3. Nystagmus, either unilateral or double, permanent or temporary, complicated by paralysis of the motor nerves of one or both eyes, constitutes a barrier to operation as the trouble is unquestionably basal.

4. When nystagmus appears in the history of a case suspected to be tumor, associated with epileptic attacks or hemiplegia, the tumor may be upon the convexity just behind the fissure of Sylvius, but so often this is *not* the location that operation can not be advised.

ORIGINAL ARTICLES.

FORCIBLE ALVEOLAR EXPANSION IN THE TREATMENT OF CONSUMPTION.

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In the search for a cure for this most deadly of diseases, it seems that experimentation has been directed entirely toward the discovery of some wonderful specific, (to the exclusion of the simple truths of physics, anatomy, physiology and pathology). All the energies of the profession and of manufacturing chemists have been spent in the vain hope of finding this specific,—to their great pecuniary advantage.

Now that the specific hunters in Germany and elsewhere have about lost themselves in the mazes of organic chemistry, it might be profitable to work over some old knowledge in these branches, which has been at a discount for some time past.

A classic paper on this subject was read in the Philadelphia County Medical Society, by Dr. Thos. J. Mays, and appeared in the *New York Medical Journal*, March 10, 1888, entitled, "Apex Expansion vs. Pure Air in Pulmonary Consumption." Concerning the cure of consumption, the following conclusions were drawn: "That the question of curing the disease did not depend on the purity or freshness of the air, nor upon the number of bacilli the atmosphere might contain, nor upon the amount of oxygen which might be introduced into the body—for these were all secondary considerations; but it was simply a mechanical question,—a question as to the best mode of expanding the lungs, and especially the apices of round-shouldered and flat-chested patients, of removing the infiltrated products already existing, and of enhancing the constitutional resistance."

It may be said that the tubercle bacillus inhabits the lung tissue as an infection of tissue already damaged by hereditary malformation, sluggish circulation, or the extension of catarrhal bronchiolitis, plugging the alveoli. The bacillus aids in the extension of the infiltration, the same as other infectious germs poison tissues which have been injured. Dr. Prudden has recently shown how the presence of the germs of suppuration hastens the destructive processes by cavity formation in a previously tubercular lung, when the two processes of tuberculosis and suppuration run a simultaneous course.

Has it never occurred to these "specific" hunters that if a remedy should be found which would kill the bacilli *in situ* in the tubercularized tissue, the alveolar plug of gelatinous matter would still remain as a spore—containing a source of irritation; and as soon as the remedy should be withdrawn, the disease would break out anew? "An empty house is better than a bad tenant." The treatment which

does not drain the alveoli, empty them, and restore ventilation, will never be of very great benefit. In the case of mastitis, where the galactiferous glands and tubes are plugged, their drainage is accomplished by nursing, the tubes are emptied and healthy conditions and functions restored.

Minute anatomy and physiology tell us that the alveolar wall is composed largely of elastic tissue, which aids in the expulsion of air when released by the relaxation of the muscles of inspiration. Air pressure will dilate them the same as any elastic vessel, and as soon as the pressure is removed, this elasticity together with the expiratory muscles, forces out the contained air as well as any fluid which happens to be in them. The alveolar plugs are composed of a thick gelatinous and albuminous fluid. These plugs irritate the lung tissue and become the foci for extended infection. The elasticity of the alveolar walls is retained until the inflammatory process has progressed to the destructive stage, then there is necrosis of portions of the consolidated area. If we succeed in an effort to empty the air cells of this plug, the cell walls retain their continuity and a return to health is inevitable. In surgery, drainage of wounds and cavities probably septic, is absolutely necessary to the healing process. Physiologic drainage of the alveolar cavities is just as certain to give good results. This drainage is a simple mechanical procedure possible of accomplishment by every patient. The gelatinous plugs with their bacilli are carried out by the air current into the larger tubes and expectorated. These principles have been the basis for the method I have pursued in the treatment of the cases in this report.

