SIMEOX ПРИ БРОНХОЭКТАЗАХ, НЕ СВЯЗАННЫХ С МУКОВИСЦИДОЗОМ

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SIMEOX КЛИНИЧЕСКАЯ ТЕТРАДЬ №3

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simeox
PROG.3
PROG.2
PROG.1
CYCLE
100%
POWER
25%
PERFORMANCE
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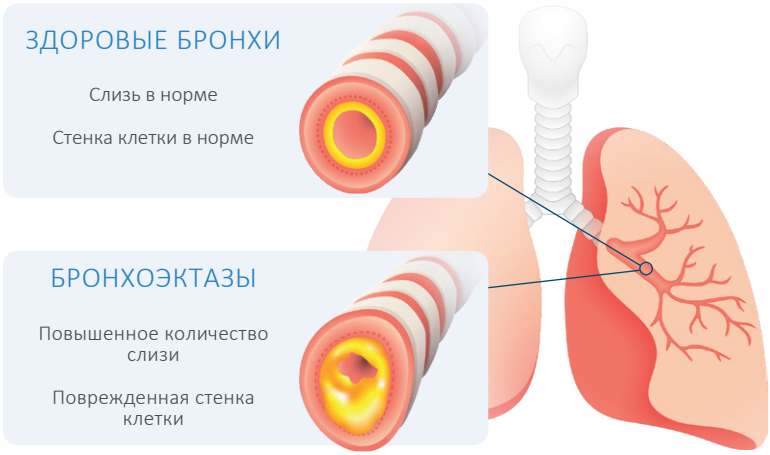
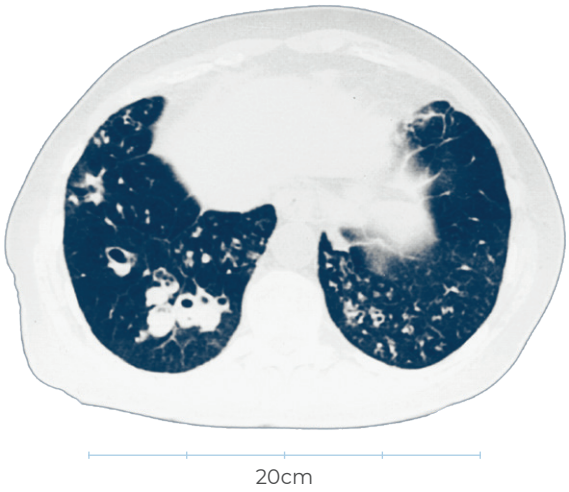
Определение

Бронхоэктатическая болезнь - это хроническое респираторное заболевание, характеризующееся постоянным кашлем, избыточным выделением мокроты и бронхиальной инфекцией. А также подтвержденным с помощью компьютерной томографии аномальным, постоянным и необратимым расширением бронхов. Наиболее частыми симптомами являются кашель и выделение мокроты, а также одышка, но также распространены риносинусит, усталость, кровохарканье и боль в грудной клетке.

Бронхоэктатическая болезнь является частым сопутствующим заболеванием у 50 % пациентов с прогрессирующим муковисцидозом и тяжелой формой ХОБЛ. Принято разделять этиологию у пациентов с муковисцидозом и без него (бронхоэктазы, не связанные с муковисцидозом, или NCFB). Поскольку муковисцидоз предрасполагает к появлению бронхоэктазов у большинства пациентов с ухудшением течения заболевания, а патофизиология и лечение бронхоэктазов при муковисцидозе хорошо описаны.





Бронхоэктазы, не связанные с муковисцидозом могут быть следствием предшествующей легочной инфекции или системного заболевания, но у 50% пациентов причина не выявлена (идиопатическая). Несмотря на то, что ХОБЛ является гетерогенным заболеванием и имеет множество причин, идиопатические бронхоэктазы и связанные с инфекцией бронхоэктазы составляют большинство случаев заболевания ХОБЛ у взрослых в большинстве случаев. ХОБЛ является ведущей причиной в Европе. В Азии посттуберкулезные заболевания являются наиболее частой основной причиной появления бронхоэктзов. Возбудители, выделенные у этих пациентов, включали нетуберкулезные микобактерии, синегнойную палочку и золотистый стафилококк. У пациентов с синегнойной палочкой прогноз наихудший. В США пациентами с бронхоэктазами являются преимущественно женщины (80%), которые никогда не курили (60%), средний возраст которых составляет 64 года.

> 75 % пациентов диагноз ставится после 50 лет. У 50% наблюдается обструкция дыхательных путей (у 15% - тяжелая). Распространенными сопутствующими заболеваниями являются: пневмония в анамнезе (68%), гастроэзофагеальная рефлюксная болезнь (47%), бронхиальная астма (29%), отит или риносинусит (25%), ХОБЛ (20%), ревматологические заболевания (8%), первичный иммунодефицит (5%).

Более тяжелые и частые обострения связаны с ухудшением качества жизни, ежедневными симптомами, снижением функции легких и смертностью. Частота легочных обострений высока и составляет в среднем 3 обострения за последние 2 года (данные регистра в США). У 50% пациентов с бронхоэктатической болезнью в Европе наблюдается два или более обострений в год, а одной трети требуется как минимум одна госпитализация в год. Следовательно, большинство терапевтических вмешательств направлено на снижение частоты обострений.

Бронхоэктатическая болезнь характеризуется порочным циклом инфекции и воспаления дыхательных путей, приводящим к необратимому повреждению мелких дыхательных путей и паренхимы легких. Эта модель, предложенная Коулом, не совсем понятна с точки зрения лежащей в ее основе биологии, но включает в себя дефицит мукоцилиарного клиренса и врожденного и адаптивного иммунитета4.

После анатомического повреждения бронхов происходит усиление травматических процессов, приводящих к прогрессирующему ухудшению физиологии легких и симптомов с сопутствующим увеличением числа обострений. Иммунный ответ организма на инфекцию в основном нейтрофильный, а производимые нейтрофилами протеазы вредны и приводят к дальнейшему повреждению легких, усиливая рецидивирующий цикл (рис.1).

