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Review article

Preoperative exercise therapy in lung surgery patients: A systematic review

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ABSTRACT

Objectives: The impact of postoperative complications after lung surgery for cancer is substantial, with the increasing age of patients and the presence of comorbidities. This systematic review summarises the effects of Preoperative Exercise Therapy (PET) in patients scheduled for lung surgery on aerobic capacity, physical fitness, postoperative complications, length of hospital stay, quality of life and recovery.
Methods: A systematic search on PET prior to lung surgery was conducted. The methodological quality of the included studies was rated using the Physiotherapy Evidence Database (PEDro) scale. The agreement between the reviewers was assessed with Cohen's kappa.
Results: A total of eleven studies were included with a methodological quality ranging from poor to good. The agreement between the reviewers, assessed with the Cohen's kappa, was 0.79. Due to substantial heterogeneity in the interventions across the included studies, it was impossible to conduct a meta-analysis. The most important finding of this systematic review was that PET based on moderate to intense exercise in patients scheduled for lung surgery has beneficial effects on aerobic capacity, physical fitness and quality of life. Also PET may reduce postoperative complications and length of hospital stay.
Conclusion: PET may have beneficial effects on various physical fitness variables and postoperative complications in patients with lung cancer scheduled for surgery. Future research must focus on developing patient tailored exercise programs and investigate the influence of co-existing comorbidities on the outcome measures. Definitions of PET, including timing, (acceptable) duration, intensity and exercise training methods should be determined and compared.

Contents

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1. Introduction

Lung cancer is one of the leading causes of cancer death worldwide [1–4,6,8,12]. It is frequently diagnosed at a late stage due to its initial asymptomatic course often leading to a poor prognosis [1,5,11]. Roughly, lung cancer can be divided into two histological groups; Non Small Cell Lung Cancer (NSCLC) and Small Cell Lung Cancer (SCLC). In general, patients diagnosed with NSCLC have higher survival rates than patients diagnosed with SCLC [13], especially in those patients which are found eligible for tumour resection [9,10,14].

Surgical removal remains the best (curative) option for patients with stage I and II NSCLC and for selected patients with locally advanced disease (stage IIIA) [9]. However most patients selected for surgical removal have limited functional capacity, owing to associated comorbidities and/or the stage of the disease [15].

Exercise interventions have been identified as a successful therapy to improve overall physical and psychological well being in some cancer populations (mainly breast cancer) [16]. Also exercise interventions have been shown to be effective in reducing symptoms and reducing the exacerbations of the disease [17].

There is increasing evidence in the field of lung surgery [18–20] and also in other surgical specialties [21–23] that a preoperative exercise therapy (PET) program has beneficial effects on the postoperative course, especially on the prevention of postoperative complications, the length of hospital admission, physical fitness and quality of life. This systematic review specifically focuses on patients scheduled for surgical removal of a suspected malignancy and will address the following research questions:

To disclose the current scientific knowledge regarding:

- What is the effect of a PET program on the postoperative course in terms of postoperative complications, mortality, length of hospital stay, physical fitness and quality of life in this patient population?
- What designs of exercise interventions have been used and are there different effects on the outcome measures?

2. Methods

We conducted a systematic literature search. The patient population of interest were all patients diagnosed with lung cancer and scheduled for lung resection surgery. The intervention studied was PET compared to standard care (no exercise program). Outcome measures were aerobic capacity, physical fitness, postoperative complications, length of hospital stay, quality of life and mortality.

Pubmed, Embase, Medline, and The Cochrane Library were searched from the earliest date of each database up to December 2014. The search string used for the literature search used the following keywords and was modified for each database: ("Lung cancer"[Mesh] OR Non small cell lung cancer OR small cell lung cancer) AND (lung surgery OR lobectomy) AND ("Physical Therapy Modalities"[Mesh] OR physical therapy OR physiotherapy OR "Exercise"[Mesh] OR exercise)

Authors SP and JF screened and selected studies on the basis of title and abstract, separately. After primary selection, authors (SP and JF) reviewed the full text of the selected studies and determined suitability for inclusion, based on the established selection criteria. For further eligible studies, cross-references were screened. Disagreements were solved by discussion with each other and the senior author (FS) until consensus was reached.

2.1. Inclusion criteria

- Randomised controlled trial or prospective cohort study.
- Patients scheduled for surgery of lung cancer
- The intervention consisted of a (preoperative) exercise-training program, which was defined as a structured regimen of physical activities (either a stand-alone regimen; home-based or supervised) for specific therapeutic goals to gain or increase musculoskeletal and/or cardiovascular and/or respiratory function.
- Reported outcome measurements were improvement of maximal oxygen uptake (VO_2 max) and/or physical fitness, postoperative complications, length of stay and/or recovery.

For rating of the methodological quality, the Physiotherapy Evidence Database (PEDro) scale was used [24,25]. This scale has 11 criteria, with a maximum score of 10 (range 0–10), because the first item (the specification of the eligibility criteria) is not included in the total score. Two authors (SP and JF) separately assessed the methodological quality of the included studies, according to the PEDro scale and the following classification was used: a score of <4 indicated a poor methodological quality, between 4 and 5 fair quality, 6–8 good quality and 9–10 excellent quality [26].

A Cohen's kappa score was calculated to determine the level of