



Deterioration in physical activity and function differs according to treatment type in non-small cell lung cancer – future directions for physiotherapy management

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Abstract

Objectives To investigate in non-surgically and surgically treated non-small cell lung cancer (NSCLC): (1) changes in physical activity, function, health-related quality of life (HRQoL) and symptoms after diagnosis; and (2) the association between physical activity and outcomes.

Design Prospective observational study.

Setting Three acute tertiary hospitals.

Participants Sixty-nine individuals (43 male, median [IQR] age 68 [61 to 74] years) with stage I–IV NSCLC.

Main outcome measures The primary outcome (Physical Activity Scale for the Elderly) and secondary outcome (six-minute walk test and questionnaires assessing HRQoL, function, symptoms, mood) were measured at diagnosis (pre-treatment), and eight to ten weeks post-diagnosis (post-operative and/or during chemotherapy/radiotherapy).

Results Individuals treated surgically ($n = 27$) experienced a deterioration in physical activity levels (baseline median [IQR] = 74 [51 to 135]; follow-up median [IQR] = 29 [24 to 73]; median difference = 45, effect size = 0.3). At follow-up physical activity was inversely related to depression, pain and appetite loss ($\rho > 0.5$, $p < 0.05$). In contrast non-surgical individuals ($n = 42$) did not experience a change in physical activity, however did experience deterioration in function, functional capacity, global HRQoL, fatigue and dyspnoea. Physical activity levels were low in this group and at follow-up the strongest relationships with physical activity levels were global HRQoL, function, fatigue and mood (inverse, $\rho > 0.5$, $p < 0.05$).

Conclusions Surgically treated individuals experienced a reduction in physical activity levels after diagnosis, which was not seen in the non-surgical group. Lower physical activity levels were associated with poorer outcomes, particularly in non-surgically treated individuals. Further research is required to establish the optimal intervention to improve physical activity levels in these cohorts.

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Keywords: Lung neoplasms; Non-small cell lung cancer; Physical activity; Function; Physiotherapy; Health-related quality of life

Introduction

Lung cancer is the most common cancer diagnosed in males and the fourth most common cancer diagnosed in

females worldwide [1]. Surgical resection provides the best potential chance of cure for non-small cell lung cancer (NSCLC), however patients are often either not fit enough to undergo thoracic surgery or present after the cancer is too advanced [2]. Therefore patients can be treated non-surgically with a combination of chemotherapy, radiotherapy and or targeted agents [2]. In NSCLC adverse physiological and psychological impairments arise from multiple causative factors including the disease, treatment, co-morbidities and pre-existing harmful lifestyle behaviours [3,4]. Symptoms include dyspnoea, and fatigue; disease burden is high; and

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subsequent activity limitations and participation restrictions commonly ensue [4–6].

Physical activity is “any bodily movement produced by skeletal muscles that results in energy expenditure” [7]. Lack of physical activity is currently a global pandemic [8]. In the general population there is a dose-dependent inverse relationship between physical activity levels and risk of premature mortality or the development of many diseases, including cardiovascular disease, type two diabetes, and cancer [9]. Physical activity is emerging as an important and clinically significant outcome in cancer [4]. Consistent evidence links higher physical activity levels post-diagnosis with reduced cancer-specific and all-cause mortality (breast, colon and prostate cancer) [10,11]. There is a vast body of research demonstrating enhanced health benefits, particularly improved fitness, function, symptoms, mood and health-related quality of life (HRQoL), for individuals with cancer who undergo exercise training; the majority of which has been performed in breast and prostate cancer [4]. There is growing evidence to support the efficacy of exercise training specifically in operable NSCLC as well [12–14].

Exercise training however is different to physical activity, the former being “a subset of physical activity that is planned, structured and repetitive and has as a final or an intermediate objective the improvement or maintenance of physical fitness” [7]; and therefore understanding the relationship between overall physical activity levels and outcomes in NSCLC is an important and different issue which needs to be examined. Previous research has demonstrated that higher levels of physical activity are associated with better HRQoL for individuals with NSCLC treated surgically [15]. Less is known about the association between physical activity and outcomes in the non-surgical NSCLC population; or if these two groups differ in terms of physical activity. Understanding if there is a sub-group of NSCLC, who are at risk of inactivity and functional decline, would help target physiotherapy resources accordingly.

The aims of this study were, in both non-surgically and surgically treated individuals with NSCLC, to investigate (1) changes in physical activity levels, functional capacity, function, HRQoL, symptoms and mood after diagnosis, and (2) the association between physical activity levels and these outcomes. It was hypothesized that the non-surgical group would experience a greater reduction in physical activity levels after diagnosis, in comparison to the surgical group. The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines were followed to report this study [16].

Methods

Study design, setting and participants

This was a secondary analysis of observational data collected within two multi-centre prospective cohort studies [17,18]. Participants were recruited from three tertiary

hospitals in Melbourne, Australia, between December 2008 and October 2012. All sites had institutional ethical approval and participants provided written informed consent. Patients were included if they were English-speaking adults with newly diagnosed NSCLC and had a physician rated Eastern Cooperative Oncology Group (ECOG) Performance Status of 0 to 2 at study entry [19]. Participants were included in this analysis if they completed the measurement of physical activity at baseline.

Procedure

For both studies, consecutive patients admitted through the lung oncology units between December 2008 and October 2012 were screened for eligibility. All patients meeting the eligibility criteria were approached. Assessments were performed at baseline (close to diagnosis, pre-treatment) and follow-up which occurred 8 to 10 weeks post-diagnosis (post-operative and/or during chemotherapy or radiotherapy).

Standard care at the institutions was followed and not modified. For surgically treated participants this included post-operative physiotherapy delivered according to a clinical pathway (Supplementary Table 1) which commenced the day after surgery and only continued until patients were able to ambulate safely for discharge home, or they no longer required respiratory management to prevent or treat a physiotherapy amenable post-operative pulmonary complication [20]. In accordance with standard care, participants were not offered pre-operative physiotherapy, formal education regarding physical activity, or referral to pulmonary rehabilitation after surgery. Patients treated non-surgically were also not offered formal education regarding physical activity or referral to pulmonary rehabilitation.

Supplementary Table 1 related to this article can be found, in the online version, at <http://dx.doi.org/10.1016/j.physio.2015.10.007>.

Outcome measures

The primary outcome was self-reported physical activity levels, measured using the Physical Activity Scale for the Elderly (PASE) [21]. The 28-item questionnaire asks about physical activity performed over the previous seven days. A total physical activity score is calculated, with higher scores representing higher activity levels. The maximum score attainable is 400 and the average score for elderly individuals is 103 [21].

Secondary outcomes were functional exercise capacity, HRQoL, function and mood. Functional exercise capacity was measured using the six minute walk test (6MWT), a commonly used, self-paced field walking tests which measures the distance an individual can walk along a flat straight corridor 30 metres long in 6 minutes [22,23]. The 6MWT was conducted according to published recommendations and duplicate tests were completed to account for the learning effect [22].

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