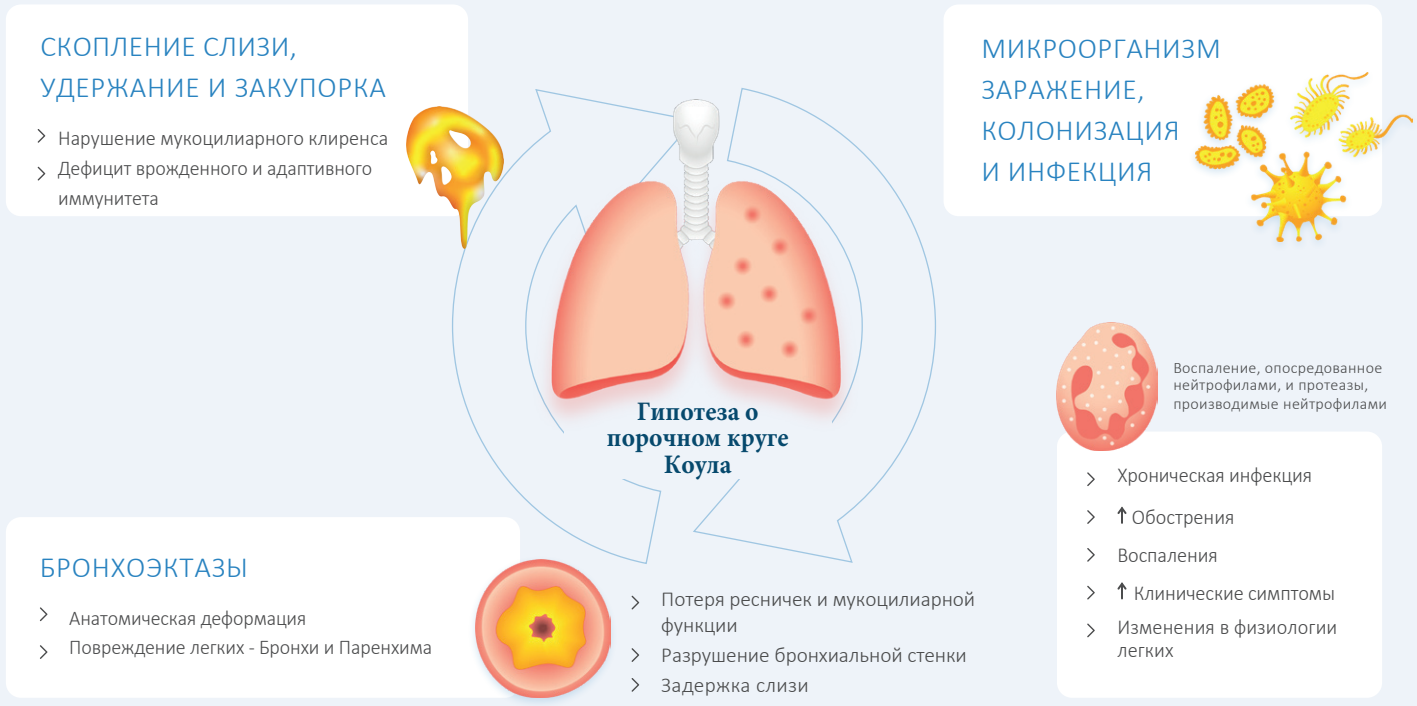


Рис. 1 - Современная интерпретация гипотезы Коула о порочном круге.

[1] Polverino E et al. European Respiratory Society guidelines for the management of adult bronchiectasis. Eur Respir J 2017; 50: 1700629.
[2] Chandrasekaran R et al. Geographic variation in the aetiology, epidemiology and microbiology of bronchiectasis. BMC Pulm Med. 2018 May 22;18(1):83. doi:10.1186/s12890-018-0638-0
[3] Aksamit TR et al. Bronchiectasis Research Registry Consortium. Adult Patients With Bronchiectasis: A First Look at the US Bronchiectasis Research Registry. Chest. 2017 May;151(5):982-992. doi:10.1016/j.chest.2016.10.055
[4] O'Donnell AE. Bronchiectasis update. Curr Opin Infect Dis. 2018 Apr;31(2):194-198. doi: 10.1097/QCO.0000000000000445.

Патофизиология обструкции легких

Хорошо известно, что обструкция мелких дыхательных путей в периферических отделах легких играет важную роль в этом пагубном процессе. Избыток слизи и медиаторов воспаления способствует закупорке просвета и бронхоспазму, которые усиливаются при перестройке дыхательных путей. Аберрантное ремоделирование эпителия с нарушением мукоцилиарной архитектуры наблюдается как в крупных, так и в мелких дыхательных путях у пациентов с бронхоэктазами, не вызванными муковисцидозом (рис.2)5

Расширение дыхательных путей при бронхоэктатической болезни обусловлено морфологическими изменениями эпителиальных клеток дыхательных путей с клеточной гиперплазией, что приводит к потере ресничек и нарушению МЦК. При бронхоэктатической болезни слизь сама по себе часто является аномальной и более сложной. Эти структурные аномалии в мелких дыхательных путях приводят к застою слизи, что способствует продолжению хронической инфекции и сохранению порочного круга у пациентов с бронхоэктазами.

