



Bronchiectasis: How Key is the Role of Airway Clearance?

A Practical Review and Guide for this Pandemic and Beyond

Background to Bronchiectasis

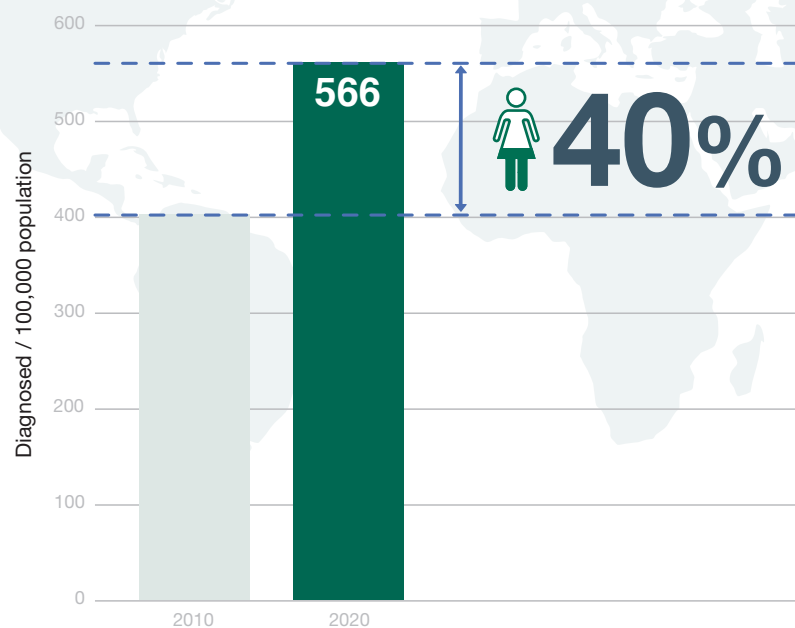
Prof. James D. Chalmers, British Lung Foundation Chair of Respiratory Research

Bronchiectasis manifests as both a radiological condition and as a disease. Radiologically, it presents as permanent dilatation of the airways, while clinically it is a syndrome of cough, sputum (mucus) production, recurrent respiratory tract infection, and other respiratory symptoms. Once regarded as a rare disease, the prevalence rates have increased by 40% over the last ten years. In the United Kingdom (UK), prevalence is approximately 566 women per 100,000 population. This translates into about one bronchiectasis patient for every 17 patients with chronic obstructive pulmonary disease (COPD).

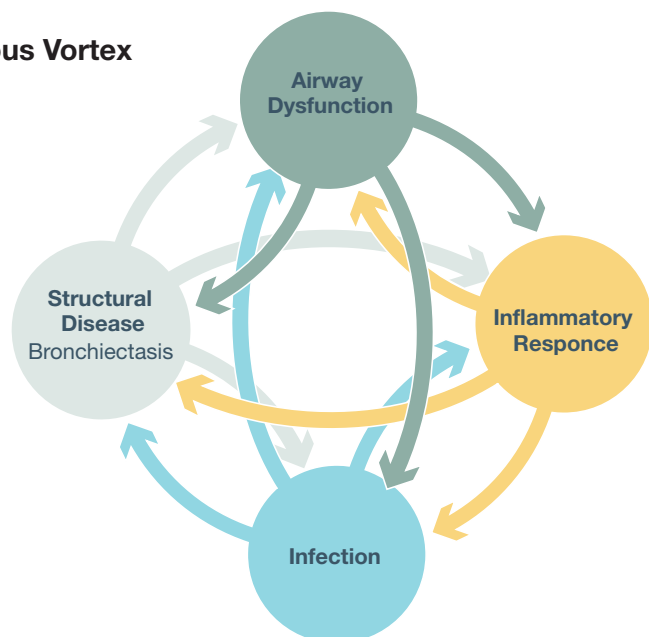
The pathophysiology of bronchiectasis is extremely complex. The four fundamental components of the disease form an interconnected web of pathologies. Patients can enter this “vicious vortex” at any point. A patient with rheumatoid arthritis might begin with inflammation, which could contribute to airway dysfunction (mucus hypersecretion and ciliary dysfunction), chronic infection, and lung dysfunction, leading to bronchiectasis.

The characteristic common to all of bronchiectasis patients is impaired mucociliary clearance. Excessive mucus production creates an environment that is receptive to bacteria and further disrupts the movement of cilia. Combined with the distorted airway anatomy characteristic of bronchiectasis, this results in a patient unable to clear their airways by normal means such as coughing.

