



# PHYSIOTHERAPY ADVICE FOLLOWING THORACIC SURGERY

## INTRODUCTION

Patients undergoing thoracic surgery can suffer a higher incidence of respiratory complications. The types of obstruction that occur, be they superinfections, ventilation disturbances or abnormalities, as well as the possible presence of severe hypoxemia (an abnormal reduction in partial pressure of oxygen in the



arterial blood) are directly related to the disturbances in respiratory function that occur during and following surgery.

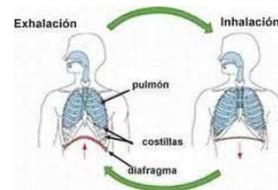
The risk factors of complications arising in these patients are of two types. On the one hand, the initial risk factors are linked to the patient such as: handling, metabolism abnormalities, obesity, age, smoking and respiratory history. The latter are usually encountered in patients undergoing surgery who are or have been smokers and present symptoms of mucus secretion with a more or less severe degree of obstruction.



The presurgery condition of the patient and the significance of the surgery can affect the postoperative prognosis in terms of morbidity and mortality. Patient assessment enables those who are at a higher or lower risk to be identified.



On the other hand, it is also necessary to consider the risk factors linked to the surgery, that is to say surgery on a patient involving the opening of the chest wall, the pleural cavity and a possible lung amputation, which in turn involve general anaesthesia, endotracheal intubation, invasive mechanical ventilation, determined surgical positioning and a reliable means of approach.



General anaesthesia reduces lung volume and eases the mismatch of ventilation and perfusion in the lung. Many anaesthetic drugs reduce the ventilatory response to

hypercapnia (elevation of the partial pressure of carbon dioxide in arterial blood) and to hypoxia (when the entire body or a part of the body is deprived of an adequate oxygen supply). Pulmonary function is further compromised by postoperative pain, thus limiting coughing and lung expansion.

Vital capacity can reach a reduction of 50% within a few hours following surgery.

The impact, in terms of physiotherapy, is significant as these patients will be candidates for a very specialised form of physiotherapy that ensures the success of the thoracic surgery.



## PHYSIOTHERAPY OBJECTIVES

Maximal inspiratory pulmonary re-expansion is one of the main objectives of postoperative respiratory physiotherapy.

In order to prevent postoperative pulmonary restrictive



syndrome, it is necessary to apply a pressure that will be able to re-expand the collapsed lung tissue. For this, guided by the physiotherapist and/or visual reference (incentive spirometer), the patient should take deep breaths. The physiotherapist will also perform manual lung inflations on the patient like hyperinflations with the use of instruments like an Ambu bag. Breaths must be slow and to the maximum capacity of the lungs with a teleinspiratory pause.

For the correct use of the incentive spirometer, the physiotherapist will explain how to use the apparatus and will control and evaluate the working capacity of his case as well as his progression in terms of the objectives to be achieved. The spirometer acts as a feedback element for each patient, displaying the volume of air that can be inhaled and the generated flow rates.



The detailed instructions for use are classified in four points:

1. **Inspiratory flow rates**: SLOW, DEEP.
2. **Teleinspiratory pause**: 3- 5 seconds in a way that boosts COLLATERAL VENTILATION and constantly filled collateral alveoli.

3. **Lung volume**: this will depend on if the situation is preoperative or postoperative

- a. In the treatment of postoperative atelectasis, the patient will be working in high lung volumes, that is to say, at 80% of the maximum lung capacity (after surgery) for alveolar recruitment in lung inflation.
- b. If the objective is to retrain the breathing pattern of the patient undergoing surgery, the patient will be working PREOPERATIVELY at 30% of his maximum lung capacity prior to surgery.

#### 4. **Guidelines**:

4.1. In the first instance, the patient will carry out 10-15 breaths at 80% every hour.

4.2. In the second instance, work sessions will be at least 30 minutes each day



The most common incentive spirometers are mainly of flow or volume and there is normally misuse because the patient tends to take rapid breaths without controlling the volume of air inhaled. This is why the use of the volume-oriented spirometer is recommended; cumulative spirometry. This limits pain and assists in muscle rest.

This increases the depth and duration of chest expansion, which is why they are specifically indicated for use in the case of surgery where pain limits chest expansion.

## PHYSIOTHERAPY TREATMENT

- ✚ Avoiding the development of atelectasis and in the case of development, resolving them.
- ✚ Improving the distension of the pulmonary parenchyma.
- ✚ Opting for collateral breathing methods and alveoli recruitment.
- ✚ Improving ventilation in the base of the lungs.
- ✚ Retraining the breathing pattern. Moving secretions and easing their clearance, thus avoiding the development of pneumonias.

## PHYSIOTHERAPY PROCEDURES

Exercises for pulmonary compliance are mainly performed:

- ✚ Controlled inspiratory muscle training exercises (IMT)..
- ✚ Incentive spirometry.
- ✚ Manual hyperinflation with Ambu bag.
- ✚ Increase chest expansion with exercises for the upper limbs.
- ✚ Breathing pattern retraining.

Bronchial permeability techniques are also added to manage secretions:

- ✚ Slow expiration with the glottis opened in a lateral posture (ELTGOL).
- ✚ Expiratory flow increase (EFI).
- ✚ Manual hyperinflation with Ambu bag.
- ✚ Education about productive coughs with the help of apparatus like the Flutter or Peak-flow



The physiotherapist will choose the most appropriate techniques for each individual case from all of the above techniques.

After having the surgery, the patient will be moved to ICU where he will receive instructions on how to use the incentive spirometer with an Airlife volumetric-incentive spirometer.



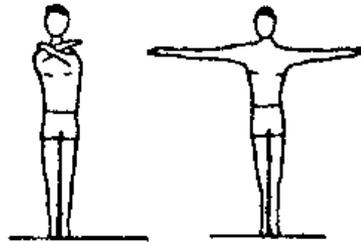
## Home Exercises and Guidelines after Discharge from the Clinic

After returning home, the patient will continue with incentive spirometer exercises at 40% of his "new" vital capacity after the surgery and until it has been readjusted in consultation with the physiotherapist upon discharge.

Diaphragmatic breathing exercises learned in the clinic and stretching exercises for the thoracic cavity with the affected limb lying face up, on the side and seated.

Stretching exercises for the thoracic cavity with the use of both of the upper limbs, in a standing position.

In the case of the persistence of bronchial secretions, the patient will continue with the apparatus provided by the physiotherapy service for the clearance of secretions.



It is recommended that the patient go for a walk in well-sheltered areas surrounding the home when it is winter or cold outside. Smoky environments should be avoided.



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