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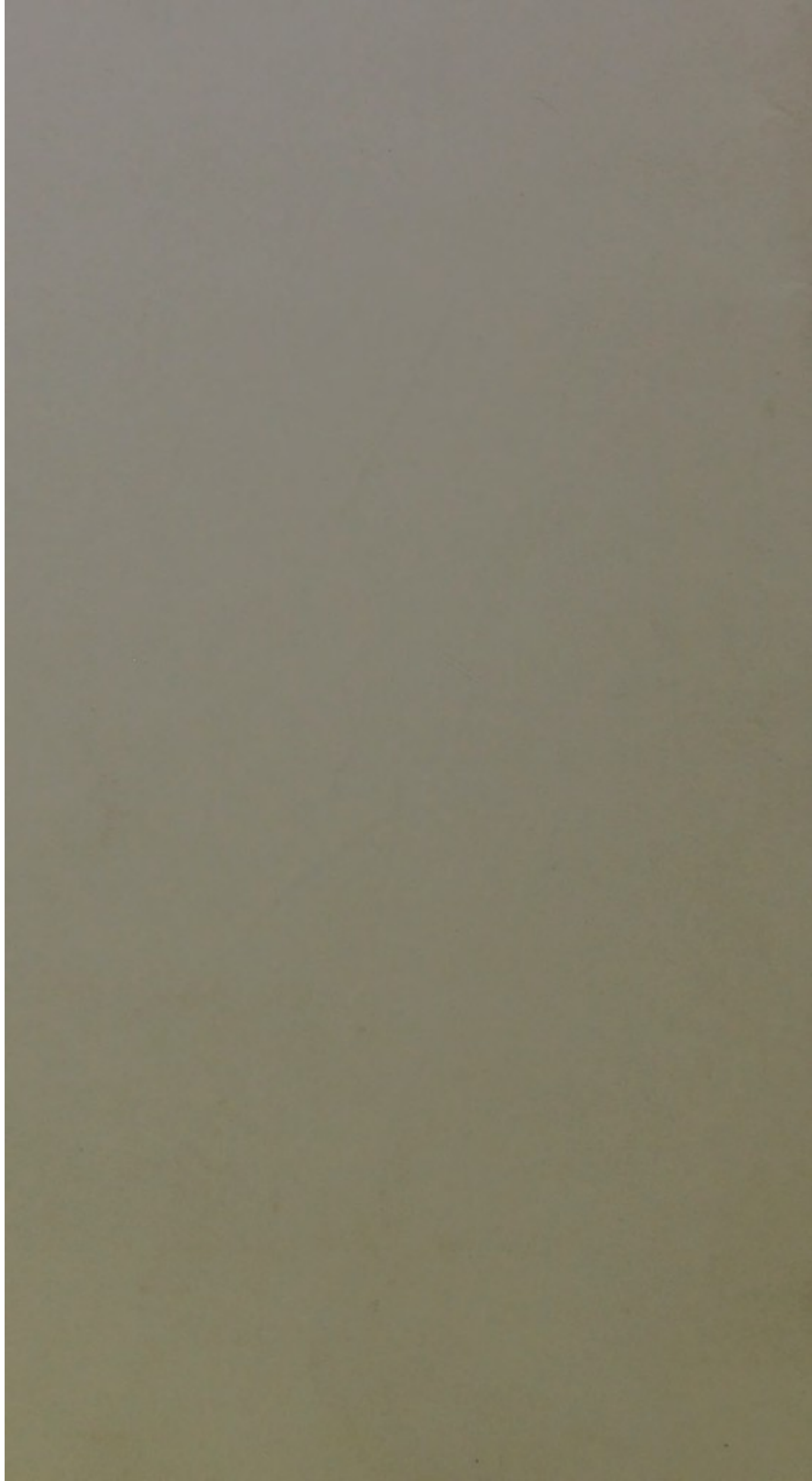
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ON

INADEQUACY

OF THE

VALVES OF THE AORTA.

BY WILLIAM HENDERSON, M.D.

(From the *Edin. Med. and Surg. Journal*, No. 133.)

