficients for the mixed-model repeated-measure models for 6 minute walking distance.

Solution for fixed effects: 6 minute walking distance (meter, M)						
Effect	Group	Estimate	Standard error	DF	t value	p value
Intercept		389.300	10.377	337	37.51	<.0001
time		0.944	0.283	316	3.33	0.0010
group	Non-NPV + D	-18.213	14.423	1527	-1.26	0.2069
group	Non-NPV + ND	-26.656	14.464	1527	-1.84	0.0655
group	NPV + D	-29.656	14.593	1527	-2.03	0.0423
group	NPV + ND	0	.	.	.	.
time*group	Non-NPV + D	-1.744	0.335	1527	-5.20	<.0001
time*group	Non-NPV + ND	-0.920	0.330	1527	-2.79	0.0054
time*group	NPV + D	-1.084	0.324	1527	-3.34	0.0009
time*group	NPV + ND	0	.	.	.	.
time*time		-0.019	0.003	1527	-6.04	<.0001

NPV: negative pressure ventilation, D: desaturation, ND: non-desaturation.

Table 4. Regression coefficients for the mixed-model repeated-measure models for Distance-saturation product (M%).

Solution for Fixed Effects: Distance-saturation product (M%)						
Effect	Group	Estimate	Standard error	DF	t value	p value
Intercept		354.040	9.342	336	37.90	<.0001
time		0.411	0.249	316	1.65	0.0998
group	Non-NPV + D	-48.799	13.014	1527	-3.75	0.0002
group	Non-NPV + ND	-25.514	13.019	1527	-1.96	0.0502
group	NPV + D	-62.926	13.135	1527	-4.79	<.0001
group	NPV + ND	0	.	.	.	.
time*group	Non-NPV + D	-1.222	0.291	1527	-4.20	<.0001
time*group	Non-NPV + ND	-0.773	0.284	1527	-2.72	0.0066
time*group	NPV + D	-0.606	0.281	1527	-2.16	0.0308
time*group	NPV + ND	0	.	.	.	.
time*time		-0.01391	0.002758	1527	-5.04	<.0001

NPV: negative pressure ventilation, D: desaturation, ND: non-desaturation.