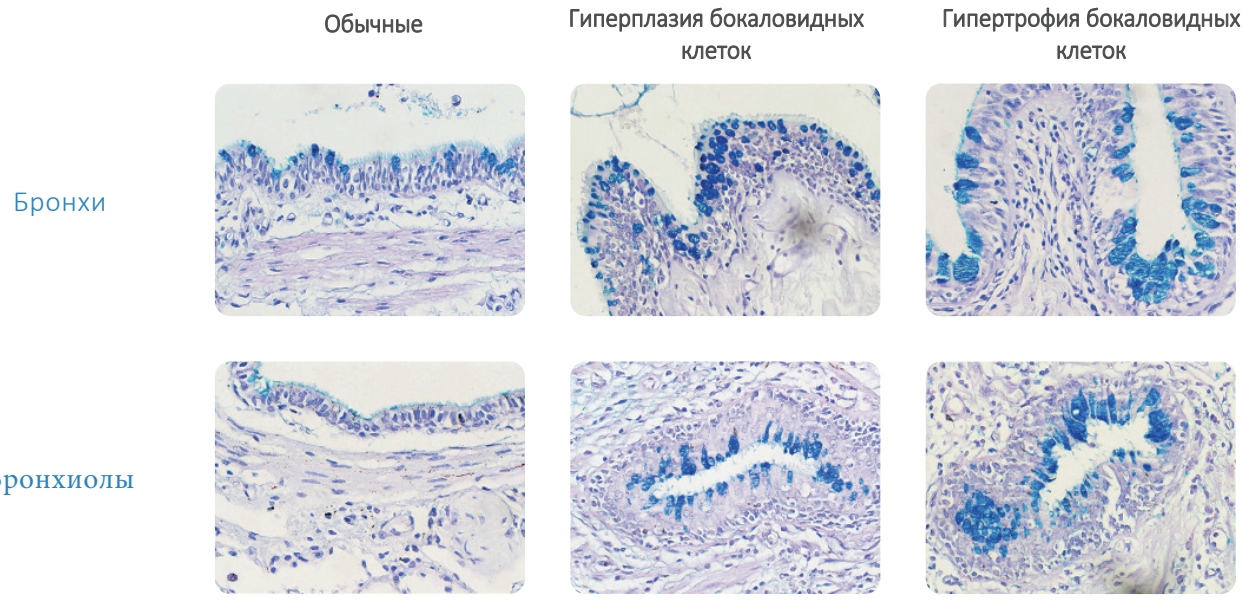


РИС. 2

[5] Chen ZG et al. Aberrant epithelial remodeling with impairment of cilia architecture in non-cystic fibrosis bronchiectasis. J Thorac Dis. 2018 Mar;10(3):1753-1764. doi: 10.21037/jtd.2018.02.13.
[6] Weycker D, Hansen GL, Seifer FD. Prevalence and incidence of noncystic fibrosis bronchiectasis among US adults in 2013. Chron Respir Dis. 2017 Nov;14(4):377-384. doi: 10.1177/1479972317709649
[7] Lin JL, Xu JF, Qu JM. Bronchiectasis in China. Ann Am Thorac Soc. 2016 May;13(5):609-16. doi:10.1513/AnnalsATS.201511-740PS

Распространенность и заболеваемость

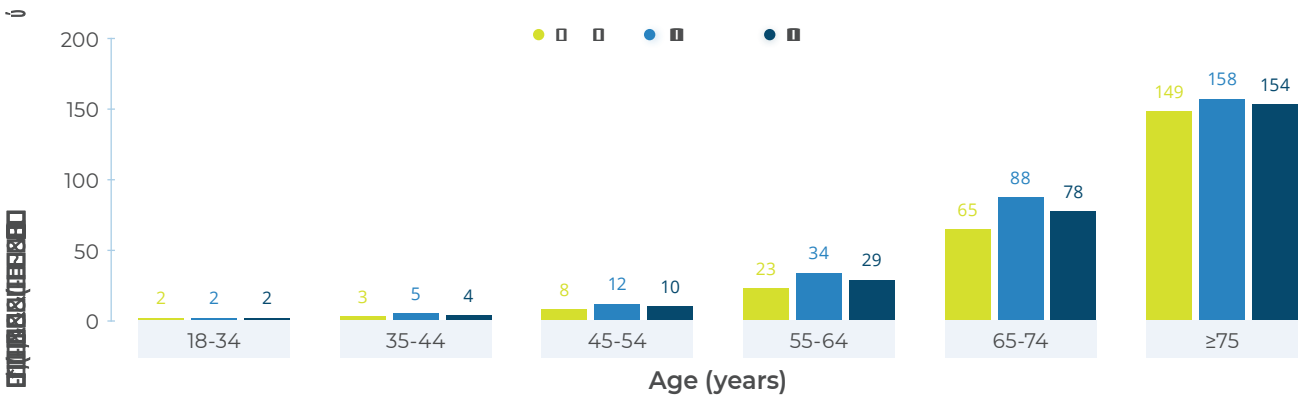


Fig. 5 - Incidence (annual) of bronchiectasis among US adults, by age and sex.

Similar incidence in Europe was reported in some studies: 20 cases per 100 000 (+17 000 / year) in Germany (2013)[9] and 48 cases per 100 000 (+20 000/ year) in Spain.

Incidence in Asia is unknown.

[2] Chandrasekaran R et al. Geographic variation in the aetiology, epidemiology and microbiology of bronchiectasis. BMC Pulm Med. 2018 May 22;18(1):83. doi:10.1186/s12890-018-0638-0

[5] Chen ZG et al. Aberrant epithelial remodeling with impairment of cilia architecture in non-cystic fibrosis bronchiectasis. J Thorac Dis. 2018 Mar;10(3):1753-1764. doi: 10.21037/jtd.2018.02.13.

[6] Weycker D, Hansen GL, Seifer FD. Prevalence and incidence of noncystic fibrosis bronchiectasis among US adults in 2013. Chron Respir Dis. 2017 Nov;14(4):377-384. doi: 10.1177/1479972317709649

[8] Martinez-Garcia MA, Miravitlles M. Bronchiectasis in COPD patients: more than a comorbidity? Int J Chron Obstruct Pulmon Dis. 2017 May 11;12:1401-1411. doi:10.2147/COPD.S132961

[9] Ringshausen FC, de Roux A, Diel R, Hohmann D, Welte T, Rademacher J. Bronchiectasis in Germany: a population-based estimation of disease prevalence. Eur Respir J. 2015 Dec;46(6):1805-7. doi: 10.1183/13993003.00954-2015

Etiologies

In Western countries, **post-infection bronchiectasis** is the most commonly identifiable cause for disease development. However, bronchiectasis caused by immune-related mechanisms including autoimmunity, immunodeficiencies and hematologic malignancies is identified as predominant etiologies in the US probably due to systemic evaluation in these diseases.

COPD and asthma are also significant contributors in Europe[2].

In Asia and Latin America, **predominant etiology is chronic pulmonary infection** and especially post-tuberculosis disease. In China the main causes have shifted from pertussis, measles, and tuberculosis to bacterial, mycoplasma, and viral pneumonia. Others significant etiologies include infection, COPD and allergic bronchopulmonary aspergillosis[6].

In Japan, an inflammatory disease associated with rhino-sinusitis has been particularly studied (Sino-bronchial Syndrome).

Potential genetic predisposition to bronchiectasis may account for the increased disease prevalence in indigenous communities in the Asia-Pacific region. The influence of the environment and its accompanying climate may also influence microorganisms and/or pathogens that affect the bronchiectasis airway.

