ARCHIVES OF HELLENIC MEDICINE: ISSN 11-05-3992

CONTINUING MEDICAL EDUCATION
ΣΥΝΕΧΙΖΟΜΕΝΗ ΙΑΤΡΙΚΗ ΕΚΠΑΙΔΕΥΣΗ

Surgery Quiz – Case 46

ARCHIVES OF HELLENIC MEDICINE 2023, 40(5):716–717
ΑΡΧΕΙΑ ΕΛΛΗΝΙΚΗΣ ΙΑΤΡΙΚΗΣ 2023, 40(5):716–717

A. Skarpas,
M. Karakeke,
E. Kapasakis,
C. Floros,
V. Kyriakidis,
E. Karakeke,
K. Athanasiou,
A. Kyriakidis

Department of Surgery, General Hospital of Amfissa, Amfissa, Fokis, Greece

A 70-year-old male patient scheduled for a surgical mesh repair of a right inguinal hernia, presented at the regular outpatient clinic. During the required examinations (blood tests, electrocardiogram [ECG], chest X-ray) for his administration into the hospital, a rare finding was revealed on his chest x-ray (fig. 1). There were no other complaints from the patient aside from his right inguinal hernia. His past medical history revealed that he worked as an officer in charge of tank supervision for a petrol company.

Comment

Man has used asbestos for many centuries. The first references to asbestos were traced to various ancient philosophers. Theophrastus, one of Aristotle's students refers to a substance, which resembles rotten wood, and when you wash it with petrol it will burn without suffering any damage. It was a Greek doctor named Dioskouridis, who first gave the name "Amiantus" meaning "undefiled", so as to reflect its resistance, to fire. Asbestos is not flammable, it has a large mechanical strength and has good friction properties. It's a good thermal and electrical insulator and has strong and flexible properties. There are two large groups of asbestos serpentine and amphibole. The group of serpentine includes the most commonly used minerals, such as white asbestos while amphibole group includes various types of fibres such as crocidolite (blue asbestos), amosite (grey asbestos), tremolite, actinolite and anthophyllite. Tremolite exists in nature in various forms and this seems to be of importance for the type of disease it causes. A significant number of factors link the development of malignant mesothelioma with occupational and environmental exposure to tremolite fibres and actinolite. The chemical and physical properties of serpentine and amphibole asbestos are considered in the context of their interaction with tissue of the tracheobronchial tree and lungs.

Figure 1

Since 1969 and onwards, there was a high incidence of endemic pleural calcifications to residents of three villages (Metsovo, Milea, Anileo), built on sandstone rocks in a mountain region of northwestern Greece, where there were no reports of industrial use of asbestos. In 1985 Bazas et al reported pleural calcifications of the people of these three villages had increased by almost 5% annually during the last ten years. In 1987 the radiological examination of 688 residents of the area of Metsovo in northwestern Greece revealed that 323 (46.9%), had pleural calcifications. The percentage of positive tests increases in regards with the age. Calcifications were observed in the three villages of the area, where a mineral from the soil had been used extensively for the whitewashing of the houses till 1950. Calcifications were observed in both sexes, equally. Their frequency increases with age from 28.6% between 30 and 39 years old to 81% in individuals over 70 years old. When the development of the plaque was extensive, there was also a small regional deficit and restriction in the lung. Because of its prevalence in the region of Metsovo, this entity was named "Lung of Metsovo".

The determination of the tremolite, and traces of chrysotile fibres in powders, in samples of soil, but also in tissue samples taken

with lung biopsy from eight individuals with calcification plates, support the hypothesis, that the minerals were responsible for the progression of the disease.

The soil was mined from the nearby hills and was rolled into a ball. The women of Metsovo would then smash these "canon sized" balls into fine powder which they boiled and then painted their house walls. During the crushing, large number of fibres were released into the environment. They would paint their inner walls and especially around the fireplace, because "the wall will not turn black" from the fire. This exposure differs from the "usual" occupational exposure in different aspects. The main differences are: (a) The exposure was starting at a very young age, (b) it wasn't continuous, and (c) it could reach extreme values during the "crushing" process.

The tremolite of Metsovo may have caused pleural calcifications in all the people born in Metsovo before 1940. This research was facilitated by the fact that it was about two neighbouring populations with similar way of life, similar professions and similar residences, had one difference: one population used this traditional soil whitewashing while the rest of the villages did not. Another point that helped the study was the brief period of time, from 1960 to 1975, the use of this soil was dramatically decreased. In addition, they were in a position to identify same age groups, but different period of exposure and show that there is a correlation between the dose of the soil and the pleural calcifications.

