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EFFECTIVENESS OF PULMONARY REHABILITATION ONCE A WEEK FOR PATIENTS WITH OBSTRUCTIVE PULMONARY DISEASE

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ABSTRACT

Background: Obstructive pulmonary diseases may interfere negatively with patients' quality of life (QOL). Specific QOL questionnaires such as the Chronic Respiratory Questionnaire (CRQ) have been used to quantify the impact of the disease and measure the effects of different rehabilitation protocols. Objective: To evaluate the effectiveness of pulmonary rehabilitation performed once a week in association with exercises at home among patients with obstructive pulmonary disease, by means of CRQ comparisons, maximum respiratory pressures (MIP and MEP) and six-minute walking distance test (6MWD), before and after treatment. Methods: This study was developed in the physical therapy outpatient clinic of the hospital. Thirty-four patients of both sexes with obstructive pulmonary disease were evaluated, and nineteen (mean age: 60.8 ± 14.2 years) were included in the study. These subjects all underwent physiotherapeutic evaluation and reevaluation with the CRQ and measurements of MIP, MEP and 6MWD. The physical therapy consisted of respiratory, aerobic and resistance exercises once a week for 12 weeks, together with home exercises twice a week. Results: The Wilcoxon test and Spearman correlation were used. Statistically significant differences between evaluations before and after rehabilitation were found for all CRQ domains ($p \leq 0.05$), MIP ($p = 0.01$) and MEP ($p = 0.002$). Conclusion: The proposed program improved QOL and promoted increases in maximum respiratory pressures among these patients with obstructive pulmonary disease, even though the current literature suggests that higher frequency of training is needed.

Key words: quality of life; COPD; asthma.

RESUMO

Eficácia da reabilitação pulmonar uma vez na semana em portadores de doença pulmonar obstrutiva

contextualização: As doenças pulmonares obstrutivas podem interferir negativamente na qualidade de vida (QV) dos pacientes, sendo que questionários específicos, como o *Chronic Respiratory Questionnaire* (CRQ), são aplicados para quantificar o impacto da doença e para mensurar os efeitos de diferentes protocolos de reabilitação. Objetivos: Avaliar a eficácia da reabilitação pulmonar uma vez por semana associada a exercícios domiciliares em pacientes com doença pulmonar obstrutiva por meio das comparações do CRQ, das pressões respiratórias máximas (PImáx e PEmáx) e da distância percorrida no teste de caminhada de seis minutos (TC6) pré e pós-tratamento. Método: O estudo foi desenvolvido no Ambulatório de Fisioterapia do hospital. Foram avaliados 34 portadores de doença pulmonar obstrutiva de ambos os sexos, sendo incluídos, no estudo, 19 pacientes, com idade média de 60,8 ± 14,2 anos. Todos realizaram avaliação e reavaliação fisioterapêutica contendo medidas de PImáx, PEmáx, TC6, e questionário CRQ. A fisioterapia era composta de exercícios respiratórios, aeróbios e resistidos, com freqüência de uma vez por semana, durante 12 semanas, associados a exercícios domiciliares duas vezes na semana. Resultados: Foram utilizados os testes de *Wilcoxon* e de correlação de *Spearman*. Verificou-se diferença estatisticamente significativa nos períodos pré e pós-reabilitação para todos os domínios do CRQ ($p \leq 0,05$), na PImáx ($p = 0,01$) e PEmáx ($p = 0,002$). Conclusão: O programa proposto melhorou a qualidade de vida e promoveu incrementos nas pressões respiratórias máximas de pneumopatas obstrutivos, apesar de a literatura atual sugerir maior freqüência de treinamento.

Palavras-chave: qualidade de vida; DPOC; asma.

INTRODUCTION

Among obstructive pulmonary diseases, asthma, pulmonary emphysema and chronic bronchitis stand out and are characterized by increase in expiratory airflow resistance[1,2]. In Brazil, there are 350,000 hospital admissions every year because of asthma, the fourth cause of hospitalization by the Unified Health System (SUS)[3,4]. The prevalence of chronic obstructive pulmonary disease (COPD) in Brazil can reach 12% of the population over 40 years of age, occupying from 4th to 7th position among the main causes of death in recent years[5].

