



## **PHYSIOTHERAPY**

### **Modern Physiotherapy in Patients with CF**

By Filip Van Ginderdeuren

In the past, the primary aim of physiotherapy in CF was to clear excessive secretions and thus reduce respiratory symptoms. The term “physiotherapy” is nowadays used in a much wider sense. Modern physiotherapy is an adequate combination of inhalation therapy, airway clearance techniques (ACT's), physical education/exercise and ongoing education about the disease and its treatment. The physiotherapist should be involved in recording the evaluation of patients, the instructions given to them, quality control, and professional development. The role of the physiotherapist is, in consultation with the patient and family, to tailor an individualized, reasonable, effective and efficient physiotherapy regimen. This should take into account all relevant physical and psychosocial factors. Modern physiotherapy in CF is primarily preventative and has to be incorporated into each patient's daily routine in a lifetime perspective. This can only be achieved by tailoring a time-efficient treatment that places the least possible burden on the patient or his family and makes compliance with the treatment possible.

### **Inhalation therapy**

The results of inhalation therapy are highly dependent on indication, the administration device, the inhalation technique and the pulmonary ventilation distribution, on possible side-effects, treatment strategy and adherence with the treatment. The use of inhalation therapy is individually tailored and the effects should be regularly evaluated.

The choice is between a nebulizer system, a metered dose inhaler (MDI) with a spacer, and a powder inhaler. The drug is transported into the lungs by the inspired air. An affected breathing pattern and decreased ventilation distribution by obstructed airways, hyperinflation and atelectasis reduce lung deposition and affect deposition pattern. Inhaled bronchodilators, if needed, and airway clearance techniques should therefore precede inhaled agents targeting mucosa, remaining viscous secretions and micro-organisms. The use of a mouthpiece instead of a mask should be encouraged as soon as possible to avoid drug deposition in the upper airways. An optimal inhalation technique (low inspiratory flow rate, breath-hold for at least 3 seconds and an appropriate expiratory flow rate) depends on each patient's age and ability.

### **Airway clearance techniques**

Mucus is moved by three mechanisms. First, *slug flow* describes the means by which a semi-solid mucus plug (partially) obstructing an airway can be pushed from behind by air flow. Second, *annular flow* describes mucus moving along the walls of the airway, either being pulled along by expiratory airflow or transported by cilia. Third, *mist flow* describes



aerosolized mucus that is exhaled as suspended droplets. Slug and annular flow account for the majority of airway secretion clearance.

The aim of modern ACT in CF is to prevent clogging of peripheral airways and micro-atelectasis. Although the immediate effect of physiotherapy may not be measurable, the long-term objective is to prevent the progression of lung disease as much as possible and to preserve lung function and physical activity.

Modern airway clearance techniques must be built upon a physiological strategy or cycle consisting of different steps :

- a) open up territories and get air behind secretions
- b) mobilize and collect secretions from the peripheral airways
- c) move secretions towards the central airways
- d) evacuate secretions

Modern ACT's based upon these principles are Autogenic Drainage, Low and High Pressure PEP, Oscillating PEP, huffing and controlled cough.

**Active Cycle of Breathing Techniques (ACBT)** is used to mobilise and clear excess bronchial secretions. The components of ACBT are breathing control, thoracic expansion exercises and the forced expiration technique. The regimen is flexible to suit the individual.

**Autogenic Drainage (AD)** is an airway clearance technique using expiratory airflow throughout the whole range of breathing from residual volume to total lung capacity. The aim of AD is to achieve an optimal expiratory flow progressively through all generations of bronchi without causing dynamic airway collapse. Assisted Autogenic Drainage (AAD) is the adaptation of AD in infants and young children not yet capable of carrying out this technique actively themselves.

Through **Positive Expiratory Pressure (PEP)**, clogged and collapsed airways are opened up with the assistance of collateral ventilation, while breathing towards an expiratory resistance, in order to get air behind the secretions. PEP can be followed by a huff or cough to transport and evacuate the mobilized secretions.

**Oscillating PEP** generates an oscillating positive pressure, protecting the patient against an airway collapse. It enables a modulation of the pressure and airflow oscillation frequency. Those vibrations of the bronchial walls will promote clearance of the small airways. Oscillating PEP devices are the Flutter, the RC Cornet and the Acapella.

**Postural Drainage (PD) and Chest Percussion** are also widely used in airway clearance therapy, especially in infants and small children. PD consists of placing the patient in a position that employs gravity to move mucus centrally from the targeted lung unit. It has been speculated that the redistribution of ventilation, as occurs with the change in body position might alter the local airway patency and gas-liquid pump. So the physiological basis on which the concept of postural drainage was originally developed may not be the only mechanism for the improvement seen with changes in position as used in Postural



Drainage. Side-effects have been observed and objectively measured by physiotherapists during PD: desaturation, discomfort and pain and gastro-oesophageal reflux (GOR), especially during the 30° head-down tilt. GOR may include aspiration of acidic gas or stomach contents into the lungs, causing wheezing and broncho-spasms. The exact mechanism by which Chest Percussion may assist in the removal of secretions is unknown.

### **Physical exercise**

Physical training and an active life show their beneficial effects in CF patients. Different types of exercise that should be included in the programme from the very beginning are:

- e) chest mobility exercises (including chest, spine, neck, shoulders, upper and lower limbs)
- f) muscle strengthening exercises
- g) working capacity training and exercises

Good chest mobility allows effective ACT, good posture reduces the risk of back pain, physical loading in upright positions reduces the risk of osteoporosis and physical exercise can also maintain a high working capacity in spite of poor respiratory capacity.

Exercises must never be uncomfortable. The exercises must be stimulating, enjoyable, and age-appropriate. They should be individualized and provided at appropriate times in different settings. Team sports provide the benefit of social interaction and mutual motivation.

### **Conclusion**

Modern physiotherapy in CF consists of a good mixture between inhalation therapy, airway clearance therapy, physical fitness, body awareness and posture. The physiotherapist has a key role in the development and continuing optimization of an individual regimen for each patient. The choice of *efficient* therapy strategies and the expected outcomes will improve adherence. Patients and their family should be actively involved in the decision making, so that an alternative solution can be found, if the treatment does not seem effective. In this case a well-trained physiotherapist can offer alternative treatment options, avoiding patients to experience their physiotherapy sessions as time-consuming, boring and a burden.

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