EDITORIAL

Diagnosis of Respiratory Diseases Caused by Asbestos

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Amianthus (from the Greek word for "undefiled") and asbestos (from the Greek word for "inextinguishable") are 2 terms used to designate a group of 6 fibrous minerals present in nature and known since antiquity for their resistance to heat, abrasion, and chemical attacks, and also for their low electrical conductivity and insulation properties. These "magic" minerals were also inexpensive; consequently, they were widely used in industry between the 1940s and 1990s, with use peaking between 1960 and 1984. In the 20th century, Spain imported 2.4 metric tons of asbestos for use mainly in the fiber cement industry (77%) but also for use as insulation (4%), in packaging materials and cardboard (5%), and in friction pads, filters, and spare parts.[1] From a mineralogical point of view a distinction is drawn between 2 types of asbestos fibers on the basis of chemical structure, biopersistence, and physical characteristics: amphibole asbestos (crocidolite, amosite, tremolite, actinolite, and anthophyllite), and serpentine asbestos (chrysotile).[2] The bulk (90%) of Spanish asbestos imports has been made up of chrysotile, which has short, curly fibers that are more easily eliminated than amphibole fibers.

The health dangers of asbestos have been widely proven and are beyond doubt. The inhalation of asbestos fibers can cause—in descending order of frequency—nonmalignant pleural disorders, lung cancer, malignant mesothelioma, and asbestosis, not to mention neoplasms outside the lung.[3] The growing number of individuals with asbestos-related diseases, the absence of a minimum risk-free exposure threshold, the difficulties associated with ensuring reliable protection in workplaces, the availability of alternatives, and significant social pressure all gradually gave rise to the introduction of progressively more restrictive regulations governing asbestos use,[4] to the point where asbestos is now banned in Europe[5] and the United States of America. However, Russia, Canada, China and Brazil, and also Zimbabwe and a few other developing countries continue to mine asbestos, and annual residual production is estimated to be over 2 million tons.

The risk of developing an asbestos-related disorder increases with cumulative exposure, the inhalable size of fibers, and the degree of fiber biopersistence.[6] In general, diseases manifest themselves following a latency period of at least 20 years after initial exposure, so despite the current bans, disorders associated with the inhalation of asbestos continue to occur as a direct consequence of widespread asbestos use in the past. It is therefore important to remain alert, particularly in terms of identifying asbestos products already installed, checking the state of conservation of asbestos-containing materials, using suitable protective measures in demolition works, and diagnosing disorders in workers who have been exposed to asbestos. The main source of exposure nowadays is asbestos-containing products in a poor state of conservation. As asbestos products deteriorate, they release fibers; consequently, when it is decided not to remove them entirely, they have to be sealed and isolated from the environment. When asbestos removal is indicated, furthermore, workers should insist on strict application of all stipulated health protection measures.[7]

As for data on the prevalence of asbestos-related disorders, according to estimates based on cohorts of workers in 6 countries in Europe, mortality rates for mesothelioma will remain high until 2015.[8] Nonetheless, a study based on data drawn from 118 cancer registries in 25 European countries pointed to broad variations in the incidence rate once standardized by age and geographic origins; thus, annual rates for men aged between 40 and 74 years ranged from 8 cases per 100 000 individuals in England and the Netherlands to fewer than 1 case per 100 000 individuals in Spain.[9] This large difference in incidence between countries with a similar level of industrialization would indicate that disorders associated with asbestos are failing to be diagnosed. The low diagnostic frequency of asbestos-related disorders in publications referring to Spain as a whole[10,11]—in direct contrast with the steady flow of notifications to the Catalan registry of occupational diseases[12]—would support this hypothesis. A low degree of suspicion and deficiencies in compiling data on previous workplace exposure to asbestos are 2 possible reasons for the low level of diagnosis.[13]

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Although the therapeutic margin for disorders caused by asbestos is narrow, the recording of a diagnosis that points to cause has important repercussions both at the individual level (in regard to financial compensation and disease prevention by managing synergistic factors such as smoking), and at the population level (in regard to epidemiological monitoring of the disease). It has to be remembered that if there is no record of a history of asbestos exposure, it may not be possible to make a diagnosis because the clinical picture is very often nonspecific. One example is the interstitial pneumonia that is typically associated with asbestosis; another is malignant epithelial mesothelioma, which can be difficult to distinguish from metastatic adenocarcinoma in histologic terms. The pathologist needs to be notified by the patient's physician of any history of exposure to asbestos so that immunohistochemical tests can be run that will enable a differential diagnosis. In patients with lung cancer, although asbestos is a risk factor, the disease is indistinguishable from that caused by other risk factors; nonetheless, knowing the level of exposure is essential for it to be recognized as an occupational disease.[14]

