

## Silicosis (still) among us

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Silicosis remains the most prevalent pneumoconiosis in Brazil and in the rest of the world, principally in developing countries. In this issue of the Brazilian Journal of Pulmonology, Ferreira et al.<sup>(1)</sup> emphasize this epidemiological fact in the introduction of their study on computed tomography scan of the chest in complicated (accelerated) form of the disease.

The occurrence of silicosis outside the working environment is practically restricted to very specific geological and climatic conditions that are difficult to control. Fortunately, none of those conditions are found in Brazil.<sup>(2-3)</sup> In contrast, silicosis, as a disease of occupational etiology, could be permanently eradicated. It is a disease of well-defined etiology, pathophysiological mechanism, dose-response relationship and occupational risk, established over the past one hundred years.

However, its prevalence remains high in certain areas of professional activity, such as mining in general, metallurgy and the manufacture of ceramic/porcelain floor tiles, due to the difficulty of eliminating the exposure to dust in these working environments. This difficulty is related to various interdependent factors: a low level of financial investment in environmental control of the working processes (fatigue, cloistered machines, research into new raw materials, etc.); inappropriate and insufficient governmental inspection; lack of specific registration of industries that manipulate raw materials containing silica; lack of knowledge on the part of workers as to the risk they run, principally in informal sectors or sectors related to small- and medium-sized companies; non-prioritization of the problem by trade unions; and low quality of medical and occupational health control programs provided by the companies, resulting in a low index of early diagnoses. This last factor is basically related to the inappropriate training of occupational physicians in this specific area and of pulmonologists in general.

Regarding pulmonology referral centers, it is common to see cases of silicosis referred to as suspected of various diseases, due to the simple failure to take an occupational history.

Recently, the Ministry of Labor and Employment Directive 99/Oct-2004 forbade the use of sandblasting machines of any kind, nationwide, as of January of 2005. This is an important decision taken by this ministry in a joint interministerial effort, as part of the Programa Nacional de Eliminação da Silicosis (PNES, National Program for the Elimination of Silicosis), initiated in 2002, whose principal objective was to develop measures on four broad fronts: definition and implementation of specific legislation; creation of a national database on silica exposure and silicosis; qualification of human resources and production of high-quality national technical/scientific material; and development of studies and specific research by branch of activity. The PNES requests and encourages the participation of all interested parties in this issue, through individual and institutional enrollment in the various projects and subprograms.<sup>(4)</sup>

In view of this joint effort of dissemination of knowledge about the disease among us (physicians and other health professionals), any support in terms of information and discussion regarding silicosis is always welcome. This is the case of the study conducted by Ferreira et al.,<sup>(1)</sup> which brings information on cases, mostly in individuals working in the field of sandblasting, that reinforces the findings of high-resolution computed tomography (HRCT) of the chest, findings characteristic of accelerated silicosis with massive fibrosis (large opacities). These characteristics, when detected in a specific clinical case, assure the pulmonologist, radiologist or occupational physician that the individual has this form of silicosis, thereby avoiding investment and risks related to invasive procedures normally used in the presence of lung masses.

The authors raise the important discussion on the frequent concomitance of this form of silicosis with tuberculosis, due to the high endemicity of tuberculosis infection in Brazil, together with alterations in the macrophagic cell defense caused by the presence of silica and the possible decreased lymphatic drainage in silicotic lungs. This combination was defined at the end of the nineteenth century and remains a reality in Brazil, thereby making us alert to this possibility when treating patients with tuberculosis or patients with silicosis.

Despite the lack of reliable data on silicosis-related morbidity and mortality in Brazil, the article draws attention to the occurrence of silicosis with certain types of work processes and occupations, emphasizing the need to invest in prevention.

The diagnosis of silicosis is based on the interpretation and analysis of radiographic imaging, as well as on the occupational history of the worker/patient.<sup>(5)</sup> The histopathological examination is limited only to the cases in which the discrepancy between the results of these two analyses point to a significant possibility of another diagnosis.

