

Original Article

Postoperative Respiratory Exercises Reduce the Risk of Developing Pulmonary Complications in Patients Undergoing Lobectomy[☆]



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ABSTRACT

Objective: To evaluate the effects of an intensive postoperative physiotherapy program focused on respiratory exercises in patients undergoing lobectomy by open thoracotomy.

Design: Quasi-experimental study.

Setting: Tertiary referral academic hospital.

Participants: 208 patients undergoing lobectomy by open thoracotomy.

Interventions: Control group patients ($n=102$) received standard medical/nursing care, and experimental group patients ($n=106$) added to the standard clinical pathway a daily physiotherapy program focused on respiratory exercises until discharge.

Outcomes: Analyzed outcomes were the frequency of postoperative pulmonary complications (PPCs) more amenable to physiotherapy (pneumonia, atelectasis and respiratory insufficiency) and length of hospital stay (LOS).

Results: Both groups were comparable regarding preoperative and surgical characteristics. Incidence of PPCs was 20.6% in control and 6.6% in experimental group ($P=.003$). Median (IQR) LOS in control group was 14 (7) days (Huber M estimator 14.21) and 12 (6) days (Huber M estimator 12.81) in experimental. Logistic regression model identified the evaluated physiotherapy program ($P=.017$; EXP [B] 95% CI 0.081–0.780) and % FEV₁ ($P=.042$; EXP [B] 95% CI 0.941–0.999) as protective factors for the development of PPCs in patients undergoing lobectomy.

Conclusions: Implementing a postoperative intensive physiotherapy program focused on respiratory exercises reduces the risk of PPCs and resultant LOS on patients undergoing lobectomy.

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Los ejercicios respiratorios postoperatorios reducen el riesgo de complicaciones pulmonares en pacientes sometidos a lobectomía

RESUMEN

Objetivo: Evaluar los efectos de un programa intensivo de fisioterapia postoperatoria basado en ejercicios respiratorios dirigido a pacientes lobectomizados mediante toracotomía abierta.

Diseño: Estudio cuasiexperimental.

Emplazamiento: Hospital universitario terciario.

Participantes: Doscientos ocho (208) pacientes lobectomizados mediante toracotomía abierta.

Intervención: Los pacientes del grupo control ($n = 102$) recibieron atención médica/de enfermería estándar y los pacientes del grupo experimental ($n = 106$), además de la atención clínica estándar, se sometieron a un programa de fisioterapia diaria basada en ejercicios respiratorios hasta el momento del alta hospitalaria.

Palabras clave:

Fisioterapia

Lobectomía

Complicaciones postoperatorias

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Variables de resultado: Las variables de resultado estudiadas incluyeron la frecuencia de complicaciones pulmonares postoperatorias (CPP) más susceptibles de tratamiento fisioterapéutico (neumonía, atelectasias e insuficiencia respiratoria) y la duración de la estancia hospitalaria (DEH).

Resultados: Las características preoperatorias y quirúrgicas de ambos grupos fueron comparables. La incidencia de CPP registrada fue de un 20,6% en el grupo control y un 6,6% en el grupo experimental ($p=0,003$). La mediana y el RIC de la DEH fue de 14 y 7 días, respectivamente (estimador M de Huber 14,21) en el grupo control y de 12 y 6 días (estimador M de Huber 12,81) en el grupo experimental. El modelo de regresión logística creado identificó al programa de fisioterapia evaluado ($p=0,017$; EXP (B) [IC 95% 0,081–0,780]) y al porcentaje del FEV₁ ($p=0,042$; EXP (B) [IC 95% 0,941–0,999]) como factores protectores frente al desarrollo de CPP en los pacientes intervenidos de lobectomía.

Conclusiones: La implementación de un programa intensivo de fisioterapia postoperatoria basado en ejercicios respiratorios reduce el riesgo de desarrollar CPP y la DEH en pacientes lobectomizados.