Quality of life (QoL) can be defined as the measure of impact of diseases on the daily living activities and the well-being of patients in a formal and standardized manner[5,6]. Obstructive pulmonary disease patients have impaired quality of life; therefore questionnaires to evaluate treatments and rehabilitation programs have been developed and validated[7,8]. Besides decrease in QoL, obstructive pulmonary disease patients have decreased tolerance to exercise and loss of respiratory muscle strength, impairments that can be optimized by pulmonary rehabilitation programs[9-11].

Despite the increasing propagation of the efficacy of pulmonary rehabilitation, there is no definitive proposal for the best training strategy. The duration and weekly frequency are varied and treatment location can be the patient's home, a hospital or a clinic[12,13]. The objective of this study was to evaluate the efficacy of once-weekly pulmonary rehabilitation in obstructive pulmonary disease patients with the use of the *Chronic Respiratory Questionnaire* (CRQ); also, to analyze maximal respiratory pressure variables, the distance covered in the six-minute walk test (6MWT) and the relationship of these variables with the CRQ.

METHODS

Subjects

The current longitudinal study assessed patients diagnosed with moderate to advanced COPD according to the criteria defined by GOLD[14] or moderate to advanced asthma defined according to clinical conditions and the III Brazilian Consensus of Asthma Management[3]. Patients were included if they were clinically stable, with no cardiovascular and/or osteoarticular diseases, or other comorbidities that would keep them from safely performing the proposed exercises.

Thirty four patients were evaluated, 13 males and 21 females, 14 of which were excluded due to withdrawal and one due to worsening clinical profile Therefore, in this prospective, clinical, non-randomized and non-controlled trial, there were effectively 19 patients which had a mean age of 60.8 ± 14.52 years, 14 COPD patients and five asthmatic patients.

During the pulmonary rehabilitation period, there were no changes in the drug treatment for any of the patients. After individual voluntary acceptance, a written informed consent was signed by the participants and researchers involved in the study.

This study was approved by Ethics and Research Committee, approval number 551/2005 and 300/2006.

Procedure

All volunteer patients from the pulmonary obstructive disease group underwent a physical therapy assessment and answered the CRQ on the first day they attended the Physical Therapy Clinic and after 12 weeks of pulmonary rehabilitation.

The assessment consisted of the collection of the patient's personal data, maximal inspiratory and expiratory pressure (MIP and MEP) measures and the distance covered in the 6MWT.

MIP and MEP were collected with the use of a manovacuometer and the patients in standing position, according to Black and Hyatt method[15]. MIP was measured after the patient exhaled from total lung capacity (TLC) to residual volume (RV), with subsequent maximal inspiratory effort against an occluded valve. MEP was obtained after the patient inhaled from the RV to the TLC, followed by maximal expiratory effort against an occluded valve. Three maneuvers of each measure were performed, and the highest value was used for analysis.

The 6MWT consisted of the assessment of the greatest distance covered by the patient during six minutes. This test was performed on a 30 meter flat track, with no oxygen supplementation and respecting initial peripheral oxygen saturation (SpO_2) over 89%. The patient was instructed to walk at maximum velocity and was encouraged with the standard phrase: "You are doing very well, keep it up", every minute. The following variables were collected during the rest period and at the end of the test: blood pressure (BP), heart rate (HR), respiratory rate (RR), SpO_2 and dyspnea levels, using the Borg Scale . The criteria for interrupting the test were following according to American Thoracic Society standards[16].

With regard to the CRQ, the first part of the questionnaire assessed the dyspnea dimension by asking the patients to identify the most important activities in their daily life that caused shortness of breath in the last two weeks. After that, a list of activities that usually provoke this symptom (dyspnea) in pulmonary disease patients was shown, and they were asked to report whether they had dyspnea at each of the activities during the referred period. The subjects would then choose from among the

Study presented in poster form at the 6th Improvement Course Seminar of Faculdade de Ciência Médicas – FCM – UNICAMP, Campinas- SP.

activities they listed the five most important activities, which were used to generate a score for the dyspnea domain. The second part of the questionnaire had 15 questions that evaluated and scored other domains: fatigue, emotional function and mastery or sense of control over the disease. All CRQ questions were asked by a well-trained interviewer, and if the patient did not understand the question, the interviewer was allowed to repeat it until understood.

The incremental upper limb test was performed to determine the maximum training load. The test consisted of the elevation of free weights with both upper limbs in the PNF diagonal pattern of movement for two minutes, with a progressive load increment. The initial load used was 0.5 kg, with progressive increments (0.5 kg) until the patient's limit was reached. A rest period of two minutes was given between load increments. The initial weight for upper limb strengthening was 50% of the maximum load achieved in the incremental test, and the load increase in the 12 weeks of training was according to each patient's personal ability[17].

