

Observations tending to elucidate the question, Is it possible to discover by auscultation which side of the heart is the diseased one, when hypertrophy or dilation, or both, exist on one side of the organ alone? / [Robert Spittal].

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*Observations tending to elucidate the question,
Is it possible to discover by Auscultation which side of the
Heart is the diseased one, when Hypertrophy or Dilata-
tion, or both, exist on one side of the organ alone? By
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AUSCULTATION, as a means of diagnosis in diseases of the heart, is surrounded by a degree of difficulty and uncertainty seldom to be encountered in the application of the same means in the diagnosis of other affections of the chest; and this in a great measure depends on the fact, that the physiological action of the organ still remains to a certain extent a matter of great doubt. These remarks apply with considerable force to the subject which we propose to consider in the following pages, viz. whether the signs perceived in the right and left precordial

regions by auscultation are caused by, and indicative of the condition of the right or left side of the heart?

The physiological action of the heart, according to Laennec,—“is only felt in the cardiac region; that is, the space comprised between the cartilages of the fourth and seventh ribs, and under the lower end of the *sternum*. The motions of the left cavities are chiefly perceptible in the former place; those of the right cavities in the latter. This is so much the case,” continues he, “that in disease of one side of the heart only, the pulsation in these two situations gives quite different results.”* Again, “the impulse of the heart’s action is usually perceptible only over the region of the heart, or at most over the inferior half of the *sternum*.”† And farther on he observes, that “the sounds heard at the end of the *sternum* are produced by the action of the right side of the heart; those between the cartilages of the ribs by the left cavities. In a state of health the sound produced by the contractions of each side is the same; in certain states of disease, on the contrary, the sound of the two sides becomes quite dissimilar.”‡

Such are the decided statements of Laennec, contained in his unrivalled work on auscultation, in which, although more recent researches have detected occasional inaccuracies, still these have in no way diminished the admiration so justly due to that truly original and useful production. On the contrary, we are astonished at the accuracy with which so many new facts have been communicated to the world.

Perhaps the most important error, as yet, or that ever will be discovered, in the work of Laennec, is that relating to the rhythm of the heart’s action, first observed by Professor Turner, and now almost generally admitted; and we take occasion to mention this inaccuracy, merely to show how errors of very great importance may be overlooked and perpetuated; while, at the same time, a little observation on the part of any one accustomed to such researches might easily, in many instances, prove them to be without foundation.

In the following observations, it is our intention to point out, if not an error in diagnosis, at least a hasty and rash induction from a few facts,—certainly from very insufficient data. We are not prepared to acquiesce in the statement so generally admitted, that it is possible to distinguish by auscultation the movements and sounds of the different sides of the heart either in health or disease; and it does not appear difficult to show that this cannot always be done, and that there is a very great want of evidence from which to draw a satisfactory conclusion on the subject.

* Laennec’s Treatise, by Forbes, p. 548. † Op. cit. p. 553. ‡ Op. cit. p. 555.

In regard to the physiological action of the heart, we are ready to admit that the sounds and impulse of that organ can be perceived in the site originally pointed out by Laennec, viz. the precordial region; but we are not prepared to admit that the sounds and impulse perceived in what is termed the left precordial region are produced by the left cavities; or that those perceived in the right precordial region are produced by the right cavities. Of this there seems to be no distinct proof; and it is more likely that the sounds and impulse are mingled together, and presented to the ear of the observer *en mass*, as remarked by a recent writer,* so as at least to render it a subject of doubt whether it be possible to separate them; and when we come to examine the same indications in a pathological state of the organ, we shall find additional reasons to doubt of their accuracy.