The method was described in an article which appeared in the *New York Medical Journal* Oct. 13, 1894, entitled, "Forcible Apex Expansion in Incipient Phthisis." It consists not only in full breathing, which has been recommended in various ways, but after a full inspiration, the breath is held for a moment by closing the glottis—*just as the breath is held while straining at stool*, so as to increase the air pressure in the lungs. It should produce a ballooning of the chest and consequently of the air cells themselves. The effect is increased if, during the holding of the breath, the lower chest is compressed with the hands, which action forces the air into the upper chest where the consolidation usually is, and at the same time lifting the weight of the arms and shoulders off the chest. After a time the inspirations become much fuller and a higher tension develops. If the patient is weak, the breath should not be held more than two to five seconds; with increasing strength the time may be extended a few seconds at each effort. But the length of time the air is held is not important, the tension which can be developed being the end desired. These efforts may be continued regularly every two hours during the day, before arising in the morning and after retiring at night, as there is probably more air inspired in the recumbent position, because the weight of the arms is removed from the chest. Holding the breath has been mentioned by some writers, but usually the patient is directed to exhale slowly at the same time. It is thus performed without closure of the glottis, by simple exertion of the inspiratory muscles. No tension is developed and it is consequently only an inspiratory exercise, and fails to accomplish the end desired because it does not forcibly dilate the alveoli. The

direction to hold the breath is very indefinite without specifying the manner in which it must be held. An inhaler may be used with some antiseptic and soothing inhalant and to stimulate interest in the treatment. The patient may be told to inhale deeply so as to get the medicament well into the lung tissue. It will require some practice in order to get the best results, but an ambitious patient will pick it up very quickly. The immediate result will be an increased amount of oxygen in the blood, a strengthened heart's action, and a facilitated expectoration, which alone gives relief. In young persons the elasticity and capacity of the chest will be permanently increased, the progress of the disease inhibited and immunity from future attacks almost insured.

The treatment by differentiation of air has a similar effect on the lungs, but in order to be of much benefit more than one treatment a day would be required.

The contra-indications are hemorrhage, and for a few days after it has stopped, the pulmonary gymnastics should be suspended. But, I think in my cases the treatment has had rather a beneficial effect on the hemorrhagic tendency, probably because the pressure tends to close up the bleeding vessels. A weak right heart and possibly any heart disease would require great care in introducing even a slight and temporary obstruction to the pulmonary circulation. However, such cases are quite rare and will not greatly interfere with the general adoption of the method.

The existence of cavities seems to be no contra-indication, as in one case not in this report the whole left lung seemed to have been reduced to cavities and the treatment has been followed with success for over a year. Pleurisy, if quite general, will be aggravated by the chest movements for a time until the consolidation begins to disappear. To overcome the muscular atrophy about the chest any gymnastic exercises will be of benefit. At the same time, proper medication should be employed in order to increase the chances and rapidity of the recovery, improve nutrition, stimulate blood formation, or in any way improve the condition of the patient. For high fever, I believe bathing is the proper antipyretic.

The rapidity of the improvement will depend greatly on the extent of the consolidation, and the capability of the patient to understand the necessity, and the zest with which he pursues the treatment. A frivolous person will not put forth enough energy to take a full breath and hold it, or even test the treatment,—as in one of my cases I could not get the patient once to take a full breath; although the case is reported, I do not consider that the treatment was ever tried twice in this case.

The histories of the following cases demonstrated the efficacy of the treatment as well as the accuracy of the principles which lead up to it:

Case 1.—Mrs. M. J., aged 35, no tubercular family history. During the winter of 1892-93 had a severe attack of bronchitis and in March, 1893, asthma was added to her torture. In May and June there was improvement in the asthma, but the expectoration was profuse. There was then afternoon fever, rapid pulse, night sweating, and emaciation—pleuritic pains and soreness through the right upper chest. Examination of the sputum revealed the presence of tubercle bacilli. Physical examination showed a marked area of dullness posteriorly over the right apex, by the slight dullness, bronchial respiration, bronchophony and râles. The treatment included an inhaler using a eucalyptol mixture, tonics when they seemed to be of any benefit, a trip to a

farm in the country, and the pulmonary gymnastics or breathing exercises, holding the breath as described and other physical exercises with Indian clubs, the exerciser, or any means which tend to develop the muscular system. In December, 1893, physical examination showed that the area of consolidation had entirely disappeared, and there had been steady general improvement during the whole treatment. At present she is practically proof against the tubercle bacillus.