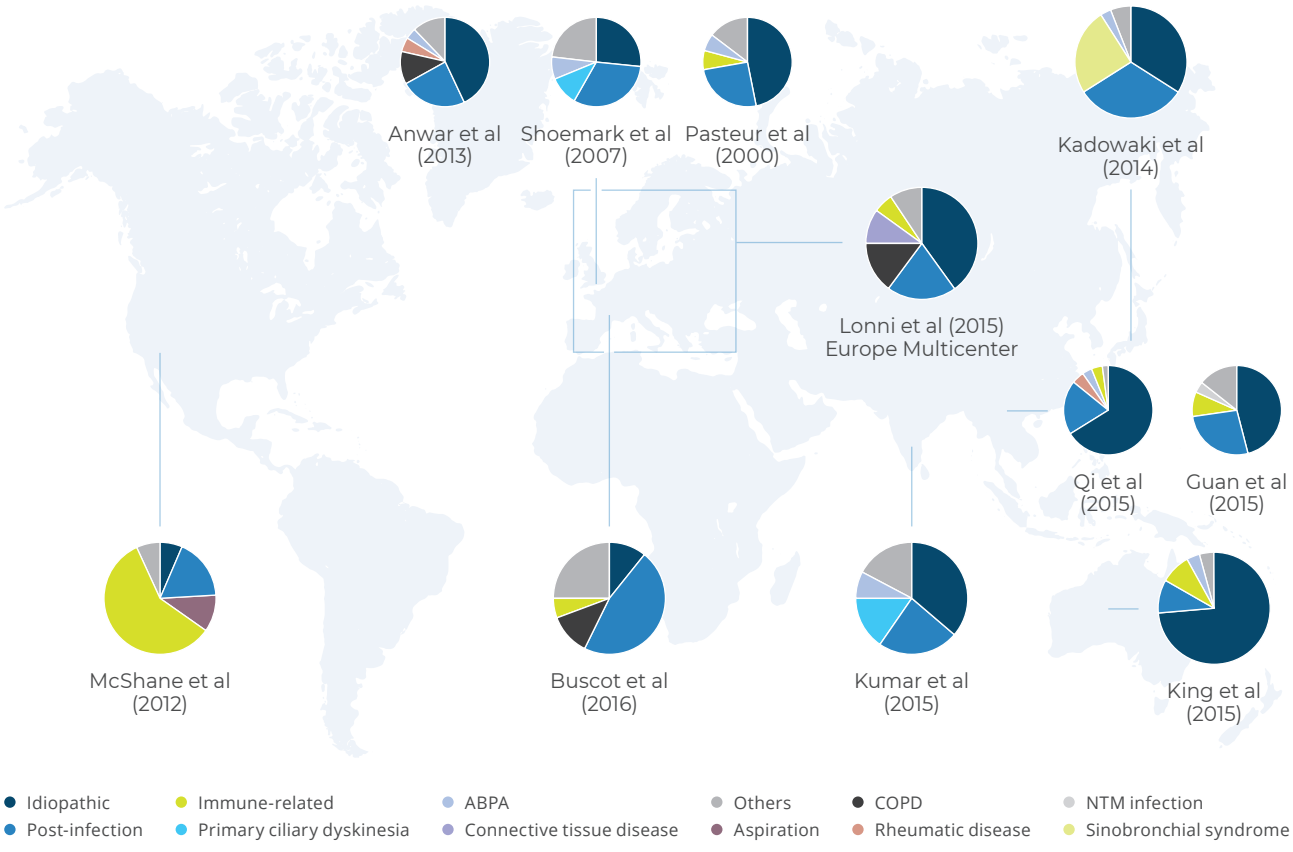


Fig. 2 - Predominant aetiologies across different geographic regions and ethnic populations. The individual pie charts indicate the top aethologies (top 4 or 5) in each cohort. Abbreviations: ABPA - Allergic Broncho-Pulmonary Aspergillosis, COPD - Chronic Obstructive Pulmonary Discorder, NTM - Non-Tuberculosis Mycobacteria, GERD - Gastro-Esophageal Reflux Disease

Airway clearance therapies

Treatment is primarily based on the principles of preventing or suppressing acute and chronic bronchial infection, improving mucociliary clearance and reducing the impact of structural lung disease. Mucociliary clearance is impaired by the impact of structural bronchiectasis, airway dehydration, excess mucus volume and viscosity. More than 70% of bronchiectasis patients expectorate sputum daily with highly variable sputum volumes. Treatment aims to prevent mucus stasis and the associated mucus plugging, airflow obstruction and progressive lung damage.