DR CORRIGAN has the merit of having made the first attempt to determine the symptoms which distinguish imperfection of the aortic valves,* and of having succeeded so far as to have pointed out some phenomena frequently attendant on the disease. The signs proper to it he concludes to be as follow: 1st, Visible pulsation of the arteries of the head and superior extremities; 2d, *Bruit de soufflet* in the ascending aorta, in the carotids, and subclavians (during their diastole.) 3d, *Bruit de soufflet*, and fremitus, or a peculiar rushing thrill felt by the finger in the carotids and subclavians, (also during their diastole.) About the same time, in 1832, Dr Hope,† in treating of the murmurs which result from diseases of the aortic valves, says, “a murmur may accompany the second sound when there is regurgitation through the aortic valves, and its source may be known by its being louder and more superficial opposite to those valves than elsewhere. I have never found it strong, and I doubt whether it can be so, as the instantaneous manner in which the ventricle is refilled by its diastole must prevent the regurgitation from being considerable.” In 1834, M. Guyot published at Paris a thesis, containing an account of four cases of this disease which had been observed in the hospital practice of M. Rayer. He sums up the peculiar signs of these cases under the following heads. 1. “Absence du bruit clair, ou superieur, du cœur, (second sound,) et son remplacement par un bruit de soufflet tres-sensible au cœur lui-même, dans l’aorte ascendante, les carotids, et les sous-clavières. 2. Pulsations visibles des artères du cou, de la tete, et des membres supérieures. 3. Pouls fort, frequent, et vibrant.”‡ M. Charcelay in a thesis of 1836, gives an account of ten new cases, and conceives the pathognomic sign to be a *bruit de soufflet* in place of the second sound having its maximum at the root of the aorta, and prolonging itself more or less through this artery and its principal branches. As signs of subordinate value he enumerates—a strong, hard, and vibrating pulse; visible pulsation of the arteries of the neck, head, and superior extremities; and flexuosity of some of the vessels.§ A few cases have besides appeared in several British journals, viz. one by Dr MacAdam in the ninth volume of the Dublin Journal of Medical and Chemical Science, in which, among many symptoms of derangement of the circulation, there were remarked—a pulse at the wrist, 90, small, weak, and occasionally intermitting; impulse of the heart weak, its sounds clear and loud, and heard distinctly all over the anterior parts of the chest—the second sound accompanied with a peculiar musical murmur, resembling the

* Edin. Med. and Surg. Journ. Vol. xxxvii. † On Diseases of the Heart, p. 340.

‡ Arch. Gén. t. v. ii. Série.

§ Ibid. Mars. 1837.

cooing of a pigeon ; two cases by Dr Watson, in the nineteenth volume of the London Medical Gazette, in one of which it was remarked that a loud and prolonged sound was heard, accompanying the diastole of the heart, with its greatest intensity at the upper part of the lower third of the sternum, like that produced by the flight of a hornet, or by the cooing of a dove, and which was heard by the unassisted ear a foot from the patient's chest,—it was also noticed that a strong jarring thrill could be felt, by the hand placed on the sternum, during the diastole of the heart. In Dr Watson's second case, in addition to the ordinary symptoms of organic disease of the heart, it was observed that the second sound (the first being natural) “ consisted in a long-drawn and very loud vocal note, audible to the patient himself, who (unprompted) compared it to the cooing of a pigeon ;” it was louder on the right than on the left of the sternum. In this latter case, as in Dr MacAdam's, inadequacy of the aortic valves was, after death, ascertained to exist. A case apparently of rupture of the semilunar valves of the aorta is recorded in the 43d volume of this Journal, in which two strong bellows murmurs obscured the usual sounds of the heart, and had their maximum near the top of the sternum, towards its right side. In this case it was also observed, that there was frequently an impulse accompanying the second sound, a diffused impulse over the upper third of the sternum, a distinct thrill occasionally to the right of this, and impaired percussion along the whole extent of the sternum. The case was, in consequence, very naturally mistaken for aneurism in the course of the ascending aorta. On examination after death the aorta was found perfectly sound, and two of its valves so torn from their attachments as to leave a large opening for regurgitation of blood into the ventricle,—while the impaired percussion, and diffused impulse, observed on the sternum, were found to have been caused by condensation of the anterior margin of the right lung, which, having been pressed upon by a considerable effusion into the right cavity of the pleura, was made to occupy more of the space behind the sternum than usual.

