

Chapter 1

PULMONARY REHABILITATION AFTER THORACIC SURGERY

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Introduction

Recent developments such as lung transplantation, video assisted thoracoscopic surgery (VATS) and lung volume reduction surgery have developed thoracic surgery extensively over the last 50 years (Reeve, Denehy & Stiller, 2007).

Thoracic surgery has a relatively high risk of developing postoperative pulmonary complications (PPC) by impairing postoperative respiratory functions. The incidence (19-59%) is much higher than following upper (16-17%) or lower abdominal surgery (0-5%) (Garcia-Miguel, Serrano-Aguilar & Lopez-Bastida, 2003).

During the early stages after thoracic surgery, surgical factors such as anesthesia, wound pain, and the surgical stress of surgery are associated with poor postoperative pulmonary functions like limited movement of the chest, poor cough reflex and sputum removal, limitation of lung expansion, imbalance of extracellular fluid volume, and temporary paralysis of the phrenic nerve. Finally, these problems lead to delayed healing of pulmonary functions, atelectasis, bacterial pneumonia, acute exacerbation of interstitial pneumonia, acute respiratory distress syndrome (ARDS) and acute lung injury (Steéphan, et al., 2000).

PPC's are the major causes or contributing factors for the death rate following lung resection, accounting for 84% of all deaths. Other important clinical and economic effects of PPCs include the need for admission to the intensive care unit (ICU) or prolonged hospital stay (Wang, S., et al., 2017, Korttila, 1995).

Interventions to reduce the incidence of postoperative pulmonary complications include modifications of risk factors, optimization of preoperative status, patient education, intraoperative management and postoperative pulmonary rehabilitation (Reeve, 2008).

The American Thoracic Society/European Respiratory Society (ATS/ERS) defines PR as "an evidence based, multidisciplinary, comprehensive intervention for patients with chronic respiratory disease who are symptomatic and often have decreased daily life activities." PR confers significant gains in symptom control, ex-

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14 weeks and was especially for patients who did not receive chemotherapy, supervised aerobic exercise training significantly improved the quality of life of patients and selected cardiopulmonary endpoints (Jones, et al., 2008).

High-intensity endurance and strength training (walking uphill on a treadmill at 80–95% of the maximum heart rate, three series of 6–12 RM of the leg press, leg extension, back extension, seat row, bicep curls, and chest-and-shoulder press), which was completed 3 times a week for 20 weeks to patients who had undergone lung resection surgery 5-7 weeks ago, was well tolerated and induced clinically significant improvements in peak oxygen uptake, muscular strength, total muscle mass, functional fitness and quality of life (Edvardsen, et al., 2014).

It is stated that postoperative exercise programs alone are not effective in patients with lung cancer resection and that the program should be continued in the postoperative period, starting from the preoperative period. A systemic PR program (respiratory exercises, respiratory control, relaxation training, exercise program) applied up to 6 months postoperatively from the preoperative period has been found to improve patients' quality of life, especially for symptoms of pain and functional status (Bradley, et al., 2013).

At this time, there is no consensus on the right timing, duration and the components of the postoperative late stage pulmonary rehabilitation programs (Pasqua, et al. 2015).

Optimum benefits are obtained from programs lasting 6 to 8 weeks. However, if patients are considered for surgical procedures that may require less waiting time, the programs can be compressed for 3 weeks with daily sessions. Supervised exercise training 2 to 5 times a week should include any regimen from endurance training, interval training, resistance/strength training; upper and lower limbs, walking exercise; flexibility, balance and inspiratory muscle training can also be incorporated. In all cases the rehabilitation intervention should be individualized to maximize personal functional gains (Celli, 2004).

In the late postoperative period, exercise in lung cancer patients is accepted as a useful and safe application in terms of improving the physical capacity and quality of life of the patients (Crandall, et al., 2014).

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