

But what is the pathology of boils and carbuncles? We may assume that in kind it is the same; the difference between the two diseases is dependent upon (1) variations in the vigour of constitution, (2) the state of the nutritive fluid (the blood), and (3) the activity of the local tissues. In the central part of boils and carbuncles are one or more pieces of dead tissue, sloughs, or cores. How is the tissue killed?—by arrest of the circulation, or failure of nutrition? What has been noted about the blood? Three very important sets of facts: 1, bacteridia oftentimes in great amount; 2, excess of urea in the urine, and uric acid in the blood; 3, diabetes. Bacteridia, however, seem to be developed only secondarily, and to be unable *per se* to produce furuncle. The excess of urea and uric acid can scarcely be said to be the cause of carbuncle and boils; and we come to the third condition, noticed by Cheselden, Prout, Latham, Landouzy, Marchal de Calvi, and others—viz., a tendency to, or actual, diabetes. Dr. Wagner has given details of fifty-two cases of gangrenous inflammation, including carbuncles and furuncles, in which a diabetic condition existed; and M. de Calvi has confirmed Wagner's observations. My own observations on this point are small; but I am convinced that, if we would clearly understand the true pathology of carbuncle, we must carefully investigate the matter in connexion with the production of sugar in the system. The existence of a diabetic habit explains satisfactorily the fatality of carbuncular disease, and the serious constitutional disturbance. Nothing is more common than for carbuncles to arise in the course of diabetes; and it will be remembered, that Cardinal Wiseman suffered for no less than four years before his death with carbuncles. More recently, Dr. Fonseca, of Pernambuco, has investigated the subject; and he tells us that in Pernambuco anthrax is very common, and that one of its forms is regarded as diagnostic of diabetes. Küchenmeister, Menestrel, and Jordao of Lisbon, have also given similar evidence.

And at this point Mr. Startin's therapeutical experience comes in to confirm the theory I have briefly sketched. He finds successful treatment in the use of *aperients, animal diet, tonics, and free stimulation without malt liquors*. The avoidance of all saccharine and amylaceous matter is an essential point; but I venture to affirm that, of all drugs, opium, judiciously used, is the most important. Clinically, I know that it has cured, and does help to cure, carbuncular inflammation, when other things fail; and therefore, if we add to Mr. Startin's recommendations the use of opium, we shall be in possession of a plan of treatment which is not only empirically dictated by the largest experience, but consonant with the most recent truths which pathology has taught us. The acid nitrate of mercury acts well, of course, as a *caustic*.

There are many other points—the origin of the local mischief especially—that I would like to notice; but I have only attempted to indicate that there is a much truer explanation than the "parasitic" hypothesis as to the cause of carbuncle, involving very wide pathological considerations. Skin-diseases have been so long handled from a *surgical*, that it is a novelty indeed for any one to investigate them from a purely *medical* point of view, and to trace connexion between them and such a profoundly subtle disease as diabetes; but I again reiterate the remark I have elsewhere made, that "the physician must be possessed of all that general medicine can teach before he can become the successful dermatologist."

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NOTES AND OBSERVATIONS ON DISEASES OF THE HEART AND LUNGS.

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[Continued from page 10.]

IN the preceding paper it was mentioned that, in the present day, there might perhaps be no very great difficulty in setting forth the quality and general characteristics of the normal sounds of the heart, or in describing what may be the peculiar sounds proper to the several lesions of this organ, but that, nevertheless, in practice, their due appreciation and perfect recognition were not infrequently found to be embarrassed by many sources of error. Some few of the occasionally recurring difficulties towards forming a correct diagnosis will, by way of illustration, be here briefly referred to. In doing this, it must not be inferred, though the sounds and murmurs belonging exclusively to the valves in their relations to the circulation of the blood are here solely referred to, that other signs no less important, and independent of these, are ignored. On the contrary, the value in diagnosis of some of these latter will be in due course not only considered, but perhaps seen to be of paramount importance, so that, without them, prognosis in disorders of the heart will be essentially at fault. The object at present, however, is mainly to illustrate the positions advanced as to the immediate cause of the sounds, and then to show what may be the importance of these sounds by themselves, towards estimating the condition of the heart itself.

In investigating, by auscultation, any of the disorders of the heart, the first and the chief point to be arrived at, in reference to sound, is the accurate ascertainment of the presence or the absence of either of the two normal sounds.

If there be an absence of either of these sounds, it may then be inferred, as a general rule, that some other sound has taken its place, and that this other sound is not a normal one—that it is, in fact, a new sound, and manufactured, as it were, by diseased structure or by disordered action.

