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Rehabilitation in COPD patients admitted for exacerbation

Wczesna rehabilitacja chorych hospitalizowanych z powodu zaostrzenia POChP

Abstract

Recovery of lung function is delayed by up to two months following acute exacerbation (AE) of COPD patients. After AE, even with optimal medical therapy, it takes a considerable time for COPD patients to recover to baseline ability to perform routine physical activities. Although pulmonary rehabilitation (PR) has long been considered a useful non-pharmacological therapy in stable COPD individuals, there have been only a few studies into the effects of rehabilitation during and/or just after AE.

This review updates the application of early PR and main physical therapies both during hospital acute care and following discharge of COPD patients who have experienced exacerbation. It is only recently that literature has demonstrated the feasibility and effectiveness of early PR in COPD patients undergoing AE.

Nonetheless, early PR clearly appears to be a treatment indicated just after, or even during, an acute episode in hospital.

Future studies should be able to clarify the practical role and effects of a timely application of rehabilitation to acute COPD, as well as the preferred modalities, duration and techniques to apply in this condition.

Key words: COPD, pulmonary rehabilitation, exacerbation

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Streszczenie

Zaostrzenia mają poważny i niekorzystny wpływ na jakość życia i czynność płuc u chorych na POChP. Powrót do stanu wyjściowego po zaostrzeniu, jest opóźniony do 2 miesięcy, nawet przy zastosowaniu optymalnego leczenia. Potrzebny jest czas, aby chory powrócił do wykonywania zwykłych aktywności fizycznych, w takim zakresie, jak przed zaostrzeniem. Dotychczas, rehabilitacja oddechowa (PR, *pulmonary rehabilitation*) była postrzegana jako forma leczenia nefarmakologicznego, w stabilnej postaci POChP, ale w kilku opublikowanych pracach oceniano wpływ zastosowania rehabilitacji oddechowej w trakcie i / lub wkrótce po zaostrzeniu. W przedstawianej pracy dokonano przeglądu i aktualizacji wiedzy na temat korzyści, wynikających ze stosowania rehabilitacji oddechowej i ćwiczeń fizycznych, w zaostrzeniu POChP i to zarówno w trakcie hospitalizacji, jaki i po powrocie chorych do domu.

Ostatnio, opublikowano wyniki badań, w których wykazano przydatność i efektywność zastosowania rehabilitacji oddechowej u chorych na POChP, leczonych z powodu zaostrzenia.

Konieczne są dalsze badania, w oparciu o które, będzie można dokładniej określić warunki, czas trwania i rodzaj stosowanych technik rehabilitacji oddechowej u chorych z zaostrzeniem POChP.

Słowa kluczowe: POChP, rehabilitacja, zaostrzenia

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Introduction

Acute exacerbation (AE) is an important cause of loss of functions in patients suffering from chronic obstructive pulmonary disease (COPD) [1]. Exacerbation per se should be considered as a serious event in these individuals, in particular when it requires hospital admission. Indeed, long-term survival progressively decreases following hospital care due to AE of COPD patients, to the extent that about 30% of patients are at risk of death one year later [2].

Recovery of lung function is delayed after AE by up to two months [3–5]. Moreover, systemic consequences (i.e. skeletal muscle weakness, anaemia, hypoxia, inflammation and/or oxidative stress, concomitant diseases) further impair physical function, exercise tolerance and enhance symptoms. After exacerbation, even with optimal medical therapy, it takes a considerable time for COPD patients to recover to baseline ability to perform routine physical activities [6].

Pulmonary rehabilitation (PR) should be considered for all patients with COPD [7] who have persistent symptoms and progressive limitation of their activity over the natural course of the disease [8]. Several studies have shown that PR has a positive effect on symptoms, quality of life [9, 10] and even on physical performance [11] in such patients who are in a stable condition. On the other hand, few studies have examined the effect of rehabilitation during and/or soon after exacerbations [12].