In hypertrophy of the ventricles of the heart, says Laennec, "the contractions of the heart, as explored by the cylinder, give the same results precisely, whether the hypertrophy be on the right or left side; only, in the former case the shock of the heart's action is greater at the bottom of the *sternum* than between the cartilages of the fifth and seventh ribs, which is the reverse of what happens when the disease is on the left side of the organ." Again, he adds, "I consider this sign drawn from the place where the heart is heard and felt beating with most force, as altogether certain. I have proved its truth so often by dissection, that I look upon it as infallible when well-marked."†

In dilatation of the left ventricle, the same author remarks, that "the only certain sign of the existence of this disease is that given by the stethoscope, viz. the clear and sonorous contractions of the heart between the cartilages of the fifth and seventh ribs;"‡ and in dilatation of the right ventricle, "the only constant and truly pathognomonic sign is the loud sound of the heart perceived under the lower part of the *sternum*, and between the cartilages of the fifth and seventh ribs of the right side."§ Again, in cases of dilatation with hypertrophy, "the examination of the actions of the heart, first on the one side, and then on the other, that is, under the lower part of the *sternum*, and between the cartilages of the fifth and seventh ribs of the left side, enables us to ascertain precisely which of the ventricles is affected, if there is only one; or, if they both are so, which is more commonly the case."|| And in the chapter on dilatation of one of the ventricles, with hypertrophy of the other, the same author observes, that "the comparative exploration of the two sides of the heart is a certain means of ascertaining every complication of this kind that can take place."¶

* Instruction Pratique, &c. par M. Corbin. Paris, 1831. P. 38.

† Forbes' Laennec, p. 602. ‡ Op. cit. p. 605. § Op. cit. p. 606.

|| Op. cit. p. 609.

¶ Op. cit. p. 610.

Lastly, in treating of the rhythm of the heart, we find the following passage:—"When only one of the sides of the heart is affected, and more particularly in the case of contraction of the orifices, the rhythm, the sound, and the impulse of the sides, may differ so much as to occasion results that might be attributed to two different hearts." *

These statements of Laennec have been more or less adopted by almost every writer on auscultation since the time of that author; but, whether from conviction,—the result of personal observation,—or merely from reliance on the accuracy of the original and enlightened observer,—will afterwards be seen when we come to look for evidence on the point under consideration. †

It is evident, from a perusal of these observations taken from the work of Laennec, that the learned author had formed a very decided opinion on this subject, viz. that it is possible, by auscultation, to tell which side of the heart is the diseased one, whether this be hypertrophy, or dilatation, or both. We do not mean to say, however, that auscultation is regarded as the only means of diagnosis in such affections. On the contrary, Laennec, and several of the authors alluded to above, press upon us the necessity of looking to the general symptoms in the formation of a diagnosis; still at the same time the stethoscopic indications are held forth as of the first importance.

Now, although auscultation by no means always reveals the condition of the heart in a general way, in reference to the more ordinary affections, such as hypertrophy and dilatation—the opinion of Andral and others being now very generally admitted, viz. that, when the signs of such affections exist, it is in general just to conclude that the disease exists also; but the absence of such signs by no means indicates the non-existence of disease. Still there can be no doubt, that very great assistance is rendered by auscultation in by far the majority of cases,—not by informing us that one or other ventricle is diseased, but in a general way indicating enlargement, diminution, hypertrophy, or dilatation of the organ, and this in reference entirely to the ven-

* Forbes' Laennec, p. 563.

† The following are the authors alluded to who have all more or less adopted the opinion of Laennec:—H. C. Van Hall, de *Stethoscopii in Morbis Pectoris usu*. Trajecti ad Rhenum, 1823.—*Traité des Maladies du Cœur*, &c. par R. J. Bertin, &c. Paris, 1824.—*Original Cases*, &c. by John Forbes, M. D. London, 1824.—*An Introduction to the Use of the Stethoscope*, by William Stokes, M. D. Edinburgh, 1825.—*Memoire sur le Diagnostic des Affections Aigues et Chronique des Organes Thoraciques*, par Elie Gintrac, M. D. Louvain, 1826.—*Clinique Medicale, Maladies de Poitrine*, par Andral. Paris, 1826.—*Traité Elementaire de Diagnostic*, &c. par M. L. Rostan. Paris, 1826.—*Lumleyan Lectures*, by Dr Elliotson. London, 1830.—*Des Diverses Methodes d'Exploration de la Poitrine*, &c. par V. Collin, M. D. Paris, 1831.—*A Treatise on the Diseases of the Heart and Great Vessels*, by J. Hope, M. D. London, 1832.

trices; for, as to the diagnostic signs of similar affections of the auricles by auscultation, we know nothing.