Increase in Prevalence Rates



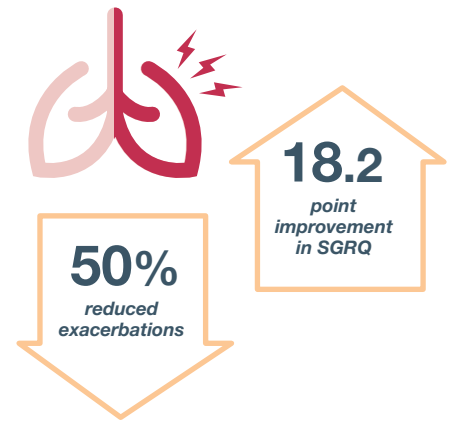
Vicious Vortex



According to European Respiratory Society survey of bronchiectasis patients and their caregivers, sputum is the single most difficult disease-related problem, ahead of exacerbations, tiredness, and shortness of breath.

There is little evidence to support the efficacy of some commonly used treatments for bronchiectasis, such as inhaled antibiotics, long-term macrolide antibiotics, mucoactive drugs and DPP1 anti-inflammatory treatment. In contrast, airway clearance techniques have a transformative effect for naïve patients. One Spanish study found that ELTGOL, an Airway Clearance Technique (ACT), reduced the number of exacerbations by 50% and significantly improved quality of life with a score of 18.2-point increase in the St. George's Respiratory Questionnaire (SGRQ).

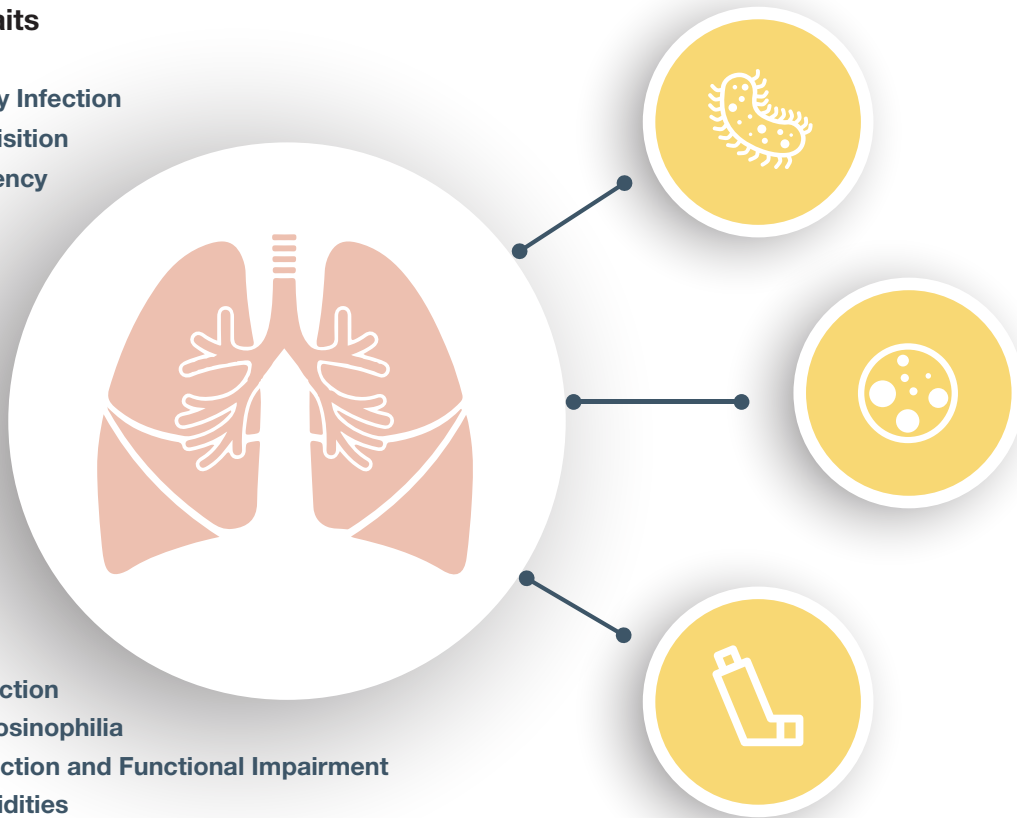
Guidelines recommend a variety of different Airway Clearance Techniques (ACTs) because bronchiectasis is a heterogeneous disease. The viscosity of mucous can vary by a factor of more than 100, which will impact the choice of ACT.



Treatable Traits

Chronic Airway Infection
Pathogen Acquisition
Immunodeficiency
Low BMI
NTM
ABPA

Cough
Sputum Production
Asthma and Eosinophilia
Airflow Obstruction and Functional Impairment
Other Comorbidities
Other Factors



Bronchiectasis can be effectively managed using what can be described as a “treatable traits” approach, that is, using the investigation of a patient to identify therapeutically modifiable aspects of their disease. Patients with frequent exacerbations may benefit from antibiotic therapy, while colonization with *Pseudomonas* can be treated with eradication. Underlying causes like immune deficiency and comorbidities such as low BMI also require treatment.

Despite the heterogeneity of bronchiectasis, however, it is arguably poor-quality airway clearance that most negatively impacts the patient's quality of life, and the bedrock good management is high quality airway clearance.

