

clinical practice, however, it is important to define and manage the determinant factors of therapeutic success in COPD. There is a need to personalise treatment strategies,<sup>11</sup> and four goals must be achieved. First, we have to assess the patient in a multidimensional way, according to the severity of the disease, its activity, future risk and impact on the patient, including their well-being. This allows us to define treatable clinical characteristics and assess future risk, and helps us tailor treatments to individual patients.<sup>12,13</sup> Second, we have to evaluate the patient's perspectives and beliefs about the treatment and the disease.<sup>14</sup> Third, it is important to prescribe the correct treatment, based on the best medical evidence, taking in account pulmonary and extra pulmonary factors, the patient's perspective and their behaviours/lifestyle. And fourth, we should monitor the treatment, assess and improve adherence, ensure correct inhalation technique and monitor the patient's well-being.

Rather than assessing treatment success based merely on the level of control that has been achieved, we should move to a more comprehensive concept by assessing COPD-related health status and evaluating the changes or the maintenance of a certain level of quality of life based on pre-established treatment goals. Deciding which tool or set of tools to use is another matter and should be discussed in another paper.<sup>15</sup>

### Conflicts of Interest

The authors have no conflicts of interest to declare.

### References

- Guimarães M, Bugalho A, Oliveira S, Moita J, Marques A. COPD control: can a consensus be found? *Rev Port Pneumol*. 2016;22:167–76.
- Miravittles M. Towards a patient-oriented treatment of COPD. *Rev Port Pneumol*. 2016;22:73–4.
- Global initiative for asthma. Global strategy for asthma management and prevention (Revised 2016).
- Taylor D, Bateman E, Boulet LP, Boushey H, Busse W, Casale T, et al. A new perspective on concepts of asthma severity and control. *Eur Respir J*. 2008;32:545–54.
- van der Molen T, Willemse B, Schokker S, ten Hacken N, Postma D, Juniper E. Development, validity and responsiveness of the Clinical COPD Questionnaire. *Health Qual Life Outcomes*. 2003;1:13.
- Reda A, Kotz D, Kocks J, Wesseling G, van Schayck C. Reliability and validity of the clinical COPD questionnaire and chronic respiratory questionnaire. *Respir Med*. 2010;104:1675–82.
- van der Molen T, Pieters W, Bellamy D, Taylor R. Measuring the success of treatment for chronic obstructive pulmonary disease—patient, physician and healthcare payer perspectives. *Respir Med*. 2002;96 Suppl. C: S17–21.
- Langer D, Demeyer H, Troosters T, Gosselink R. The importance of physical activity. *Eur Respir Monogr*. 2015;69:224–39.
- Waschki B, Kirstem A, Holz O, Muller K, Meyer T, Watz H, et al. Physical activity is the strongest predictor of all-cause mortality in patients with COPD: a prospective cohort study. *Chest*. 2011;140:331–42.
- Kerr D. Oral presentation at 2016 ASCO Annual Meeting.
- Roche N. Adding biological markers to COPD categorization schemes: a way towards more personalized care. *Eur Respir J*. 2016;47:1601–5.
- Agusti A, Bel E, Thomas M, Vogelmeier C, Brusselle G, Holgate S, et al. Treatable traits: toward precision medicine of chronic airway diseases. *Eur Respir J*. 2016;43:410–9.
- Jones R, Price D, Chavannes N, Lee A, Hyland M, Stållberg B, et al. Multi-component assessment of chronic obstructive pulmonary disease: an evaluation of the ADO and DOSE indices and the global obstructive lung disease categories in international primary care data sets. *NPJ Prim Care Respir Med*. 2016;26:16010.
- Horne R, Chapman S, Parham R, Freemantle N, Forbes A, Cooper V. Understanding patients' adherence-related beliefs about medicines prescribed for long-term conditions: a meta-analytic review of the necessity-concerns framework. *PLOS ONE*. 2013;8:e80633.
- Cave A, Atkinson L, Tsigianni I, Kaplan A. Assessment of COPD wellness tools for use in primary care: an IPCRG initiative. *Int J Chron Obstruct Pulm Dis*. 2012;7:447–56.

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## Pulmonary Mucormycosis at Onset of Diabetes in a Young Patient<sup>☆</sup>



### *Mucormycosis pulmonar en paciente joven con inicio de diabetes mellitus*

To the Editor,

Mucormycosis is an infection caused by filamentous fungi that presents in different forms: rhinocerebral, pulmonary, renal, cutaneous, and gastrointestinal. The species *Rhizopus oryzae*, responsible for 70% of cases, is the most frequently isolated organism.<sup>1</sup> Risk factors for developing mucormycosis include blood diseases, diabetes mellitus with poor metabolic control, solid organ or hematopoietic transplantation, neutropenia, injury, iron overload, and severe burns. It is unclear whether the

chronic use of corticosteroids predisposes patients to developing mucormycosis. In recent years, we have witnessed an increase in the incidence of this entity due to population aging, which goes hand in hand with an increase in the above-mentioned risk factors.<sup>2,3</sup>

