Effects of a new Airway Clearance Technology versus manual physiotherapy in COPD

ATS 2019, Dallas

F. Mihaltan1, L. Morin2, C. Borcea1, A. Constantin1, A. Pahontu1, L. Marinescu1, V. C. Cosei1

[1]National Institute of Pneumology Marius Nasta, Bucharest (Romania), [2]Physio-Assist, Aix-en-Provence (France)

Introduction

Chronic obstructive pulmonary disease (COPD) is an umbrella term used to describe progressive lung diseases including emphysema and chronic bronchitis. COPD patients often experience dyspnea, cough, sputum and chest tightness which may worsen during acute exacerbation of COPD (AECOPD).

Airway clearance techniques (ACTs) are safe and enhance mucus clearance in COPD (Holland et al Chronic Respiratory Disease 2006, Osadnik et al Cochrane Database of Systematic Reviews 2012). Performing ACTs reduce during an AECOPD the likelihood of needing mechanical ventilation, as well as the length of time for which it was required. There are a few evidences to suggest some benefits of ACTs on pulmonary exacerbation and health-related quality of life (Mascardi et al J Thorac Dis 2016, Nicolini et al Clinical Resp J 2017).

Aim

Study objective was to evaluate the effects of a new ACT technology in hospitalized COPD patients suffering of chest congestion compared to manual physiotherapy.

Methods

10 COPD patients (FEV1>20%) with AECOPD who reported excessive mucus congestion and difficulties to clear airways despite bronchodilator therapy were treated 5 days (2 sessions of 20-min/day) during hospitalization with either new device (Simeox, Physio-Assist) or manual physiotherapy (5 patients in each group). The device generates a vibratory pneumatic signal in the bronchial tree during relaxed exhalation by disseminating a succession of very short air depressions of constant volume at a frequency similar to that of the vibratory cilia of the bronchial epithelium.

By this way, the signal mobilizes mucus in the distal tracts to change its rheology and transport it to the proximal tract for expectoration. Patients were excluded if they had recent pneumothorax, severe cardiac health issues, recent haemoptysis or inability to perform spirometry.
Spirometry, symptoms, CAT score, usability and safety were compared between the 2 groups.

Results

Age 65±8ys, 7 men and 3 women, 7 with bronchiectasis and 8 had lung crackles, BMI 27.1±6.1kg/m2, Borg scale 4.5±1.8, SpO2 96.3±1.7%, FEV1% 42±19.

Baseline characteristics

Variables	Global Group values (N=10)	Device group values (N=5)	Manual physiotherapy group values (N=5)
Age (years) mean ± SD	65±8	65.8±7.3	64.2±9.4
Male (N / %)	7 (70%)	4 (80%)	3 (60%)
Body mass index (kg/m²) mean ± SD	27.1±6.1	28.1±6.1	26.1±6.6
CAT score mean ± SD	21.6±5.9	20.2±6.4	17.2±5.4
Dyspnea (BORG scale) mean ± SD	4.5±1.8	3±0.7	6±1.2

Clinical characteristics

Variables	Device group values (N=5)		Manual Physiotherapy group values (N=5)	
	Baseline	EOS**	Baseline	EOS*
CAT score Mean ± SD	20.2±6.4	17.0±4.6	17.2±5.4	18.6±4.0
Drainage improvement (N, %)	5 (100%)		4 (80%)	
Dyspnea improvement (N, %)	4 (80%)		4 (80%)	
Fatigue improvement (N, %)	4 (80%)		4 (80%)	
Autonomy in execution	5 (100%)		4 (80%)	

* End of Study (EOS) : 2 sessions of 20 minutes per day, for 5 days
** End of Study (EOS) : 2 sessions of 20 minutes per day, intensity 50-75%, for 5 days

All the patients of device group acquired quickly autonomous usage.
No adverse event nor pain was reported.

Improvement of mucus clearance and symptoms were similar between groups.
FEV1(L) improved by +0.15±0.10L (FEV1% +5±2%)
FEV1/FVC increased from 52.5±2.4% to 58.0±12.8% in the device group but remained stable in the manual physiotherapy group.
CAT score improved in the device group only from 20.2±6.4 to 17.0±4.6

PFTs characteristics

Variables	Groupe values (N=10)	Device group values (N=5)		Manual Physiotherapy group values (N=5)	
		Baseline	EOS**	Baseline	EOS*
FVC (L)	1.97±0.89	2.01±0.82	2.19±0.77	1.93±1.05	1.99±0.90
FVC (%)	55.7±17.5	55.5±18.4	60.6±15.9	55.9±18.7	60.2±18.0
FEV1 (L)	1.14±0.59	1.12±0.44	1.27±0.54	1.16±0.77	1.12±0.66
FEV1 (%)	42.2±19.0	39.5±13.5	44.6±15.8	45.0±24.8	44.8±24.9
FEV1/FVC%	53.2±7.5	52.5±2.4	58.0±12.1	55.4±10.7	51.7±14.1

All parameters ▲
FEV1 ▲ with 150±100ml and 5.2±2.3%

▲ in FVC, ▼ in FEV1, FEV1/FVC%
FEV1 ▼ with 40±110ml and 0.02±0.08%

* End of Study (EOS) : 2 sessions of 20 minutes per day, for 5 days
** End of Study (EOS) : 2 sessions of 20 minutes per day, intensity 50-75%, for 5 days

Conclusions

These preliminary data suggest safety and additional benefits of Simeox airway clearance technology for COPD with severe chronic bronchitis symptoms or bronchiectasis.

There is a need in further randomised studies including more patients for a longer follow-up.