

Remoção de Obstáculos: Reabilitação Respiratória de um Doente com DPOC Muito Severa durante o Internamento

Removing “Another Brick in the Wall”: Pulmonary Rehabilitation of a Patient with Very Severe COPD during Hospitalization

Bruno Cabrita¹ , Cláudia Santos¹, Sónia Silva¹, Eva Gonçalves¹, Raquel Oliveira²

Resumo:

A reabilitação respiratória é fundamental na doença pulmonar obstrutiva crónica. Contudo, poucos doentes realizam, pelo que deve ser considerado o início em internamento.

Descrevemos o caso de um doente do sexo masculino, 72 anos, com doença pulmonar obstrutiva crónica muito severa, apresentou agravamento de dispneia, astenia, hemoptises e arrepios. A radiografia torácica revelou uma opacidade redonda, com nível hidroaéreo, sugestiva de abscesso pulmonar. O doente foi internado e iniciou oxigenoterapia e piperacilina-tazobactam. Por ausência de resposta, foi escalado para meropenem e linezolid. O doente demonstrou uma evolução favorável e iniciou um programa de reabilitação respiratória. À data de alta, após 7 semanas de internamento, apresentava resolução do abscesso, melhoria da dispneia, ansiedade, depressão, autonomia e necessidade de oxigenoterapia, comparativamente ao estado basal.

Neste trabalho, os autores apresentam os benefícios significativos de implementar um programa de reabilitação respiratória durante o internamento.

Palavras-chave: Doença Pulmonar Obstrutiva Crónica/reabilitaçãoHospitalização.

Abstract:

Pulmonary rehabilitation is fundamental for chronic obstructive pulmonary disease. However, few patients complete the intervention, and enrolling during hospitalization needs consideration.

We report the case of a 72-year-old male patient, with very severe chronic obstructive pulmonary disease, presented with aggravated dyspnea, fatigue, hemoptysis and shivering. Chest radiograph showed a round opacity, with air-fluid level, suggestive of lung abscess. The patient was hospitalized and began treatment with oxygen and piperacillin-tazobactam. The lack of response led to escalation of

therapy with meropenem and linezolid. The patient showed favorable response and a supervised pulmonary rehabilitation program was started. At discharge, after 7 weeks of hospitalization, he showed resolution of lung abscess and improved dyspnea, anxiety, depression, autonomy, and oxygen requirements compared to its baseline.

In this work, the authors present the significant benefits of implementing a pulmonary rehabilitation program during hospitalization.

Keywords: Hospitalization; Pulmonary Disease, Chronic Obstructive/rehabilitation.

Learning points

1. Pulmonary Rehabilitation is an essential intervention for patients with chronic obstructive pulmonary disease (COPD), improving exercise capacity, quality of life, and reducing hospitalization and mortality.
2. Starting pulmonary rehabilitation during hospitalization can be beneficial, especially for patients who do not have access to outpatient programs.
3. Personalizing the pulmonary rehabilitation program, adjusting the intensity and exercises according to the patient's tolerance, is crucial for the effectiveness of the intervention and to avoid complications.
4. Patient satisfaction with the intervention and the absence of adverse events related to pulmonary rehabilitation reinforce the importance of including the patient's opinion in the planning and implementation of rehabilitation programs.

Introduction

Pulmonary rehabilitation (PR) is a fundamental treatment that reduces the disability of people with chronic lung diseases, hospital admissions and healthcare needs, improves symptoms, exercise capacity, self-management skills, quality of life and survival.¹⁻⁸ PR use tailored approaches that include physical exercise and educational components, nutritional and psychosocial support, to achieve behavioral change and long-term adherence to a healthy lifestyle.^{1,2,9-11} It should

¹Pulmonology Department, Hospital Santo André, Unidade Local de Saúde da Região de Leiria, Leiria, Portugal

²Nutrition Department, Hospital Santo André, Unidade Local de Saúde da Região de Leiria, Leiria, Portugal

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be conducted by a multidisciplinary team, but the best protocol remains unknown.^{1,9} Despite the benefits, there are still multiple barriers in the delivery of PR, such as lack of referral, institutional conditions, access and other patient/professional-related barriers.⁷