Thus far we are willing to go; and we also admit, that the peculiar indications of the action of the heart may vary their site, so as in one case to be more distinctly perceived at one part of the precordial region than in another. But this, as remarked by M. Corbin, with whom we are very much inclined to agree, does no more than point out the space in which the pulsations of the heart take place; and the more or less extended from this space indicates, in a general manner, hypertrophy or dilatation, without permitting us to designate the special site of the disease.*

We shall now bring forward various statements and facts in support of the views adopted in this paper, which seem quite at variance with the opinion of Laennec and others. This will be chiefly drawn from the writings of the most eminent authors who have written on this subject; and, according to seniority of publication, Bertin is the first we shall notice. In that author we find the following remarks:—"Dans les cas d'hypertrophie des parois du ventricule gauche seulement, cette cavite parait constituer le cœur tout entier, et le ventricule droit ne semble qu'une sorte d'appendice de l'autre, comme celui-ci s'était hypertrophié aux dépens du droit. Quand le ventricule droit est épaisse, par exemple, le gauche, moins ferme et moins robuste que dans l'état naturel, se rapproche de l'état normal du ventricule droit. Ce qui a fait supposer, dans ses cas, une espèce de transposition de ces organes. Quel que soit le ventricule hypertrophié, on remarque que sa pointe descend plus bas que celle de l'autre."† In the article on malposition of the heart, the same author observes:—"Nous avons rapporté des cas où le cœur était situé transversalement dans la cavité thoracique; et nous avons dit que ce vice de position se rencontrant souvent dans les cas d'hypertrophie et de dilatation considérable du cœur."‡ And again, "D'autres observateurs ont trouvé le cœur situé perpendiculairement, comme celui des quadrupèdes. Les exemples de véritable déplacement du cœur ne sont pas très rares."§

In the work of Laennec we find the following remarkable passage, being a portion of the same paragraph, in which he states, that he considered the site in which the action of the heart is perceived, a sign, not only as altogether certain, but infallible when well-marked, viz. "nevertheless there is still one exception to this rule. When the left ventricle has acquired an enormous size from hypertrophy and dilatation, and the right still remains small, the former becomes quite anterior, and the last posterior. In this case the pulsations of the left ventricle are perceived much bet-

* Op. cit. p. 51. † Bertin, p. 344. ‡ Op. cit. p. 441. § Op. cit. p. 442.

ter under the sternum than in the left precordial region ; while those of the right are not perceived at all.”* Again, in considering displacement of the heart, we have the following passage. “ When the heart is enlarged, its point is carried to the left, and the auricles to the right side,—in such manner, that it comes to lie almost transversely across the chest. This observation has been made by M. Bertin, and I have myself often proved its accuracy.”†

It is well known that various confident statements, made by Laennec in the first edition of his treatise, published in 1819, were very much modified, if not abandoned, in the second, published in 1826. The present quotation shows this. In both editions we find the passage formerly noticed, announcing the infallibility of certain signs occurring in a particular site, as diagnostic of disease of one or other side of the heart ; but in the second edition, this statement is qualified by the addition of the first paragraph noticed.‡ The second paragraph,§ in corroboration of Bertin, is only to be found in the latter edition, from which also all the previous quotations from that author have been taken. These, as well as other instances, might be mentioned to illustrate a want of caution, to a certain extent, in the enlightened observer, in originally drawing his inductions from the facts before him.

