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THE THERAPEUTIC USES OF THE PNEUMATIC CABINET,

BY

KARL VON RUCK, B. S. M. D.

Director Winyah Sanitarium for Diseases of the Lungs and Throat; Member American Climetological Association, American Public Health Association, etc., etc.

ASHEVILLE, N. C.

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Read by invitation before the Minnesota State Medical Society, June 20th, 1894.

During the continued use of this apparatus for nearly ten years, I have at various times had occasion to refer to it as a therapeutic agent in the treatment of pulmonary affections, in contributions to the medical literature on this subject.

At the present time I have neither anything to add, nor to subtract from what I have stated elsewhere, and only wish to call attention to the fact, that the apparatus does not find such use and application, especially with the general practitioner, as it should, since we have nothing in all the array and list of our therapeutic agents, that can in any way be substituted or take its place; while in the treatment of pulmonary disease, it alone can comply with very important indications, sometimes absolutely essential to the improvement and cure of the patient.

The Pneumatic Cabinet should be the more welcome to the scientific practitioner, because its application and the results therefrom depend entirely upon physical laws, and if we contemplate its use in a given case and leave nothing out in our equation, we can absolutely foretell the result.

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The mastery of its physics, a thorough knowledge of physiology and a correct appreciation of pathology in the particular case to be treated are of course prerequisite. The former is not difficult, and is excellently set forth in an exhaustive paper by Dr. Chas. Quinby, of New York, published in the transactions of the Am. Climatol. Ass. for 1892.

My available time scarcely sufficing to point out a few of its clinical advantages, I must be content in stating that the Pneumatic Cabinet is an air-tight chamber, large enough for a person to sit in and in which we can regulate the air pressure at will, and change or reverse it in the course of a single respiratory act.

A breathing faucet connects the interior with the outside air, and through an attached breathing tube the patient can breathe in and out, or both, under any pressure that we desire within the cabinet; while at the same time we can introduce sprays or vapor with each inspiration.

You can readily appreciate that many modifications of differential air pressure are thus possible. To illustrate the effects of excessive air pressure, I need only remind you of the spinal and cerebral symptoms in the so-called Caison disease, and of the hemorrhages likely to occur in very high altitudes, being coarse examples of *undesirable* effects; but it will not be difficult to understand, that when such forces are controlled, variously combined and judiciously applied, they can be made available in favorably influencing the circulation and respiration in a manner, so as to become of the greatest value in dealing with pathological conditions, not only of the respiratory and circulatory organs, but also, indirectly, of distant parts of the body.

For illustration, allow me to describe the necessary results of one of the various applications of the Pneumatic Cabinet.

The patient entering the chamber, the door is closed air-tight, and rarefaction, to the degree, let us say of one inch fall in the mercury manometer, is produced. We have thereby reduced the atmospheric pressure about half a pound upon the cutaneous and pulmonary surfaces.

Imprisoned air in the alveoli and bronchioles necessarily expands and seeks to discharge itself in the direction of least resistance; if this is outward and toward the larger bronchi, secretions are loosened and carried forward with it. At the same time, the diminished pressure upon the cutaneous and pulmonary vessels diminishes their tension, and a free flow of blood from the right heart to the lung, and from the left heart to the dilated cutaneous vessels, is the result; the labor of the heart is thus temporarily diminished and a gentle hyperaemia varying in degree with the diminished pressure takes place in the lung and in the integument.

The patient is now directed to put the breathing tube into his mouth, the faucet is opened and the comparatively heavier outside air enters the lung and compells a deep and full inspiration, the latter being deeper in proportion to the diminished pressure inside the chamber.

Thus the volume of inspired air is increased from 20 to 30 per cent. over the amount obtainable without differential pressure; the circulation in the lung is now again under the tension of ordinary air pressure and the necessary result upon the hyperaemic lung is, its depletion, in discharge toward the left heart, whence under the still diminished cutaneous pressure, the left ventricle can throw its contents easily and with diminished labor into the general circulation. Upon expiration into the rarefied air in the cabinet, the volume of expired air is also increased, the hyperaemia in the lung again returns and is again overcome by the next inspiration through the breathing tube.