Chronic obstructive pulmonary disease (COPD) is characterized by persistent dyspnea, cough, sputum and exacerbations.¹² It represents a major cause of morbidity and the third leading cause of mortality worldwide.^{6,12} PR has more evidence in patients with COPD and may be offered during a stable phase or shortly after an acute exacerbation (early PR), with benefits in quality of life, exercise capacity, length of hospitalization and hospital readmissions.^{2,3,13,14} However, only a minority of patients complete early PR, and starting during hospitalization may be the answer.¹⁵

Acute exacerbations of COPD are one of the most common reasons for emergency admission.^{5,7} They are associated with significant healthcare costs, morbidity and mortality.^{5-8,14} Patients report worsening of symptoms and comorbidities, leading to a significant decline in physical activity, muscle strength and health status, especially during hospitalization.^{8,16} Anxiety and depression - common comorbidities of COPD - are associated with a doubled risk of short-term hospital readmission.¹⁶ Therefore, PR has become an intervention of interest during exacerbations and hospitalization.^{5,14,16}

Studies regarding PR during hospitalization have demonstrated heterogeneous results.^{5,8,11} In fact, previous European Respiratory Society (ERS)/American Thoracic Society (ATS) Task Force recommendations were against the initiation of PR during hospitalization, with very low quality of evidence, due to increased mortality.¹⁶ However, early PR after an acute COPD exacerbation (within 3-4 weeks) can improve quality of life and

exercise capacity, especially in supervised interventions, and are suggested by the most recent ERS/ATS guidelines.⁵⁻⁷

In this work, the authors conducted a novel PR program in the Pulmonology Department, during the hospitalization of a patient with exacerbated very severe COPD, to assess the benefits.

Case Report

A 72-year-old male patient, followed in PR consultation due to very severe COPD (Global Initiative for Chronic Obstructive Lung Disease [GOLD] 4B, with post-bronchodilator forced expiratory volume in 1 second [FEV1] 22%) and chronic hypercapnic respiratory failure, with triple inhaled, long-term oxygen (1.5 L/min resting; 6 L/min walking) and bilevel positive airway pressure (BPAP) therapies, presented with aggravated dyspnea and fatigue, hemoptysis and shivering with 3 days evolution. He had diminished lung murmur and wheezing. Oxygen saturation was 93% (with oxygen 4 L/min). Chest radiograph showed a round opacity in the lower zone of the right hemithorax, with air-fluid level (Fig. 1). The patient was hospitalized for additional exams and treatment.

During hospitalization, the patient underwent additional exams. Thorax computed tomography (CT) scan showed a consolidation adjacent to a well-circumscribed air-fluid density in the right lower lung lobe, confirming a lung abscess. Blood tests showed increased C-reactive protein (64.6 mg/L). He began treatment with oxygen (4 L/min) and piperacillin-tazobactam.

After 10 days of treatment, he aggravated radiologically. Bronchofibroscopy showed residual blood from the right main bronchus and mucopurulent secretions. No microbiological agent was isolated from bronchoalveolar washing, sputum, blood or urine cultures. Treatment was escalated to meropenem

