

Diagnostic challenges of silico-tuberculosis in a case with progressive massive fibrosis – a Zimbabwe case report

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ABSTRACT

This is a case study of an ex-gold miner with an exposure duration to silica dust of 13 years, presenting with silico-tuberculosis and progressive massive fibrosis. We describe his tortuous and expensive route to diagnosis after being treated with antibiotics during his several visits to the local district hospital, and the challenges associated with diagnosis and management of such complicated cases in poorly-resourced developing countries. The case highlights the plight of ex-miners needing continuous medical care after retirement. We recommend the setting up of a dedicated national occupational health surveillance system for ex-workers in Zimbabwe as the key in the prompt investigation and diagnosis of occupational diseases; training and education in occupational health for clinicians in primary healthcare centres; and specific training in the early identification of silicosis, asbestosis and coal workers pneumoconiosis.

Keywords: silicosis, tuberculosis, progressive massive fibrosis, occupational disease, gold mining

INTRODUCTION

Globally, silicosis is the most prevalent serious occupational lung disease, occurring mostly in developing countries.¹ In Zimbabwe, there is a paucity of studies and literature defining the occupational burden of silicosis and/or silico-tuberculosis. South Africa has a serious silicosis problem in traditional silica industries.² There is a well-documented increased risk of tuberculosis in patients with silicosis.³⁻¹¹ Cowie reported that an increasing severity of silicosis leads to an increased risk of tuberculosis.⁹ Tuberculosis was one of the top ten causes of death world-wide in 2015, and was responsible for more deaths than the (HIV) human immunodeficiency virus and malaria.¹²

One of the challenges facing developing countries is the identification of silicosis cases infected with tuberculosis; even more problematic are the cases with silico-tuberculosis and progressive massive fibrosis (PMF).¹⁰ Some of the health challenges confronting Africa include lack of effective diagnostic, preventive or treatment options.¹³ One of the challenges faced by both developing and developed countries is the much unrecognized morbidity due to under reporting and lack of recognition of silica-related diseases, such as pulmonary tuberculosis (PTB), lung cancer and scleroderma, beyond classical silicosis.^{1,14}

We report a case of silico-tuberculosis with PMF, following 13 years of exposure to silica dust. The case highlights the diagnostic challenges and financial burden of occupational diseases in ex-miners. A full ethical review clearance exemption was obtained from the Medical Research Council of Zimbabwe on the basis that this case review was based on review of clinical notes and anonymous description of any investigative institutions that were involved.

CASE DESCRIPTION

Presentation

A 68-year-old male, ex-miner and pensioner from one of the rural areas in Zimbabwe presented to us on 23 February 2015 with a two-year history of insidious, slowly progressive shortness of breath on exertion, an occasional cough productive of white sputum, and chest pains. He also complained of night sweats and fever on most days in the previous year. On systems enquiry, he did not have any haemoptysis or paroxysmal nocturnal dyspnoea, or any other significant findings. Prior to this, he had been perfectly well.

In the previous two years, he had been treated with various antibiotics with minimal improvement. A chest X-ray had not been done until five months prior to our consultation. His sputum had tested negative for alcohol and acid fast bacilli (AAFB) in 2013 and twice in 2014. He had also tested negative for HIV on two different occasions in 2014. He had a 15-year history of smoking tobacco, late to start, at an average of five cigarettes per day since the age of 50.

Occupational history

He had worked as a drill operator for 13 years, an occupation that he described as being very dusty, with no consistent use of personal protective respiratory equipment. This job involved hard rock drilling in gold mines and granite quarries.

Clinical examination

He was clinically stable without any dyspnoea at rest. The significant findings were a mild clubbing and widespread bilateral crepitations on auscultation. The rest of the examination was normal.

RESULTS

A chest X-ray done in February 2015 revealed a bilateral nodular pattern with almost the entire right upper lobe occupied by a mass lesion extending into, and distorting, the right hilum. The lung function test performed in February 2015 was normal: FEV1 of 2.24 L (99%); FVC of 3.17 (109%).

The CT scan revealed a 10.5 x 9 x 5.6 cm ill-defined heterogeneously enhancing mass on the right hilum, and extensive discrete and conglomerate nodules in the central zone of the lungs. The concern was about the possibility of a large right hilar neoplasm, and further evaluation to exclude lung cancer was recommended. An open lung biopsy was then performed, which revealed sections of the lung with fibrotic areas of granulomata with mostly foreign body type giant cells as well as some Langerhans type giant cells. The Ziehl Neelsen Stain for AAFBs and fungal elements was negative. The pathology report noted a granulomatous inflammatory process requiring clinico-pathological correlation. A second review of the initial CT scan, lung biopsy results and a full occupational history confirmed a diagnosis of silicosis with PMF, with possible PTB reactivation. Old PTB changes were noted on both upper zones. Two months following the lung biopsy, the patient tested positive for AAFBs and was started on anti-TB treatment.

