



Research Article

ROLE OF PREOPERATIVE PULMONARY REHABILITATION IN A PATIENT UNDERGOING LUNG CANCER RESECTION: A CASE REPORT

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ABSTRACT

Patients with lung cancer are at increased risk of developing postoperative complications due to compromised cardiopulmonary function, making lung cancer resection a high-risk surgery. This case study describes a 64-year-old hypertensive female with a Body Mass Index of 31kg/m² and a diagnosis of spindle cell neoplasm of the left lung for which lung resection was advised but due to low Pulmonary Function test (PFT) values subject was not considered fit for surgery. She was given a structured Pulmonary Rehabilitation (PR) program for 5 days a week, for 4 weeks. Results showed improvement in preoperative PFT values and 6 minute walking distance (6MWD) (from 330 meters to 420 meters). Also, Quality of life (QOL) assessed using FACT-L questionnaire score showed an improvement (from 30 to 70). Anxiety and Depression assessed using Hospital Anxiety and Depression scale (HADS) also showed improvement in both anxiety subscale score (from 15 to 11) and depression subscale score (from 17 to 10). This case report proposes preoperative PR as an intervention to improve preoperative fitness and decrease surgical morbidity.

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INTRODUCTION

Lung cancer is a catastrophic and progressive disease. Patients with lung cancer are at an increased risk of developing postoperative complications due to compromised cardiopulmonary function making lung cancer resection almost inoperable. Surgery causes further reductions in the lung capacities depending on the extent of resection. However, complete anatomical surgical resection is currently the only curative treatment for lung cancer.² Pulmonary Rehabilitation (PR) is considered as an interdisciplinary approach during the preoperative phase of lung cancer resection surgery. Preoperative PR can optimize individuals' exercise tolerance limited by dyspnea and deconditioning there by improving the patients' lung capacity and quality of life.^{3, 4} The role of preoperative PR in patients undergoing lung resection is gaining momentum as a beneficial part of recovery.^{5,6} Thus in this case report, preoperative PR has been proposed as an intervention to improve preoperative fitness and decrease surgical morbidity.

Case Report

This case report describes a 64-year-old female with a Body Mass Index of 31kg/m² with a diagnosis of solitary fibrous tumour of the left pleura. She presented with complaint of dyspnea on exertion since 1 year gradually worsening in nature with fatigue. Resection was advised but subject was not considered fit for surgery due to low Pulmonary Function test

(PFT) values and was advised to manage conservatively. However, subject underwent pleural tapping three times in 1 year and her dyspnea was progressively worsening in nature. There was further increase in the size of the mass, increased compression of the right lung resulting in further decline in the PFT values. Forced expiratory volume in one second (FEV₁) dropped from 41% to 34.7%. Subject was also homebound due to worsening dyspnea, had a poor quality of life (QOL) and showed depression and anxiety symptoms. Patient was referred to our physiotherapy department for improving her pulmonary and functional capacity; as a prerequisite for surgery. After performing baseline assessment, PR program was designed and incorporated for the patient.

Intervention

PR program was started which consisted of one session, 5 days a week, which was carried out for 4 weeks. Session consisted of warm-up; endurance and strength training followed by cool down. Session started with 10 minutes of warm up at 30% of subject's maximal heart rate. Endurance training included cycle ergometer (20 min) and walking (20 min) at 70% of maximal heart rate. Strength training was performed for major muscle groups using weight cuffs by 10 RM protocol (2 sets of 10 repetitions). Inspiratory muscle training (IMT) was also incorporated using the Threshold Inspiratory Muscle Trainer. Each IMT session consisted of 3 sets of 10 repetitions performed thrice a day. Participant was coached to establish a

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slow, rhythmical pattern of breathing keeping inspiration and expiration time equal while using the IMT device. Session ended with cool down exercises and Jacobson’s relaxation therapy. Sessions also incorporated educational support, bronchial hygiene techniques, lung expansion therapies, diaphragmatic facilitation, volumetric incentive spirometer, breathing control techniques and energy conservation techniques.