Different effects may be produced upon the respiration, the heart and upon the lesser and greater circulation by, for instance, compressing the air in the cabinet during expiration, or during inspiration, or both. In the illustration quoted, we practically pump the blood from the right heart to the left heart, collapsed air-cells are reinflated, a better ventilation occurs, more blood is exposed to a greater lung surface, and a greater interchange of gases and better oxygenation of the blood must necessarily result, while the labor of the heart is

diminished. Expectoration is also favored and may be modified by the simultaneous inhalation of medicated sprays or vapors.

To formulate the most important effects obtainable by the thoughtful and judicious use of this instrument, they will be found as follows:

1st.—Increased nutritive changes; particularly in the lung, through its effect upon the circulation.

2nd.—Re-inflation and restoration of collapsed air-cells, but also retraction of the emphysematous lung tissue.

3rd.—Relief of congestion in the lungs and in distant organs, or increase in their blood supply.

4th.—Absorption of exudates and inflammatory products.

5th.—Better ventilation of the lungs and expulsion of secretions.

6th.—Increase of the respiratory forces, by strengthening of the respiratory muscles.

7th.—Increase of the vital capacity of the lung.

8th.—Strengthening of the heart, prevention of degenerative processes in its muscular fibres, restoration of lost compensation.

Some of the effects enumerated can also be accomplished by other means which may be used in preference, or as adjutants to the pneumatic treatment, according to individual judgment. I hold, however, that other things being equal, mechanical means, under absolute control, always deserve our preference over drug remedies.

Others of the effects mentioned cannot be produced at all without this apparatus, and of these I wish to speak a few words, especially in their relation to certain pulmonary affections, with which I have had the greatest experience in the use of the apparatus.

I pass its successful application in acute bronchitis, in acute hyperaemia or congestion of the lung, in pulmonary oedema and in chronic bronchitis, due to heart disease, either alone or in combination with cardiac drug remedies, in all these the Pneumatic Cabinet stands pre-eminent as a thera-

peutic agent, a fact which I have confirmed many times by clinical results, while for essential pulmonary emphysema, there is absolutely no other therapeutic procedure which can accomplish a cure or even lasting improvement, and it has only been by the pneumatic treatment that I and others have been able to accomplish permanent results.

Its mode of application in emphysema suggests itself, and requires compression of air in the cabinet, while the patient performs expiration into the lighter external air through the breathing tube. Inspiration may also be through the tube or of the rarefied air in the chamber. The presence of bronchial catarrh and heart lesions would suggest necessary modifications in the use of the instrument.

In the sequellae of acute pneumonias and pleurisies, especially when resolution is delayed or collapse of lung tissue is present, or when in pleurisy, the absorption of serous exudates is slow; when the expansion of the lung is mechanically hindered by fluid, fibro-plastic exudates and adhesions, the Pneumatic Cabinet has a rich and useful field, its timely employment is more uniformly followed by good results than that of any other means with which I am acquainted, and will save your wealthier patients expensive trips to health resorts, while affording the middle and poorer classes certainly a more rapid and satisfactory convalescence.

This class of patients are peculiarly predisposed subjects to the acquirement of pulmonary tuberculosis or are at least temporarily more liable to infection. I need not point out the importance of preventing such an occurrence by the speedy restoration of normal functions, which is more rapidly, more certainly, and more satisfactorily done through the agency of the Pneumatic Cabinet than by climatic treatment, even when in combination with any other therapeutic agent.

In cases where such lung affections are primarily upon a tubercular basis, the pneumatic treatment will constitute one of the most efficient aids to recovery.

This brings me to the consideration of its utility in pulmonary tuberculosis itself, and first to "Prevention" of the

disease. Whatever our theories may be, as to prophylactic measures (in preventing the infecting germs reaching and finding entrance into the lungs,) my belief is, that at present the production of barrenness of soil to the growth and development of pathogenic germs, is of as great importance, as the destruction of the seed, or efforts to restrict their inhalation. Before we can hope to prevent tuberculosis by the latter methods, many generations, and perhaps centuries will probably pass, and although in full sympathy with every reasonable effort toward its accomplishment, I wish to see efforts in the other direction also.

