than the latter, and seems to be present in what may be termed "passive" increase of intracranial pressure—that is, where the intracranial pressure is increased from alteration of the circulation in the rest of the body.

14. In some conditions the intracranial circulation seems to vary independently of the circulation elsewhere. This would tend to show that, although the blood vessels of the brain are not directly controlled from the general vasomotor centre, there must be some local mechanism for altering their calibre.

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ON THE IMPORTANCE OF REST IN THE TREATMENT OF ACUTE PHTHISIS.

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THE great importance of attempting, in so far as it lies in our power, to give local rest to the diseased lung is, I think, sometimes overlooked in the treatment of acute phthisis. The deficient movement of the affected side, the tendency of the whole chest to fall into, and as far as possible to maintain, a position of expiration, the onset of unexpectedly severe dyspnoea on slight exertion, the pain induced so frequently when a deep inspiration is forcibly taken, and the consequent disinclination to make the attempt, and the tendency to persist with an irritable slight cough rather than to force a more violent one, and thus cause the chest to expand and the sputum to be dislodged in the way that occurs in bronchitis and other chest affections, all point to the fact that in acute phthisis there is a continuous flow of inhibitory impulses to the respiratory muscles which prevents them from making strong contractions; in other words, there is a continuous unconscious effort on the part of the body to keep the diseased part as much at rest as is compatible with a sufficient aëration of the blood. Arguing from the above only, one would be inclined to suggest that in all cases of phthisis an attempt ought to be made by every means in our power to limit the movements of the affected side; experience, however, has abundantly shown that this is inadvisable. For instance, the fact that phthisical patients, in whom the disease is not acute, derive marked benefit from residence at a high altitude, both in the early and later stages—under which circumstances, of course, the amplitude of the respirations is increased—in itself plainly shows that the diminution in the movement of the lung, and its consequent partial rest, are by no means always a necessity for recovery.

The cases in which the best results are to be looked for from the local rest treatment, that is to say, from limiting the movements of the affected side, are undoubtedly those of acute and progressive disease, where the temperature is materially raised, where wasting is rapid, and where all the signs of a severe toxic infection are well marked. Further, this local rest is especially beneficial when the mischief is not only active but early, and where there is reason to believe that the wide area over which physical signs can be made out does not correspond with the actual area of tuberculous dissemination, but rather with a tolerably wide area of consolidated lung, the result of a broncho-pneumonia in the neighbourhood of one or more tuberculous foci. It must have been within the experience of everyone to have seen cases where, in spite of the brief history of ill health, the

physical signs have been so marked and so widely diffused as to have suggested the rapid breaking down of a whole lobe, but yet which, after a brief period of complete rest, have improved to such an extent as to have become almost quiescent. These are the cases in which great good results from limiting the movements of the affected side. The notes of the following case, seen in consultation with Drs. Metcalfe and Crocker, afford a fair example of what may be frequently expected from rest.

A. A., aged 28. Cough and slight wasting for some months. Acutely ill, with high temperature for ten days. Has not been resting, though feeling ill. Only consulted a doctor a few days ago. *Râles* down to the root on the left side, and in the second space in front and in the supraspinous region on the right. Impaired note at both apices in front and behind. The patient was from this time on kept strictly at rest in bed. Small doses of creasote and quinine were given, and he was moved into a nursing home. A week later the general condition had much improved; the catarrhal signs in the lungs were much less marked, and the patient stated that he felt nearly well. The temperature still, however, went up to 102° at night. The sputum was still profuse, and contained tubercle bacilli in considerable numbers. I did not see the patient again for a month, by which time the lung signs had become almost quiescent; the temperature had been normal for a week, and the general health was in every way better. The patient now exerted himself somewhat more, and at the same time had a good deal of worry, the result being that the temperature again rose, and he had for about a week signs of some recrudescence. He was again kept strictly at rest, and the adverse symptoms slowly disappeared. Tubercle bacilli could still be found in the sputum in considerable numbers. Finally, after another period of rest, the temperature again became normal. The patient was then taken by easy stages to Falkenstein, where he remained for some months undergoing the rest, over-feeding, and air cure, the result being that his general condition so much improved that he was able to return to his ordinary mode of life. A year later I heard that he was still going on well.

Perhaps, however, the strongest proof of the importance of local rest is furnished by those cases in which a pleural effusion has occurred on the affected side. A most instructive case bearing upon this point has been put on record in the Hunterian Society's *Transactions* for 1895-6 by Dr. Arnold Chaplin, and the views therein expressed by Dr. Chaplin as to the advisability of not interfering with a moderate amount of fluid in cases of acute phthisis are abundantly borne out by experience.