Outcome Assessment

Following outcome measures were assessed in the patient:

1. PFT values of FVC, FEV₁, FEV₁/FEV – on the first and last day of PR
2. 6 minute walking distance (6MWD) - on the first and last day of PR
3. Quality of life (QOL) using Functional Assessment of Cancer Therapy-Lung (FACT-L)
4. Anxiety and depression using Hospital Anxiety and Depression scale (HADS)

The FACT-L score ranges from 0 to 136. Higher FACT-L score corresponds to better QOL. FACT-L was assessed on the first day and last day of PR. HADS scores range from 0 to 21 for each subscale. A score ranging from 0-7 denotes a non-case i.e. normal , 8-10 denotes a possible case i.e. borderline case and 11 or higher denotes a probable case. HADS questionnaire was asked on the first and last day PR. On completion of PR, following improvements were seen in the outcome measures. (Table1) PFT showed improvement in terms of FEV₁, FVC and FEV₁/FVC (%) values. FEV₁ value improved from 34.4% to 45.3%, FVC value improved from 33.7% to 44.1%and FEV₁/FVC (%) improved from 108.4 to 109.3. 6MWD improved from 330 meters to 420 meters. FACT-L questionnaire score showed an improvement from 30 to 70. HADS anxiety subscale score improved from 15 to 11 and HADS depression subscale score from 17 to 10. After undergoing PR for 1 month, subject successfully underwent lung resection. Subject was extubated in 2 days postoperatively and no postoperative complications (PPCs) were reported.

Table 1

| Parameters | Before PR | After PR |
|--------------------------------|-----------|----------|
| PFT: | | |
| (i)FVC | 33.7 | 44.1 |
| (ii)FEV ₁ | 34.1 | 45.3 |
| (iii)FEV ₁ /FVC (%) | 108.4 | 109.3 |
| 6 MWD | 330m | 420m |
| FACT-L questionnaire | 30 | 70 |
| HADS anxiety subscale | 15 | 11 |
| HADS depression subscale | 17 | 10 |

DISCUSSION

Lung cancer resection has a huge impact on patients. This case report indicates preoperative PR enhances pulmonary function along with functional capacity in the patient. We observed that after preoperative PR, there was improvement in the PFT and 6MWD values. Cesario A et al (2007) in their study done in 8 patients with lung cancer and severe COPD showed that there was significant improvement in PFT (increase of VLC by 0.44 l and FEV₁ by 0.12 l) and exercise tolerance (6MWD by 79m) suggesting preoperative PR can increase resection rates of patients who were not considered fit for surgery based on PFT values and poor functional capacity.⁷ Similar effects were seen in this case report. Many studies⁸⁻¹¹ have shown that PR helps in improving the QOL in patients suffering from various

respiratory conditions. Meta-analysis done by Carla S Gordon et al (2019) showed significant decrease in anxiety and depression rates in COPD patients following PR.¹¹ Improvements in both QOL and anxiety and depression were seen in this report.

PPCs following lung cancer resection are experienced by 14-40% of the patients.¹² Reduced preoperative cardiorespiratory capacity is considered as one of the many factor for developing PPCs.¹³ Along with reduced cardiopulmonary capacity, ageing, physical inactivity, comorbidities and chemotherapy treatment for cancer are considered as major contributing factors and predictors of developing PPCs post lung cancer resection.^{14,15} Preoperative PR interventions can lead to improved exercise capacity parallel with reduction of risk in cardiopulmonary complications. PR challenges the entire pathway of oxygen transport by improving gas exchange by boosting oxygen transport; enhancing cellular uptake and utilization.³ In this case report, lesser duration for mechanical ventilation, easy weaning and no PPCs can be detected as a result of preoperative PR, which may be in connection with increased exercise and pulmonary capacity. Preoperative PR has shown to improve exercise capacity prior to surgery allowing the subject to undergo curative surgery. PR helps in optimizing preoperative exercise capacity, enhances QOL, helps in reducing postoperative respiratory complications, and improves confidence prior to surgery. It also reduces anxiety and depressive symptoms as seen in this case report. This exercise intervention was safe and effective for our patient.

CONCLUSION

Pre-operative PR had positive effects before lung cancer surgery by improving exercise capacity, functional reserve and QOL. Thus, Pre-operative PR can be considered as an important adjunct in patients posted for lung cancer resection.

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