One conclusion to be derived from the foregoing observations is, that we have yet no formula of diagnostic signs which can afford us a certainty that cases of incompetency of the aortic valves may not sometimes escape detection, even after the most careful and judicious investigation. In Dr Corrigan's enumeration of the signs, the second and third are nowise peculiar to the disease in question, nor do they add any significance to the first. The “ visible pulsation” of the arteries in the neck and superior extremities is a very important indication of a patent state of the aortic valves, when this sign is present *in a remarkable degree* ; but that it is not always so my own experience

has convinced me, and when it is not, the state of the pulsation of the vessels in this complaint cannot be satisfactorily distinguished from the full and bounding pulse of other diseases. The "*bruit de soufflet*," and "*fremissement*," in the large vessels during their diastole, depend either on valvular excrescences, or on disproportion between the quantity and velocity of the blood, and the orifice which transmits it. That Dr Corrigan should, in common with other physicians, have witnessed all these signs in cases of incompetency, is consistent with the pathological changes effected at the mouth of the aorta, for the valves are not unfrequently in such a state of disease that they are both patent before the reacting column of blood, and an obstacle to the egress of fluid from the ventricle. The error has consisted in associating the signs of the latter with those of the former condition, either of which may occur separately in different cases.

The murmur incidentally noticed by Dr Hope, as accompanying regurgitation from the aorta through patent valves, is, under certain restrictions, a very valuable distinguishing sign. The simple occurrence of a murmur instead of the clear second sound at the base of the heart is no evidence of patency of the aortic valves, since it equally attends contraction of either of the auriculo-ventricular openings. Could we, indeed, rely on its being always louder on that part of the chest immediately contiguous to the place at which it originates, and were we able to guess exactly the position of the several orifices of the heart, the murmur, as described by Dr Hope, would readily indicate its source. But experience has proved that the maximum of the murmur indicative of patency of the aortic valves is not uniformly at the usual situation of the root of the aorta, as stated by Dr Hope and M. Charcelay, for in Dr Watson's second case the murmur was loudest on the right side of the sternum. It is also highly probable that the remarkable increase in the size of the heart, commonly attendant on incompetency of the aortic valves, has the effect of altering the relations usually subsisting betwixt the several parts of the heart and the external surface. The murmur, instead of the second sound, which denotes imperfection of the aortic valves, is capable of being distinguished from that which results from narrowing of an auriculo-ventricular opening solely by its being chiefly audible in the course of the aorta, and its principal branches in the neck, while the murmur occasioned by the latter disease, although it may in some instances be considerably diffused, does not follow so distinctly the course of the vessels. The track of the murmur does not serve to distinguish patency of the aortic valves from an aneurism in the course of the aorta, which produces a murmur coincident with the diastole

of the heart.* The state of percussion on the sternum and neighbouring parts, a remarkable phenomenon in the progression of the pulse hereafter to be mentioned, and other circumstances, require to be previously considered.

This murmur, instead of the usual second sound, is not, however, all that is wanted to indicate incompetency of the valves of the aorta, for cases of this disease occur in which no such sound is present. Dr Corrigan, although he excludes it from his formula of diagnostic signs, allows that it is occasionally present, but limits it, I think with questionable propriety, to cases "in which the deficiency of the valves is considerable." That cases of the disease occur without this sign I have reason to believe, on the testimony of other competent observers in addition to Dr Corrigan, although in the several cases which have fallen under my own notice, a murmur attending the recoil of the arteries existed in the course of the ascending aorta, and usually more or less in its chief branches.

Of the several instances of this affection, amounting to four, which have recently occurred to me, all had one or more of the signs which occasionally characterize defective action of the valves, and, moreover, agreed in presenting a remarkable phenomenon in the circulation, which, as it appears to me necessarily to result from the mechanism of the disease, and the laws regulating the motion of blood in the arteries, I conceive it of some importance to recommend to the notice of those who have opportunities of extending the inquiry into its value. The sign to which I allude is a greatly increased interval between the systole of the heart and the pulse of the remote arteries, such as the radial. The concurrent testimony of Sœmmering, Wedemeyer, Magendie, Weber,† and many other physiologists, sustains the conviction which any one may derive from a scrutiny of his own circulation, that in a state of health there is some degree of succession in the arterial pulse, although Harvey, Haller, Spallanzani, and many others maintained as a fact universally true, that the arteries pulsate synchronously with the heart. This error, though easily tested and rectified, furnished Kerr, in his opposition to the Harveian doctrine of the circulation, with a powerful argument, had the fact been as Harvey had supposed. "The motion of a fluid," says Kerr, "propelled through elastic tubes, in diameter such as the arteries, and by a force much greater than that exerted by the heart, is still progressive, as may be ascertained by the fingers applied and also by the eye; whereas the natural pulse of warm-

* Edin. Med. and Surg. Journ. No. 127. "On the sounds afforded by sub-sternal aneurisms."