Much attention to the diagnosis of diseases of the heart has been given by Dr Elliotson ; and in his work we find the following remark :—“ When the left ventricle is severely affected with hypertrophy and dilatation, its violent pulsations are felt, not merely in the left lower half of the cardiac region, but also under the *sternum*, and even to the right of this bone.”||

The last author we shall notice is Dr Hope, whose work is perhaps the ablest on the subject in the English language. In it we find the following observations :—“ The left ventricle being more prone to thickening, and not less to dilatation than the right, sometimes attains a volume seldom or never acquired by the right ; and when its enlargement is enormous, it occupies not only the left precordial region, but extends far under the *sternum*, when its impulse and sound may be mistaken for those of the right ventricle.”¶ In another memoir on hypertrophy of the heart, the same author remarks,—“ that, when all the cavities are hypertrophous, and at the same time dilated, the heart attains a volume two, three, and occasionally even four times greater than natural ; its form, instead of being ob-

* Forbes's Laennec, p. 603.

† Op. cit. p. 627.

‡ Op. Cit. p. 603.

§ Op. Cit., p. 627.

|| Lumleyan Lectures, p. 27.

¶ Hope, p. 183.

long, is spherical; its apex is scarcely distinguishable; and as the diaphragm does not retire sufficiently to yield space downwards for the enlarged organ, it assumes an unnaturally horizontal position, encroaching so far upon the left cavity of the chest, as sometimes to force the lung upwards as high as the level of the fourth rib, or even higher."*

These extracts sufficiently show that the distinguished authors, from whose works they have been taken, were quite aware of the fact, that exceptions existed to the general rule which they had adopted in regard to the diagnosis of the different sides of the heart by auscultation; but it seems they did not consider these exceptions sufficiently numerous and important, to disturb the general accuracy of the opinion they had formed. The collective evidence contained in the observations just quoted, however, is quite at variance with such an opinion; for it is evident that, under the circumstances mentioned, the diagnosis would be at least rendered exceedingly doubtful in many such cases, and altogether erroneous, and the reverse in some; and there is reason to suppose, that, were this subject more attended to, such exceptions would be more frequently observed. As it is, these appear sufficiently numerous, and, when taken together, with the very slender evidence which shall be presently noticed in support of the opinion at present combated, are quite enough to render the general truth of such an opinion at least very doubtful.

The following is the most remarkable case bearing upon the subject which has yet come under our notice. It occurred some time ago in the Royal Infirmary of this city, and is remarkable for the existence of great disease of one side of the heart, with distinct stethoscopic signs of an affection of the opposite, according to the ordinary physical signs, as laid down by almost every writer on this subject.—W. P., a man ætat. 24. Action of the heart loud, and irregular in strength and frequency. Impulse much stronger than usual, and perceived most distinctly between the fifth and sixth ribs,—more to the left than usual. The pulse at the wrist is feeble and intermitting. There is no *bruit de soufflet* or other morbid sound heard during the action of the heart.

Dissection.—Heart enlarged, and lay more obliquely to the left in the chest than usual, its apex pointing between the fifth and sixth ribs. The left ventricle was rather below the usual size and thickness, very flabby and soft, so that it collapsed on being cut into. The right ventricle, on the contrary, was much di-

* Article Hypertrophy, Cyclopædia of Pract. Med., Part xi. p. 536.

lated, and its walls in a state of considerable hypertrophy; its *columnæ carneæ* were also much enlarged. The walls of this ventricle were much firmer than usual, so that they did not collapse on being cut into, and even yielded a somewhat hollow sound when struck with the scalpel. The extremity of this ventricle, twisted round to the left, formed the apex of the heart. The mitral valve was very much diseased; its two segments were united for a considerable way at each side by a cartilaginous deposition, which had likewise involved some of the *cordæ tendineæ*. By this disease of the valve, the left auriculo-ventricular opening was so much narrowed, that it could only admit the point of the little finger. There was slight dilatation and thickening of the walls of the left auricle; and here and there, on its inner surface, small earthy scales were observed.