DISCUSSION

The presentation of PMF in this case is highly atypical. PMF masses are commonly bilateral while unilateral masses may occur but are an exception. Having considered all the diagnostic possibilities, it was concluded that a diagnosis of PMF was not only tenable but could, without reasonable doubt, be considered the most likely diagnosis. What was perhaps the strongest supportive evidence for silicosis and PMF in this case was the presence of a small mass lesion surrounded by nodules (which were at least 'q' in size) that were demonstrated on the coronal CT scan image.

The chest X-ray findings of a bilateral nodular pattern with almost the entire right upper lobe occupied by a mass lesion extending into and distorting the right hilum, the persistently negative sputa, an open lung biopsy with negative results for AAFBs and fungal elements, together with a CT lung scan that was suggestive of a malignancy, presented a challenge in the diagnosis of silico-tuberculosis with PMF. The associated diagnostic costs for silico-tuberculosis presented a significant financial burden to the ex-gold miner.

Medical practitioners without training in diagnosing silicosis or pneumoconioses, and with no access to specialised radiological and laboratory services, face challenges in diagnosing cases of silico-tuberculosis with PMF. Despite a silica exposure period of 13 years as a driller, a productive cough, and insidious onset of dyspnoea over a two-year period, a chest X-ray and a full occupational history were not taken for almost two years; hence the diagnosis of silicosis was missed. Silico-tuberculosis may also be difficult to distinguish from PMF. In southern Africa, silicosis is relatively

common in current and ex-miners and new cases continue to be diagnosed.⁵

Although silicosis develops after many years of exposure to silica-containing dust, in some occupations, such as drilling and shot blasting, it can develop to advanced pneumoconiosis after a short duration of intense exposure.^{11,14,15} teWaterNaude et al. (2006) found a higher prevalence of PTB in occupational groups such as drillers.⁶

In this case, repeated PTB investigations were done on the basis of a common chest pathology rather than from an occupational health point of view. There are clinical variants of silico-tuberculosis that are fibrotic, and initially slowly



Figure 1. Chest X-ray, PA view, taken on 01/02/2015



Figure 2. Coronal CT scan image taken on 09/03/2015

Note: The poor quality of the original plain film reproduction makes it difficult to see the background nodules. The authors and editors are aware of this fact.

“One of the challenges facing developing countries is the identification of silicosis cases infected with tuberculosis; even more problematic are the cases with silico-tuberculosis and progressive massive fibrosis (PMF).”

progressive cases where sputum examination is persistently negative.¹⁰ It is always important to consider such variants despite persistently negative sputum for AAFBs, as happened in this case. Radiologically, overt PTB offers little diagnostic difficulty to the experienced chest radiograph reader, whereas challenges arise with the concomitant interstitial manifestation of PTB and silica nodulation.¹⁶ The radiological solid lesion eventually led to an open lung biopsy. The differential diagnosis of PMF includes lung cancer, tuberculosis, sarcoidosis and rheumatoid nodules.¹⁷

The occupational risk exposure profile, job category, length of employment, radiological appearance and severity should always raise the index of suspicion for silico-tuberculosis and PMF. Obtaining an adequate occupational history from the patient and a thorough review of the chest radiographs by a medical practitioner trained in diagnosing pneumoconioses should not present any great difficulty in diagnosing silicosis.¹⁵

CONCLUSIONS AND RECOMMENDATIONS

Diagnosing occupational diseases requires expertise and may need extensive and expensive investigations which might not be readily available in public health institutions. Workers without means, and not just pensioners, face significant financial costs when undergoing investigations for occupational diseases. The costs of investigations, including time and transport, effectively reduce the eventual compensation amount should they qualify. This patient went through numerous testing procedures for TB, and eventually tested positive for TB after a series of negative sputa results. This indicates the need for persistent, and not only expensive, investigations. The histology and CT scan results were inconclusive. Despite the noted PMF, the lung function test remained normal in this case.

The establishment of a dedicated national occupational health surveillance system for monitoring ex-workers in Zimbabwe is key to the prompt investigation and diagnosis of occupational diseases. Training and education in occupational health for clinicians in primary healthcare centres would be of great benefit. As Zimbabwe has had extensive gold, asbestos and coal mining activities in the past, training for doctors and nurses, focusing on the main occupational lung diseases such as silicosis, asbestosis and coal workers pneumoconiosis, would be invaluable.

LESSONS LEARNED

1. The associated diagnostic costs for occupational diseases can be prohibitive to all workers and ex-workers of limited means
2. Lack of a dedicated national health surveillance system for ex-workers leads to delayed and under-diagnosis of occupational diseases
3. Laboratory and radiological investigations may pose constraints in the diagnosis of silico-tuberculosis with PMF, and the diagnosis should not be excluded on the basis of negative results
4. Training of general practitioners and nurses in primary healthcare centres on the basics of identifying occupational diseases is crucial

DECLARATION

Both authors declare that they have no competing interests.

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