A crucially important aspect of a clinical history is its capacity to accurately reflect the patient's actual level of exposure to asbestos. However, there is little guidance available in this regard in the medical literature. A simple question to the patient along the lines of "Have you ever come into contact with asbestos?" would not discriminate adequately between exposed and unexposed individuals.[15] What is ideally required is a detailed listing of all previous employments in chronological order, including activities, ventilation conditions, and preventive measures; during questioning, it can be helpful to consult a list of jobs associated with asbestos exposure. That said, even when a clinical history is exhaustive, determining exposure is difficult since it largely depends on the patient's knowledge and recall. Many people are not aware that they may have been exposed at some point to asbestos and others simply do not remember if they were. These are also issues when determining environmental and domestic exposure. If a patient's employment implied risk but the patient fails, for whatever reason, to report this, the physician—possibly with the assistance of a hygienist—can make an estimate of exposure.

A direct approach to measuring previous exposure, which in turn provides an assessment of the extent of risk, is to analyze asbestos content in the lung. Optical microscopy can detect asbestos deposits as ferruginous bodies (FBs), formed when asbestos is coated by ferrous material inside macrophages. Values above 1000 FBs per gram of dry lung tissue or 1 FB per milliliter indicate workplace exposure that is evaluable in a lung biopsy or bronchoalveolar lavage, respectively.[16] An electron microscope is required to detect asbestos fibers; the chemical composition of fibers (and, consequently, the type of asbestos) can be determined using one of a number of alternative techniques available for analyzing asbestos samples (for example, energy dispersive x-ray analysis). These techniques require suitably trained personnel to prepare samples and count fibers or FBs. Each laboratory should apply reference values in accordance with the patient's particular population. It therefore seems logical that asbestos content in lungs should be determined in specialist centers.

As for patient management, it must be decided which patients require an analysis of lung asbestos content and which analytical technique to use. Analysis will not be necessary if the patient's report of exposure is reliable or if the cause of the disease is specific to asbestos—as occurs with malignant mesothelioma. Nonetheless, it often happens that the manifestations of the disease are nonspecific, or it may be the case that incomplete or imprecise information obtained by the physician may not coincide with the symptoms or with the radiograph of the patient. A study of asbestos retained in the lung is undoubtedly useful in such cases. Another key issue is that asbestosis, malignant mesothelioma, lung cancer, and, more recently, pleural and pericardial fibrosis with restriction, in patients with evaluable exposure to asbestos in workplaces have been classed as occupational diseases for which patients are eligible for financial compensation.[17] Detection of asbestos fibers in the lungs of individuals with lung cancer or interstitial lung fibrosis could allow the disease to be attributed to occupational exposure to asbestos, even if other risk factors (smoking for example) are present or estimated cumulative exposure is below the threshold of 25 fibers per milliliter per year.[18] Conversely, the absence of fibers would indicate that the disease is not caused by exposure to asbestos. In a recent study,[19] subjects from the general population and lung cancer patients were administered an exhaustive questionnaire on occupational, domestic, and environmental exposure to asbestos. Levels of exposure for the 2 groups were compared by determining lung FB counts. Questionnaire sensitivity and specificity to detecting FB deposits composed of 1000 or more FBs per gram were 86% and 66%, respectively. Although a finding of higher levels of asbestos in the lung indicates exposure, negative values do not necessarily rule out exposure to chrysotile because exposure to this type of asbestos does not necessarily leave traces in the lungs.

Another issue of practical importance is deciding how to obtain tissue samples for analysis. For patients with diffuse lung disease or pleural lesions or for lung cancer patients who are candidates for surgery, bronchoscopy with bronchoalveolar lavage is recommended as there is good correlation between the number of FBs in the bronchoalveolar lavage and in the lung.[16] As for patients with resectable lung cancer, it is a simple matter to set aside a fragment of tissue for analysis of asbestos content.

In conclusion, the most difficult aspect of the diagnosis of disorders associated with asbestos continues to be the question of determining whether or not a patient has been exposed. A priority in terms of improving diagnosis is to provide training to both primary and specialist care physicians in collecting employment history data so as to be able to pinpoint or rule out asbestos as the cause of a disorder.[20] Furthermore, as has been done in other countries, Spain needs to designate specialist centres for certifying exposure by means of analyses of asbestos content in the lungs.

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