Journal of Physiotherapy 62 (2016) 60–67

Journal of PHYSIOTHERAPY

journal homepage: www.elsevier.com/locate/jphys

Invited Topical Review

Physiotherapy management of lung cancer

Catherine L Granger [a,b,c]

[a] Department of Physiotherapy, University of Melbourne; [b] Department of Physiotherapy, Royal Melbourne Hospital; [c] Institute for Breathing and Sleep, Melbourne, Australia

KEY WORDS

Lung cancer
Physiotherapy
Exercise
Physical activity
Rehabilitation

[Granger CL (2016) Physiotherapy management of lung cancer. *Journal of Physiotherapy* 62: 60–67]

Introduction

Lung cancer is associated with significant morbidity and mortality and is a substantial burden to healthcare systems. Physiotherapists play an important role in the management of people with lung cancer. Advances in research over the past decade, particularly supporting the use of exercise training, have rapidly progressed the role of physiotherapy in lung cancer. This review summarises the burden associated with lung cancer, the management of lung cancer with a particular focus on physiotherapy interventions, and future directions for research and clinical practice.

What is lung cancer?

Cancer is a generic term for a heterogeneous group of diseases that occur when abnormal cells are not destroyed by normal metabolic processes, but instead proliferate and metastasise out of control.[1] Lung cancer is the leading type of cancer diagnosed in males worldwide.[2] In females, lung cancer is the fourth most common cancer diagnosed behind breast cancer, colorectal cancer and cancer of the cervix uteri.[2] Multiple factors are understood to play a role in the induction of lung carcinogenesis. Tobacco smoking is the leading cause.[3] Other risk factors include exposure to environmental or occupational carcinogens, pulmonary inflammation, airflow limitation, chronic obstructive pulmonary disease (COPD) and genetic predisposition.[1,3,4] Weaker evidence links physical inactivity and poor nutrition to an increased risk of lung cancer.[5] Non-small cell lung cancer (NSCLC) is the most common type of lung cancer and accounts for 85% of new lung cancer diagnoses.[6] Small cell lung cancer accounts for a small proportion of lung cancer diagnoses and is remarkably different to NSCLC in terms of aetiology, prognosis and treatment.[6] This review mainly focuses on NSCLC, which is where the majority of physiotherapy research exists.

Lung cancer is a disease predominantly seen in the elderly population; more than 80% of people diagnosed with lung cancer are aged 60 years or older.[6] Due to the high incidence of smoking among people with lung cancer, multi-morbidities are common.[7] The most common of these is COPD, occurring in 40 to 70% of people with lung cancer.[3,4] Due to the aetiology of lung cancer, the older age of patients, and presence of multi-morbidities, people with lung cancer constitute a complex patient population to manage.

Medical management of lung cancer

The medical treatment of lung cancer has improved over recent decades; however, lung cancer remains the leading cause of cancer death worldwide and the overall 5-year survival rate is 14%.[2] Medical treatments include surgical resection, chemotherapy, radiotherapy and targeted agents, each of which is associated with several side effects (Box 1). The choice of treatment combination depends on the histological type, tumour location, cancer stage and the patient's degree of frailty.[8]

Surgical resection

Surgical resection of the tumour provides the best potential chance of cure; however, approximately 70% of people present with advanced inoperable disease and 25% of people with operable disease are unfit for surgery.[8] For those people who are able to undergo surgery, surgical options include pneumonectomy, lobectomy or sub-lobar resection.[9] Lobectomy is the preferred surgical approach over limited pulmonary resection in early stage NSCLC as it is associated with lower rates of loco-regional recurrence and improved survival.[9] However, limited pulmonary resection is advantageous in terms of preserving a greater amount of lung volume, limiting postoperative physiological impairment and, consequently, reducing postoperative complications and hospital length of stay.[9] Video-assisted thoracoscopic surgery is the preferred approached over a thoracotomy incision and is associated with: less pain, better shoulder range of motion and improved function early after surgery; fewer postoperative complications; decreased risk of intensive care readmission; shorter hospital length of stay; and less need for inpatient rehabilitation.[8,10,11] Following lung resection, clinically important

http://dx.doi.org/10.1016/j.jphys.2016.02.010

Box 1. Common side effects resulting from lung cancer treatments.

Surgery	Chemotherapy	Radiotherapy	Molecular targeted therapies
• pain • cough • fatigue	• fatigue • nausea • infection • vomiting • anaemia • diarrhoea • constipation • loss of appetite • hair loss • mouth ulcers • weight gain or loss	• fatigue • cough • oesophagitis • nausea • vomiting • skin erythema • diarrhoea • loss of appetite • hair loss • rigors • flu-like symptoms	• fatigue • nausea • vomiting • loss of appetite • diarrhoea • constipation • skin and hair changes

immediate postoperative pulmonary complications (PPCs) can include respiratory failure (prolonged mechanical ventilation, re-intubation or acute respiratory distress syndrome), pneumonia and atelectasis requiring bronchoscopy.[12] Reported rates of PPCs vary from 3 to 15%; this is partly due to a lack of consensus on a PPC definition.[13,14] Postoperative pulmonary complications are associated with increased hospital length of stay, intensive care readmissions and mortality.[13]