If the above position be true, it will be at once seen how very important it is to ascertain the existence, or the contrary, of both normal sounds; and that here confusion in diagnosis must be sought to be carefully avoided, lest the inferences thence deduced be erroneous.

A careful observer, and one of our best authorities upon diseases of the heart, says that absolute deficiency of either sound, or of a murmur taking its place, has never fallen under his observation; that, in fact, neither systole nor diastole has ever been, in his experience, absolutely noiseless over the entire cardiac region. The above strong and pointed statement is made by Dr. Walshe (p. 78). After noting that, in cases of extreme weakness, the first sound may be *quasi*-deficient at the left apex, he says: "But it will then be found at the right apex and at the base. So, again, the second sound may be *quasi*-deficient at the base from excessive feebleness, or from being covered by a prolonged systolic sound or systolic murmur; but, in the first case, excitement of the heart, increasing the energy of its contractions, will invigorate the sound, and in the second case the sound will be heard at the right apex."

Though cases have occasionally presented themselves to my observation in which I could not satisfy myself of the absolute conclusiveness of Dr. Walshe's statement, that both the sounds, if not superseded

by others, were thus always present, yet the position is so generally a safe one that, in order to arrive at a correct and sure conviction of the presence, or of the absence, of the two normal sounds, it is necessary fully to appreciate those various accidental circumstances which, when the two normal sounds are really present, tend to obscure their being duly recognised.

Doubtless, in estimating these circumstances, those special variations and peculiarities which may occur in the several properties or conditions proper to, and characteristic of, the sounds themselves, such as "intensity, duration, pitch, and quality," must be considered. Each of these may, under the modifying influences of sex, age, attitude, exertion, excitement, debility, etc., be so altered or intensified as to lead to false inferences; and hence, in the place of normal valvular sound, the presence of a murmur may be erroneously assumed.

A naturally weak heart, or a heart in which the ventricles are hypertrophied, will frequently on agitation generate sounds, or so modify the valvular sounds, that these are to a certain extent masked; the sounds become hurried, intensified, and confused, and might, on a hasty examination, be regarded as being murmurs. A little care in examination will generally succeed in detecting that the sound is really a normal valvular one. Sometimes, however, from continued hurry of the ventricular impulses, and from these not following in regular succession, the marked and uniform valvular sound is merged in, or superseded by, that continuance of sound which, in contradistinction to regulated rhythmical sound, is denominated by the term "noise". It then becomes difficult indeed to separate and appreciate the two normal sounds.

In cases of fever, the first or systolic sound is often the subject of considerable modifications. In some cases, there is a feebleness, passing into nearly a total absence of this sound; in others, it becomes prolonged, and almost assumes the characteristics of a murmur—perhaps there may even be a murmur; for occasionally, in fever, the muscle of the left ventricle is found to be weakened and even degenerated in its structure. It is, therefore, probable, though neither the mitral nor tricuspid valves may be diseased, there is some want of proper action in the muscles attached to these valves; so that, practically, there may really exist a certain amount of valvular error.

The above sources of error, more or less, arise from modifications of the valvular sounds themselves; but the main causes of embarrassment, whereby the correct recognition of the presence of the normal valvular sounds becomes obscured, have not their origin so much from any real variations or actual modifications of the valvular sounds as from causes extrinsic to the valves themselves.

The modification of the sound occasionally induced by an excess of nervous excitement has perhaps its cause more exclusively in the disturbed passage of the blood through the irregularly palpitating heart itself. Immediately succeeding the first sound, but still commencing, as it were, the second sound is a soft murmur, and the second sound itself, which concludes this, is heard, sharp, loud, and accentuated. Both these latter sounds are produced under the influence of nervous excitement during an increased and rapid impulse. The murmur itself has been by some attributed to the action of the heart within the pericardium, whereby a slightly appreciable friction-sound is produced. It is not, however, a friction-sound; for it not only has not its distinctive character, but an equally rapid and augmented impulse without the nervous excitement fails to induce this specific murmur. Considering the character of this

murmur, and of the succeeding accentuated valvular sound, it is not unreasonable to conclude them both to be due to the increased rapidity of the flow of blood through the heart agitated and rapidly palpitating under nervous excitement; the murmur being produced by an eddy disturbance in the flow of blood through the ventricle, and the accentuated second sound by the sudden jerk of the semilunar valves, whereby its backward flow is arrested. In these cases of nervous excitement, it is invariably the second sound which is implicated, and from the alteration in which error in diagnosis may arise.