In these acute cases as soon as the temperature has become normal, the greatest benefit may be expected to result from a stay in one of the health resorts, such as Falkenstein in the Taunus, or Nordrach in the Black Forest, where the so-called "air cure" is carried out. Lately the same method of treatment has been advocated and adopted in some of the health resorts at high altitudes, but the climatic conditions in these places appear to me to be quite unsuitable for this method of cure, and I have heard of many cases in which the patient has not only not improved, but has rapidly lost ground under this treatment. After a somewhat prolonged stay at Falkenstein, when the lung condition is no longer acute, and when the patient is able to take exercise without risk, a winter spent at Davos or St. Moritz Dorf is, however, of the greatest advantage.

BRONCHIAL AND VESICULAR BREATHING.

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To make students easily understand the mechanism by which the chief varieties of breathing to be heard over the lung are produced it is necessary to begin, and to insist by frequent repetition, with the postulate that the sounds are primarily produced in the glottis by the vibration of the currents of air as they rush past the vocal cords in inspiration and expiration; that these sounds are modified and diminished by the progressive narrowing and increase in total sectional area of the bronchi and bronchioles, and, finally, by the spongy tissue of the lung itself. The sounds

are conducted downwards from the larynx in two ways, partly by vibrations of the solid walls of the trachea and bronchi, and partly by aerial conduction. That the latter is by far the most important is proved by the silence over a certain area of the lung when one of the larger bronchi supplying it is occluded by pressure or by a foreign body. Now when by any process the spongy tissue of the lung becomes consolidated, leaving the divisions of the bronchi supplying it still open, as in pneumonia, or compression of the lung by fluid, then the vibrations produced at the glottis will be better able to reach the chest wall and the stethoscope, as they are now conducted by solid tissue instead of being modified by transmission through the badly-conducting spongy tissue.

In a recent article on *Bronchial Breathing and Râles* in the *BRITISH MEDICAL JOURNAL* for July 10th Dr. West has, I think, helped rather to mislead than to make things simpler for the student by attempting to represent all the forms of breathing to be heard in the chest by a diagram, the varying thickness of the lines indicating the amount of noise according to the intensity of the conduction of the sounds produced at the glottis.

The question as to the exact meaning of the normal vesicular breathing and as to how it is produced has always been much debated. Dr. West sums up its characteristics: (1) by the absence of noise, (2) by its blowing character, (3) by the absence or diminution in length of the expiratory sound. It is also described as a sighing, breezy sound, and I am in the habit of comparing it to the distant rustling of trees in the wind.

In speaking of the conduction of the glottic sounds downwards, Dr. West says: "The vesicular structure of the lung may be likened to a feather pillow, and the vesicles muffle the sound in a similar way." Dr. Gee¹ states: "Vesicular breathing may be supposed to lose the bronchial hollow quality in consequence of the badly-conducting material (the spongy texture of lung) through which the sounds have to pass." Now, if the vesicular murmur were simply a damping down of the glottic sounds by means of their transmission through the spongy lung, the expiratory sound should be almost as clearly heard as the inspiratory, just as in direct auscultation over the larynx, though both would be weak. But, as a matter of fact, the sound is almost entirely inspiratory; and here we come to a difficulty which I think has not hitherto been adequately explained.

Murmurs, whether cardiac or pulmonary, are produced by means of "fluid veins." That is to say, when a fluid stream passes from a narrow channel into a larger one, a fluid vein and eddies are produced, and by the vibration of the particles of fluid in these a murmur is produced, and the more rapid the stream and the more sudden the dilatation of the channel, the louder is the murmur. In this way murmurs in valvular lesions of the heart are caused, the systolic murmur over an aneurysm, or the factitious murmur produced by compressing a large artery with a stethoscope. Similarly I have been able to demonstrate a systolic murmur heard over the origin of the axillary artery, which varied in intensity with deep inspiration when, owing to the rising of the ribs, the vessel became compressed between the first rib and the clavicle.

Again, it is well known that in severe aortic regurgitation, when there is an actual back current in the larger arteries during diastole of the heart, pressure on the femoral artery with a stethoscope will produce an audible to-and-fro murmur.

We will leave out of consideration the upper air passages, nasal and pharyngeal, where the breath sounds may become altered slightly; for example, the sounds heard by auscultation over the cervical vertebrae are slightly different in character according as the mouth is kept open, or if it is closed and the air has to travel through the nasal passages.