In routine clinical practice, severe AE of COPD is generally managed in hospital settings where medical care is the norm; when AE leads to an acidotic state, patients may require admission to intensive care for assisted ventilation. There is a poor prognosis for survivors after discharge [13]. However, non-acidotic AE of COPD is treated via hospitalisation in medical wards [14]. Such patients may present with depressive symptoms, prior hospital admissions, co-morbidities, advanced age, malnutrition, and severe exacerbation, all factors which may independently predict poor short- and long-term outcomes [15]. Interestingly, disability status could also be identified as a risk factor associated with six-month mortality for frail and elderly patients admitted for non-acidotic AE of COPD [16].

Nonetheless, a retrospective cohort study of a population of more than 65,000 COPD patients with AE revealed physical therapies (chest physiotherapy in particular) to have been applied in less than 10% of patients, while a structured PR course was not even mentioned [17].

Therefore, taking all the aforementioned factors into account, PR is likely to be more than a useful therapy if applied to COPD patients recovering from AE. Indeed, removing secretions, preventing peripheral muscle deterioration, and improving educational skills and self-management of patients are all reliable goals of a specific course of early PR in these conditions.

In this review, we briefly update the application of early PR both during hospital acute care and following discharge of COPD patients undergoing AE.

Rehabilitation during exacerbation

Only recently, the additional approach of physical therapies in the context of acute care has been applied to COPD patients hospitalised for AE, with the rehabilitation course running in parallel with the usually required medical therapy (medications, oxygen, and/or ventilatory support).

Very recently, Troosters et al. reported the effects of peripheral muscle training for hospitalised COPD patients undergoing severe exacerbation [18]. Compared to untreated controls, specific training with incremental resistance over the course of one week proved to be effective in counteracting the deleterious effects of AE on quadriceps muscle force.

Some interesting aspects of this study deserve comment. Firstly, 85% of patients randomised to quadriceps training completed the rehabilitation course, suggesting that this intervention is feasible even in an acute setting and as early as two days following admission. Secondly, 14 patients revisited for one month follow-up had maintained the same level of quadriceps performance they had reached after rehabilitation in hospital. Thirdly, five out of the seven patients who underwent muscle biopsies at discharge, showed a positive correlation between the global muscle anabolic/catabolic index ratio and the pre- to post- change in quadriceps force; i.e. the ratio increased as well as the muscle force.

Taken together, these results suggest that intensive training is feasible (at least at the quadriceps level) and is able to counterbalance the process of muscle wasting due to acute inflammatory changes and the predominance of catabolism in COPD patients [19].

The prevention of quadriceps deterioration in the trained group was associated with a significant improvement in walking, which was maintained one month later. This makes sense, because this effect clearly depends on the improved function of the trained muscle. However, the authors did not assess the physical activity level of their subjects

after AE, which is known to be below the level reached during stable COPD, even one month after hospital discharge [6].

Even if that study [18] cannot prove that muscle catabolism after AE can be counterbalanced by a short period of resistance training, it does show that quadriceps resistance training during an AE of COPD can prevent deterioration of muscle function at discharge, and can assist patients in maintaining their function during and after the stay in hospital. Even though only quadriceps muscle was targeted for training, one can speculate that similar effects could also be obtained after training different muscle groups, relevant to the individual's functions.

As a practical consequence of this trial, it may appear that in-hospital rehabilitation during AE (beyond the usual medical therapy) is potentially relevant as a non-pharmacological therapy at the earliest onset of disability, and that physical therapy has a definitive role in the acute hospital setting for these patients [20].

Other physical interventions have been applied in very severe COPD patients recovering from AE and in different hospital settings.

The first attempt to assess the effectiveness of step-by-step physical training in a high dependency respiratory care unit was conducted among spontaneously breathing COPD patients just weaned off mechanical ventilation [21]. In that controlled trial, the author was able to demonstrate that the application of gradual peripheral muscle training to these patients was associated with improved functional capacity and improved physical independence.

Moreover, passive training of specific locomotor muscle groups by means of low-volt electrical stimulation (ES) might be a technique better tolerated than whole body exercise in COPD patients with severe deconditioning, even during AE [22]. In one study, ES was applied to bed-bound COPD patients with AE, receiving mechanical ventilation and showing marked peripheral muscle hypotonia and atrophy [23]; compared to controls, the application of this physical therapy in these patients resulted in significantly improved limb muscle strength and in a lower number of days needed to transfer them from bed to chair.

