SARCOIDOSIS VASCULITIS AND DIFFUSE LUNG DISEASES 2014; 31; 262-264

Wire brushing wood furniture, granulomatosis and microscopic mineralogical analysis

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Introduction

There is increasing evidence that sarcoidosis can occur in workplaces in which there is exposure to inorganic triggers (1-3). Moreover, transmission electron microscopy (TEM) and energy dispersive X-ray (EDX) analysis may contribute to identifying micro and/or nanoparticles in granulomatous tissues (4-6) and, out of the workplace, hobby activities may also involve dangerous exposure. Our case shows the possibility of correlating abnormal exposure and inorganic particles identified in granuloma by TEM and EDX analysis.

Ms. Ma, born December 28, 1946, of Caucasian origin, was admitted to internal medicine in 2010 at CH St Joseph St Luc (Lyon) for polyadenopathy supra- and sub-diaphragmatic reappraisal. A diagnosis of sarcoidosis was established 35 years ago, in front of mediastinal adenomegaly and middle lobe opacity, and treated for several months with corticosteroids. She also presented with chronic renal failure, hypertension, thromboembolic disease with a protein C deficiency, chronic cardiomyopathy, COPD in the context of smoking at 60 pack-years. In 2010, the patient contracted a bronchial infection accompanied by hemoptysis. Bronchial endoscopy was negative and tomodensitometry (TDM) found a stable middle lobe opacity and calcified mediastinal lymph nodes. PET-CT scanner showed the absence of formally suspected tumor but the presence of numerous and large hypermetabolic adenomegalies suspect of lymphoma in the absence of identifiable primary neoplasm. Sub-diaphragmatic adenopathy biopsy revealed non-necrotizing granulomas with epithelioid cells and multinucleated giant cells according with a sarcoidosis diagnosis. However, it was noticed that some epithelioid cells presented granular materials. The patient was transferred to pneumology for coticotherapy discussion. After deeper inquiry, the patient admitted using, every week for more than forty years, sand paper and wire brush to polish wood furnitures as a hobby without any protection. A mineralogical analysis was undertaken by our laboratory.

Methods

Histological slides of lymph node biopsy were examined with a petrographic light microscope (Zeiss® Axioskop A1) fitted out with a camera (Zeiss® AxioCam ICc3). Particles are observed in natural light while anisotropic particles are detected in polarized light at maximum brightness. The mi-

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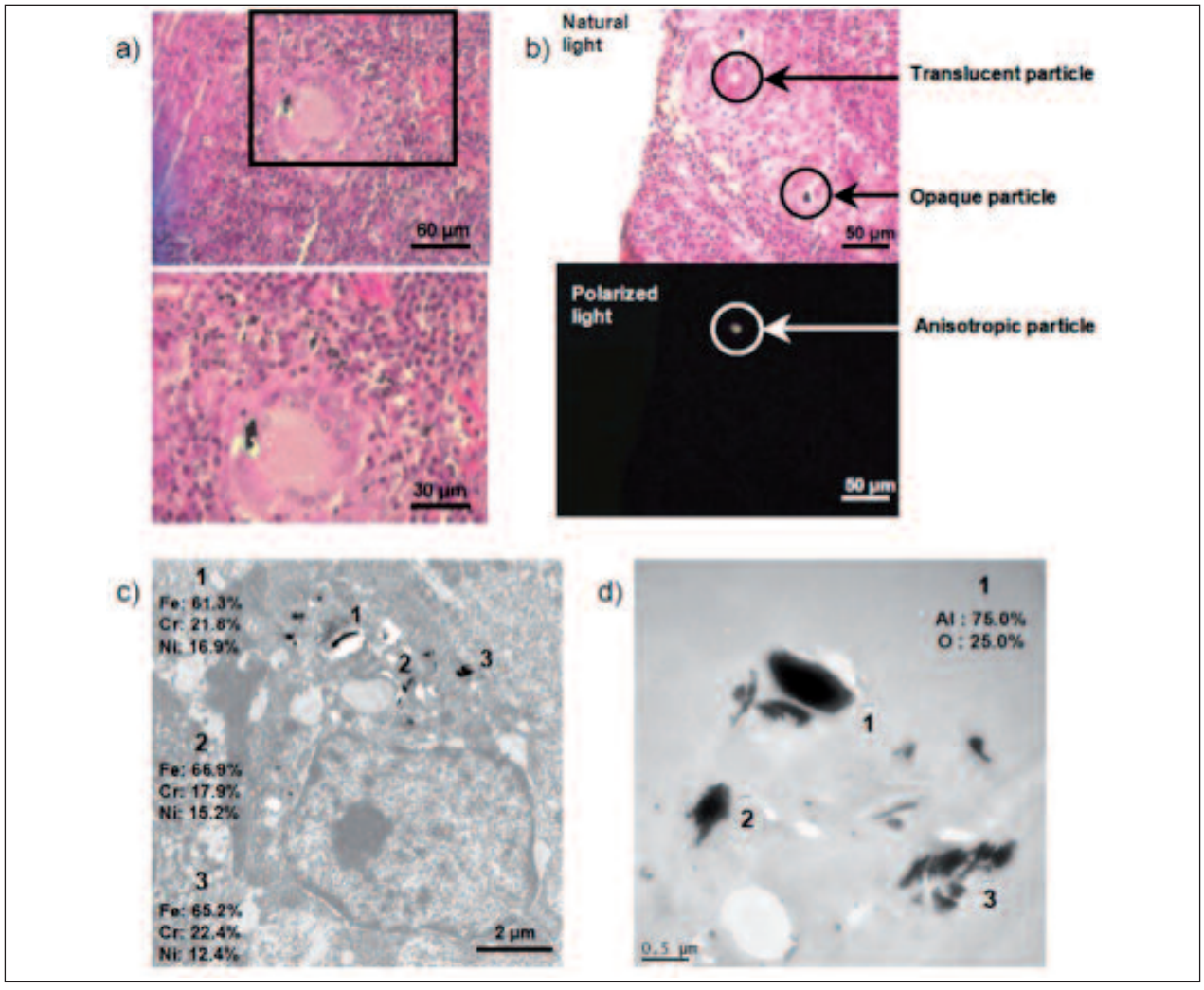

