

ABRAMS (A.)

Pulmonary atelectasis  
as a Cause of Anemia.

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# PULMONARY ATELECTASIS

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## Cause of Anemia

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In this paper I will discuss anemia not as a substantive, but as a symptomatic affection. I have referred elsewhere\* to cases of anemia occurring in individuals, the examination of whose lungs showed insufficient distension (atelectasis). Since then, my observations have been supplemented by accurate blood measurements, which enable me to assert positively, that atelectasis of the lungs is a frequent factor in the etiology of anemia. Atelectasis, or collapse of the lung, is often encountered as a physiological condition, and I have adverted to it in my "Manual of Clinical Diagnosis"† as follows:

"Remembering that the tidal or breathing volume of the air amounts to only 33 cubic inches, and the complementary air, which is the air taken into the lungs by forced breathing, in addition to the tidal volume, amounts to 100 cubic inches, and knowing that the average respiratory capacity of an adult is about 225 cubic inches, the conclusion is evident, that even in a state of health, the lungs are imperfectly aerated and in a condition of *physiological atelectasis*.

"My invariable custom before conducting an examination of the lungs is to have the patient make repeated forced inspirations. In this way I avoid many errors in auscultation and percussion."

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† Manual of Clinical Diagnosis, Abrams, 1891.

\*Report of 163 cases treated by the Pneumatic Cabinet, *Pacific Medical Journal*, September, 1891.



I have particularized this matter for the reason, that I have failed to find similar detailed reference to physiological atelectasis in our text-books on diagnosis. I can recall a number of cases where an examination of the lungs revealed dullness in one or both apices and where an unfavorable prognosis was given in accordance with the physical examination. I can also testify with chagrin that these very cases which I considered so unfavorable continued well despite my inauspicious prognostications. These errors in diagnosis are examples of similar errors made by other physicians, and will continue to be made until pulmonary atelectasis is recognized as a physiological condition. I have repeatedly demonstrated patients to my classes in physical diagnosis who showed not only circumscribed dullness of the apices or borders of the lungs, but even, in fact, of an entire lung; and it was shown in these cases how, after repeated forced inspirations, dullness was supplanted by resonance. These cases were not recruited from bed-ridden individuals, in whom such a condition might be expected, but from ambulatory patients. There is no individual, however resonant his lungs on percussion, who cannot render them more resonant after repeated deep inspirations. If atelectasis is found as a physiological condition in robust individuals, how much more frequent is it in those individuals with incomplete thoracic development who forego all hygienic influences which tend to promote proper respiratory activity? The occurrence of anemia with its concomitant symptoms in pulmonary atelectasis is not accidental, but almost constant. The blood is a definite living tissue whose chemical composition is almost constant. By means of the blood the constituent elements of the body are furnished with the nutrient substances and the oxygen they require; both are derived from without, the former from the alimentary tract, the latter, through the lungs. The entrance of oxygen into the blood is necessarily influenced by the vascular area exposed to the air, which in pulmonary atelectasis is of course diminished. The excretion of carbonic acid from the blood must for the same reason be impaired. Then again, the excretion of organic matter during expiration is interfered with, the accumulation of which in the blood conduces to auto-intoxication. The symptomatic complex, of individuals with collapse of the lung, based on an analysis of 25 cases, is as follows: hæmoglobin (estimated with Fleischl's hæmometer) is reduced to 50 per cent or lower; the red blood corpuscles are diminished in number. The reduction of hæmoglobin and in the number

of red blood corpuscles is proportional to the area of lung collapsed.

Fatigue on exertion, shortness of breath, palpitation of the heart, loss of appetite, and constipation are the usual subjective symptoms.

On inspection diminished movements of the thorax are noted. Percussion of the lungs shows diminished resonance throughout; the apices may show dullness on percussion and circumscribed areas of dullness are often found in the interscapular regions, particularly on the right side. The upper lobe of the left lung adjacent to the manubrium sterni is a frequent seat of dullness.

Auscultation shows on quiet respiration an absence of respiratory sounds over the dull areas, while over the entire lung the respiratory murmur is diminished. When the patient is instructed to take deep inspirations, atelectatic crepitation is heard. The diagnosis is usually easy; repeated forced inspirations cause a disappearance of the dullness and a reappearance of respiratory sounds. All my cases showed almost immediate improvement after the inhalation of relatively compressed air by means of the pneumatic cabinet. The improvement in pulmonary atelectasis was phenomenally rapid and occurred in some of the cases after three or four sittings.

The color of the patients improved, the hæmoglobin and red corpuscles increased, and the subjective symptoms of anæmia disappeared.

If relapses occurred, which were not infrequent, they were attributed in the main to neglect of lung gymnastics and a return to former modes of life. In a few cases nasal obstruction led to relapses. In this connection reference must be made to the investigations of Holbrook Curtis,\* who demonstrated, that all patients with nasal stenosis were anemic, and after removal of the obstruction the cases were cured.

In cases where nasal obstruction cannot be removed the simple expedient of having the patient breathe through the mouth may be adopted.

Although I have used the pneumatic cabinet for the treatment of pulmonary atelectasis, I am thoroughly convinced that no special apparatus is required if the patient is properly taught to make repeated voluntary forced inspirations.

In anemia of pulmonary origin the therapeutic action of

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chalybeates may be hastened by inhalations of oxygen. Oxygen is as essential an element of hæmoglobin as iron.

Sufficient oxygen for all practical purposes may be taken into the lungs provided no atelectasis is present, and forced inhalations will prove of great value in the treatment of anemia, although not of pulmonary origin.

Oxygen is now commonly used as a therapeutic agent in many diseases. The oxygen of the blood is chemically united to the iron, and is not subject to the law of absorption, and in consequence the exchange of gases between the gases of the blood and those of the air vesicles occurs almost exclusively through the agency of chemical processes, and therefore independently of the diffusion of gases.

When pure oxygen is respired, the blood does not take up more oxygen than when atmospheric air is respired. Inhalations of oxygen, nevertheless, do good, and this good is effected to my mind, not because pure oxygen is inhaled, but in consequence of repeated forced inspirations opening up normally collapsed lung areas and thus exposing a greater quantity of blood to the inhaled oxygen. The cachexia of individuals who suffer from cardiac valvular lesions is due largely to stasis in the lungs, the turgid vessels compressing the air vesicles. It can be shown that the blood of these individuals contains less hæmoglobin than normal, and that the hæmoglobin increases when the collapsed lung is opened by voluntary forced inspirations.

I know of no more simple means of relieving the dyspnœa of non-compensated valvular lesions under certain circumstances than by the inhalation of compressed air, the object being to dilate the collapsed areas of lung.

The following conclusions may be formulated :

1st.—Physiological atelectasis of the lung is a frequent condition.

2d.—It may be readily diagnosed by the presence of circumscribed areas of lung dullness, which disappear after repeated forced inspirations.

3d.—Physiological atelectasis of the lung is frequently associated with anemia.

4th.—In all cases of anemia of obscure origin, examination for physiological atelectasis of the lung should be made.

5th.—Anemia, due to physiological atelectasis, may be cured after inflation of the lungs.

6th.—Forced voluntary inspirations are an excellent substitute for inhalations of pure oxygen, and are of great value in anemia from whatever cause.