† Burdach, Physiologic, B. iv.

blooded animals is instantaneous, and altogether, as Harvey observes, "*quasi trajecto fulgure.*"* A similar observation must have occurred to all who reflected on the mechanism of the circulation, and have enforced at all events the *notion* of a necessary succession in the pulse, and accordingly Spallanzani says, "but although it is evident this successive motion must take place, it cannot be perceived, as the circulation is carried on with such astonishing celerity, that at the very moment when the heart contracts, the aorta, and the whole arterial system seem to beat at one and the same time."† From the difference of opinion which appears to have prevailed on the subject, it may be presumed, as is in fact the case, that the succession of the pulse is exceedingly rapid, and that the proper interval between the pulsations in any two parts of the body is very brief. This swift transmission of the shock communicated to one extremity of the column of blood in the arteries has been referred to the state of repletion, in which the vessels are maintained,—a condition universally admitted to be essential to the velocity of an undulation in fluids confined in elastic tubes. The necessary state of fulness cannot exist in the large vessels, when a quantity of the blood propelled into them recedes into the heart during each diastole of the ventricles, as must be the case when the aortic valves are incapable of exercising their function. Each succeeding systole of the heart propels the new wave of blood into vessels too much relaxed to admit of the onward pulse being transmitted with the usual velocity; and there results a remarkably increased interval between the beat of the heart and of the remote arteries. The increased interval in the several cases to which I have alluded was so great that the radial pulse exactly alternated with the systole of the ventricles, or occurred in the middle of the interval between the successive pulses of the heart. I have examined many persons affected with disease of the heart in different forms, and found this peculiarity of the pulse in none, except those in whom there were signs of defective action of the aortic valves. Those cases I relate minutely, that the probable accuracy of this diagnosis may be judged of, there having been but one examination after death to confirm the justice of the previous expectation. Three of the patients are, in so far as I know, yet alive, and the only additional information of any importance which could be wished for in the event of examination after death would relate to the degree of the incompetency of the valves. If the defect be to a small extent in those cases which exhibited so great a pause between the systole of the ventricles, and the pulse of the remote arteries,

* Observ. on the Harveian Doct. p. 20.

† Spallanzani's Experiments on the Circulation, p. 254.

we should expect it in the case of a greater incompetency to be, if not more remarkable, at all events, not less so. But if the incompetency be very considerable in those cases, it is possible that in a small degree of the disease the retarded progression of the pulse may not be observable. Dr Corrigan has, indeed, stated that the murmur, with the second sound, which was present in these cases, is confined to instances of considerable deficiency of the valves, yet the statement does not appear to be founded on actual knowledge of the fact. In the absence of ocular proof, I may be allowed to state the grounds on which I found my belief, that at least in two of the subjoined cases the disease did not, when examined by me, exist in an aggravated form. The two to which I refer were characterized by a prolonged cooing, or musical note, in place of the second sound. So lengthened was this note, that, as in Dr Watson's cases, the inference is very natural, that the ventricle into which the blood that originated the note was receding became very gradually filled. Now this slow rate of filling could not have occurred if blood were rushing into the cavity at once from a large opening among the semilunar valves, as well as through the ordinary passage from the auricle. The inference is further supported by other circumstances in the history of Case II., to wit, the cessation of the musical note after the lapse of some months, and the occurrence in its room of a feeble bellows-murmur, not sufficient to denote patency of the valves, while at the same time the interval between the pulse in the region of the heart and at the wrist became reduced to its healthy state. From what causes this state of the phenomena resulted, it were needless at present to endeavour to determine. The evidence that incompetency of the aortic valves did exist at one time in this case is very strong, and the possibility of a cessation of this morbid state of the valves, we are not warranted in denying, when we have the assurance of M. Charcelay, that inflammatory turgescence of the valves is one cause of their incompetency; and when it may be reasonably presumed that their deficiency may admit of being compensated in some instances by the growth of excrescences, or formation of organized laminae. The supposition may be justly hazarded in regard to the conditions of this case, that the deficiency of the valves, if great, was not likely to be remedied as it appears to have been.