We report the case of a 29-year-old woman, smoker of 10 pack-years, with recent onset of diabetes mellitus type 1 (ketoacidosis the week before presentation of this clinical episode). She consulted due to a few hours history of dyspnea, fever 38 °C, pain in the right flank, cough and rust-colored expectoration. Auscultation revealed crackles in the right lung base. Clinical laboratory tests showed significant leukocytosis (30 100/μl) and elevated CRP (224 mg/l). Consolidation of the right lower lobe was observed on chest radiograph. The patient was diagnosed with community-acquired pneumonia, and empirical antibiotic therapy was started. The chest computed tomography (CT) scan showed consolidation of the pulmonary parenchyma in the right lower lobe, with the formation of a thick-walled hypodense lesion containing air bubbles, with axial diameters measuring 6.1 cm×4.2 cm, consistent with an abscess (Fig. 1A). During hospitalization in the general

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**Fig. 1.** (A) Chest CT with contrast medium (parenchymal window), showing a lung abscess associated with necrotizing pneumonia of the right lower lobe. (B) Sagittal chest CT slice (mediastinal window), showing a mycotic aneurysm in the infero-medial segmental branch (asterisk). (C) Pulmonary arteriography performed before embolization of the aneurysm.

ward, the patient had several episodes of hemoptysis, so fiberoptic bronchoscopy was performed, revealing total stenosis of the right anterior basal bronchus (B8) and partial stenosis of the right basal-lateral bronchus (B9) with necrotic tissue on solid tissue. Given the lack of clinical improvement, the chest CT was repeated, showing, in addition to the necrotizing consolidation, aneurysmal dilation of the exit of the segmental artery of right bronchial segment 10, consistent with mycotic aneurysm, measuring 1.4 cm in length and 5 cm in diameter (Fig. 1B). Arteriography (Fig. 1C) confirmed the diagnosis. The aneurysm was successfully embolized with a 14-mm type 2 Amplatzer® plug and hemoptysis was controlled. The source of the aneurysm and the right lower truncal branch were subsequently embolized with 10-mm coils and an 8-mm Amplatzer® plug. Bronchial biopsy obtained during the bronchoscopy showed the presence of hyphae consistent with mucormycosis, so treatment began with liposomal amphotericin and caspofungin. Following this, the patient showed slow but clear clinical improvement. Lower right lobectomy was performed by posterolateral thoracotomy, revealing pleural adhesions throughout the lung surface, particularly between the lower

right lobe and the diaphragm. The postoperative period was free of complications, recovery was favorable, and cure was achieved.

A defining characteristic of pulmonary mucormycosis is its rapid progress and marked angioinvasive capacity. Invaded tissue becomes necrotized and occupied by hyphae, causing infarction and fostering the development of cavitating pneumonias. Mucormycosis can also invade adjacent structures such as the mediastinum, the heart, or the bloodstream (fungemia). Hemoptysis is a common complication and can be massive. Diagnosing mucormycosis is a complex process, since the presentation is similar to that of community-acquired pneumonia: the most common symptoms are fever, pleuritic pain, and cough with purulent expectoration. Imaging tests are nonspecific, since no characteristic signs exist that can be distinguished from other processes. Identification of the organism in the tissue is necessary to reach a safe diagnosis of invasive fungal infection. The species can be confirmed on culture. Bronchoalveolar lavage (BAL) can be used in immunosuppressed patients, although a positive result for fungi is only orientative. However, it is considered highly suggestive if

hyphae are visualized on optical microscopy. Medical treatment of choice is intravenous liposomal amphotericin B at a dose of 5 mg/kg/day, which should continue until clinical and radiological resolution of the process. Resistance to voriconazole is a significant feature of these organisms. For drug treatment to be effective, existing necrotic tissue must be removed, either by debridement or by lobectomy, so that the antifungals can penetrate well-perfused tissues.<sup>4,5</sup> Mucormycosis is an emerging disease that must be considered in daily clinical practice, and therein lies the interest in this case: necrotizing pneumonia in a patient with predisposing factors, presence of hemoptysis, and necrotic areas in the bronchial mucosa are key data that point toward a diagnosis of invasive fungal infection.

## References

1. Ibrahim AS, Spellberg B, Walsh TJ, Kontoyiannis DP. Pathogenesis of mucormycosis. *Clin Infect Dis*. 2012;54 Suppl. 1:S16–22.
2. Petrikos G, Skiada A, Lortholary O, Reoilides E, Walsh TJ, Kontoyiannis DP. Epidemiology and clinical manifestations of mucormycosis. *Clin Infect Dis*. 2012;54 Suppl. 1:S23–34.
3. Kauffman CA, Malani AN. Zygomycosis: an emerging fungal infection with new options for management. *Curr Infect Dis Rep*. 2007;9:435–40.
4. Greenberg RN, Scott LJ, Vaughn HH, Ribes JA. Zygomycosis (mucormycosis): emerging clinical importance and new treatments. *Curr Opin Infect Dis*. 2004;17:517–25.
5. Kontoyiannis DP, Lewis RE. How I treat mucormycosis. *Blood*. 2011;118:1216–24.

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