In this case the right ventricle had, as it were, changed places, to a certain extent, with the left. Its great enlargement seems to have forced the heart more to the left side of the *thorax* than usual, in all probability from not having met with a corresponding nutritive, and consequent physical, force on the left side of the organ, which, there is every reason to suppose, had it encountered, viz. a state of hypertrophy, with dilatation of the left ventricle, the direction of the organ would not have been changed. That this is the way in which the change of direction has taken place, appears very probable; and it is stated in the case, that the left ventricle was soft and flabby, and rather below its usual size; it was, therefore, in a very fit condition to be so acted upon by the right ventricle. The direction of the apex of the heart seems to be maintained in its proper position principally by the integrity of its ventricles.

The signs of auscultation in the present case, according to the opinion of Laennec and others, were unequivocally those of hypertrophy and dilatation of the left ventricle, with no indication whatever of the right being affected at all; while on examination after death quite the reverse was found to be the case. The impulse, instead of being at the lower part of the *sternum*, as it is said it will be found in such cases as the present, was perceived rather more to the left of its usual position in health; and when we consider the softened state of the left ventricle, and, on the contrary, the hypertrophied, dilated, and indurated condition of the right, we cannot have the slightest hesitation in attributing the strong impulse to the latter, independently of the position which the heart was found to have assumed, and which was revealed by dissection. Farther, it may be mentioned, that the examination of the body took place only fifteen hours after death, so that the softening of the left ventricle cannot be attributed to incipient decomposition. Moreover, both

ventricles were equally, of course, exposed to the influence of the same causes. Besides, it is remarked by Bertin, that in cases of considerable hypertrophy, with induration of the right ventricle, the left ventricle is in general soft and flabby, the two having as it were changed conditions.

The converse of the case just related has been already mentioned in a former part of this paper. In such cases the left ventricle seems to exert a similar influence in changing the direction of the heart, only it is to the opposite side. The bias of the organ, it will be observed, is to its weaker side,—thus in the one case the heart was directed more to the left side of the *thorax*, the left ventricle being in a flabby and diminished condition,—in the other to the right side of the *thorax*, the right side of the organ being the weaker. It is of importance to keep such cases in view; and there is reason to suppose that they occur more frequently than is imagined; and we believe that similar physical signs to those we have recorded in the case above will be found in every instance in which the right ventricle alone is much hypertrophied and dilated, and when it forms the apex of the heart.

The table (pages 10, 11,) contains all the evidence in the form of facts that we can find in the works of the most eminent, as well as the latest authors on this subject, viz. Laennec, Bertin, Forbes, and Hope. On referring to the works of these authors, we find about eighty cases of disease of the heart,—in almost every case hypertrophy or dilatation,—in which auscultation had been made use of as a means of diagnosis; and it seems a matter of some surprise, that of these eighty, the following eighteen, mentioned in the table, are the only cases which contain any thing like evidence on the point at present under discussion.

In the table, we have stated as shortly as possible in the first column the nature and site of the impulse. In the second column, the nature and site of the sound; in the third column, the diagnosis which accompanies every case; and in the fourth column, the condition of the heart as found on dissection.

It is quite evident from a perusal of the table, that there is a very great want of agreement in the cases therein mentioned, between the signs afforded by auscultation and the actual condition of the heart; and a careful comparison between the first, second, and fourth columns, will show that a correspondence between the signs afforded and the morbid conditions of the heart, according to the rules laid down by Laennec, occurs only in about one-fifth part of the whole; while in a large number the indications are either entirely, or in part, erroneous, incomplete, or altogether absent. And to show how little such indications are to be trusted, even in the hands of the eminent individuals whose works we have consulted, it may be mentioned, that of

