Multimodal Exercise Program

A pilot randomized trial for patients with lung cancer receiving surgical treatment

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BACKGROUND: Curative lung resection is the best option for patients with stage I–III lung cancer, and the best exercise intervention in these patients has not been determined.

OBJECTIVES: This pilot study explored whether a short-term pre- and postsurgery multimodal exercise program affected dyspnea, exercise capacity, inspiratory capacity, anxiety, and depression.

METHODS: A total of 101 patients were randomly allocated into the combined intervention group (n = 34), the breathing exercise group (n = 32), or the control group (n = 35). During hospitalization, patients in the two intervention groups received one or more kinds of exercise intervention, and patients in the control group only received usual care. Outcomes were assessed at admission, on the day before surgery, and at discharge.

FINDINGS: Both intervention groups achieved significant improvements in dyspnea, exercise capacity, and inspiratory capacity, and patients in the combined intervention group exhibited greater improvements in outcomes as compared to those randomized to the breathing exercise group.

KEYWORDS
aerobic exercise; breathing exercise; lung cancer; surgery; pulmonary rehabilitation

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NON-SMALL CELL LUNG CANCER (NSCLC) ACCOUNTS FOR 85% of lung cancer diagnoses in the world (Ferlay et al., 2018; Hong et al., 2015). Although multidisciplinary treatments are prevalent, surgical resection is still the best option for patients with lung cancer (stage I–IIIA) (Hoy et al., 2019; Martin et al., 2018). Because of the cancer itself and the effect of surgical injury, patients with lung cancer often experience multiple health-related issues (e.g., dyspnea, pain, fatigue), which could affect their postoperative recovery and health-related quality of life (Hoffman et al., 2017). In addition to these physical disorders, patients also experience some mental health disorders, such as anxiety and depression (Park et al., 2016). Effective pulmonary rehabilitation strategies are needed to help improve these clinical outcomes.

Breathing exercise has been widely used in patients with chronic respiratory diseases, such as chronic obstructive pulmonary disease (COPD) and asthma, and aims to correct wrong breathing pattern, promote respiratory muscle activity, and increase the amount of alveolar ventilation (Liu et al., 2013). In patients with surgically treated lung cancer, not providing preoperative breathing exercise has been reported to be an independent risk factor for postoperative pulmonary complications (Kim et al., 2016). Commonly used breathing exercise methods include deep-breathing exercise and inspiratory muscle training (IMT). Some research has shown that the reduction in inspiratory capacity is responsible for the marked dyspnea and low exercise tolerance, and the occurrence of dyspnea and the decline of exercise capacity may have a negative effect on survival (Beaumont, Mialon, et al., 2018). The aim of IMT is to improve respiratory muscle strength and endurance, and the most common approach to IMT uses devices that impose a threshold load (Beaumont, Forget, et al., 2018). In addition, deep-breathing exercise can keep the upper chest relatively motion-free, which can reduce breathing effort and improve ventilatory efficiency (Yokogawa et al., 2018). Deep-breathing exercise using specific devices to increase lung volume and ventilation, such as incentive spirometry, has also been widely reported in studies (Eltorai et al., 2018; Tyson et al., 2015).

Physical exercise, including aerobic exercise and resistance exercise, is a core component of pulmonary rehabilitation. Aerobic exercise is the mainstay of exercise programs in pulmonary rehabilitation, the aim of which is