

Original article

Clinical Significance of Environmental Mycobacteria Isolated From Respiratory Specimens of Patients With and Without Silicosis[☆]



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ABSTRACT

Objective: To describe the clinical, functional and radiographic differences of respiratory disease caused by environmental mycobacteria in patients with and without silicosis.

Method: Retrospective, observational study in patients with nontuberculous mycobacteria isolated in the Hospital Meixoeiro (University Hospital of Vigo) microbiology laboratory between January 2007 and December 2013. Patients were grouped according to the presence or absence of silicosis and mycobacterial lung disease, using American Thoracic Society criteria.

Results: In 156 cases, at least one species of environmental mycobacteria had been isolated from the respiratory culture. A total of 71% were identified in men, 40 (25.6%) of whom had silicosis. Sixty patients (38.5%) met American Thoracic Society microbiological criteria: 62.5% of the silicosis group and 30.2% of the non-silicosis group. The most common species were *Mycobacterium avium complex*, *Mycobacterium genavense* and *Mycobacterium chelonae*. American Thoracic Society criteria for environmental mycobacterial disease were met in 34 (22.7%) patients: 14 in the silicosis group and 20 in the non-silicosis group. Treatment was administered in 24 cases, with better bacteriological eradication levels in the non-silicosis group.

Conclusions: In our series, a history of silicosis was related with a higher incidence of environmental mycobacterial disease. The causative species in the majority of cases in our setting was *Mycobacterium avium complex*, followed by *Mycobacterium genavense*. Patients with silicosis showed lower cure rates after treatment.

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Significado clínico de las micobacterias ambientales aisladas en muestras respiratorias en pacientes con silicosis y sin silicosis

RESUMEN

Objetivo: Describir las diferencias clínicas, funcionales y radiográficas de la enfermedad respiratoria por micobacterias ambientales (MA) en pacientes con silicosis y sin silicosis.

Palabras clave:

Silicosis

Micobacterias no tuberculosas

Micobacterias ambientales

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Método: Estudio observacional retrospectivo en pacientes a los que se les había aislado una micobacteria no tuberculosa en el laboratorio de Microbiología del hospital de O Meixoeiro (CHU de Vigo) desde enero 2007 hasta diciembre 2013. Se diferenció a los pacientes según presentaran o no silicosis y enfermedad pulmonar por MA utilizando los criterios de la American Thoracic Society.

Resultados: Se identificaron 156 casos con aislamiento respiratorio de al menos una especie de MA. El 71% eran varones, de los cuales 40 (25,6%) tenían silicosis. En 60 pacientes (38,5%), el 62,5% del grupo de silicosis y el 30,2% del grupo sin silicosis, se cumplían los criterios microbiológicos recomendados por la American Thoracic Society siendo las especies más comunes *Mycobacterium avium complex*, *Mycobacterium genavense* y *Mycobacterium chelonae*. En 34 pacientes (22,7%), 14 del grupo de silicosis y 20 del grupo sin silicosis, se cumplían los criterios de la American Thoracic Society de enfermedad pulmonar por MA. Se realizó tratamiento en 24 casos, con mayores niveles de erradicación bacteriológica en el grupo sin silicosis.

Conclusiones: En nuestros pacientes el antecedente de silicosis se relacionó con mayor incidencia de enfermedad por MA. La especie causante de la mayor parte de los casos de enfermedad en nuestro medio por MA es *Mycobacterium avium complex*, seguido de *Mycobacterium genavense*. Los pacientes con silicosis presentaron menores niveles de curación tras el tratamiento.

