



Chest Physiotherapy in Lung Resection Patients: State of the Art

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The role of chest physiotherapy in limiting postoperative pulmonary complications and in the recovery of pulmonary function and exercise capacity after lung surgery is still unclear because of the lack of conclusive, well-designed clinical trials. In this article the available literature on these topics is reviewed, and the effects of respiratory physiotherapy, instituted preoperatively or administered after surgery to patients undergoing lung resection, are commented on. The authors conclude that chest physiotherapy improves preoperative exercise capacity; this is a parameter highly predictive of postoperative pulmonary complications. Also physiotherapy administered during the immediate period after lung resection probably decreases frequency of pulmonary complications. Finally, further investigation is required for a better understanding of the effects of long-term chest physiotherapy after hospital discharge in lung resection patients.

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Although surgery-related mortality has decreased in lung cancer patients, the prevalence of postoperative complications is still high, with such problems mainly being cardiorespiratory in origin. In Europe according to the European Society of Thoracic Surgeons database, current hospital mortality after lobectomy for lung cancer is as low as 1.9%, but postoperative cardiopulmonary complications occur in up to 23% of patients after scheduled lobectomy and 32% after bilobectomy.¹ The high frequency of cardiorespiratory complication seems reasonable because more than one-third of lobectomy cases exhibit chronic obstructive pulmonary disease (COPD)

criteria,² and some form of coronary disease is present in 50% of patients scheduled for pneumonectomy and 9% of all lung resection cases.¹ Among postoperative pulmonary complications (PPCs), hospital-acquired pneumonia and atelectasis are the most frequent and are also preventable.^{3,4} This is the reason why perioperative chest physiotherapy is considered a must in thoracic surgical patients⁵ and in most patients undergoing major surgery,⁶ with the exception of cardiac patients,⁷ and easy access to chest physical therapy facilities are recommended in all centers practicing lung resection.⁸ Unfortunately, although sound evidence exists on the benefits of respiratory rehabilitation in COPD,⁹ the recommendation for chest physiotherapy in patients undergoing lung resection is still based on weak scientific evidence.⁶

The aim of this article is to review the available literature on the physiological effects and clinical benefits of respiratory physiotherapy before and after lung resection, its costs, and recommended procedures.

EFFECTS OF THORACOTOMY AND LUNG RESECTION ON PULMONARY FUNCTION AND EXERCISE CAPACITY

Patient-related factors (advanced age, COPD, tobacco smoking, and increasing age) as well as

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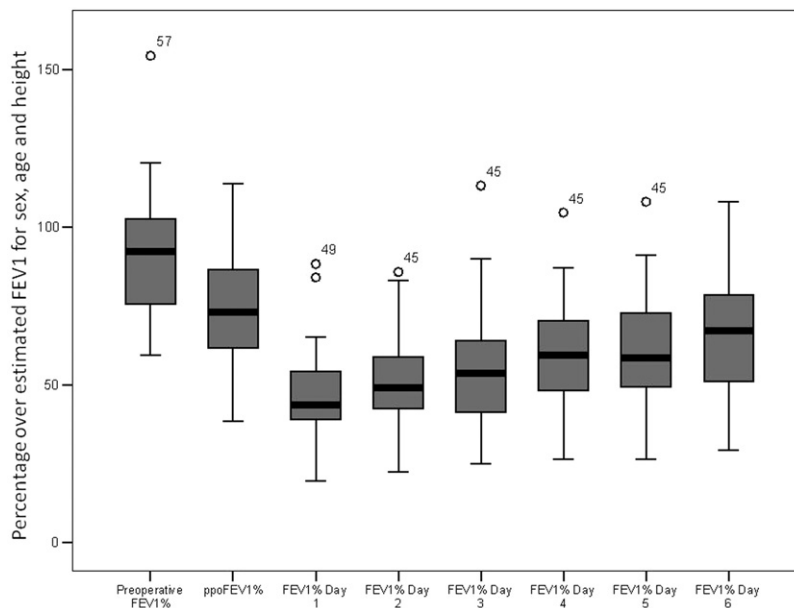


Figure 1. Comparison of preoperative FEV₁, ppo FEV₁, and measured postoperative FEV₁ on postoperative days 1-6. (Reprinted with permission from Varela et al.¹⁴)

procedure-related risk factors (type of surgical approach and anesthetic management, extent of resected lung parenchyma, duration of surgery) have to be considered as variables predictive of postoperative cardiac and respiratory complications.¹⁰ Lung resection is followed by some degree of oxidative damage,¹¹ which is less pronounced in video-assisted procedures,¹² and deterioration in right ventricular hemodynamics¹³ that could be related to the development of cardiopulmonary complications. Chest physiotherapy is not expected to have a favorable influence on these or cardiac complications; therefore, we are paying attention to the changes in pulmonary volumes, diffusing capacity of the lung for carbon monoxide (DLCO), and exercise capacity and their relation to the development of PPC.

EARLY POSTOPERATIVE CHANGES IN LUNG VOLUMES, DLCO, AND EXERCISE CAPACITY

In the immediate period after pulmonary lobectomy, an important decrease of forced expiratory volume in one second (FEV₁) can be seen (Fig. 1), slowly recovering during the first 6 postoperative days but never reaching the estimated post-resectional FEV₁.¹⁴ FEV₁ decrease is caused not only by the removal of the lung parenchyma but also by impairment of the diaphragm and chest wall motility, leading to an increase of pulmonary residual vol-

ume¹⁵ that is strongly associated with postoperative morbidity.¹⁶ Immediate postoperative FEV₁ decrease is lower in COPD patients,¹⁷ who demonstrate an early volume reduction effect that becomes more evident several months after surgery.^{18,19}

DLCO is one of the most valuable parameters in risk assessment for pulmonary resection,²⁰ and the relevance of its routine measurement has been recently emphasized in all patients,⁵ but more importantly in cases undergoing induction chemotherapy.²¹ Studies on early postoperative DLCO trends are scant in the medical literature, but some data have been published demonstrating that on hospital discharge, observed DLCO values were 12% lower than predicted after lobectomy and recovered after 3 months.²²

In the immediate period after major lung resection, exercise desaturation can be demonstrated in around 15% of patients,²³ compromising further recovery and representing a risk for delayed complications. Also, exercise capacity on hospital discharge, measured with the stair-climbing test, shows an important reduction with respect to the preoperative test that is directly related to patient age.²⁴ The initial drop of exercise capacity after lung resection seems to be a consequence of both circulatory and ventilatory limitations. Once the injury to the chest has been healed, improvement in ventilatory limitation is followed by improvement in exercise capacity.²⁵

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