BRIEF NOTE

Observations on a Case of Probable Bone Marrow Anthracosis

By DAVID MILLER

ALTHOUGH THE DEPOSITION of mineral dusts in extrapulmonary sites, especially in the lymphatic drainage of the liver and in the spleen, is known to occur in the pneumoconioses, the finding of such material in bone marrow aspirates taken for routine examination has not, to my knowledge, been reported. In the following case prominent focal accumulations of a dense black particulate material were found in specimens of marrow taken both from the sternum and the iliac crest. The material could not be conclusively demonstrated as being of anthracotic origin but histochemical studies were entirely consistent with its being carbon in composition.

CASE REPORT

The patient was a colored man, 85 years of age, admitted to the Barnes Hospital with symptoms of congestive heart failure due to arteriosclerotic heart disease and subsequently found to have a severe hypochromic anemia due to occult blood loss from the intestinal tract. Although he had worked over 40 years in the manufacture of bricks and had a very heavy exposure to mineral dusts, he specifically denied any prolonged contact with coal dust. Repeated roentgenograms of the chest showed only cardiomegaly and pulmonary congestion.

Because of the anemia, aspiration of the sternal marrow was performed. This yielded abundant clumps which were normally cellular and which showed a complete absence of stainable iron with the Prussian blue reaction. A striking finding was the presence of large aggregates of dense black particulate material distributed in the marrow clumps as shown in figure 1. A second aspirate from the sternum and one from the iliac crest showed an identical picture. It had at first been suggested that the pigment might be charred, dried blood originating from improperly cleaned equipment and special care was taken in the repeat aspirations to rule out this possibility by careful attention to the cleanliness of the needles and syringes.

Despite a thorough search for the source of the patient's gastrointestinal bleeding, no lesion was found. After improvement had been effected in his cardiac status he was discharged from the hospital on oral iron therapy, and plans were made to follow him as an outpatient.

Sections of the marrow clot which had been fixed and decalcified in Zenker's acid fixative and stained with hematoxylin and cosin showed the clumps of pigment to consist mainly of numerous fine black particles aggregated in phagocytic reticulum cells, as

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shown in figure 2. Examination of the fresh unstained clumps with the polarizing microscope failed to demonstrate any birefringent material in or adjacent to the foreign particles. Presumptive identification of the material as carbon was based on its disappearance from sections following microincineration and its persistence after exposure to concentrated sulfuric acid.\(^1\)

**DISCUSSION**

The pathogenesis of mineral dust accumulation in the bone marrow with special reference to anthracosis has been discussed in detail by Askanazy.\(^2\) In autopsy studies of anthracosis he occasionally found the pigment widely distributed in the reticulum cells of the bone marrow as well as in the liver and spleen, a condition he referred to as “Kohlenmetastase.” In his discussion

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*Fig. 1 (above).—Unstained wet preparation. Original × 480.*  
*Fig. 2 (below).—Section of marrow. Zenker’s fixative. Hematoxylin and eosin. Original × 470.*
he cited the conflicting ideas of Weigert and von Recklinghausen as to the mechanism by which the anthracotic material is disseminated from the sites of its initial deposition in the pulmonary lymphatics and hilar lymph nodes. Although von Recklinghausen stressed retrograde lymphatic spread, Weigert felt that the pigment was introduced into the bloodstream by rupture of involved hilar nodes into pulmonary vessels and was subsequently taken up by the cells of the reticuloendothelial system. Askanazy favored this last concept of a hematogenous dissemination as best accounting for the ultimate widespread distribution of the pigment, not only in the liver and spleen, but also in such distant sites of the bone marrow as the long bones of the extremities. He mentioned autopsy studies providing evidence that the erosion of anthracotic nodes into the major pulmonary vessels may occur without symptoms and perhaps repeatedly over long periods of time. He also noted many experimental studies on the sequence in which injected foreign particles are cleared from the blood by the reticuloendothelial system with initial uptake in the sinusoidal endothelium followed by deposition in tissue reticulum cells and eventual redistribution to form larger aggregates. The histologic similarities between the autopsy material in anthracosis and the experimental material provide further support for a hematogenous mechanism.

In the present case the absence of demonstrable pulmonary involvement and of a history of exposure to coal dust makes the identification of the marrow pigment as anthracotic in origin only presumptive. On the other hand the microscopic appearance of the substance and its behavior on microincineration and treatment with strong acid is consistent with its being carbon. The appearance of the fixed section is actually very similar to the figure published by Askanazy. Furthermore, the patient's serologic test for syphilis was negative and he denied ever having been treated with injections of heavy metals. Lastly, demonstration of the material in two widely separated sites is in keeping with the concept that the phenomenon represents the reticuloendothelial uptake of blood-borne material.

**Summary**

A case is described in which marrow aspiration demonstrated a foreign material which is presumed to be carbon on the basis of its appearance and resistance to the action of strong acid. The resemblance to a previous description of anthracosis involving the bone marrow is noted.

**Summario in Interlingua**

Es describite un caso in que aspiraciones de medulla ossee demonstrava le presentia de un materia estranie, identificate presumptivemente como carbon super le base de su apparentia e de su resistentia contra un forte acido. Es notate le similaritate de iste caso con illo de un previe description de anthracosis afficiene le medulla ossee.
PROBABLE BONE MARROW ANTHRACOSIS

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REFERENCES

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