Though, under these circumstances, there is undoubtedly the presence of a murmur, and though the valvular sound is exaggerated and altered in tone, yet a careful examination can separate the accentuated sound from the murmur, and thus enable it to be recognised as the normal sound, only modified by the excited systolic action of the heart.

The more usual source of confusion arises, however, from various sources extrinsic not only to the valves but to the heart itself. Amongst these the most common are breathing sounds so synchronously occurring with the diastole as to obscure and (as it were) overlay one or other of the normal sounds of the heart. Dr. Latham (vol. i, p. 65) states this condition of things clearly. "It has been said that endocardial murmurs are best imitated by modulations of the breathing and by help of the mouth. Hence it is not to be wondered at that there should be an endocardial murmur which nearly resembles the natural murmur of respiration. The commonest of all the endocardial varieties is the bellows-murmur; and the natural murmur of respiration is only a gentle sound of the same kind, but more prolonged. Hence the morbid sound of the heart and the natural sound of the lungs are sometimes so much alike that, if the systole of the ventricles and the act of inspiration kept time with each other, it might not be easy to determine from which of the two organs the murmur came; and, in point of fact I have sometimes listened and hesitated, and hesitated and listened again and again, before I could satisfy myself that a murmur which came altogether from the lungs did not in part proceed from the heart also. It has been carried with an impulse into the ear as if it came from the heart." Dr. Latham adds that "the method of clearing up the doubt is to auscult the heart, while the respiration is suspended for a quarter of a minute."

Doubtless, this is true. Nevertheless, cases constantly occur where the respiratory murmurs are both so prevailing and so protracted as to render it extremely difficult, and even at times impossible, to separate the sounds of the heart from them. Perhaps the most embarrassing circumstances exist when the lung contiguous to the heart is, besides being in an emphysematous condition, the seat of bronchial rales; the murmur, the resonance of the lung, and, as almost invariably occurs, a feebleness of the sounds of the heart themselves, each offering elements of difficulty. The first sound, especially of the left heart, is, under these circumstances, at times so effectually masked as to render it next to impossible, taking the element of sound only, to diagnose the absence of murmur in the left auriculo-ventricular valve.

Murmurs, generated in neighbouring structures when in certain inflamed and morbid states, not unfrequently appear to proceed from the heart, and thus interfere with a due appreciation of its existing normal sounds.

The more notable examples of this source of confusion are to be met with when the pericardium becomes the seat, especially of acute, disease. Doubtless, the friction-sounds of a recent case of pericard-

itis may very frequently be suspected to be murmurs, and thus to be indicative of valvular disease. Difficult though at times it may be, nevertheless there are signs which, if attentively considered, will generally lead to a correct diagnosis. First and foremost, the intrinsic character of the sound must be ascertained and appreciated. A pericardial friction-sound has neither the quality nor the pitch of a valvular murmur; it is deficient in that blowing or whistling character which invariably characterises the latter. It is, however, easier to state this than always correctly to appreciate the characteristic differences of the two sounds; but other circumstances come to our aid. The sound is usually increased on pressure; and it is found to occur most commonly both with the systole and the diastole, and always with the systole if with the diastole; and in favourable cases—that is, where the ordinary rhythm of the heart's action is not greatly impeded—careful auscultation will detect the normal valve-sound followed by the pericardial friction-sound, and this latter is usually observed to be a more pronounced sound with the systole than with the diastole. Other circumstances also tend to separate the pericardial from the normal valve-sounds—as the more sudden occurrence of the former, the rapidity with which they shift their seat, the fremitus often communicated to the hand, but more especially their sudden disappearance under treatment.

Occasionally during pericardial disease a short clicking sound is heard accompanying both systole and diastole. Dr. Walshe says (p. 110) these are only distinguishable at the time from modifications of the valvular sounds by their non-synchronism with them, and by the extreme irregularity of their occurrence, and that he has satisfactorily traced them to the pericardium, and further, in all probability, to the separation, without attrition, of surfaces glued together with exudation matter.

Various other sources of difficulty, extrinsic to the heart, whereby the normal sounds are occasionally materially interfered with, and even at times effectually overpowered, might be enumerated. Amongst the chief of these are those which have their origin in foreign and abnormal pressure, by contiguous diseased structures, on the great vessels immediately emerging from the heart, or even pressing on the heart itself; so that murmurs are manufactured, if we may so apply the term, in places which, in health, are not the seat of sound; but so near to the seats of normal sounds as to interfere with the true appreciation of these latter.

It is not only essential to be on our guard as to the existence of murmur having this foreign origin, but essential towards a correct diagnosis that their true cause should be recognised.