Reflecting on the extent to which an aneurism appears to expand with every influx of blood, I apprehended, that, in the event of such a disease occurring in the substernal aorta, it might have the effect of retarding the progression of the pulse, and consequently of detracting from the value of this as a sign of patency of the aorta. Only one case of aneurism in this situation has occurred to enable me to determine this question,

and in this instance, although a very extensive aneurism, occupying a large portion of the right side of the chest, and still pervious to blood, the pulse of the heart and arteries bore their usual relation to each other. Nor is it surprising that it should be so, when we remember, as Haller remarks, that the blood resumes its velocity after having passed an aneurism,—indeed, were it otherwise, the sac would necessarily undergo a permanent increase of size from every new influx of blood—and that the expansion of an aneurism at each pulsation probably is, as in the healthy arteries, more apparent than real.

In concluding this brief notice of incompetency of the aortic valves, it may be of use to sum up what appears to be warranted regarding the more prominent signs by the accumulated observations of different authorities.

1st. Visible pulsation, or remarkable leaping of the arteries of the head and upper extremities, is a very common attendant on the disease,—yet not worthy of being considered a pathognomic sign, because it is not always present in a degree of peculiar significance, may result merely from a greatly enlarged left ventricle (to which, indeed, M. Guyot attributes it in patency of the valves,) and may be caused by continued nervous excitement (Corrigan); nor is its true cause revealed by

2dly. Bruit de soufflet and fremissement, accompanying the diastole of the arteries, as maintained by Dr Corrigan, for the former of these may result from mere irritability (Hope,) and the latter is often absent altogether in cases of patency. These phenomena may also result from disproportion between an enlarged ventricle and the orifice of the aorta, and from vegetations on the valves.

3dly. A bellows-murmur, in place of the usual second sound, most audible along the track of the aorta and its primary branches, is an indication of patency of the aortic valves, except in those rare cases of aneurism in the course of the sub-sternal aorta which have the power of originating two murmurs, (Edin. Med. and Surg. Journ. No. 127.) The musical or cooing note, in place of the second sound, has hitherto been found to originate only in cases of patency of these valves. The morbid murmur during the diastole of the heart, whether a bellows-sound or a sonorous note, may, contrary to the opinion of Dr Hope, be very loud in cases of incompetency of the valves. In some cases, however, there are no such sounds.

4thly. The occurrence of a preternatural interval between the period of the heart's contraction, and of the remote arterial pulse, promises to prove a valuable sign of inadequacy of the aortic valves. Should it prove on further inquiry to be constant, it will remove the difficulties in the differential diagnosis of patency.

5thly. The usually full pulse and tortuous state of the arteries are natural consequences of the great volume of the left ventricle, which, since the time of Haller, has been known to result from insufficiency of the semilunar valves. (Biol. Von. Trevir. iv.) The longer the continuance of the disease, the more remarkable these become.

CASE I.—A. B. aged 42, a gardener, July 30, 1836. He states that he enjoyed good health till about three months ago. He then became subject to asthma or difficulty of breathing, which usually attacked him in the evening. After a short time he was liable to fits of palpitation, and pain, during the paroxysms, all over his left arm. For six weeks past his complaints have been particularly troublesome, and he is now unable to leave his room, and often spends the night without sleep, owing to the severity of his dyspnœa. Pulse 90, regular and firm; pulsation of the carotid arteries visible; and also of the radials, though less remarkably so.

In the region of the heart there are two morbid murmurs in place of the healthy sounds, of which the first is loudest. About the sternal extremity of the fourth rib the two sounds are louder and more superficial, and there is less difference between them. They are heard nearly equal in intensity, as far as the upper end of the sternum, and immediately above this bone they become of a deeper and hoarser tone, while at the same place there is some degree of impulse during the diastole of the arteries. The two sounds are audible on every part of the chest; in front they are less distinct on the sides than on the sternum, and are faint on the back. They are of the character of a harsh bellows-murmur, except in the space above the sternum, and in the carotids. In these vessels, the first sound is hoarse and distant, the second feebler than towards the region of the heart. Dulness of percussion extended in the precordial region. The pulse of the heart against the side is now and then energetic during the diastole, or with the second sound, while little more than an undulation is felt to accompany the preceding first sound; generally, however, the impulse occurs, as usual, during the systole of the heart. The first sound of the heart, and the pulse of the radial artery, alternate in the most distinct manner, as also do the beat of the heart and of the same artery, when the former marks the contraction of the ventricles. When, however, the impulse of the heart attends the second sound, it coincides with the radial pulse.