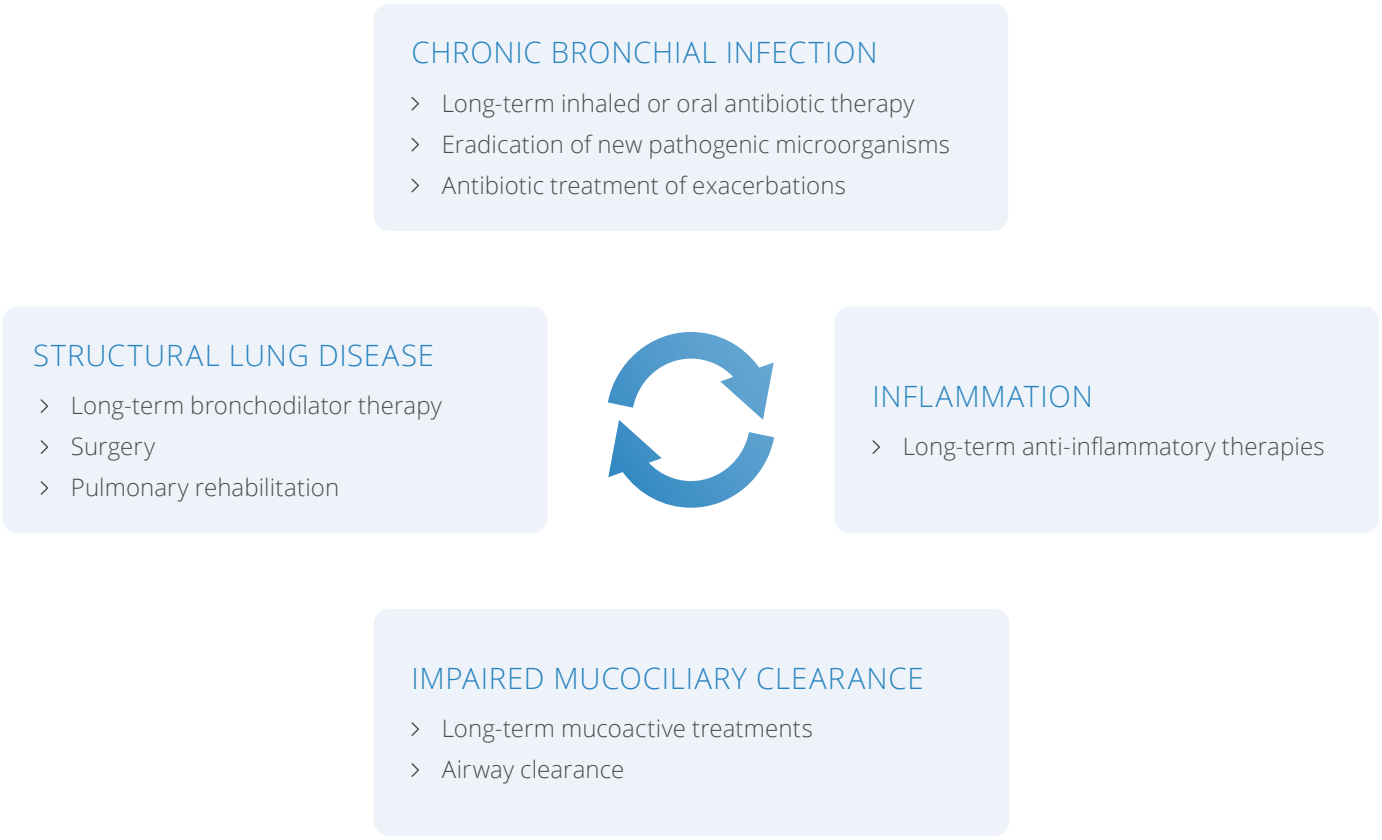


Fig. 1 - Treatments for bronchiectasis considered in this guideline according to the vicious cycle concept of bronchiectasis.

Medical treatment consists in suppressive ATB, bronchodilators, ICS, mucolytic agents (only if Airway clearance Technique failed). Dornase alpha (Pulmozyme) is not recommended. Before considering the prescription of long-term antibiotics, general aspects of bronchiectasis management need to be optimized, **such as airway clearance** and treating modifiable underlying causes[1].

According to ERS guidelines, **patients with chronic productive cough or difficulty to expectorate sputum** should be taught an ACT by a trained respiratory physiotherapist to perform **once or twice daily.**

ACTs are safe and enhance mucus clearance in BE. There are a few evidences to suggest some benefits on lung function, pulmonary exacerbation or health-related quality of life. **Patients with BE may be good responders to ACT.** Available clinical evidences showed that no ACT demonstrated to be superior to others and that the **prescription of ACTs should be individualized based on patient preference.**

ERS guidelines propose the following flow chart for ACT interventions in bronchiectasis:

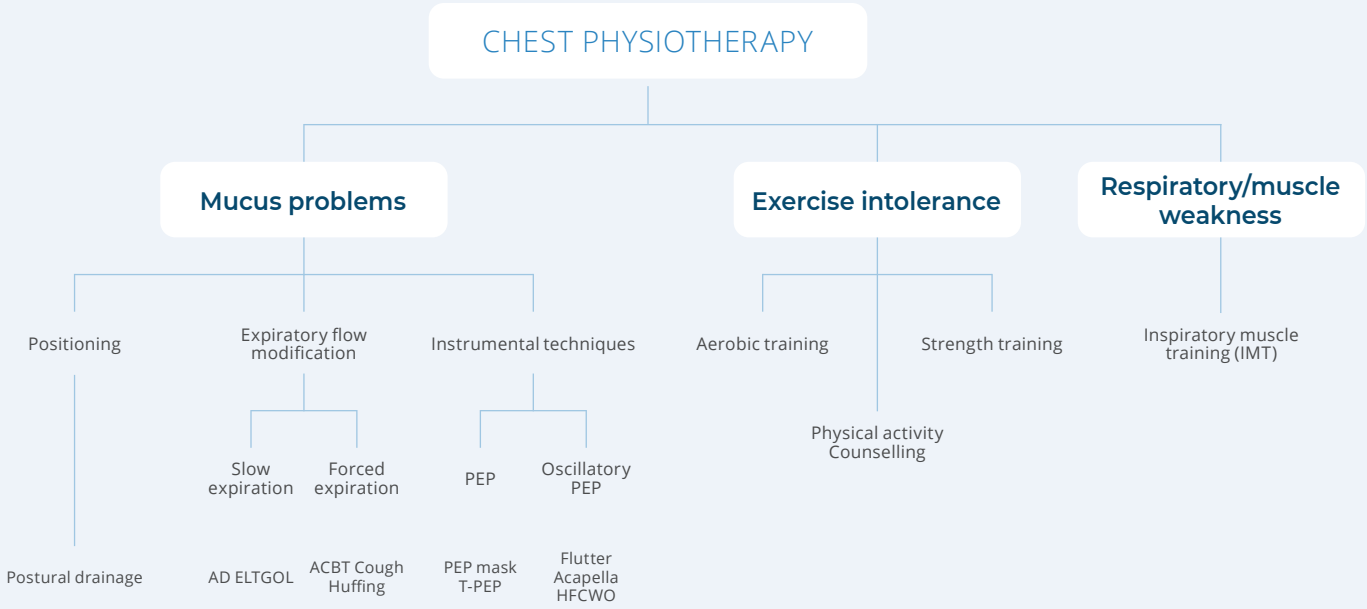


Fig. 6 - Chest physiotherapy interventions flow chart based on clinical experience from the task force panel. AD: autogenic drainage; ELTGOL: total slow expiration with open glottis and infralateral position; ACBT: active cycle of breathing techniques; PEP: positive expiratory pressure; T-PEP: temporary positive expiratory pressure; HFCWO: high frequency chest wall oscillation.

Data from US registry[3] showed that 55% of patients with BE have ACT:

- 16% chest percussion, postural drainage
- 50% PEP, flutter
- 15% HFCWO (uncommon outside US: 1-2%)

[1] Polverino E et al. European Respiratory Society guidelines for the management of adult bronchiectasis. Eur Respir J 2017; 50: 1700629.

[3] Aksamit TR et al. Bronchiectasis Research Registry Consortium. Adult Patients With Bronchiectasis: A First Look at the US Bronchiectasis Research Registry. Chest. 2017 May;151(5):982-992. doi:10.1016/j.chest.2016.10.055

Preliminary data for Simeox in non-CF Bronchiectasis

The following clinical documentation brings together the Simeox experience of several recognized national centers of medical expertise and research from different EU countries (Poland, Czech Republic, Romania, Slovakia) in the management of patients with non-CF bronchiectasis suffering from pulmonary congestion and requiring airway clearance.