Case 2.—Miss H. M., aged 28, stenographer; mother died of consumption. Began treatment August 9, 1893, for hay fever, which was readily cured by the removal of some post-nasal hypertrophy. Had been feverish and losing weight and strength, sweating at night, and coughing of late. Physical examination showed a marked consolidation at the right apex. As the expectoration was scanty, no microscopic examination was made. Treatment much the same as in Case 1, save that the patient had only a short vacation of two weeks from work. As she was ambitious to get well she pursued the treatment with great determination. In this case I was able to examine the patient frequently enough to observe the rapidity with which the infiltration disappeared so that I was able to foretell almost the exact time it would take to remove it and pronounce her practically cured. Feb. 1, 1894, the lung had entirely cleared and the symptoms of the trouble had disappeared. Her weight had increased to normal and to this day she is well.

Case 3.—Mr. J. A., aged 32, student, whose family history reveals the fact that four sisters have died of consumption. He came to me Nov. 1, 1893, feeling very miserable, was coughing, losing weight, sweating at night, afternoon fever; temperature 100 to 102, pulse 96 to 110. Physical examination disclosed a considerable area of consolidation over upper half of left apex. Microscopic examination showed numerous bacilli. Treatment brought about a complete recovery by the latter part of March, 1894. At this writing he assures me that of all the colds he has had this winter not one has extended below the larynx, when previously every cold he had descended to the chest, and that he is entirely well and weighs 148 pounds.

Case 4.—R. D., aged 26, began treatment Dec. 23, 1893, having hypertrophic rhinitis and catarrhal laryngitis. Weakness, emaciation and fever induced me to examine the lungs when the evidences of consolidation of the apex of the left lung were unmistakable. As one reputable physician had previously diagnosed the case one of tubercular laryngitis, I felt considerably interested in the case. Treatment was followed by complete recovery, in the month of April, 1894, and his health remains good to this day.

Case 5.—Mr. H. P., aged 49, carrier, came to me Feb. 18, 1894, having cough with profuse expectoration, pain in the right side, emaciation, having lost twelve pounds, losing rapidly the past month. Physical examination showed an area of consolidation in the lower anterior portion of the middle lobe of the right side. Patient often had an evening temperature as high as 102.5 degrees F. Pulse rapid, especially during fever. Bacilli numerous in the sputum. Treatment brought about a slow but steady recovery and all signs of the local lesion had disappeared in November, 1894. This patient was almost constantly out of doors, and if fresh air will prevent tubercular consumption, he should never have developed the disease.

Case 6.—Miss B. A., aged 18, began treatment March 23, 1894, having had hemoptysis, the two nights previous. Has coughed for some months, fever every day, mostly in the afternoon, ranging from 101 to 103 F., emaciation and night sweating. Examination showed consolidated left apex. Treatment included ergot for hemorrhagic tendency and tonics. Pulmonary exercise was neglected by this patient. I endeavored in every way to induce her to continue the practice, but failed, and in the course of two months she passed from my charge and has since died.

Case 7.—Mr. C. H. M., aged 38, came to me April 12, 1894. Had had attacks of stomach disorders for several years, emaciation, slight cough, scanty expectoration, containing a few scattering bacilli. Physical examination showed infiltration of the apex of the right lung. Temperature 100 F., pulse 90 to 100. Treatment removed every trace of the trouble in eight months.

Case 8.—Miss L., age 24, came April 18, 1894, having a temperature of 101, pulse 90, hypertrophic rhinitis, slight cough, and scanty expectoration, emaciation and profound prostration, tired all the time, weight 95 pounds. Physical examination showed increased expiratory murmur over right apex, also voice and whisper sounds, with dullness on percussion. Treatment was energetically carried out and in

August every sign of the lung infiltration had disappeared, her general condition improved and weight increased to 115 pounds.