Fig. 1. a) Photographs of histological section of the lung biopsy lymph node, HES colored and at magnification to x200 and x400. b) Photographs of histological section of the lung biopsy lymph node, HES colored, at magnification to x400 by natural and polarized light. c) TEM photograph (magnification x12,000) of histological section contrasted with uranyl acetate of the lung biopsy lymph node and microanalysis of three particles. d) TEM photograph (magnification x30,000) of histological section of the lung biopsy lymph node not contrasted and microanalysis of particle n. 1.

neralogical analysis was performed using a transmission electron microscope (TEM Jeol 1400 EX, 120 kV) equipped with a CCD camera (Gatan Orius 600) and an energy X-ray analyzer (Jeol JED-2300). One hundred particles larger than 0.1 µm in size and encountered during a screening at a magnification of x 30,000 were counted. Particles were sorted and classified using the major elemental components in their X-ray spectrum in different groups: silicates, steel, silica, calcite, iron oxide, aluminium oxide, titanium oxide.

Results

The optical microscopy observation of histological slides at natural light highlights the presence of particles. Figure 1a shows a picture of a giant cell wherein an opaque particle of about 15 µm in length and 6 µm in width is trapped. Increased magnification allows us to visualize, above the giant cell, a cluster of many opaque particles ranging in size from several hundred nanometers to about 3 microns. An examination under polarized light at maximum light

intensity reveals the presence of anisotropic particles (Figure 1b).

Figure 1c, which is a TEM photograph of a histological section of the lymph node biopsy, shows the presence of particles smaller than 1 μm trapped within a cell. Microanalysis performed on the three particles of the photograph shows that they are composed of iron (64.5% ± 2.9 S.D), chromium (20.7% ± 2.4 S.D) and nickel (14.8% ± 2.3 S.D) which correspond to the mineral composition of steel. In figure 1d, particle 1, whose composition is expressed as a percentage at the corner of the picture, is an aluminum oxide. Microanalysis of 100 particles randomly taken from the histological section of the lymph node biopsy has been completed. The major portion of the particles corresponds to silicates (48%) and a significant portion is made up of steel particles (32%). The other particles are silica (8%), iron oxides (5%), aluminum oxides (3%), calcite (2%) and titanium oxides (2%).

Discussion

On the whole, this case seems to be a granulomatous disease caused by regular inhalation of steel particles (supposed to come from metal polishing brushes) and Al_2O_3 particles (supposed to come from the corundum contained in sandpaper). As described in "Silicosis" by Salvin et al. (7), inhaled particles could migrate in sub-diaphragmatic lymph nodes. Mineralogical analysis, by allowing to establish a link between granulomatosis and excess of steel particles and aluminum oxide, tends to redirect the sarcoidosis diagnosis into one of pneumoconiosis. It has been described in the literature of cases of granulomatous lung by inhalation of aluminum (8) as well as cases of contact granulomatosis caused by the release of steel particles by prostheses (9), but it is the first recorded case related to disseminated adenopathies. It convinces us that a professional and environmental inquiry targeting mineral dust exposures should be routinely submitted to patients with suspected sarcoidosis. Such a questionnaire is being devised as part of the ERC Advanced Grant project "SILICOSIS" directed by P.-A. Rosental (Center of European Studies – Sciences Po- Paris) (10). The identification of an abnormal exposure may be correlated with *in situ* TEM and EDX analysis.

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