Training program

The training program was performed in groups of 2 to 4 people and included respiratory, aerobic and strengthening exercises. The protocol lasted 12 weeks, once-weekly, at the hospital's Respiratory Physical Therapy Clinic, and home exercises were performed two more times a week.

Each supervised session in the clinic lasted on average one hour and 15 minutes and consisted of:

• 10 minutes of general stretching;

• 10 minutes of diaphragm reeducation against resistance (1kg weight);

• 5 minutes of abdominal exercises;

• 15 minutes of upper limb calisthenics;

• 15 minutes of resisted exercises for upper limbs in the PNF diagonal pattern of movement;

• 15 minutes of alinear physical training on a Funbec® stationary bicycle;

• 5 minutes of relaxation.

With regard to the home exercises, patients' were supplied with an Instruction Manual on how to perform the exercises and the number of repetitions for each of them. These were simple exercises and required easily accessible material. The types of exercises and the number of repetitions were similar to the exercises performed during the supervised sessions in the physical therapy clinic, with the exception of the aerobic training in cycle ergometer, with was replaced by a 15-minute walk outdoors.

Statistical Analysis

Data were stored and analyzed using the software SPSS 11.0. To compare the means of the variables between pre- and post-rehabilitation, we used the *Wilcoxon* test, and to verify the correlation between maximal respiratory pressures and distance covered in the 6MWT with each CRQ domain, we used the *Spearman* correlation test. We chose the non-parametric tests because the data did not have a normal distribution even after a transformation attempt. The level of significance for both tests was 5% ($p \leq 0.05$).

RESULTS

The means and standard deviations for each of the CRQ domains are presented in Figure 1. There was a statistically significant difference between the pre- and

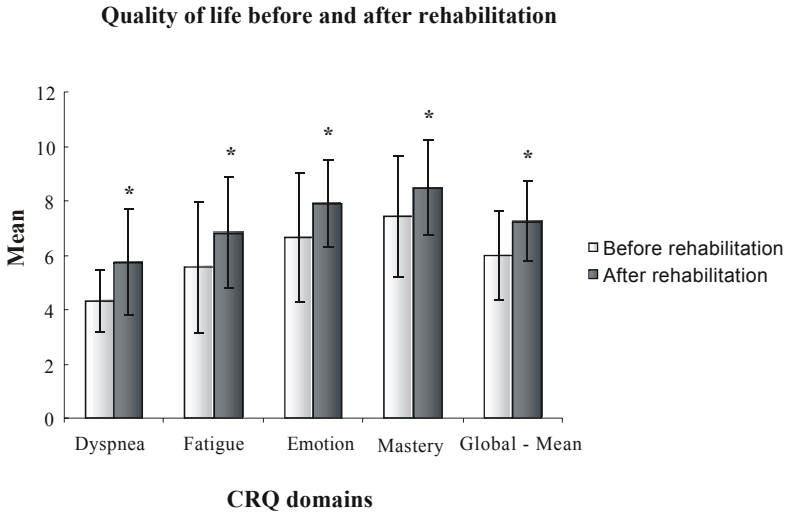

Figure 1. Chronic Respiratory Questionnaire (CRQ) domains before and after pulmonary rehabilitation in obstructive pulmonary disease patients. Values are expressed as mean ± SD. * Significant difference ($p \leq 0.05$).