He died in a few weeks after. I was not present at the examination of the body, but am favoured by Dr Begbie, whose patient he was, with the following notice by the gentlemen who conducted the inspection. I may observe, that the writer of

the notice was acquainted neither with the symptoms during life, nor with the diagnosis. "The heart was found nearly four times the natural size. The left ventricle greatly dilated, with a very slight thickening of the walls, which seemed softer than usual, so as to collapse slightly when cut into. The aortic opening seemed too large in proportion to the semilunar valves; the structure of the latter, however, was natural. The right ventricle was also dilated, but less in proportion than the left. The auricles were slightly dilated, their walls very thin. The pericardium contained three or four ounces of bloody serum. The cavities of the pleura contained a considerable quantity of serum, and were lined, especially in the vicinity of the heart, with a thick layer of lymph in various degrees of organization. The lungs were evidently congested with blood, but otherwise healthy. There was some œdema of the cellular membrane of the whole body."

CASE II.—J. P. a marble cutter, beyond middle age, 4th June 1836. Some weeks ago this man had great œdema of the limbs, and much difficulty of breathing. By the influence of repose and moderate blood-letting, the œdema has been removed, and he has no dyspnoea except when moving about.

Attending the impulse of the heart, there is an obscure murmur, soon succeeded by a sonorous note instead of the usual valvular sound. The musical note is low but distinct. It is very well heard in the region of the ventricles; but less perfectly opposite the right ventricle, or at the base of the sternum, than in the situation of the left. At the cartilage of the fifth left rib, close to the sternum, it has its greatest volume. As the examination is extended upwards, it is found to become slightly diminished, yet is still quite distinct at the top of the sternum. In the carotids there is a deep, hoarse, saw-sound, accompanying the ventricular contraction, succeeded by a soft bellows-murmur. The apex of the heart beats at the sixth rib; impulse pretty strong; pulse occasionally intermits; is full and below 80. There is generally a considerable interval between the impulse of the heart and the arterial pulse at the wrist,—now and then this preternatural interval cannot be distinctly observed.* There is an unusual interval also between the pulse of the carotids and of the radial. There is permanent distension of the veins of the neck, and a pulsation in them synchronous with the systole of the heart. The carotid arteries exhibit the "visible pulsation" a good deal, and so do the radials.

* Whether or not this resulted from the impulse in the precordial region having occasionally attended the diastole of the ventricles, as in the preceding case, I did not ascertain, but am inclined to suspect it did, as no notice is taken of any such difficulty in distinguishing the increased interval between the beat of the carotid and of the radial arteries.

In October of the same year, this man had an aggravation of his complaints, and was again relieved by means of cupping on the chest, blisters, and other remedies. In the interval between this and his previous illness he had returned to his occupation, and found himself quite fit for work for several months, until at length, after continued exposure to inclement weather, his former ailments, dyspnœa, palpitations, and œdema recurred. After his recovery from these in the end of October, and several times subsequently, I examined the phenomena of the circulation. On the 19th October, I found the impulse of the heart considerably increased, especially in the region of the left ventricle. The pulsation of the arteries not remarkable. A murmur sup-
planted each sound in the region of the heart. The first was soft inferiorly, and not strong on any part of the chest, though gradually augmenting towards the summit of the sternum, while in the carotids it had a deep, hoarse, rasping character as before. The second murmur was considerably more prolonged than formerly, less developed, and feebly sonorous; so as to be remote and indistinct. It was still at its maximum about the level of the fifth cartilage. Pulse regular in general, intermitting but seldom, and not frequent, full, yet not immoderately so. The interval between the precordial and radial pulse was found, after an attentive examination of several minutes, not greater than in health.

Several subsequent examinations enabled me to ascertain a farther diminution in the second murmur, until it had become extremely insignificant,—the state of the pulse continuing as just noticed.

Diagnosis.—Eccentric hypertrophy, chiefly of left ventricle. Disease of the aortic valves. Probably a very small insufficiency when the valves are down.

CASE III. J. H. aged 36, a brass-founder, May 1836. Of his previous history it was merely learnt that he had enjoyed in general good health, was little troubled with uneasiness in the chest until lately, and that the cooing sound, hereafter to be noticed, had been remarked by his wife a considerable time ago.