Their investigation and study is also interesting in a physiological point of view; for they serve to illustrate and confirm, strongly and clearly, the positions assumed on the formation of murmurs and the cause of the normal sounds. We find these murmurs induced when there is evidence of disturbance of current only; and we also find the normal sounds interfered with, though there be a normal ventricular systole and a perfect contraction of the valves, when at the same time there exists an arresting of the perfect recoil, so that an interference is effected with the vibrations which would occur in an unbroken column of moving blood suddenly checked.

The friction-sounds produced by a pericarditis, and which very nearly assimilate themselves to valvular murmurs, have been just alluded to; still they are but friction-sounds. The physical consequences of a pericarditis do, however, at times, really cause mur-

murs in the great vessels. The lymph exuded during a pericarditis may so envelope the two large arteries at their origin, as to bind them down and contract their area; thus effecting a disturbing pressure adequate to produce a considerable amount of murmur, and even to completely mask the normal second sound.

Dr. Markham extends this observation (p. 35); and says that this murmur may be due to loss of elasticity in the aorta, "or some other alteration of its coats caused by the inflammatory process; or to irregular action in the heart's muscular movements involving those of the columnæ carneæ, whereby the function of the auriculo-ventricular valves is rendered temporarily incomplete; or, again, when the murmur is persistent, it may possibly be ascribed to the pericardial adhesions; these being of such a character as to prevent the walls of the heart, and consequently the columnæ carneæ, from freely contracting, so that the mitral orifice is left partially unclosed during the heart's systole." In this latter case, however, the valvular sound cannot be said to be masked, but is really obliterated by the murmur induced.

It has been stated by some observers that the presence of a serous effusion into the sac of the pericardium may also be the remote cause of a murmur; it has, however, never been my lot to observe a case in which this has been satisfactorily made clear. It is, however, very certain, that effusions of fluid, in cases of acute pleurisy, into the left pleura, especially when attended with excitement of the heart, will produce a murmur. Dr. Stokes (p. 531) says, "It is distinct from any modification of the friction-sound, and consists in a systolic murmur often broken into two parts, sometimes intense. This murmur is most evident during inspiration; but it continues in expiration, and even when the patient holds his breath."

It is probable that the immediate cause of this murmur are the eddies caused in the flow of blood through either or both the aorta or pulmonary artery, as these vessels are contracted at their orifices from being bent and somewhat twisted in consequence of the forcible displacement of the heart—a displacement which at times is very considerable.

It is also probable that those murmurs, so often met with in cases where the heart is displaced by deformities in the parietes of the chest, or by tumours in the abdomen or of the abdominal organs, are, in like manner, due to the contraction caused by the bending or twisting of the great vessels as they emerge from the heart.

In those chests which have a weakly constructed bone-work, a murmur may sometimes be produced by pressure from without, or, at any rate, so very like it as to excite suspicion of the existence of a valvular murmur. This is especially the case in those who, having weak bone-work, are also pigeon-chested. In some cases, especially in these latter, this murmur is so very easily effected, that the slight pressure of a stethoscope during investigation may be adequate to produce it, and even occasionally to require the greatest caution that it be not thus produced.

The murmurs induced by tumours within the mediastinum, or by glandular and similar enlargements encroaching on the great vessels, appear to be due to simple pressure only; so also is the murmur induced in the pulmonary artery when pressed upon by an aortic aneurism.

The whole of these artificial murmurs are synchronous with the systole. Nevertheless, they are heard more distinctly at the base of the heart than at the apex; and this is a very important feature of

their existence, and to be well considered and appreciated in summing up the diagnostic signs.

Murmurs may also be heard, the valves being perfect and normal in their function, in those cases in which an obstruction to the flow of blood within the ventricle or in the larger arteries takes place in consequence of the accidental formation of clots, or of those remarkable and unaccountable matters, the purulent cysts. I conclude there are no very distinct signs by which the presence of these latter may be inferred. The former may, perhaps, by their more frequent seat being in the right ventricle, and by the suddenness of their production, and by the nature of the antecedent illness, yield some grounds of suspicion for their existence. The whole subject, however, of these formations, is one of doubt and difficulty.

The valvular sounds occasionally undergo a complication of some passing interest, whereby they become, as it has been termed, reduplicated. The two normal sounds may thus be added to, so as to form three or even four sounds. Dr. Walshe (p. 79) has given an elaborate summary of these sounds, and such as only a very practised ear, exercised in a large field of observation, could hope to recognise and fully to appreciate. This difficulty of accurately appreciating these sounds in all their specified varieties is not to be wondered at, considering the space of time in which they occur, and the very limited field of their generation, and the invariably agitated state of the heart's action at the time.