Case 9.—Miss E. P., aged 25, came to me May 7, 1894, having severe pain and tenderness in back of upper dorsal region. Had been failing rapidly during the winter, with irritating cough and scanty expectoration, afternoon fever and rapid pulse. Physical examination found consolidated right apex, with some pleuritic friction, sounds, soreness, and pain in that region, chest expansion twenty-six to twenty-seven inches. Treatment removed the area of consolidation by November.

Case 10.—Mr. C. J. D., aged 24, consulted me June 26, 1894, for relief from fever, night sweating, loss of weight and strength, and cough. Weight 112 pounds. Upon examination I found dry râles, and the usual evidences of a consolidated right apex extending as low down as the third rib. Temperature 101 to 102, afternoons. Pulse ranging about 100. Microscopic examination showed numerous tubercle bacilli in the sputum. Treatment at once instituted and followed out vigorously, brought a complete cure. August 29 there were no râles or other signs of the consolidation discoverable; and later in the fall he recovered all his lost weight.

Case 11.—Miss L. K., aged 29, consulted me July 20, 1894, for supposed nasal catarrh, and a generally run down condition, weight 99 pounds. She had afternoon fever, cough, but scanty expectoration. Upon examination, the usual signs of consolidation of the left apex were found. In two months treatment she had gained ten pounds, and in one month more the lung tissue had resumed a normal condition.

Case 12.—M. H., aged 23, book-keeper, consulted me Feb. 27, 1895 for an irritating cough and general weakness, following a recent attack of la grippe. Patient was never in good flesh, being tall, thin and pale, recently losing strength, and what little superfluous flesh he had. Had afternoon fever, pain in the left upper chest, expectoration mostly in the morning, which on microscopic examination was found to contain numerous bacilli. Examination of the chest showed moist râles, slight dullness and bronchial breathing over left apex, anteriorly and posteriorly. Treatment at present writing is giving the best results, having reduced the afternoon fever from 101 to 99, increasing the weight by six pounds and restoring almost his normal strength and feeling.

Case 13.—R. W., aged 30, merchant, seen in consultation with Dr. A. Salter at Lena, Ill., April 15, 1893. For six months or more previously had night sweating and emaciation, weight 128 pounds, temperature, morning 95.51 to 97, and every afternoon as high as 102 F.; pulse 90 to 100. Examination disclosed a complete consolidation of the right upper lobe. Treatment including tonics and 10 minim doses of creasote three times daily, alternating with hypophosphitis. Breathing exercise was begun and improvement began in two weeks, which was steady until January 1894, when there were no signs remaining of the lung infiltration. His weight at present is 150 pounds, and he is an active business man.

Case 14.—Mrs. H., aged 33, was also seen with Dr. Salter, Feb. 4, 1894. Had been taking various remedies for a year or more for a cough and other pulmonary symptoms, complaining mostly of pain in the shoulders and upper chest. Upon examination the right apex was consolidated, and slight infiltration of the left apex. While before treatment the patient was so poorly that she could do no housework, she has recovered sufficiently to do her own housework, gaining twelve pounds in weight, and two inches in chest expansion. There are at present no signs of the old consolidation.

Case 15.—Mr. J. H., aged 28, book-keeper. This man was seen in consultation with Dr. P. L. Anderson of this city, June 1, 1894, having in all about fifteen hemorrhages; night sweats; temperature 102 F.; pulse 120; profound weakness; barely able to do light work. Sleep greatly interrupted by coughing and a great amount of expectoration. Microscopic examination showed very large numbers of bacilli. Patient had attacks of asthmatic coughing, and hay fever symptoms during September. Upon examination of the chest the lower lobe of the left lung was found consolidated, also the apex of the same side. This patient has not been seen for some months, but at my request he came in for examination. He says that he had considered himself cured, having increased in strength so as to be at work every day—weight increased from 128 to 145 pounds. He coughs some, however, and expectorates most in the morning. He says that he has