Another research in 1987 by Constantopoulos et al showed that between 1981 and 1985, 7 patients from these villages from the area of Metsovo (population 5,000) developed pleural mesothelioma (PME). The diagnosis was performed with pleural biopsy and cytological examination of the pleural fluid. Six of the patients died within 18–24 months after the first symptoms (usually shortness of breath, fatigue), and only one patient remained alive after 24 months. Seven cases of mesothelioma in a population of 5,000 inhabitants within five years is about 280 times above the expected frequency of occurrence (1/1,000.000/year). However, none of the patients had pleural calcifications. The combination of mesothelioma and pleural calcifications at such a high frequency in the same region, led to the conclusion that asbestos fibres were the common causative factor. On the other hand, the fact that their combination does not present to the same person, shows a different response to this common factor. Transbronchial biopsy in patients with disease containing tremolite fibres where similar to those found in lung tissues of people with "Metsovo Lung". This enhanced the hypothesis that the cytotoxicity of this fibre is the cause of "Metsovo Lung" and mesothelioma.

Similar findings (endemic pleural calcifications and high incidence of Mesothelioma) were reported in a few more regions of Greece: Distrato, Karditsa, Megarchi, Trikala-Mousaki, Serres, Evia, Pella. Like Metsovo, these regions are located on similar materials of soil, like the one in Metsovo. These findings showed that the "Metsovo Lung" appears in several regions of Greece, and has similar rationale and epidemiology.

Epidemiological data confirm the risks of pleural calcification and malignant pleural mesothelioma associated with non-occupational exposure to asbestos, especially in the area of Metsovo-Greece.

References

1. BAZAS T, OAKES D, GILSON JC, BAZAS B, McDONALD JC. Pleural calcification in northwest Greece. *Environ Res* 1985, 38:239–247
2. CONSTANTOPOULOS SH, GOUDEVENOS JA, SARATZIS N, LANGER AM, SELIKOFF IJ, MOUTSOPOULOS HM. Metsovo lung: Pleural calcification and restrictive lung function in Northwertern Greece. Environmental exposure to mineral fiber as etiology. *Environ Res* 1985, 38:319–331
3. SAKELLARIOU K, MALAMOU-MITSI V, HARITOU A, KOUMPANIOU C, STACHOULI C, DIMOLIATIS ID ET AL. Malignant pleural mesothelioma from nonoccupational asbestos exposure in Metsovo (North-west Greece): Slow end of an epidemic? *Eur Respir J* 1996, 9:1206–1210
4. CONSTANTOPOULOS SH, SARATZIS NA, KONTOGIANNIS D, KARANTANAS A, GOUDEVENOS JA, KATSIOTIS P. Tremolite whitewashing and pleural calcifications. *Chest* 1987, 92:709–712
5. CONSTANTOPOULOS SH, MALAMOU-MITSI VD, GOUDEVENOS JA, PAPATHANASIOU MP, PAVLIDIS NA, PAPADIMITRIOU CS. High incidence of malignant pleural mesothelioma in neighbouring villages of Northwestern Greece. *Respiration* 1987, 51:266–271
6. LANGER AM, NOLAN RP, CONSTANTOPOULOS SH, MOUTSOPOULOS HM. Association of Metsovo lung and pleural mesothelioma with exposure to tremolite-containing whitewash. *Lancet* 1987, 1:965–967
7. CONSTANTOPOULOS SH, THEODORACOPOULOS P, DASCALOPOULOS G, SARATZIS N, SIDERIS K. Metsovo lung outside Metsovo. Endemic pleural calcifications in the ophiolite belts of Greece. *Chest* 1991, 99:1158–1161
8. SICHLETIDIS L, DASKALOPOULOU E, TSAROU V, PNEVMATIKOS I, CHLOROS D, VAMVALIS C. Five cases of pleural mesothelioma with endemic pleural calcifications in a rural area in Greece. *Med Lav* 1992, 83:326–329
9. SICHLETIDIS L, DASKALOPOULOU E, CHLOROS D, VLACHOGIANNIS E, VAMVALIS C. Pleural plaques in a rural population in central Macedonia, Greece. *Med Lav* 1992, 83:259–265

Corresponding author:

A. Skarpas, Department of Surgery, General Hospital of Amfissa, 331 00 Amfissa, Fokis, Greece
e-mail: andrewskarpas@gmail.com