Each center performed a pilot prospective study with the aim of assessing short-term benefits and safety of Simeox technology compared to conventional physiotherapy in patients hospitalized for acute pulmonary exacerbation. Patients with acute exacerbation were treated for chest congestion with Simeox for 5-7 days (1 or 2 sessions per day) during hospitalization while receiving optimal drug therapy. Pulmonary function tests, symptoms, mucus clearance, SpO2, usability, quality of life and adverse events were evaluated during the study.

The body of clinical evidence in non-CF bronchiectasis is summarized in the following Table:

Study Title/Authors	References	Study Design/Population
Effect of a new Airway Clearance Technology versus manual physiotherapy in COPD Mihaltan et al.	ERS 2018: F. Mihaltan, L. Morin, C. Borcea, A. Costantin, A. Pahontu, L. Marinescu, V. C. Cosei, Effects of a new Airway Clearance Technology versus manual physiotherapy in COPD, ERJ 2018 52: Suppl. 62, PA4047 (poster)	Prospective comparative study of 10 COPD patients (70% with bronchiectasis) hospitalized for AECOPD, comparing manual ACT versus ACT using Simeox, 5 patients per group
Benefits of SIMEOX Airway clearance technology in non-CF patients with Bronchiectasis Sliwinsky et al.	ERS 2018: K. Iwan, D. Klatka, A. Gladzka, L. Morin, P. Sliwinski, Benefits of Simeox airway clearance technology in non-CF patients with bronchiectasis, ERJ 2018 52: Suppl. 62, PA805 (poster) ATS 2019: P. Sliwinski, D. Klatka , A. Gladzka , L. Morin , K. Iwan , Benefits of Simeox airway clearance technology in non-CF patients with bronchiectasis, American Journal of Respiratory and Critical Care Medicine 2019;199:A5720 (oral communication)	Prospective comparative study of 21 patients with non-CF bronchiectasis hospitalized for PEx, Comparing manual chest therapy (n=8) Vs Simeox (n=13)
Feasibility and safety evaluation of Simeox airway clearance technique in patients with bronchiectasis V Kolek et al.	ERS 2019: Vitezslav Kolek, Petr Jakubec, Jana Doleželová, Laurent Morin, Jiří Kufa European Respiratory Journal 2019 54: PA601; DOI: 10.1183/13993003.congress-2019.PA601 (poster)	Prospective comparative study of 12 patients with CF or non-CF bronchiectasis hospitalized for PEx, comparing conventional ACT versus ACT using Simeox, 6 patients per group
Feasibility and benefits of an innovative Airway Clearance Technology in COPD patients hospitalized for acute exacerbation I Solovic et al.	Internal data (abstract submitted to ERS 2020)	Prospective comparative study of 32 patients with COPD (37% bronchiectasis) hospitalized for AECOPD, comparing standard care (n=13) Vs Simeox (n=19)

The studies listed on Table above are further described thereafter:

Effect of a new ACT versus manual physiotherapy in COPD

Mihaltan et al, National Institute of Pneumology Marius Nasta - Bucharest (Romania)

STUDY METHODOLOGY

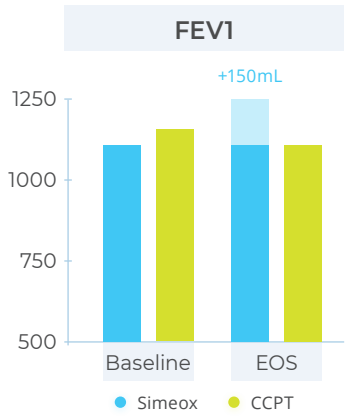
Comparative non-randomized prospective series (conducted in 2018) of 10 COPD patients (FEV1>20%) with bronchiectasis and Acute Exacerbation of COPD (AECOPD) who reported excessive mucus congestion and difficulties to clear airways despite optimal bronchodilator therapy.

Patients were treated for 5 days (2 sessions of 20-min/day) during hospitalization with either Simeox technology or conventional chest physiotherapy (5 patients in each group). Pulmonary Functional Tests (PFTs: spirometry), respiratory symptoms, CAT score, usability and safety were compared between the 2 groups.

STUDY RESULTS

While mucus clearance and evolution of respiratory symptoms were similar between the two groups after 5 days of therapy, all PFTs variables improved from baseline for the Simeox group. FEV1(L) improved by +0.15±0.10L (FEV1% +5±2%) and 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. From usability perspective, all the patients of Simeox group acquired quickly autonomous usage. The device was well tolerated with no adverse event nor pain reported.



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 improvment (N, %)	5 (100%)		4 (80%)	
Dyspnea improvment (N, %)	4 (80%)		4 (80%)	
Fatigue improvment (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

CONCLUSION

The study concluded that the preliminary data suggest safety and additional benefits of use of Simeox airway clearance technology for COPD with severe chronic bronchitis symptoms or bronchiectasis.

Benefits of SIMEOX Airway clearance technology in non-CF patients with Bronchiectasis

Sliwinski et al, Institute of Tuberculosis and Lung Diseases, Warsaw (Poland)

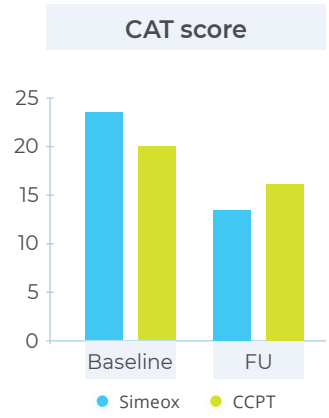
STUDY METHODOLOGY

Comparative non-randomized prospective series (conducted in 2018) of 21 patients with non-CF bronchiectasis hospitalized for severe pulmonary exacerbation, undergoing ACT with either Simeox (n=13) versus conventional chest physiotherapy (CCPT, n=8) followed for 7 days. Change in respiratory symptoms, lung function, disease-specific quality of life questionnaire (CAT score) and 6-minute walking distance test (6MWT) were compared between both groups.

STUDY RESULTS

The results confirmed the significant improvement from baseline after 7 days of therapy in the Simeox group in CAT score which was reduced by 8 points (p=0.008) in Simeox group. No significant change was observed in control group. Also cough intensity, chest congestion and perceived dyspnea decreased significantly in Simeox group (p<0.05) while only cough intensity improved in control group.

Furthermore, 6MWT improved also significantly from baseline in the Simeox group (n=10, 74±117 m; 23%); oxygen desaturation during exercise improved also significantly from baseline in the Simeox group (reduction of -0.9±1.2 %; p<0.05). In contract, changes in control group were not significant.