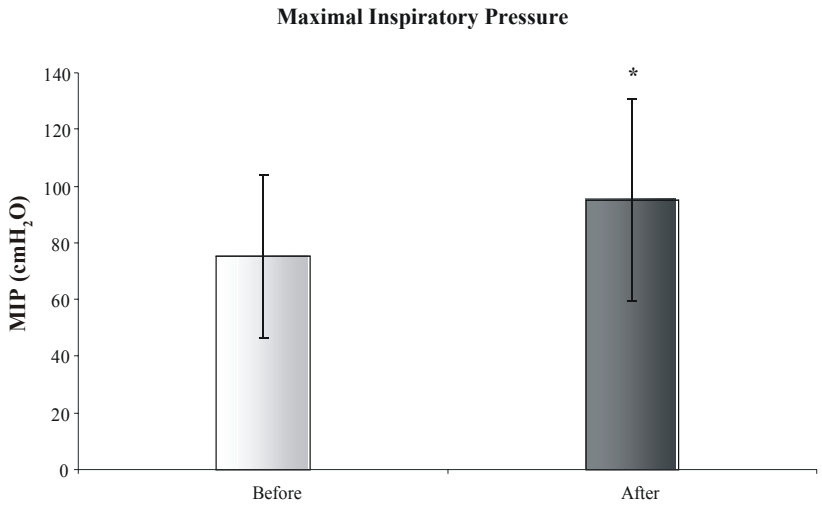

Figure 2. Maximal inspiratory pressure (MIP) before and after pulmonary rehabilitation in obstructive pulmonary disease patients. Values are expressed as mean ± SD. * significant difference ($p \leq 0.05$).

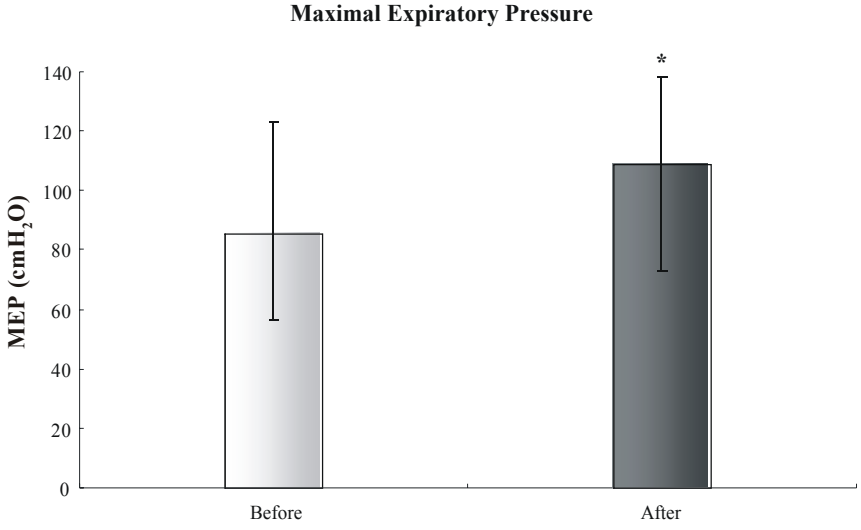

Figure 3. Maximal expiratory pressure (MEP) before and after pulmonary rehabilitation in obstructive pulmonary disease patients. Values are expressed as mean ± SD. * Significant difference ($p \leq 0.05$).

post-rehabilitation periods for all domains, indicating an improvement in quality of life of the patients after rehabilitation: dyspnea from 4.32 ± 1.16 to 5.73 ± 1.96 (p= 0.052); fatigue from 5.55 ± 2.41 to 6.83 ± 2.06 (p= 0.03); emotional function from 6.65 ± 2.37 to 7.89 ± 1.60 (p= 0.009) and mastery from 7.43 ± 2.22 to 8.49 ± 1.75 (p= 0.012).

Regarding the maximal respiratory pressures, we also found significant differences between the pre- and post-pulmonary rehabilitation periods for MIP (from 75 ± 28.86 to 95 ± 35.5 cmH_2O; p= 0.01) and MEP (from 85.42 ± 37.6 to 108.73 ± 29.43 cmH_2O; p= 0.002) (Figures 2 and 3).

Regarding the distance cover in the 6MWT, there was no difference in the assessment and reassessment of obstructive pulmonary disease patients. For the assessment, the distance covered was 442.94 ± 85.1 meters, and after pulmonary rehabilitation, it was 461.52 ± 57.62 meters (Figure 4).

For the correlation analysis between each of the CRQ domains with maximal respiratory pressures, there was a weak non-statistically significant correlation. The same was observed for the analysis of correlation between the CRQ domains and the distance covered in the 6MWT.