IMPULSE	SOUND.	DIAGNOSIS.	AUTOPSY.
16. Strong in right precordial region; less in left.	Sufficiently marked in right region; louder in left region.	Hypertrophy with dilatation of heart, especially of right side; afterwards hypertrophy of right side.	Dilatation and thinning of left ventricle; hypertrophy and dilatation of right ventricle.
47. Strong in both precordial regions.	Obtuse; loudest in left region.	Hypertrophy of both ventricles.	Hypertrophy and dilatation of both ventricles.
49. Very strong in left precordial region; moderate in right region.	Sufficiently loud in left region; moderate in right.	Hypertrophy of heart.	Great hypertrophy and dilatation of left ventricle; slight dilatation of right.
49.* Sufficiently strong in left region.	Not very clear in left region.	Hypertrophy and dilatation of left ventricle.	Considerable hypertrophy and dilatation of left ventricle; slight hypertrophy of right.
50. Strong in left region.	Moderate in left region.	Hypertrophy of left side of heart.	Hypertrophy of left ventricle.
51. Strong, concentrated, in left region.	Dull in left region.	Hypertrophy of left ventricle.	Great hypertrophy of left ventricle.
3. Great.	Loud, especially at right side of <i>sternum</i> .	Dilatation, with hypertrophy of heart. Dilatation especially of right cavities.	Hypertrophy and dilatation of left ventricle; dilatation of right, and greater than in left.
7. Slight in cardiac region.	Diffused, and heard most distinctly in right region.	Hypertrophy, with dilatation (of one or both?) the ventricles.	Considerable dilatation and hypertrophy of left ventricle; slight hypertrophy of right ventricle.
1. Strong in left region.	First dull; second loud.	Hypertrophy with dilatation.	Immense hypertrophy of left ventricle; considerable of right; both dilated.
2. Increased in force and extent.	Loud prolonged murmur in left region.	Organic disease of heart.	Simple hypertrophy of left ventricle.

7. Increased in left region weaker in right.	Diffused, short, flat.	Dilatation of left ventricle, with thinning of walls.	Considerable dilatation of left ventricle; walls natural; less dilatation of right; walls natural or thinner.
9. Feeble.	Clear and short; loudest in left region.	Dilatation of heart.	Slight dilatation of right ventricle; walls of left ventricle thinner than natural, not dilated.
16. Tumultuous, diffused, & most felt in right region.	Diffused.	Hypertrophy and dilatation.	Dilatation of both ventricles; walls natural.
18. Diffused.	Most distinct in right region.	Dilatation of heart, particularly on right side.	Dilatation and hypertrophy of right ventricle; dilatation of left ventricle; walls natural.
20. Diffused; strongest in left region.	Loud in left region; remote in right,	Dilatation and hypertrophy of left ventricle; walls not thickened; right ventricle dilated, not thickened.	Dilatation of left ventricle; walls natural; right ventricle dilated; <i>columnæ carneæ</i> enlarged.
22. Diffused; stronger than natural, particularly in left region; felt in <i>epigastrio</i> .	Diffused, loud; loudest between second and third ribs.	Hypertrophy, and still more dilatation, greatest on left side.	Hypertrophy and dilatation chiefly on left side.
26. Tumultuous; strongest in left region.	Loudest in left region.	Hypertrophy, with dilatation of heart; most of the former in left, of the latter in right side.	Dilatation, with hypertrophy of right ventricle; hypertrophy, with dilatation of left ventricle.
31. Heart presents signs of	Dilatation of the right side.		All the cavities dilated.

Note.—The numbers in the table refer to the numbers of the cases in the works of the authors from which they are taken. Nos. 16, 47, 49, are from Laennec. Nos. 49, * 50, 51, from Bertin. Nos. 3, 7, from Forbes. Nos. 1, 2, 7, 9, 16, 18, 20, 22, 26, 31, from Hope.

the eighteen cases, each of which is furnished with a diagnosis, only one-fourth are, as a whole, correct. With these exceptions, almost all the rest are incomplete, and many are very erroneous.

We have thus endeavoured to show the actual state of the evidence on the question at issue; and enough, we trust, has been advanced to induce us to pause a little before coming to join in any conclusion analogous to that so decidedly advanced by Laennec, and apparently so cordially supported by those who have followed in his steps. We do not say that such an opinion is in every case erroneous, but that exceptions to it are very numerous; and, from this fact alone, it will in all probability become of little importance;—misleading the observer who puts his trust in it, should it even be proved true in some cases. It is quite impossible, however, to come to a satisfactory conclusion at present, and we fear it will remain so until a far more extensive mass of evidence on this subject shall have been accumulated.