Group		ΔSaO2 (%) during exercise	Distance covered (m)	Δ Borg scale during exercise
Device N=10	at admission	4.8 ± 7.2	334 ± 119	0.9 ± 1.3
	after 7 days	4.4 ± 7.6	412 ± 87	1.1 ± 2.3
	Δ	-0.9 ± 1.2	74 ± 117	0.2 ± 1.8
	p value	**<0.05**	**0.036**	**NS**
Control N=8	at admission	2.1 ± 1.6	382 ± 232	1.1 ± 1.9
	after 7 days	1.6 ± 1.9	438 ± 188	0.6 ± 1.8
	Δ	-0.5 ± 1.9	56 ± 110	-0.4 ± 1.1
	p value	**NS**	**NS**	**NS**

Results of 6MWT before and after 7 days of ACT with device or CP (control).

CONCLUSION

The study concludes that Patients with non-CF bronchiectasis of different origin may benefit from the use of Simeox during acute exacerbation in hospital setting. Easy to use and efficient airway clearance technology may quickly and significantly improve quality of life and exercise capacity of these patients. Simeox technology was well tolerated by all studied patients and proved to be safe and easy to handle even for older and disabled person.

Simeox feasibility and safety evaluation in patients with bronchiectasis

Kolek et al, Palacky University Hospital, Olomouc (Czech Republic)

STUDY METHODOLOGY

The objectives of this randomized controlled trial were (1) to demonstrate non-inferiority of the Simeox device compared to traditional manual physiotherapy technique for airway clearance of hospitalized patients suffering from bronchiectasis in cystic fibrosis, COPD and idiopathic pulmonary fibrosis, (2) to evaluate clinical outcomes of Simeox procedure measured by pulmonary functional tests, and (3) to consider daily autonomous use of Simeox technology in patients with various obstructive lung diseases. Feasibility of Simeox procedure was the primary endpoint. Secondary endpoints were: Safety of the procedure with regard to respiratory and other complications, PFTs results (FEV1, RV), chest expansion measured on xiphoid processus level (in cm), SpO2 measured by pulse oximetry (%), 24-hour collected mucus amount (ml).

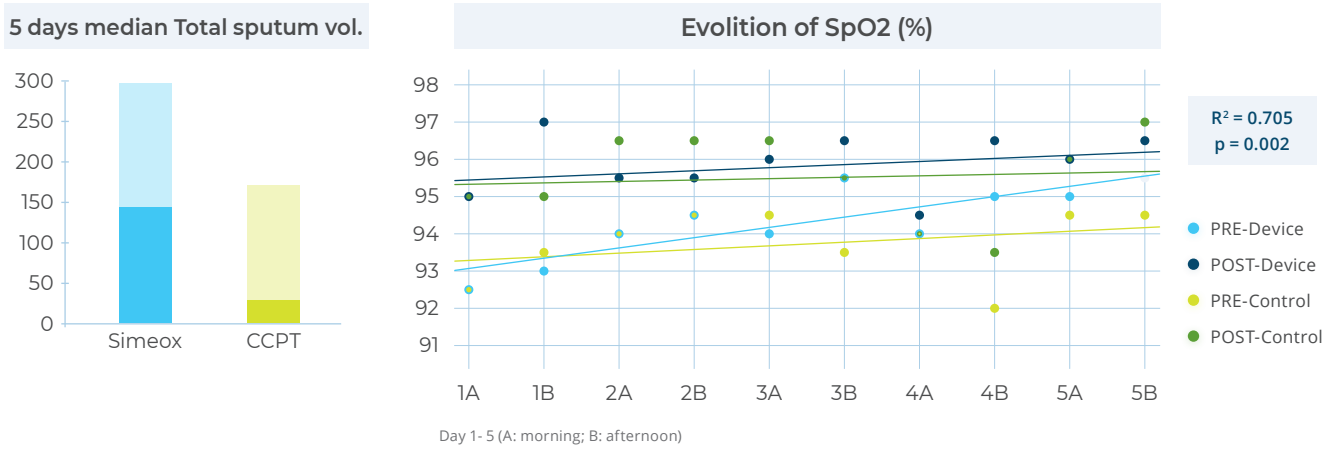
Patients between 18-75 years, with bronchiectasis and diagnosis of cystic fibrosis, COPD or idiopathic pulmonary fibrosis (IPF) reporting symptoms of excessive mucus production and difficulties to clear the mucus were enrolled into the study in consecutive manner and were randomized to either conventional chest physiotherapy (CCPT, control) or Simeox procedure. Both procedures were conducted for 5 days with 2 sessions per day (morning and afternoon). Each session lasted 20 minutes minimum. Measurement of pulmonary function tests, chest expansion, oxygen saturation of hemoglobin was performed before and after session, and mucus was collected daily.

All patients achieved planned procedures.

STUDY RESULTS

12 patients were included from March to April 2018. 7 men, 5 women; Mean age 46.5 y. Lung diseases: 7 CF+BE (Control: 5, Simeox: 2), 3 COPD+BE (Control: 1, Simeox: 2); 2 IPF+BE (Control:0, Simeox:2). After 5 days of therapy, there was a similar trend in FEV1 improvement between Simeox (+2.5%; +70ml) and Control (+1.5%; +40ml). Chest expansion and SpO2 increased significantly to a similar extent in both groups. Total sputum production (median [Min; Max]) seemed to be higher with the device (+143ml [25; 300]) than Control (+30ml [20; 180]) but the difference between groups was not statistically significant.

A longitudinal rise of SpO2 pre-therapy leading to less negative SpO2 variations between ACT sessions was observed during the 5 days in the device group only (R2=0.705; p = 0.002), suggesting a persistent effect of therapy with the device on oxygen saturation. Simeox procedure was tolerated by all patients. Functions of Simeox were easily understood and proper handling was simple for every patient. No safety signal was detected. Patients appreciated the device and found it comfortable.



CONCLUSION

The investigators concluded that these preliminary data showed non-inferiority of Simeox procedure compared to manual chest physiotherapy in patients with bronchiectasis of various origins hospitalized for PEx. Simeox technology was considered safe and feasible for airway clearance management during hospitalization of different lung diseases with mucus retention.