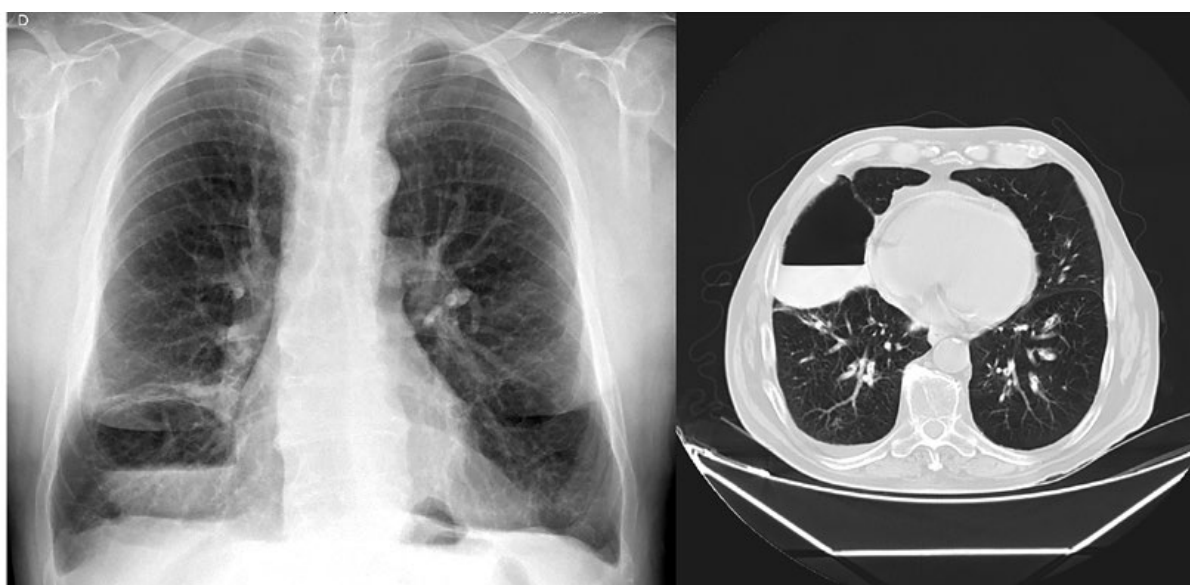


Figure 1: Lung abscess before treatment. Chest radiography (left picture), postero-anterior incidence, showing a round opacity in the lower zone of the right hemithorax, with air-fluid level. Thorax CT scan (right picture), showing bilateral emphysema, a round air-fluid densification in the right lower lung lobe, and a minimal right pleural effusion.



Figure 2: Lung abscess during treatment. Chest radiography (left picture), postero-anterior incidence, showing bilateral emphysema, a residual heterogeneous opacity in the lower zone of the right hemithorax, after 5 weeks of treatment. Thorax CT scan (right picture), showing a residual round air-fluid densification in the right lower lung lobe after 4 weeks of treatment, and also an aggravated moderate right pleural effusion in the context of heart failure.

and linezolid empirically. Surgical treatment or pleural catheter drainage were not considered adequate options.

The patient showed a favorable response to this treatment, with complete resolution of hemoptysis and progressive radiological improvement. When stable (after 12 days of treatment efficacy), a PR program was offered as an adjunct to medical treatment. An informed consent was obtained. The PR program was conducted for almost 4 weeks, at the Pulmonology ward, and included progressive exercise training, adjusted to his tolerance:

- Warm-up with breathing exercises (5 minutes);
- Upper body exercises, in a seated position, first without weights and then with 1 kg dumbbells (chest crosses, overhead raises, bicep curls);
- Lower body exercises, first without weights and then with 1 kg ankle weights (seated leg extensions, supported leg curls) and supported squats;
- Core exercises, in seated position, first without weights and then with 1 kg ankle weights (knee raises);
- Balance exercises (5 minutes);
- Walking 10-15 minutes/day.

PR was always supervised and the patient monitored. Oxygen saturation was kept >90%, heart rate target was up to 20 beats/minute above baseline. The Modified Borg scale target was 3-4. The patient rested 1-2 minutes between sets and used the pursed lip breathing technique. He performed the program 4-5 times/week. Sets of exercises varied between 1-3 (at the beginning and last week, respectively); repetitions varied between 8-12 (increased based on tolerance).

At discharge, after 7 weeks of hospitalization and 5 weeks of efficient antibiotic therapy, the patient showed a significant clinical, analytical and radiologic response (Fig. 2). He had no nosocomial infections and was discharged with better dyspnea, anxiety, depression and autonomy levels compared to his stable baseline (before the exacerbation and hospitalization), as well as fewer oxygen requirements (1 L/min at rest). Clinicians recommended the maintenance of a home-based program and regular follow-up in consultation. The inhaler technique was reviewed, and an action plan was given. He was very satisfied with the intervention and there were no adverse events related to PR. The results are described in Table 1.

Table 1: Pulmonary rehabilitation results. Baseline values refer to patients' state prior to the exacerbation and hospitalization.