Individual predisposition and its casual relation to the acquirement of tubercular disease, stands unassailed in clinical experience, and prevention of the predisposition or its eradication is a subject as full of importance, as is the destruction of disease germs or the prevention of their presence in the air. Prevention of hereditary predisposition begins, however, in the cradle; yes, even with the parent; but leaving the latter out of consideration, we find in many children and youths, the chest badly developed, and other associated conditions which, when well expressed, we have called the paralytic thorax.

Such children, and all others whose chest development is faulty, and whose lungs are crippled or hindered in their fullest functional activity, are candidates for consumption. The use of the Pneumatic Cabinet offers to them the only rational method to restore such defects, and especially when applied during the period of growth, and therefore at a time when changes in form and contour of the chest can readily be accomplished, the Pneumatic Cabinet becomes an agent for prevention of pulmonary tuberculosis of the greatest importance.

It is not within the limit of this paper to consider all of the proper management and direct treatment of pulmonary tuberculosis. What I wish to do is to direct your attention to the apparatus under consideration as one of our useful agents, believing that it will be found of great value by all

who appreciate the uselessness of chasing for unfailing specifics on the one hand, and the necessity of comprehensive individualizing treatment adapted to the existing indications, on the other.

The hopes engendered at the time of its first introduction, that by its use alone, this disease would be readily cured proved elusive, and the theory that through its agency the inhalation of germicidal remedies could be made effective in the destruction of pathogenic germs within the lung, was so palpably absurd, that the simple mention of it at this time, must elicit the pitying smile of every physician, who has ever attempted to sterilize a bottle of distilled water in a laboratory, or his hands for a surgical operation.

I would therefore disclaim such hopes from the use of the Pneumatic Cabinet, the same as I would from the use of any other single remedy which has heretofore been proposed for the cure of this disease.

I claim, however, that our therapeutic resources of to-day are such, that when properly understood and employed, we are by no means indifferently equipped, and that the disease is curable in the early stages without undue difficulty and can frequently be arrested even in well advanced cases.

One of our means, but only one of them, is this apparatus, and if by its use we can improve the local nutrition of the lung, if we can strengthen the respiratory muscles, if we can increase the breathing capacity of such patients, if we can produce absorption and favor expectoration, if we can recover collapsed lung portions, and accomplish all that I have heretofore stated, surely this one means is not an indifferent one.

From an experience of nearly ten years in its use, and with a clinical material of approximating 2,000 consumptive patients, I cheerfully bear testimony to all that I have claimed. Indeed, I cannot conceive how I could continue my work without a Pneumatic Cabinet, and accomplish the results I do, unless something equally effective would be given me in its place.

Nevertheless, the treatment of this disease must ever be

a comprehensive whole, from which nothing of value can be taken, without at the same time jeopardizing the ultimate results, and to take away everything else and only leave the Pneumatic Cabinet would be a fatal mistake, the same as it would be a fatal error to simply give a patient creasote, or codliver oil, or tuberculin, or some other remedy, or employ climate, no matter how favorable, and then expect him to recover. If a single choice from all our resources were, however, necessary, and everything else had to be left to chance and accident, I certainly would not choose any of the agents named, nor even the Pneumatic Cabinet, but I would depend upon proper management; *i. e.*, I would so control and watch my patient's mode of life and attend to his dietetic and hygienic necessities, as to give the inherent restoring and repairing powers of nature the best chance, and I would then still expect to show better results than can follow the routine use of any one agent, valuable as it may be.

In conclusion, I express the hope, that I may have contributed something toward calling your attention to an apparatus, which can be made to confer great benefit in the affections referred to, as well as in many others, and since no longer patented, and obtainable at a reasonable price, that its use will become more general than it has been.

WINYAH SANITARIUM,
ASHEVILLE, N. C.
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