



Editorial

Impact of a Pre-Operative Pulmonary Rehabilitation Program on Functional Performance In Patients Undergoing Video-assisted Thoracic Surgery for Lung Cancer[☆]



Impacto de un programa de rehabilitación pulmonar preoperatoria sobre el rendimiento funcional de pacientes sometidos a cirugía torácica asistida por vídeo debido a neoplasia maligna pulmonar

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The role of pulmonary rehabilitation in lung cancer has been systematically reviewed in the literature and it has been recommended as part of the pre-operative management to enhance recovery after thoracic surgery.^{1,2} However, few studies have focused on patients undergoing video-assisted thoracic surgery (VATS). To fill this research gap, we designed a pilot study to investigate the effects of a preoperative pulmonary rehabilitation program in patients awaiting VATS for lung cancer.

From February 2013 to June 2013, 23 patients were screened at the University Hospital of A Coruna. Patients who agreed to participate gave written informed consent before any formal testing. The research protocol was approved by the local ethics committee.

The rehabilitation program consisted of one and a half hour sessions, 3–5 times per week during the preoperative period, including: (1) interval aerobic training on a cycloergometer for 30–40 minutes; (2) resistance training with elastic bands and body-weight exercises for 3 sets of 15 repetitions each; and (3) breathing exercises with an incentive spirometer twice daily.

Participants were evaluated at 4 time points: at baseline (T_0); prior to surgery (T_1); at hospital discharge (T_2); and 3 months after surgery (T_3). Functional capacity measured with the 6-minute walking test (6MWT) was the main study endpoint. Other outcomes included muscle strength measured with the Senior Fitness Test

(SFT),³ health-related quality of life (HRQoL) measured with the Short-Form 36 Health Survey (SF36), and postoperative outcomes (incidence of postoperative complications and hospital stay).

Non-parametric tests were used to examine difference across time in the main outcomes. Univariate and multivariate regression analyses were used to identify the potential risk factors associated with a decrease in postoperative functional capacity. Analyses were performed using SPSS for Windows.

Twelve patients met the inclusion criteria and entered the rehabilitation program. Two patients withdrew and another was excluded because surgery was brought forward, leaving 9 patients (mean age was 68.5 ± 10.4 years, 8 men), who attended a median of 21 sessions (range 11–27; mean adherence: 125.7%). Six patients underwent lobectomy and 3 had wedge resection. Postoperative complications occurred in 2 patients (prolonged air leak in 2 and 1 with pneumothorax).

Main outcomes are summarized in Table 1. An almost significant increase was found in the 6MWT after rehabilitation ($P=.050$). The 2 SFT items were also significantly improved ($P<.05$). HRQoL was less than normal at baseline. No significant changes were observed in any domain of the SF36 except for the Mental Health Subscale ($P=.041$). After surgery, all items decreased, especially the physical role ($P=.012$). Univariate analysis indicated that postoperative 6MWT was highly correlated with baseline FEV₁, baseline physical functioning, and baseline physical summary component (PCS) of the SF36. The multivariate analysis confirmed that the PCS was a strong, independent factor for postoperative decline in the 6MWT ($R^2=.581$).

The results of this pilot study suggest that a preoperative pulmonary rehabilitation program for patients undergoing VATS is feasible and appears to improve functional capacity and muscle

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Table 1
Main Study Outcomes (Mean and Standard Deviation).

Variable	T ₀	T ₁	T ₂	T ₃
6MWT (m)	557.56 (74.43)	580.11 (80.67)	489.67 (98.69)**,†	529.63 (83.23)
Curl-Arm Test (number)	16.89 (5.34)	20.67 (2.64)*	20 (3.28)**	19.25 (3.19)††
Chair Sit-To-Stand Test (number)	14.56 (5.91)	15.86 (3.93)*	16.11 (4.98)	13.22 (6.98)

* $P < .05$ between T₀ and T₁.

** Between T₀ and T₂.

† Between T₁ and T₂.

†† Between T₀ and T₃.

strength. This finding is consistent with earlier studies in individuals undergoing thoracotomy⁴ and should be considered as a method for optimizing patients' status before surgery and for increasing the number of candidates for surgical resection. The borderline improvement found in the 6MWT could be explained by the ceiling effect observed in individuals who are already fit (defined as baseline 6MWT 124.6% predicted) and the lack of responsiveness of the test in this scenario. Even so, it achieved the minimal clinically important difference reported for the lung cancer population.⁵ Our results also confirm earlier findings in sedentary and elderly populations,⁶ suggesting that in the absence of more sophisticated equipment, elastic bands are an effective way of improving muscle strength in individuals with lung cancer. Unfortunately, no significant changes were found in HRQoL after training. Further studies are required in larger series to address this issue. A randomized controlled trial is also needed to investigate whether these functional improvements can lead to a reduction in postoperative complications and length of stay, in comparison to standard care.

Authorship

Raquel Sebio was the main investigator in this research. She was responsible for the design of the Preoperative Pulmonary Rehabilitation Program (PPRP), obtaining ethical approval, and conducting the screening and initial evaluation of the patients. She also contributed to the writing process.

Esther Gimenez Moolhuyzen was responsible for the implementation of the PPRP and evaluation of patients.

Isabel Yáñez Brage is Raquel Sebio's supervisor. She also contributed to the design of the PPRP.

Carmen Valenza, Gregory Reychler and Larry Cahalin were experts who advised on the design of the PPRP. They also contributed to the writing process and statistical analysis.

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References

1. Jones NL, Edmonds L, Ghosh S, Klein AA. A review of enhanced recovery for thoracic anaesthesia and surgery. *Anaesthesia*. 2013;68:179–89.
2. Granger CL, McDonald CF, Berney S, Chao C, Denehy L. Exercise intervention to improve exercise capacity and health related quality of life for patients with Non-small cell lung cancer: a systematic review. *Lung Cancer*. 2011;72:139–53.
3. Rikli RE, Jones CJ. Development and validation of criterion-referenced clinically relevant fitness standards for maintaining physical independence in later years. *Gerontologist*. 2013;53:255–67.
4. Jones LW, Peddle CJ, Eves ND, Haykowsky MJ, Courneya KS, Mackey JR, et al. Effects of presurgical exercise training on cardiorespiratory fitness among patients undergoing thoracic surgery for malignant lung lesions. *Cancer*. 2007;110:590–8.
5. Granger CL, Holland AE, Gordon IR, Denehy L. Minimal important difference of the 6-minute walk distance in lung cancer. *Chron Respir Dis*. 2015;12:146–54.
6. Fahlman MM, McNeven N, Boardley D, Morgan A, Topp R. Effects of resistance training on functional ability in elderly individuals. *AJHP*. 2011;25:237–43.