not practiced the pulmonary gymnastics for some time. Upon examination pulse and temperature are normal, as also were the respirations. The left chest was found somewhat contracted, and the respiratory capacity diminished. Percussion note same on both sides; auscultation revealed no bronchial breathing or voice sounds, or anything that would indicate consolidation. There were, however, a few fine and some coarse mucous râles, with diminished vesicular murmur over the left lower lobe and the upper half of the left upper lobe. Also there were heard some faint pleuritic friction sounds over the left apex. This case is interesting, in that it shows how extensive and how rapid the tubercular processes may be, and still be entirely checked and recovery take place in a comparatively short time by this system of treatment. The condition of the left lung at the present time may be considered as practically restored; although there still remain catarrhal processes in the bronchial tubes, some few scattering plugged alveoli and others which are entirely collapsed or obliterated and replaced by cicatricial tissue which interferes with its normal elasticity and respiratory capacity.

Case 16.—Mrs. B. P., age 33. This case was also seen in consultation with Dr. Anderson some time in March, 1893. A diagnosis of pulmonary consumption was made in September, 1892, by Dr. Anderson and confirmed by Dr. Wm. E. Quine of this city, and the patient advised to go immediately to Albuquerque, N. M. Patient remained in New Mexico about four weeks during which time she suffered greatly from pleuritic pain, becoming extremely weak, night sweating, chills and fever, temperature at times as high as 103 degrees F., lost all appetite and it was with the greatest difficulty that she stood a stage ride of thirty miles to the nearest railroad to Colorado Springs. During a stay of two weeks in Colorado Springs she was much worse than in New Mexico. Believing there was no hope for recovery she came home. Soon after her return to Chicago, she began to improve and was able to come to the office for consultation. I made an examination of the chest and found the usual evidences of tubercular deposit in the apex of the right lung, accompanied with the most extensive pleuritic friction sounds I think anybody ever heard over the upper half of the chest. Deep breathing caused a great deal of pain in the chest. Pain was the most distressing symptom in the case, while there was also a great deal of emaciation, anemia and night sweating. Weight 110 pounds. She was cautiously trained in the pulmonary gymnastics and light physical exercise. Notwithstanding the pleurisy and the pain caused by the taking of full breaths, this patient continued the pulmonary gymnastics until every sign of the consolidation had disappeared, which was in September, 1894. There is still considerable pleuritic pain but nothing compared to what she had previously suffered.

It would seem from the results in this case that chronic pleurisy is no important contra-indication, and it must be decided by the results after a cautious trial in each case. Some patients with sufficient practice may be able to hold the breath at a tolerably high tension, enough to inflate the alveoli without much chest motion.

To recapitulate the cases:

Recoveries 13; improved and under treatment 2, dead 1.

I consider that of the sixteen, fifteen are consecutive recoveries, the remaining one not having followed out the treatment.

Phthisis is curable by the application of well-known mechanical principles, viz., the inflation of an elastic air sac with elastic air, which gradually during expiration expels the semi-solid or fluid contents. It is necessary in order to get the quickest and best results, to begin treatment while the sac wall is still intact and elastic, for when it is once broken down and cavity formation has begun, then the area must heal by cicatrix.

In the matter of prevention of consumption, the same process of alveolar ventilation is necessary and absolutely certain of results. During the years of physical growth and development the puny, flat-chested, round-shouldered children should be taught proper methods of breathing, together with occasional forcible expansion of the chest. While the

bony chest wall is still elastic it should be developed. After the age of 25, the capacity for chest development is necessarily limited.

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SERUM THERAPY IN PULMONARY TUBERCULOSIS, WITH AN EXPLANATION OF SECONDARY SYMPTOMS FOLLOWING THE ADMINISTRATION OF ANTITOXIN.

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Much has been written in regard to certain unpleasant and untoward symptoms attending the administration of antitoxin in cases of diphtheria. There has been a disposition on the part of physicians to attribute these symptoms to some peculiarity of antitoxin after its introduction into the system of diphtheritic patients. Some regard them as due to secondary septic infection. I believe, however, that I shall be able to prove substantially that these identical symptoms will follow the administration of pure serum with the same certainty and severity as they follow the use of antitoxin. I base this statement upon the manifestations which I have observed to follow the administration of serum from the blood of the mule in cases of laryngeal and pulmonary tuberculosis.