As long as the walls of a tube are smooth, fluid veins are not produced during the passage of a stream of fluid through it or its subdivisions, so long as each branch is of not larger calibre than the original tube; but as soon as the tube enlarges, then fluid veins are produced and murmurs can be heard. If we examine the form of the air passages we notice at once two places where the air as it is inspired passes from a smaller into a larger channel.² The first and chief one is

the glottis, where the air eddies vibrating cause the sound of ordinary laryngeal breathing, and, since the cavity enlarges both above and below the glottis, inspiratory and expiratory sounds are more or less equally produced. Tracing thence the air channels to their periphery, we find that their walls are smooth, and the calibre of the branches becomes progressively smaller down, indeed, to the smallest subdivisions of the bronchi—the bronchioles. Here, however, the calibre of the channel again enlarges suddenly to three times its diameter, as the bronchiole opens out into the infundibulum beset with air cells. Here, then, fluid veins are again formed, in each infundibulum and air cell the air is again set vibrating as they expand in inspiration, and so suck in air which rushes in to them from the bronchioles and smaller bronchi. This, then, is the key to the production of the vesicular murmur which is so different in character from the glottic sounds. The reason for its being heard normally only during inspiration is now obvious. In expiration the direction of the current of air is reversed, and has to pass from the infundibulum into the bronchiole, which is of smaller calibre, and therefore no fluid veins are produced, and consequently no murmur.

Diagram of the direction of the air currents in the infundibula; A, during inspiration; B, during expiration.

The sound thus produced in a single infundibulum would be a negligible quantity, but multiplied a hundred-thousand-fold by the number of infundibula in the lungs (there are 355,000,000 alveoli according to Macalister), and the normal vesicular murmur is easily accounted for, and also the fact that this is heard almost solely in inspiration.

In ordinary quiet respiration the progressive increase in calibre of the bronchioles and bronchi is not sudden enough to cause fluid veins of intensity sufficient to cause an audible expiratory murmur until we reach the union of the larger bronchi and of the two main bronchi to form the trachea. In forced expiration, however, an expiratory murmur may thus be produced and heard all over the lung.

In the article already referred to Dr. West, after representing vesicular breathing by a single thin line, figures the various forms of bronchial and tracheal breathing with double lines of increasing thickness. Laryngeal breathing (in which he includes cavernous and amphoric breathing) is represented by two lines enclosing a space instead of by a thick line so as to indicate its hollow character. Typical bronchial breathing is described as that heard over the consolidated lung in acute pneumonia, and the statement is next made that "this everyone calls bronchial breathing." Now this variety of bronchial breathing heard in pneumonia is much more frequently called "tubular," and it is distinguished from other varieties of bronchial breathing by its peculiar whiffing character, which is difficult to describe, but once heard can scarcely be forgotten. The use of the term "tubular" dates back to Laennec's time, and its clinical usefulness, even if the word be not hallowed by long usage,

should preserve it. Dr. West, however, no doubt intentionally, omits all reference to it, perhaps for fear of superfluity of terms.

Again, it seems unnecessary to call amphoric breathing as heard over a tuberculous cavity, or sometimes in a case of pneumothorax, laryngeal, though it closely resembles it. There are two factors in the production of amphoric breathing which cause it to differ from laryngeal breathing: First, the reverberation of the conducted glottic sounds in the cavity itself, causing the breathing to resemble the sound made by blowing across the mouth of an empty bottle; and secondly, the direct opening of a small bronchus into the cavity. In this latter factor we have another instance of the calibre of a tube becoming suddenly larger; and consequently, during inspiration, with even a slight expansion of the cavity, a fluid vein and vibrating air eddies are formed in the cavity, causing an inspiratory murmur. During expiration there would be no murmur actually produced in the cavity itself, since the fluid stream is now passing into a smaller channel. The addition, therefore, of this inspiratory murmur produced in the cavity itself, to the conducted glottic breathing, accounts for the proportionately louder sounds during inspiration than in expiration heard frequently over a cavity. This element is wanting in consolidation, and so in ordinary bronchial breathing the expiratory sound is often quite as loud as the inspiratory.

In bronchiectasis again, where there is a fusiform or saccular dilatation of the wall of a bronchus, fluid veins are necessarily formed locally both in inspiration and expiration, and so the term tubular is more exact as applied to the breathing heard over a bronchiectatic cavity than the word bronchial.

The conclusions we necessarily arrive at are:

1. That the various forms of breath sounds to be heard are due to the production of fluid veins and vibrating eddies of air, both in inspiration and expiration.
2. That the glottis is the main source of most of the varieties of breath sounds.
3. That vesicular breathing is not glottic in origin, but that the sound is produced peripherally, each infundibulum contributing its quota.
4. That in certain conditions, as in tuberculous cavities, pneumothorax, or bronchiectasis, there are local causes which are productive of murmurs which may be superadded to or even replace the glottic sounds.