The more simple form of this reduplication is not, however, rare, nor difficult of recognition. It occurs with the second sound, which thus becomes divided in time, and as it were cleft in two. But, whether it occur with the second, or with the first, or with both the sounds, it is heard sometimes similar in tone, and sometimes not, to the sound of which it is the reduplication; but usually the first portion of the divided or cleft sound is the most accentuated. For the most part, a reduplicated sound is met with in cases which present apparently the characteristics of functional disorders of the nervous heart only; but it also occurs in cases of active inflammatory disease; and in these cases it is usually the second sound that is cleft, while there is associated with it a mitral murmur. It rarely or never occurs in chronic diseases of the heart. But, whether it be a nervous or inflamed heart, there is one condition necessary for its development, which is, that the heart should be the subject of an unusual amount of systolic excitement. It is for the most part a passing symptom, varying often, and rarely or never permanent.

Dr. Stokes (p. 119) says, "its origin is difficult to declare; but that it is to be attributed to valvular, rather than to muscular action, appears more than probable." Dr. Walshe (p. 80), from the limitation of the phenomena to certain points of the cardiac region, sees difficulty in referring these reduplicated sounds to irregularity in the closure of the valves in respect to time. Seeing, however, that a reduplicated sound is heard over the spot where it is produced, and that the normal sounds themselves are not necessarily very pervading, and are easily obscured, the first one by the second, and *vice versa*, this limitation does not appear sufficient to overthrow the hypothesis of the valvular formation of a reduplicated sound.

I am disposed to conclude this reduplication of the sounds is due entirely to irregularity in the systolic action of the two hearts, so that this function does not agree in time; that hence there arises a want of synchronism in the closure of the valves; and hence also one set, or may be both sets of valves of one heart, act more tardily than their congeners in

the other heart—thus dividing into two sounds what in health would be, from their synchronism, one sound only.

As the first sound depends on the blow caused by the column of blood on the closure of the auriculo-ventricular valves, it may be inferred that a reduplication of the first sound has its origin in the disturbance of the synchronous closure of the mitral and tricuspid valves; while, as the second sound results from the sudden closure of the semilunar valves in each heart, a reduplication of this sound may be said to have its origin in a want of synchronism in these valves.

Such is the theory of the formation of these sounds, and which agrees entirely with the view proposed in these papers, that the heart's action is essentially ventricular, and that the sounds are caused by the sudden closure of the valves on a column of moving fluid. The production of two sounds only, in the heart's normal state, from the four valves, is effected by each corresponding set of valves acting in the most perfect synchronism. Any irregularity in this synchronism may hence induce the reduplication in one or both sounds.

If we examine the cases accurately in which these reduplicated sounds occur, they certainly present features which offer fair ground for assuming that there exists that amount of turbulent action which may induce a want of synchronism in the systole of the ventricles, and that hence this may be the cause of these irregularities in the sounds of the heart. The soundness of this view being granted, then the existence of a reduplicated sound is to be regarded as symptomatic of a want of synchronism in the contractile action of the two ventricles.

In nervous affections of the heart, there often is to be observed the elements which might produce this want of unison.

In those cases in which the second sound, being reduplicated, is associated with a mitral murmur, may be assumed it arises from the too early closing of the aortic valves, in consequence of the spasmodically hurried systole of the left ventricle, under the excitement of recent inflammatory disease; whereby the sound induced by the aortic valves anticipates that caused by those in the pulmonary artery.

Or, on the other hand, any condition of the blood whereby its amount may be unduly forced into, or retained in, one ventricle over the other, would, by impeding its free, ready, and synchronous expansion, be certainly adequate to cause this phenomenon.

Those cases where a full inspiration induces a doubling of the second sound, and which is inaudible in ordinary breathing, Dr. Walshe (p. 81) says, may be explained by the unduly abrupt rush of blood into the pulmonary artery, whereby the necessity for closure of its valves to meet the recoiling fluid is felt a little earlier than usual.

Looking at the circumstances that belong to each of these instances, it is probable that reduplications of the first sound originate in want of synchronism of the commencement of the systole, and of the second sound in excitement, whereby its systole is terminated too quickly.

[To be continued.]

CHOLERA IN SCOTLAND. A deplorable mortality by cholera is reported from the little mining village of Methill Hill, near Leven, in Fifeshire, where, out of a population of at most 400, there were 30 deaths between Sunday and Wednesday, the dreadful epidemic continuing to make fresh victims.