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Introduction

Nontuberculous mycobacteria (NTM), also known as environmental mycobacteria, are ubiquitous microorganisms that can inhabit body surfaces and secretions, even in the respiratory tract, without causing disease. For this reason they were considered purely as colonizers until the latter half of the last century. The geographical prevalence of the different mycobacterial species varies widely,¹ and accurate identification is essential, due to differences in their clinical relevance. In countries with low rates of pulmonary tuberculosis (PTB), such as the United States, the incidence of NTM (5 cases per 100 000 and up to 15 per 100 000 in individuals over 50 years of age) is higher than that of PTB (4 per 100 000).² Known risk factors for NTM lung disease include cystic fibrosis and other diseases presenting with bronchiectasis, and immunosuppressive states, such as those associated with biological therapy (anti-TNF, rituximab), organ transplantation, and autoimmune deficiency syndrome, although an increasing number of cases of NTM are now detected in patients with no underlying disease.² A risk factor which has received less attention is NTM lung disease in silicosis. Although the relationship between silicosis and PTB is well characterized,³ the role of silicosis as a risk factor for NTM lung disease is less well defined.⁴ NTM infection most commonly presents as chronic lung disease. Two radiographic patterns are observed: fibrocavitation in the upper lobes of patients with underlying respiratory disease, such as chronic obstructive pulmonary disease; and bronchiectasis in the right middle lobe or the lingula.⁵ For a diagnosis of NTM lung disease, certain clinical, bacteriological and radiological criteria must be met.⁶ Radiological criteria in particular are difficult to determine in cases with silicosis, as the pre-existing interstitial-nodular disease makes it difficult to determine if the NTM isolated from the sputum constitutes mycobacterial disease or simply colonization. Accordingly, a detailed evaluation of symptoms and radiological findings is essential. Although the pathogenic potential of NTM is being increasingly recognized, the clinical relevance of NTM has not been determined. The aim of this study was to identify the different species isolated in NTM-infected patients with and without silicosis in our setting, and to describe the clinical characteristics, predisposing factors, and the progress of patients in both groups.

Materials and Methods

We conducted a retrospective observational study of patients with confirmed NTM infection, determined by the Microbiology Laboratory of the Hospital O Meixoeiro (University Hospital Complex, Vigo, Spain) between January 2007 and December 2013.

Species were identified, isolation rates were determined, and 2 groups were categorized: those who met diagnostic criteria for silicosis, and those who did not.⁷ Age, sex, underlying respiratory disease, comorbidities [diabetes, solid tumor disease or hematological malignancies, human immunodeficiency virus (HIV), transplantation], and use of corticosteroids and other immunosuppressive drugs were collected. History of exposure to silica dust and radiological findings consistent with silicosis were recorded. Air-flow obstruction was defined as FEV1/FVC ratio of less than 0.7.⁸ Symptoms, chest X-ray and computed tomography (CT) findings were evaluated, if available, particularly in the presence of cavitation.

A diagnosis of NTM lung disease was established on the basis of clinical, radiological and bacteriological data according to the 3 categories recommended by the American Thoracic Society: definitive disease, clinically significant infection (or possible disease, if microbiological criteria were met), and colonization, in the case of positive mycobacterial culture only.^{6,9} Definitive disease was defined as: (a) consistent symptoms (cough, fever, weight loss, hemoptysis or dyspnea) not attributable to other diseases; (b) characteristic lesions on chest X-ray (infiltrates, nodules or cavitation) or on high resolution computed tomography (multiple nodules or multifocal bronchiectasis), and (c) 2 positive sputum cultures on 2 separate occasions, or positive bronchoalveolar lavage culture, or any positive culture of a bronchopulmonary biopsy, or else acid-fast bacilli visualized on any positive sputum culture. Cases with 2 or more positive microbiological cultures were considered clinically significant infection, and a single positive microbiological culture obtained in the absence of other qualifying criteria was defined as colonization. These microbiological criteria were selected in view of their proven utility as good predictors of disease.^{9–11}

Bacteria were identified using molecular and radiometric methods. Response to treatment was assessed from clinical, radiological and microbiological progress. Bacteriological conversion was defined as three separate consecutive negative cultures, at least 3 weeks after the initial diagnosis of the disease.

A descriptive data analysis was performed: mycobacteria species, underlying disease and silicosis and other patient-related variables were presented as frequencies and percentages. Univariate analyses were performed using the chi-squared test to determine the association between silicosis and baseline patient characteristics, type of mycobacteria, disease prevalence, infection and colonization, treatment, and symptoms. The relationship between age and silicosis was analyzed using the Student's *t*-test for independent samples. Analyses were performed using the Statistical Package for Social Sciences version 15.0 (SPSS, Chicago, IL, USA).

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