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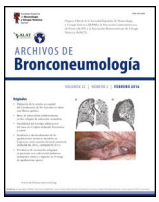

Editorial

Changes in the Profile of Diseases Caused by the Inhalation of Silica☆

Cambio en el perfil de las enfermedades por exposición a la inhalación de sílice

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The 20th century industrial boom in the Western world went hand-in-hand with the use of coal as a source of energy, and coal mining, in turn, was closely associated with an enormous increase in rates of pneumoconiosis, attributable in large part to precarious working conditions in the mines. By the end of the 20th century, the prevalence and severity of pneumoconiosis caused by coal had reduced significantly, due to the progressive replacement of coal by other fuels, the implementation of preventive measures in the mining industry, early diagnosis of these diseases, and the progressive introduction of medical and legal coverage.[1] In 1995, the International Labor Organization, together with the World Health Organization, set up the "Global Program for the Elimination of Silicosis", with the aim of eliminating this disease as a worldwide occupational health hazard by 2030. This initiative prompted programs for the control and prevention of silicosis in many countries, including Brazil, Chile, China, Indonesia, Malaysia, Mexico, Poland, South Africa, Thailand, Turkey, Ukraine, and Vietnam. Although adherence to these recommendations has reduced the incidence of this disease,[2] it is not yet fully controlled or eliminated. Silicosis persists, particularly in the more impoverished regions, due to factors such as ineffective techniques for the prevention of workplace exposure to respirable dust containing silica, and the persistence of other risk factors, such as high rates of tuberculosis.[3] Moreover, silicosis continues to be a cause of morbidity and mortality in both developed and developing countries.[4,5] In industrialized countries, unlike developing countries, healthcare and institutional systems are in place to register changes in the profile of diseases caused by exposure to silica that can be addressed from different perspectives:

1. *Sources of exposure*: in 1999, at the peak of the construction boom, Spain was the world's highest producer of granite and slate, and in 2004, 24 000 workers were employed in this sector. The extraction and exploitation of these rocks was the greatest source of silica exposure during the years prior to the economic crisis. In the 1990s, quartz conglomerates, composed of crystalline silica, mainly quartz and smaller amounts of cristobalite, dyes, and acrylic resins, were introduced. The range of colors and resistant properties of these materials led to their widespread use in kitchens and bathrooms, and exposure to silica increased across the country. Another new source of silica exposure is hydraulic fracturing (fracking) for gas and oil production. Significant exposure also continues in foundries, sand-blasting industries, and the production of abrasives and ceramics, and during the quarrying of sand and gravel (limestone, clay, sand, quartz, quartzite, etc.) and its use in concrete and road-building.
2. *Exposed workers*: exposure to silica is no longer mainly restricted to miners with well-paid, stable jobs in large companies located in certain geographic areas. The current profile now comprises workers in small companies scattered all over the country. Successive periods of growth and subsequent economic crisis have contributed to a deterioration in working conditions and health monitoring.
3. *Preventive measures:* several epidemiological studies have called into question the effectiveness of the accepted limits of respirable dust set down in the regulations.[6] Similarly, in the early years of quartz conglomerate production, adequate health and safety measures for workers handling these materials were only introduced after the appearance of alarming cases of silicosis.[7]
4. *Diagnostic process:* a history of more than 10 years' exposure, along with a characteristic radiological and functional presentation in the absence of other symptoms, has been sufficient for medical experts to give a diagnosis with a high degree of certainty.[8] Changes in occupational exposure, the development of severe, atypical forms of the disease in young individuals, and management by physicians unfamiliar with silicosis have led to the indiscriminate use of high-resolution computed tomography. This technique can help identify very early radiological patterns, but the data are still insufficient for evaluating the pathological and prognostic relevance of these findings.[9] New endoscopic techniques and the development of mineralogical analysis of tissue samples have led to the characterization of new presentations.
5. *Effects of crystalline silica inhalation:* the main pathogenic effect of the sustained inhalation of silica is the development of silicosis. Different entities among the spectrum of diseases caused by silica or coal dust can be detected with the latest diagnostic procedures, and include cases of diffuse interstitial fibrosis

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with a very similar radiological pattern to the usual interstitial pneumonia associated with idiopathic pulmonary fibrosis,[10] granulomas similar to sarcoidosis, as well as the conventional silicosis nodules and forms of desquamative interstitial pneumonia.[11] In exposed individuals, particularly smokers, who develop lung cancer or chronic obstructive pulmonary disease, some effort is required to recognize the carcinogenic effect of silica[12] and its effect on the rapid decline in lung function[13] (much weaker than smoking), and to assess the individual causal attribution of either deleterious substance.

Silicosis is an old disease which, to paraphrase the Italian writer Lampedusa, is changing in order to stay the same. To bring about real change, the most urgent measures required are the following: the incorporation of standardized reading of high-resolution computed tomography images,[14] standardization of diagnostic procedures based on longitudinal studies which show the significance of early findings, research focused on the use of antifibrotics already used in idiopathic pulmonary fibrosis, a search for new therapeutic targets based on knowledge of the inflammasome,[15] generalized use of new methods for the detection of latent tuberculosis infection, and the rigorous application of preventive measures in all the industrial sectors mentioned above. It is also essential to pass on the accumulated body of knowledge to young pulmonologists and to stimulate their interest in preventable diseases that remain a problem in our environment.

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