The most constant and unpleasant symptom following the administration of mule serum is the intense eruption which covers every portion of the body and gives rise to terrible itching. The eruption is of a bright red appearance and if scratched too persistently will assume for a short time the form of a large "water blister" which appears suddenly. It remains for a greater or less length of time, usually a few hours, and then disappears as suddenly as it made its appearance. Accompanying the onset of the eruption there is marked anorexia and depression.

Another symptom which fortunately does not appear as frequently as the eruption, but which is very much more painful and serious, is the "neuralgic pains" which are most apt to occur in the neighborhood of the point of injection, but which may occur in a remote part of the body. The pains are usually of so severe a nature as to deprive the patient of sleep, even after an opiate has been administered. I have known them to continue for twenty-one days without interruption, although this is an unusually long period.

In my experiments with serum, I used that obtained from the mule, because of the recognized immunity of that animal from tuberculosis.

In December, 1894, I obtained a full grown, healthy mule, and after he had by good care and feeding been brought to an excellent standard of vitality, tapped the jugular vein and drew therefrom a quart of blood. The most careful antiseptic precautions were observed in the operation. The hair was shaved for a radius of several inches around the site of the intended incision. The skin was then cleansed and finally washed with pure alcohol. The lancet used, was procured especially for the purpose and was thoroughly antiseptic. The blood was received in a glass jar, especially prepared. (I mention these precautions to show that the results finally obtained from the serum were not due to any infection consequent upon its preparation.) The blood was allowed to

stand twenty-four hours, and the serum was then drawn off and filtered through antiseptic filter paper. This work was done in a cold room to protect against putrefaction changes. After the first filtering the serum was allowed to stand a few hours, when it was observed to have thrown down a slight sediment. After a second filtering no sediment was observed. An effort was made to add a 5 per cent. solution of carbolic acid, but by every method tried, a precipitate was thrown down and the serum became cloudy. The serum used was, therefore, the pure article, without additions of any description. The serum was preserved in antiseptically prepared vials, which were hermetically sealed and only opened as immediately needed. Syringe used was an ordinary one drachm, rubber piston, and when not in use was kept filled with alcohol. The greatest care was observed in cleansing it, following its use. Gold needles were used.

The first case treated was one of tubercular laryngitis, with secondary pulmonary involvement. Cough was severe. Expectoration profuse and purulent.

Dec. 31, 1894. First injection was administered in the lower part of the thigh. The amount given was 1 drachm. On the second day dose was increased to 2 drachms. Cough seemed to improve at once and expectoration diminished slightly. No other appreciable improvement either in symptoms or local condition. The site of injection gave rise to no swelling or inflammation, more than that attended by needle puncture, and I was congratulating myself upon the ease with which these treatments could be administered when my hopes were severely crushed. On about the tenth day the patient complained of severe pain shooting up and down the thigh. Examination of the limb gave no indication of inflammation. Next day, however, the limb was swollen, the pain was worse and patient was put to bed. Pain was so severe that a hypodermic injection of morphia was given and poultices were applied over the painful area, but with little relief. Patient slept but little for nearly a week, at the end of which time the pain was a little better, but it did not disappear until the twenty-first day from its beginning. The limb was at no time much swollen and there was scarcely any rise of temperature, except during the period of eruption which appeared soon after the pain set in and continued about four days. Subsequent injections, after the pain had entirely disappeared, did not give rise to any further pain or eruption. Patient received a total of between forty and fifty injections of the serum of 1 drachm each, but at the end of the treatment no improvement whatever, either in symptoms or physical signs, had taken place.

At first I was inclined to believe that the pain and eruption were due to something peculiar in my supply of serum, or perhaps also to some extent due to the condition of the patient, but seeing in current medical literature reports of cases of diphtheria treated with antitoxin which gave rise to symptoms so closely identified with mine, I concluded that the origin of these unpleasant manifestations was to be found in the primary serum.

In eight cases of pulmonary tuberculosis, subsequently treated with the serum injections, the eruption was a typical attending symptom, while the pain did not occur unless a large amount of serum had been injected in a short period of time. From