Finally, acute hospital-based non-pharmacological care might also offer the opportunity to start and/or enhance an individual's skills for long-term management and to favour an early discharge plan extending a 'home-from-hospital' rehabilitation programme for those COPD patients who were recently admitted for AE [24].

Rehabilitation after exacerbation

A prerequisite to apply a rehabilitation strategy to COPD patients after an AE of their disease would be addressing all the patient's needs following discharge from the acute care hospital.

In a recent interview with a small cohort of COPD patients at seven days and three months after discharge due to AE, high levels of depression and anxiety were found, and these were associated with the fear of another 'attack' and uncertainties about social and medical care provision (especially oxygen) at home [25]. This serves to underline the role of any discharge procedure and effective medical intervention, including PR and self-management strategies, which may potentially reduce the rate of readmission for AE once the patient has returned to the community. Nonetheless, co-existing systemic consequences which impair physical function during and after AE further reinforce the need for an effective physical therapy for these patients. Indeed, a small controlled study has shown deterioration in lung function after exacerbation in COPD patients who were not treated with rehabilitation after discharge from hospital [26].

Thus, appropriate treatment for COPD patients beyond the classical acute care hospital is likely to include a rehabilitation course as early as possible following discharge.

Application of a PR course to patients recently discharged from hospital refers to a standard recommended programme [9] including specific training of the peripheral limb muscles, education, and chest physiotherapy, with psychological and nutritional support if required.

A large retrospective study has shown that inpatient rehabilitation following (seven to ten days after) AE is associated with a clinically meaningful improvement in exercise tolerance, regardless of the severity of dyspnea [27]. Two main findings arise from that clinical observation. Firstly, the study showed that 'early' PR is feasible in a population which is likely to be severely deconditioned and not in the most stable state: only 7% of patients failed to complete a minimum of 15 sessions, which is regarded as a benchmark for effective training during a rehabilitation period [9]. Secondly, and even more interestingly, the absolute improvement and the proportion of patients reaching the clinically meaningful improvement in six-minute walking distance after PR was greater in those patients who presented the highest grade of disability.

These findings should alert clinicians to instigate a prompt rehabilitation programme after

exacerbation, whatever the degree of severity, and to consider the sickest and most disabled patients as those most likely to benefit.

Man et al. have carried out the first study showing both the feasibility and effectiveness of outpatient PR applied to COPD patients recovering from AE and discharged from hospital [26]. They found that an early programme led to significant changes in exercise tolerance, health-related quality of life, and emergency visits in the short- and long-term (three months), compared to a group given the usual care.

From an economic point of view, outpatient PR appears to minimise the care burden costs for COPD, as compared to hospital. However, this location might not enable all hospitalised patients to participate. Therefore, some very disabled patients may benefit from sequential PR only if delivered in different settings. In addition, this study did not suggest the optimal length for a PR course in this clinical condition; longer periods might have a greater impact on patients' outcomes, although at potentially higher costs.

Although aspects relating to organisation and healthcare costs still need to be discussed, and clearly will differ in different countries and policy situations, a PR course following acute care should be considered a very important option for all COPD patients.

Indeed, a very recent systematic review stated that pulmonary rehabilitation is a "highly effective and safe intervention to reduce hospital admissions and mortality and to improve quality of life in COPD patients after suffering an exacerbation" [12].

Conclusions

Exacerbations of COPD patients are complex events with long-term impacts on individuals' physiology, including pulmonary and extra-pulmonary functions.

In this condition, a rehabilitation course, the most important non-pharmacological therapy for symptomatic but stable COPD patients, can prevent a decline in physical function, enhance the individual's activity level, improve self-management skills, and prevent recurrence of the disease.

Although literature is scarce regarding the feasibility and effectiveness of early PR in COPD patients undergoing AE, it appears clearly indicated just after an acute episode, and can even be started during hospital care.

Future studies should be able to clarify the practical role and effects of a timely application of rehabilitation to acute COPD patients, as well

as the specific and preferred modalities, duration and techniques to apply in order to achieve all the goals.

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