Percussion natural on both clavicles and on the chest generally. The precordial dulness extends much beyond its natural limits, commencing at the cartilage of the fourth left rib, and reaching nearly to the seventh, two inches and a-half below the nipple, thus describing a triangular space, with the left side of the sternum and the seventh rib, nearly four inches from base to summit. The murmur of respiration is obscure but not absent, save at the dull space just indicated. The apex of the heart strikes between the sixth and seventh ribs, two inches and a half below and to the left of the nipple. The im-

pulse is moderate. A thrill synchronous with the diastole of the ventricles is felt on the lower half of the sternum. Previous to a recent bleeding from the arm this thrill was felt along the whole sternum, and on the contiguous cartilages of both sides, and was much stronger than at present.

The first sound of the heart is of a duller character than natural, but is not otherwise changed. The second is replaced by a remarkably sonorous musical note, not unlike the buzzing of a wasp. This sound is very distinct at the point where the apex impinges against the side, and gradually augments towards the situation of the fourth cartilage, at the lower margin of which it is particularly strong. From this point across to the right side it undergoes occasionally a slight diminution in volume, and is rather sharper than elsewhere at the third and fourth right cartilages. It is very distinct along the whole sternum, but is loudest towards the middle of the bone, yet the difference is not great between its intensity at this point and at other parts of the sternum. Nor can it be decidedly ascertained at what particular spot the musical sound is permanently loudest, as it has about the same intensity at the fourth left cartilage, on the contiguous part of the sternum, and at the second, third, and fourth right cartilages. It now and then varies in intensity at particular places, being at one time strongest at the fourth right cartilage, and soon after either on the adjacent portion of the sternum, or at the fourth left cartilage. It is not so loud anywhere now as it was previous to the several blood-lettings lately performed.

On the right side, both in front and rear, the sonorous sound is louder in some measure than in the corresponding places of the left. In the carotids it follows, after a brief interval, the diastole of the arteries, and is loud, but less so than at the upper part of the chest. There is a very slight and brief rasping in the carotid and subclavian arteries, during their diastole, which is heard nowhere else.

Pulse 74, regular. It is sudden, and to a moderate degree visible in the neck. The pulse of the radial arteries distinctly alternates with the impulse of the heart, and first sound, the usual interval being greatly lengthened. There is considerable tenderness on the middle of the sternum and over the whole region of the heart.

CASE IV. A. F. aged about 50, a porter, April 1837. Pulse 120, sudden and sharp. He has much breathlessness on climbing a stair or hill, yet he walks quickly when going messages—his usual employment. He experiences great relief to the oppression of his breathing, after fatigue, by drinking ale or diluted spirits.

The external figure of the chest is in nowise remarkable. The apex of the heart beats at the seventh rib, away to the left, much beyond its usual position. The impulse of the heart is extremely energetic, shaking the whole front of the chest as with repeated blows in rapid succession. The arteries of the neck beat with remarkable energy, leaping visibly forward. The impulse of the heart, and the beat of the radial arteries alternate almost exactly. There is not nearly the same interval between the beat of the carotid and of the radial arteries. In the situation of the ventricles there is a dull, rough, sound, intermediate in character between the bellows and rasping sounds, accompanying the impulse; the second sound is very obscure and muffled. About the level of the fourth left cartilage there are two superficial sounds of the nature of a strong or harsh bellows sound. These sounds are heard up the sternum, and at the top of this bone, on the right side: the first has its greatest developement; that of the other is nearer the fourth left cartilage, yet it is of almost equal intensity, for a couple of inches above this, and not greatly diminished even at the top of the sternum. In the carotids there is merely one deep, hoarse saw sound, synchronous with the contraction of the ventricles. The first bellows sound of the heart is heard faintly on the left posteriorly, and is barely audible on the right. In front both sounds are heard better on the right than on the left. He has been affected with symptoms of diseased heart for several years. Percussion is dull in the region of the heart over a triangular space three inches in extent, commencing at the fourth rib. *

Edinburgh, July 1837.

* Since the above went to press, a fifth case, with visible pulsation in the neck, a bellows murmur in place of the second sound, and increased interval between the pulse of the heart and radial artery, has occurred to me, and also a case, in a nervous female, of temporary visible pulsation and bellows-sound in the neck without this state of the pulse.