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MEMORANDA:

MEDICAL, SURGICAL, OBSTETRICAL, THERAPEUTICAL, PATHOLOGICAL, ETC.

THYROID INSUFFICIENCY.

A. R., female, aged 9, was seen on January 16th, 1897. The parents complained that the child did not grow, and was not developing satisfactorily. Her height was 40 inches, and she was no taller than her brother aged 4. Her mental condition appeared normal; she was not slow in answer, she loved going to school, and was the best scholar in her class. But her movements were always staid and languid, and she preferred sitting still to playing.

The skin was dry and rough "like a nutmeg-grater." The complexion "waxy-white," showing blue veins, the hair dry and brittle. There was only one permanent tooth, and no sign of six-year-old molars. There was very little subcutaneous fat, and no swelling of the connective tissues. The hands were quite natural in appearance. On the right side of the neck there was no trace of thyroid gland, on the left side there appeared to be a small lobe. She was very subject to chilblains, felt the cold acutely, and could not be kept warm at night. There was no suspicion of specific disease.

She was given thyroid tablets, 2½ gr. night and morning for the first week, and 5 gr. subsequently. At first there was a little vomiting.

On January 30th the mother stated that the child was not so sensitive to cold, and that her appetite had greatly improved. There was some desquamation of the scalp, and the hair was falling out in quantities. Violent beating of the carotid, a sign which is so conspicuous in Graves's disease, came on after the treatment was begun.

On February 24th she had shed four temporary teeth, and on March 24th all the six-year-old molars had made their appearance. I find the following note on the latter date: "The child has a good colour, and is romping and playing and getting dirty with play all day long; she dislikes school now and behaves as an average healthy child does towards education."

At the present time (September 15th) her height is 43½ inches, an increase of 3½ inches in eight months. The skin has become supple and the hair soft. She has eight permanent teeth. She no longer feels the cold but only the heat. Her spirits are irrepressible, and her schoolmistress complains that she has become difficult to control, and pays little attention to her lessons. The pulsation in the carotids is no longer noticeable. She is still taking 5 gr. of thyroid extract every other day.

REMARKS.—Although the stunted growth, the non-development of the teeth, and the want of bodily activity must have existed some years, the diagnostic signs of thyroid disease were absent; there was no deposit of mucin in the connective tissues, nor was there any conspicuous loss of intellect. It is, therefore, probable that besides the typical forms of disease known as myxœdema and sporadic cretinism, there may be minor states of malnutrition differing from the severer forms only in degree. The improvement which in this case occurred under thyroid feeding may be held to confirm the diagnosis of thyroid insufficiency, and shows the great advantage to be derived from recognising similar conditions.

Thames Ditton.

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THE SEQUEL TO A CASE OF IMPERFORATE ANUS OPERATED ON IN INFANCY.

As I believe that cases of imperforate anus relieved by operation in which the infant recovers are of very rare occurrence, I should like to relate the sequel to such a case that was operated on some seventeen years since, and at the time reported as successful.

The patient, a boy, first came under my care some six years back. Unfortunately, from the abnormal condition of the rectum, he neither had power to retain nor to expel its contents when he wished to do either. Though various mechanical devices were tried, nothing could be worn that would successfully control the former, but, strange to say, the want of power to do the latter became the most serious. For in spite of every care in administering enemata and in giving suitable aperients, immense masses of fecal matter would collect in the upper part of the rectum and in the sigmoid flexure, causing general constipation, which for the last year or two could only be removed by the spoon, though there was generally an oozing from the vent. These masses, by preventing the proper distension of the bladder, caused incontinence of urine.

Thus the poor boy's life became a misery to himself as well as to his family. The troubles gradually increased as he got older, until they were recently brought to a close by perforation of the bowel and peritonitis.

About a year since Mr. Bloxam, who frequently saw the boy with me, suggested making an artificial anus in the left groin, which would have been in a better situation for a pad to be worn to control the aperture, and would probably have diverted the course of the contents of the bowel before they arrived at the part where the obstruction usually commenced, but the friends would not agree to the operation.

It is therefore clear that though the operation undertaken during the patient's infancy was successful in a mechanical point of view, it was so in no other sense; for the boy was almost unfitted for the business of life, or for social life, while during the period that I knew him he had the chances of fatal peritonitis constantly hanging over his head.

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