The simple chest X-ray remains the instrument of greatest versatility and efficacy in the regular and repeated monitoring of exposed workers, due to its low cost and low radiation dose.<sup>(6)</sup> The newly revised (2000) edition of the International Labour Office International Classification of Radiographs of Pneumoconiosis, which contains only minor modifications in relation to the 1980 edition, ratifies the importance of simple chest X-rays in the medical control programs for exposed populations. In view of this, an international investigation on the use of digital chest X-rays has been initiated. It is the consensus among specialists in the area that HRCT, despite its greater sensitivity in some situations, should not become a monitoring test, precisely because of its low competitiveness in the two aspects mentioned above: cost and radiation dose.

Nevertheless, in the clinical area and in the monitoring of patients with diagnosed silicosis, computed tomography offers advantages that make it an important complementary examination.<sup>(7-8)</sup> It has been shown that HRCT has greater diagnostic sensitivity in the presence of large opacities not visualized on the simple chest X-ray or mediastinal

adenopathy evaluation. In borderline cases, when the profusion of simple radiographs is between 0/1 and 1/0, HRCT can reveal the presence of centrilobular ground-glass opacities, whose anatomopathological correlation, in a context of a history consistent with exposure and absence of recent smoking habit, can warrant a diagnosis of silicosis in its initial phase (early silicosis).

A recent study, comparing simple chest X-ray findings with HRCT findings, revealed a 100% correlation between the methods in relation to the absence of pneumoconiosis (category 0 on a simple chest X-ray and category 0 on an HRCT scan).<sup>(8)</sup> Bearing in mind the finding of a high frequency of reinforcement imaging of centrilobular dichotomous bronchial ramification (the alteration most frequently seen on the HRCT scans analyzed), the authors demonstrated the possible advantage of the method in the early diagnosis of the initial phases of silicosis, prior to the appearance of more solid nodules. Regarding the frequency of visualization of non-nodular lesions (areas of coalescence and large opacities), it was demonstrated that HRCT is more sensitive in revealing the presence of these alterations. The finding of eggshell calcification on an HRCT scan was rare in this study.<sup>(8)</sup> The result, however, agrees with the literature, in which punctuated or uniform calcification is more frequently described, differing from the findings of Ferreira et al.<sup>(1,9)</sup>

Various studies have demonstrated the importance of standardization in the reading of HRCT scans, aiming at decreasing the differences in findings among readers, principally when the focus is the profusion and extent of the lesions. The use of a standardized reading protocol based on Bégin et al.<sup>(10)</sup> has certainly contributed to the high indices of concordance in relation to the diagnosis of silicosis among the readers in the study conducted by Antão et al.<sup>(8)</sup> Since the 1990s, radiologists have proposed standardized protocols for this type of reading, aiming to decrease the variability among the readers and to create the possibility of comparing clinical and epidemiological studies in the area, similarly to what has been done with the simple chest X-ray since 1930.<sup>(11)</sup>

An extensive and detailed proposal of a standardized reading protocol for HRCT scans in cases of pneumoconiosis (considering those

individuals exposed to silica, coal dust or asbestos), to which is annexed a set of image patterns showing characteristic lesions in digitalized media for comparison purposes, has recently been published. It is hoped that such proposal will be adopted at the time of the performance of clinical and epidemiological studies, in order to guarantee the comparability between the results.<sup>(12)</sup>

Practical algorithms for the indication of HRCT in cases of exposure to silica are being researched, with the aim of using HRCT in a manner that is rational and yields satisfactory results. A recent study among underground gold miners in Brazil, for example, revealed that a semiquantitative index of exposure, combined with the result of the measurement of forced vital capacity, presented satisfactory discriminative power in the indication of HRCT.<sup>(13)</sup>

Therefore, in the general context of measures necessary for the control and eventual eradication of silicosis in Brazil, the study published in this issue of the Brazilian Journal of Pulmonology contributes by depicting, albeit at a specific point in time, a situation in which there is a lack of control. The patients/workers studied presented clinical evolution to the complicated forms of the disease, with a high index of concomitant pulmonary tuberculosis. The study also demonstrates, albeit indirectly, that some working environments expose workers to high concentrations of free silica, underscoring the need for investment in prevention.

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