Variables	Baseline	At discharge
mMRC	4	4
CAT	13	10
CFS	85	95
HADS	16	3
Anxiety score	9	1
Depression score	7	2
Blood gas (room air)		
pO ₂ (mmHg)	50	59
pCO ₂ (mmHg)	58	53
SatO ₂ (%)	87	94

mMRC, Modified Medical Research Council; CAT, COPD Assessment Test; CFS, Clinical Frailty Scale; HADS, Hospital Anxiety and Depression Scale; pO₂, partial pressure of oxygen; pCO₂, partial pressure of carbon dioxide; SatO₂, oxygen saturation.

Discussion

Lung abscess is a severe necrotic infection with a circumscribed area of pus, forming an air-fluid level inside a cavity.^{10,17,18} It can be secondary to other diseases, including bullous emphysema,^{10,18} as seen in this case. Most occur in elderly men,^{10,18} have polymicrobial etiology and are located in the right lower lung lobe,^{10,17} as represented. Treatment include prolonged broad-spectrum antibiotics,¹⁰ and surgery in severe cases.¹⁰ Despite the lack of referral, PR is also an important treatment adjunct.¹⁰ and was offered to this patient when significant clinical improvements and stability were evident. Lung abscess cases have an overall mortality that reaches up to 38.2%,¹⁰ however, PR contributed to improving the baseline health status (dyspnea, oxygen requirements, independence skills and mood) of this patient, and possibly to the low intercurrents observed despite a long hospital staying.

This patient had very severe COPD, and this disease carries a significant impact on the quality of life and physical activity,¹⁹ and PR has become a standard of care of treatment.¹⁹ Acute exacerbations are associated with worsening symptoms and muscle dysfunction, which limit exercise capacity, physical activity levels, autonomy and quality of life.⁵ All these outcomes were expected in this patient, but after PR and optimal medical treatment the authors verified and improvement in Clinical Frailty Scale and dyspnea levels.

Some studies have been conducted with early PR and it shows benefits and appears to be safe.⁵ A meta-analysis concluded that it was associated with improvements in the 6-minute walk test (6MWT), modified Medical Research Council (mMRC) dyspnea scale and quality of life.¹⁴ However, a trial conducted by Greening *et al* with 389 patients, who began PR after 48 hours of hospital admission and continued a home-based program, for 6 weeks in total, observed no difference in readmission risk and a higher risk of death in the intervention group.⁵ This data has been extensively analyzed and there might have been significant bias, including: increased mortality risk unlikely related to PR (after 7 months); subtle differences between groups; insufficient differences of exercise stimulus between groups; very short inpatient intervention (median 3 sessions); unsupervised home-based program with low adherence.^{5,16} Also, per protocol analysis did not show significant differences in mortality.¹⁶ More recent randomized controlled trials have demonstrated that PR may be safely conducted during hospitalization, even in critically ill patients.¹⁶ Early PR should be initiated according to the stability of the patient,⁶ as we did in this case, which contributed to the safety of the intervention.

The main strength of this study is the addition of more data in favor of conducting PR during hospitalization in patients with exacerbated COPD, despite healthcare professionals concerns based on previous recommendations, which have been contributing to the avoidance of PR.¹⁶ The main

limitation is the lack of larger population. However, to our knowledge, there are no other studies offering PR during hospitalization of such severe COPD case. Due to the promising results achieved, the authors hope to develop larger studies and to conclude about the overall benefits of this intervention, which questionnaires and measurements are necessary to assess the long-term benefits. There is an urgent need to improve access to early PR and develop further research in this area.^{5,6,11,16}

In conclusion, a lung abscess is a severe pulmonary infection which may exacerbate COPD. PR is an important intervention to treat these patients and may be safely offered during hospitalization, as represented in this case. Further research in this area is required and may contribute to improve access to PR. ■

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BC, CS, SS, EG, RO - Participação no estudo, pesquisa bibliográfica, redação e revisão do artigo

Todos os autores aprovaram a versão final a ser publicada.

Contributorship Statement

BC, CS, SS, EG, RO - Participation in the study, bibliographical research, writing and revision of the article

All authors approved the final version to be published.

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Correspondence / Correspondência:

Bruno Cabrita – bmcabrita@gmail.com

Pulmonology Department, Hospital Santo André, Unidade Local de

Saúde da Região de Leiria, Leiria, Portugal

Ria de Santo André, 2410-1897 Leiria

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