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Original Article

Effect of caregiver education on pulmonary rehabilitation, respiratory muscle strength and dyspnea in lung cancer patients

Jong-hwa Jeong[1)], Won-gyu Yoo[2)*]

[1)] *Department of Physical Therapy, The Graduate School, Inje University, Republic of Korea*
[2)] *Department of Physical Therapy, College of Biomedical Science and Engineering, Inje University: 607 Obangdong, Gimhae, Gyeongsangnam-do 621-749, Republic of Korea*

Abstract. [Purpose] This study evaluated the effects of caregiver education on pulmonary rehabilitation of patients who have undergone lung resection for cancer. [Subjects] Patients were divided into experimental (n = 22) and control (n = 19) groups. [Methods] The caregivers of the experimental group patients received education on pulmonary rehabilitation, while the control group patients received general management advice for 4 weeks. [Results] Pulmonary muscle strength (maximum inspiratory pressure and maximum expiratory pressure) was increased significantly in the experimental group compared to the control group. Modified Borg scale scores were decreased significantly in the experimental vs. control group. [Conclusion] Providing caregivers with education pertaining to pulmonary rehabilitation was associated with improved pulmonary function in lung cancer patients following lung resection.

Key words: Lung resection, Pulmonary-rehabilitation, Caregiver

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INTRODUCTION

Currently, complete surgical resection represents the only curative treatment for lung cancer[1)]. However, the majority of lung cancer survivors who undergo lung resection experience pulmonary complications; one-third of these patients report dyspnea, and one-fifth suffer from severely diminished pulmonary function, including respiratory muscle weakness[2)]. Pulmonary rehabilitation (PR) has been proposed as an adjunctive therapy to decrease the risk of postoperative pulmonary complications[3)]. However, patients may not be able to consistently engage in PR, for personal or economic reasons (e.g., lacking the funds to travel to rehabilitation centers)[4)]. Therefore, there is a need for alternative methods, such as home-based PR, to maintain physical functioning in a more economical manner[5)]. Previous studies have focused mainly on PR for patients or hospital workers. Few studies have addressed PR education for caregivers, who typically facilitate home-based exercises during the outpatient period. This study evaluated the effects of caregiver education on PR (i.e., respiratory muscle strength and dyspnea) in lung cancer patients following lung resection.

*Corresponding author. Won-gyu Yoo (E-mail: won7y@inje.ac.kr)

SUBJECTS AND METHODS

Patients scheduled for lung resection at the Department of Thoracic Surgery of a national university hospital, between March 2013 and November 2013, whose caregivers had not previously received education pertaining to PR, were selected for the study. A total of 50 patients agreed to participate following an explanation of the study procedure, and written informed consent was obtained from all participants. Ethics approval was obtained from the Inje University Faculty of Health Science Human Ethics Committee. The subjects were randomly assigned to experimental (n = 25) and control (n = 25) groups the day before surgery. Of these, 3 and 6 subjects dropped out of the experimental and control groups, respectively, during the 4-week study period, due to violation of the exclusion criteria. Therefore, the final experimental and control groups were comprised of 22 and 19 subjects, respectively. The subjects' mean age was 60.22±10.89 years; their mean height was 163.01 ± 8.77 cm, mean weight was 61.39±11.35 kg, and average BMI was 23.01±3.34. They were evaluated 2 weeks (baseline) and 6 weeks after surgery. Caregiver education on PR included guidance pertaining to splinted coughing, airway clearance and breathing, and stretching and strengthening exercises. The control group received general advice from the Department of Thoracic Surgery (once per week for 30 minutes) pertaining to pain management, postoperative care, use of an incentive spirometer and nebulizer, and mobilization of the upper limbs and trunk. In the case of subjects who were not able to visit the hospital, a nurse telephoned them weekly to provide encouragement and clarification as necessary. Re-

Table 1. Comparison of respiratory muscle strength and dyspnea

Mean± SD		Control	Experimental
MIP (cmH_2O)	Baseline	62.5±21.4	63.8±18.2
	4 weeks	68.0±21.2	71.5±19.0*
MEP (cmH_2O)	Baseline	62.42±24.3	61.6±15.6
	4 weeks	66.5±32.5	71.2±16.8*
MBorg	Baseline	3.08±1.16	2.45±1.46
	4 weeks	2.63±1.61	1.77±1.40*

*$p<0.05$

spiratory muscle strength was assessed using a MicroRPM device (Micro Medical Ltd., Cambridge, UK). Maximum inspiratory pressure (MIP) and maximum expiratory pressure (MEP) were measured using the method described by Black & Hyatt[6], and these served as indices of inspiratory and expiratory muscle strength. Dyspnea was evaluated using the modified Borg scale, ranging between 0 (*no dyspnea*) and 10 (*most severe dyspnea*). Data were analyzed using the SPSS for Windows software package (ver. 12.0; SPSS, Inc., Chicago, IL, USA). $P<0.05$ was set as indication of statistical significance. Data pertaining to the general characteristics of subjects are provided as means ± SE, with intergroup homogeneity assessed using χ^2 and independent t-tests. Group differences in scores before the experiment, and 2 weeks (baseline) and 6 weeks after surgery, were assessed using repeated-measures analysis of variance.

RESULTS

MIP, MEP and modified Borg scale values were more significantly improved in the experimental group compared to the control group, but there were no group differences ($p<0.05$, Table 1).

DISCUSSION

Refai et al.[7] reported an association between respiratory muscle weakness after lung resection and increased incidence of pulmonary complications. Recovery of respiratory muscle function after surgery is important because lung resection leads to impairments in these muscles. Nomori et al.[8] reported a 4.3% increase in MIP, and 6.4% increase in MEP, 2–12 weeks after surgery. These data are consistent with our finding that MIP and MEP increased between weeks 2–6 in the control (8% and 6%, respectively) and experimental (12% and 15%, respectively) groups. However, these group differences were not significant. Previous studies demonstrated that smaller lung resection areas are associated with greater differences in respiratory muscle strength before and after surgery[8, 9]. We speculate that respiratory muscle strength did not differ significantly among our groups because all subjects had undergone video-assisted thoracoscopic surgery, which requires a minimal incision in the respiratory muscles interacting with the chest wall. Dyspnea caused by lung resection is an important determinant of patients' quality of life[10]. Our study commenced 2 weeks after the surgery; the experimental group was characterized by a decrease in dyspnea over time, but this decrease was not significant compared to the control group. Differences between our results and those of this previous study may be due to the use of indirect and direct interventions, respectively. In conclusion, our data suggest that caregiver education on PR can improve respiratory muscle strength and dyspnea.

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