Chemotherapy

Chemotherapeutic agents inhibit cell division in both cancerous and non-cancerous cells and therefore result in side effects due to the damage caused to normal cells.[15] These side effects include bone marrow suppression and resultant immunosuppression, which are worst 2 weeks following treatment,[16] and impaired respiratory function, particularly diffusing capacity.[17]

Radiotherapy

External beam radiotherapy works by producing radiation, which is targeted at the tumour, and results in apoptosis of the cancerous cells. Side effects of radiotherapy occur due to the associated formation of free radicals, widespread inflammatory response and release of cytokines.[15] Respiratory function, particularly diffusing capacity, is impaired following radiotherapy.[18]

Molecular-targeted agents

Tumours are driven by genomic mutations and, increasingly, the different genomes in NSCLC are being recognised and targeted in the treatment of the disease. Targeted agents differ from chemotherapy agents because they inhibit 'pathways outside of the nucleus that are required for malignant proliferation chemotherapy agents to act', whereas chemotherapy agents act in the nucleus by inhibiting the division of any rapidly dividing cells.[19]

In summary, lung cancer is associated with adverse physiological impairments that arise from multiple causative factors, including: the disease, treatment, multi-morbidities and pre-existing harmful lifestyle behaviours. Consequently, this leads to significant disease burden.

Burden of lung cancer

Lung cancer is associated with higher disease burden, more physical hardship and greater symptom distress than other cancer types.[6,20,21] Important symptoms include dyspnoea, fatigue, cough, pain and insomnia. These often occur as symptom clusters and result in high patient distress and interference with daily activities.[21,22] Distress due to symptoms at the time of diagnosis is predictive of mortality.[20] Avoidance of symptom triggers (namely physical activity) promotes a vicious cycle of inactivity and functional decline; a phenomenon that is becoming well described in the lung cancer literature and a cycle that is important for physiotherapists to address.[23]

Cancer cachexia is a multi-factorial syndrome defined by an ongoing loss of skeletal muscle mass that cannot be fully reversed by conventional nutritional support and leads to progressive functional impairment.[24] Clinically, cancer cachexia presents as a combination of anorexia, metabolic alterations, loss of fat mass, loss of skeletal muscle protein, loss of weight, impaired muscle strength and fatigue.[24] Important implications include reduced ability to tolerate surgery, poor response to chemotherapy or radiotherapy, impaired resilience to treatment, worse health-related quality of life and increased mortality.[24] At diagnosis, people with lung cancer have reduced peripheral muscle strength compared to healthy aged-matched peers.[23] Skeletal muscle dysfunction is likely to significantly contribute to exercise intolerance, particularly given that 70% of preoperative peak exercise tests are stopped due to leg discomfort rather than dyspnoea, and functional capacity is not related to spirometric measures of lung function in this population.[25,26] Peripheral muscle strength declines further during and after lung cancer treatment.[23] Given the importance of peripheral muscle strength to overall physical function, this impairment is an important feature of lung cancer for physiotherapists to manage.

Following diagnosis, functional decline is common and rapid, and activity limitations and participation restrictions commonly ensue.[23,27,28] At diagnosis, functional capacity is reduced compared to healthy aged-matched peers.[23] Functional capacity measured preoperatively is predictive of postoperative outcomes, including: respiratory failure, hospital length of stay, health-related quality of life and survival.[29] Functional capacity is also predictive of survival in advanced lung cancer. With every 50 m improvement in the 6-minute walk test, survival improves by 13% and people who walk at least 400 m before chemotherapy have greater survival time.[30,31] A number of studies have reported that functional capacity progressively declines after diagnosis; however, it is possible that this decline may be limited to the inoperable population. In the surgical literature, most studies report functional capacity to temporarily decline after lung resection and then return to baseline by 3 to 6 months postoperatively.[32,33] Conversely, people undergoing a pneumonectomy experience sustained reductions in functional capacity postoperatively.[33] Deterioration in functional capacity is also observed during chemotherapy. An Australian study, including people with operable and inoperable lung cancer, found an overall large clinically and statistically significant mean decline of 78 m in the 6-minute walk test over 6 months from diagnosis, suggesting that in many people, functional capacity does not recover back to pre-treatment levels in the short term.[23] Not surprisingly, functional capacity is the most common endpoint targeted by lung cancer exercise trials to date.[29]

Physical inactivity is common and prevalent in lung cancer. Studies have demonstrated that before surgery or treatment, physical activity levels are low and less than those of healthy aged-matched peers; this is based on self-report and objective measures.[23,34,35] United States and Australian data show that only 26% and 40% of people with lung cancer meet cancer-specific recommended physical activity levels, respectively.[23,34] Importantly, before treatment, higher physical activity levels are seen in people with better functional capacity, muscle strength, physical function, nutritional status and self-determination to exercise, and less anxiety, depression, distress, fatigue and symptoms.[23,35] There are many reasons why people with lung cancer may be inactive at diagnosis: they might have been inactive for a large proportion of their life (this is a risk factor for developing cancer) or physical