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Introduction

Perioperative physiotherapy has regularly been used to prevent or reduce pulmonary morbidity after lung resection^{1,2} and has recently been recommended by the European Respiratory Society, the European Society of Thoracic Surgeons and the American College of Chest Physicians for providing functional benefits.^{3,4} In 2006, Varela and co-workers⁵ published a cross-sectional study showing that implementing an intensive perioperative respiratory physiotherapy program for patients undergoing lobectomy, in addition to incentive spirometry and standard nursing care, decreased the rate of postoperative atelectasis and produced costs savings associated with a shorter hospital stay. The experimental program started the day before surgery and was based on aerobic exercise up to discharge.

To date, no single-blind randomized clinical trial evaluating the benefits of respiratory physiotherapy or an added specific intervention, focusing only on the immediate perioperative period, has shown significant differences between groups in the frequency of postoperative pulmonary complications (PPCs) or length of stay (LOS).^{6–10} There is a need to identify exactly which interventions are most beneficial in the immediate perioperative period in terms of reducing PPCs and in which patients, particularly now that guidelines are recommending surgery in increasingly higher risk patients.³ This is of clinical and economic importance as PPCs are directly associated with higher mortality and costs.¹¹

Hence, the aim of this study was to evaluate the effects of a postoperative physiotherapy program based on respiratory exercises in reducing PPCs and LOS in patients undergoing lobectomy.

Methods

Design

Quasi-experimental study.

Participants

This was a comparative study of the medical records of a total of 208 patients undergoing lobectomy in a tertiary referral teaching hospital (Complejo Hospitalario de Navarra). Control group patients underwent the procedure between 2006 and 2007 and experimental group patients between 2009 and 2010, after the hospital introduced a daily postoperative physiotherapy program until discharge. We did not include data from patients who underwent the procedure in 2008, as the program was not systematically established during that period. Both series were operated on by the same team, following similar operative and resectability selection criteria and anesthetic management. The approach in all patients was open thoracotomy, some with posterior muscle-sparing or a

small axillary thoracotomy, at the surgeon's choice. This study was approved by the local institutional review board.

Control Group

Patients in the control group received a volumetric incentive spirometer device in the preoperative room and were instructed how to perform deep inspiratory maneuvers at a moderate flow, maintaining an inspiratory apnea for 3–5 s. Patients were asked to start practicing the lung expansion exercises soon after the intervention in the post-anesthesia recovery unit, and to continue every hour until discharge. Once in the thoracic ward, nurses were responsible for encouraging patients to adopt an early upright position and ambulation from the first postoperative day.

Experimental Group

The experimental group received standard care as above, plus daily targeted individual respiratory physiotherapy sessions until discharge. Treatment design included two main objectives: patients should (1) achieve proficiency in pulmonary re-expansion techniques and (2) become autonomous in airway clearance maneuvers. Physiotherapy sessions lasted around 20 min and exercise techniques most commonly included were maximum sustained inspirations, debit controlled inspiratory exercises (EDIC), autogenic drainage, effective cough training, and progressive shoulder and thoracic cage weight-free mobility exercises. Patients were encouraged to practice the learned exercises independently during waking hours at least 3 more times a day. The importance of the patient's active role in their recovery during the immediate postoperative period (early ambulation, pulmonary hygiene, lung expansion exercises, etc.) was strongly emphasized during treatment sessions.

Variables and Outcomes

The comparability of both series was assessed by the following independent variables: sex, age, predicted preoperative forced expiratory volume in 1 s (%FEV₁), body mass index (BMI), smoking habit at the time of operation (current smoker or not), Charlson comorbidity index,¹² diagnosis, and patient-controlled epidural analgesia (PCEA).

The primary outcome was the incidence of postoperative pulmonary complications (PPCs), considered the presence of at least a diagnosis of pneumonia, atelectasis or acute respiratory failure in medical records. Both pneumonia and atelectasis were documented medically when clinical signs [temperature >38 °C, production of purulent (yellow/green) sputum differing from preoperative status, no breath sounds on auscultation, etc.] were accompanied by chest X-ray confirmation. Acute respiratory failure was recorded

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