DISCUSSION

According to Arnadóttir et al.[18], prolonged and expensive pulmonary rehabilitation models that include several weekly sessions have yielded important beneficial effects

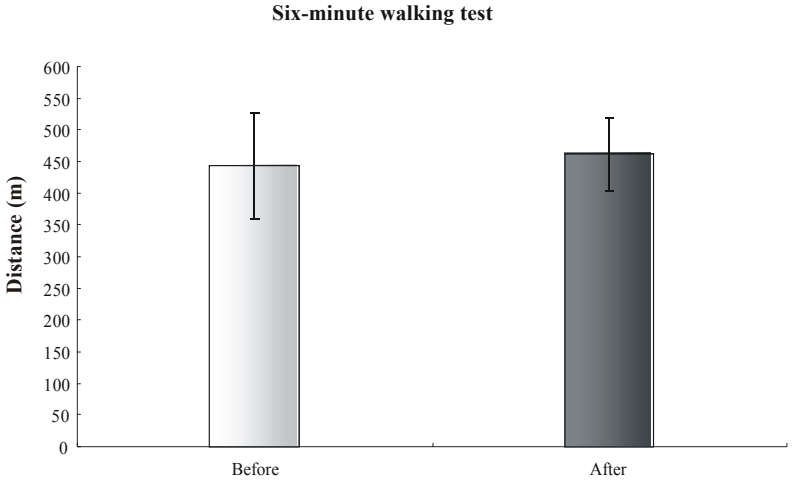

Figure 4. Distance covered in the six-minute walking test (6MWT) before and after pulmonary rehabilitation in obstructive pulmonary disease patients. Values are expressed as mean ± SD.

in obstructive pulmonary disease patients, however these programs cannot always be conducted in the clinical practice. Different protocols with fewer training sessions, such as twice or three times a week[13,17,19,20], have also proved to be efficient.

In the present study, with once-weekly training in the hospital, there was noticeable improvement of all CRQ domains in post-treatment for obstructive pulmonary disease patients, suggesting the efficacy of the implemented program on their QoL. Other pulmonary rehabilitation protocols also found an improvement in QoL in asthmatic and COPD patients[20-24].

Wijkstra et al.[25] used the CRQ to investigate how a home exercise program could interfere in the quality of life of COPD patients. This program, that included twice-weekly 30-minute home exercises (total of 84 hours) and twice-weekly 30-minute sessions with the physical therapist (total of 24 hours) during three months, was able to improve its subjects' QoL. Similarly, this present study also found positive effects in the association of pulmonary rehabilitation and home exercises. Therefore, even a program with less frequent but well-instructed and simple training sessions, which can be combined with home exercises can bring benefits to obstructive pulmonary disease patients, observed by means of QoL improvement.

With regard to maximal respiratory pressures, there was a significant difference for these variables between pre- and post-treatment, suggesting that the rehabilitation program increased the respiratory muscle strength (RMS) of obstructive pulmonary disease patients. This improvement in both MIP and MEP occurred even without specific linear resistance training of the respiratory muscles. Zanchet et al.[13] suggest that, in COPD patients, this increase may be due to an improvement to the patient's general conditioning. Furthermore, there was resisted diaphragm reeducation and abdominal exercises in the present study, which may have contributed to the results.

Regarding the distance covered in the 6MWT, the present study found no significant difference between pre- and post-pulmonary rehabilitation distances, unlike the results obtained in many studies in literature which found that aerobic training was able to increase submaximal exercise capacity[11,17,20,21].

The results of the this present study are most likely related to less frequent training and the hospital clinic's limited infrastructure, which did not allow tests to determine maximal exercise capacity or aerobic training with load increments. Costa[9] and Silva[11] suggest that obstructive pulmonary disease patients have reduced tolerance as a consequence of physical inactivity or prolonged sedentary lifestyle. Therefore, even with limited infrastructure, we opted to give cycle ergometer training with alinear resistance.

In the correlation analysis between CRQ domains and maximal respiratory pressures and the 6MWT, there was weak and non-significant correlation between the variables. These findings may be related to the fact that positive effects on quality of life derive from the global result of the pulmonary rehabilitation program and not from specific aspects of training[22,25]. Particularly for the non-correlation between CRQ domains and the distance covered in the 6MWT, Wijkstra et al.[25] suggest that subjective parameters, such as quality of life, are not influenced by the tolerance to exercise.

Perhaps the merit of the present study on obstructive pulmonary disease patients lies in the shortcomings of the clinic's installations and equipment; also, these

patients have limitations due to the seriousness of the illness and socioeconomic difficulties which hamper adherence to treatment. For these reasons, a protocol with a fewer weekly sessions at the clinic was developed and combined with home exercises that required minimal infrastructure.

CONCLUSION

Once-weekly pulmonary rehabilitation combined with home exercises improved QoL and promoted increments in maximal respiratory pressures in obstructive pulmonary disease patients, however there was weak correlation between the variables studied and CRQ.

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