ACBT: active cycle of breathing techniques.

ACT: airway clearance technique.

BTS: British Thoracic Society.

ELTGOL: L'Expiration Lente Totale Glotte Ouverte en décubitus Latéral (in English, slow expiration with the glottis opened in a lateral posture).

ERS: European Respiratory Society.

NHS: National Health Service.

PEP: positive expiratory pressure.

OPEP: oscillating positive expiratory pressure.

SGRQ: St. George's Respiratory Questionnaire

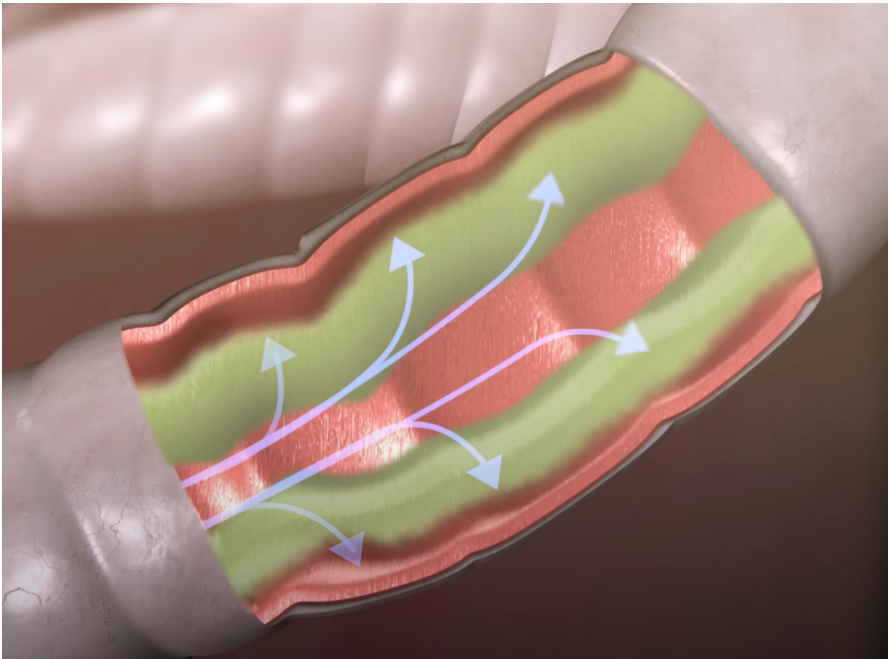
The Role of Physiotherapy in the Management of Bronchiectasis

Pamela Vaughn, Principal Respiratory Physiotherapist, NHS Greater Glasgow and Clyde Paul McCallion, Advanced Respiratory Physiotherapist, Newcastle upon Tyne Hospitals NHS Foundation Trust

The Central Role of ACT

Current guidelines for management of bronchiectasis recommend that all patients receive some instruction in ACT. Most recently, the **BTS 2019 guidelines** have made physiotherapy a mainstay of treatment from diagnosis through to exacerbation.

ACT plays a central role in prevention of exacerbations. When exacerbations continue despite treatment, the authors recommend adding hypertonic saline (if not already in use) and other mucoactives. For deteriorating patients, both the **BTS** and the **ERS** agree that patients should have airway clearance checked and optimized, particularly before considering long-term pharmacotherapy. Guidelines also support ACT review during exacerbations.



Mucus Clearance with PEP and OPEP

Mucus clearance requires air to move behind the obstruction. On exhaling, sufficient positive expiratory pressure helps to break the bonds that adhere mucus to the airway walls. An OPEP device further enhances clearance by making use of oscillations. Although the mechanism is not clear, vibrations of increasing frequency lower mucus viscosity and facilitate mucus transport.

Benefits of OPEP

OPEP devices like **Aerobika***, are useful in solving several problems associated with bronchiectasis. In areas that are plugged up with mucus, positive pressure helps to prevent alveolar collapse by ensuring air gets behind mucus in the blocked airways. In the case of bronchospasm, positive pressure stents open the airways and prevents early airway closure. When patients experience breathlessness, positive pressure from an OPEP device enhances functional residual capacity and allows the lungs to empty. Finally, OPEP allows gentler expiratory manoeuvre, which can help to expand collapsed airways.

The impact of COVID-19 on Bronchiectasis patients

There is limited evidence, however, Bronchiectasis patients who have contracted COVID-19 with minor symptoms have been able to continue OPEP therapy without changes to their Bronchiectasis management plan. It is also too early to confirm whether patients with more serious COVID-19 symptoms, resulting in mechanical ventilation support, have developed Bronchiectasis post-recovery. Early experiences have demonstrated that severe COVID-19 symptoms have not resulted in an increase in Bronchiectasis incidence.



Aerobika*

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TRUDELL MEDICAL
INTERNATIONAL

725 Baransway Drive, London, Ontario, Canada, N5V 5G4
info@trudellmed.com

aerobikaopep.com