Feasibility and benefits of an innovative Airway Clearance Technology in COPD patients hospitalized for acute exacerbation

Solovic et al, National Institute for TB, Lung Diseases and Thoracic Surgery, Vyšné Hágy (Slovakia)

STUDY METHODOLOGY

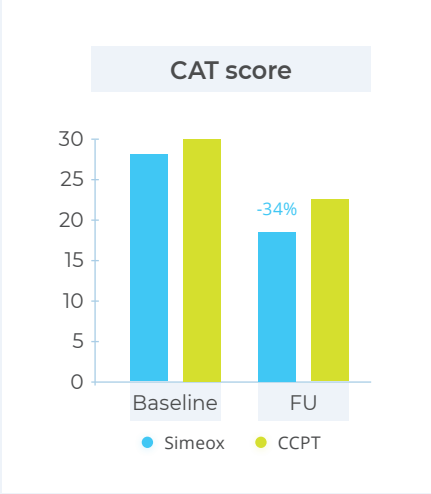
This comparative prospective study conducted in 2018-2019 aimed to assess feasibility and effects of Simeox in COPD patients with acute exacerbation of COPD and suffering from chest congestion despite adherent medication and conventional chest physiotherapy. Patients were included from 13 March 2018 to 20 Sept. 2019. Objectives were to assess ability to properly use the device, safety, tolerance, patients reported outcomes (CAT score), changes in mucus production, and spirometry. Inclusion criteria were: age >18yr, patient with AECOPD reporting symptoms of excessive mucus and difficulties to clear the mucus despite usual manual physiotherapy technique performed by the physiotherapist. Patient had one daily bronchial drainage session with Simeox or conventional chest physiotherapy (CCPT) and pulmonary rehabilitation program session for 6 days. Three successive programs were performed during each device session: 4x6 expiratory cycles, 4x8 expiratory cycles and 4x10 expiratory cycles. Power selection was 25 or 50%. Expectoration were monitored by clinical team during each session and the patient monitored himself the expectoration after the session.

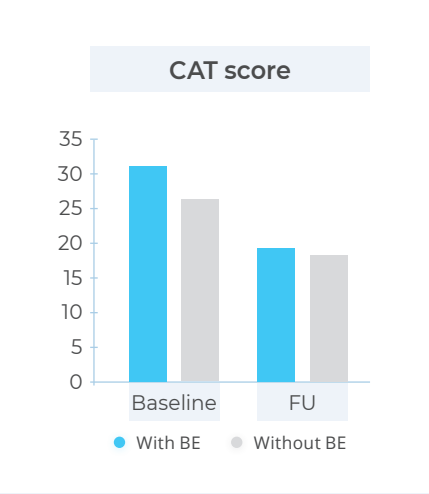
STUDY RESULTS

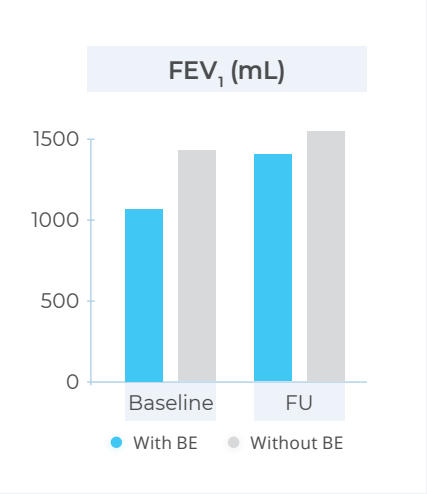
32 patients hospitalized for AECOPD who reported symptoms of excessive mucus congestion were treated with Simeox device (n=19) or manual CP (n=13). The cohort (67y, 68% of male) included a majority of very symptomatic patients with high risk of exacerbation (based on GOLD grading). The duration of clearance therapy session with Simeox was between 15-25 min. Patients were able to use the device after a 15-min of training during the first session.

No adverse event nor pain was reported. Mucus clearance was improved in all patients. FEV1 increased significantly from baseline by +170±60 ml (p=0.0017) and +220±100 ml (p<0.001) in Control and Simeox, respectively (Control vs Simeox NS).

Improvement of CAT score was significantly higher in Simeox than in Control group (-9.6±3.0, -34±9% versus -7.2±1.2, -24±4% respectively; p=0.02). Moreover, in COPD patients with bronchiectasis (BE) comorbidity treated with Simeox, FEV1 and CAT score improvement was even higher (with BE: FEV1 +300±90 ml, CAT -11.7±2.9 vs without BE: FEV1 +180±80, CAT -8.3±2.5; p<0.05).







CONCLUSION

The authors concluded that these results confirmed the feasibility of managing airway clearance in patients with COPD and chest congestion with Simeox device. This technology may contribute to respiratory symptoms and quality of life improvement especially in COPD patients with bronchiectasis without worsening fatigue or pain during chest physiotherapy.

Conclusion on preliminary clinical evidences in bronchiectasis

PhysioAssist has conducted several studies in recognized national centers in various EU countries (Poland, Czech Republic, Romania, Slovakia). These studies included hospitalized patients with non-CF bronchiectasis suffering from pulmonary congestion and requiring airway clearance. Pulmonary function tests, respiratory symptoms, mucus clearance, SpO2, usability, quality of life, exercise capacity and adverse events were evaluated.

Based on the various studies described above, Simeox has been used in 4 clinical studies including patients with non-CF bronchiectasis (Simeox n=41; Control n=34). The results are listed in the following table:

STUDIES	NBR. OF PATIENTS	ETIOLOGY	THERAPY	RESULTS
Mihaltan et al.	10	COPD (7 with BE)	Simeox vs CPT, 5 days	FEV1 (+150 ml) and CAT (3) score seemed to improve with Simeox only
Sliwinsky et al.	21	Non-CF BE	Simeox vs CPT, 7 days	6MWT (+23%, p<0.05) and CAT score (p=0.008) improved with Simeox only
Kolek et al.	12	7 CF and 5 non-CF with BE	Simeox vs CPT, 5 days	Higher increase in sputum vol. with Simeox (+143 vs 30 ml). Less negative SpO2 variation with Simeox.
Solovic et al.	32	COPD (12 with BE)	Simeox vs CPT, 6 days	Higher improvement in CAT score with Simeox (10 vs 7, p=0.02). Simeox seemed to increase FEV1 in COPD with BE (+300 ml)

Findings are summarized below

Patients with BE can acquire quickly autonomous usage of the device during hospitalization after a short training by physiotherapists. The technology is very well tolerated and most patients find it comfortable and easy to use. No side effect related to Simeox device is reported. **Mucus clearance improves at least to the same extent as manual physiotherapy. Moreover, Simeox device may provide also additional benefits on respiratory symptoms, lung function and quality of life in patients with non-CF bronchiectasis.** While the clinical studies discussed above are conducted in hospitalized patients, the data provide confidence in home use for Simeox in these patients after proper training.

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