aid. In this town alone, there are some fourteen medical charities : in 1876, there were 7,786 in-patients; 69,876 out-patients; 18,872 visited at home; 3,525 accidents, etc.; total, 101,579 separate individuals, or about one-fifth of the entire population.

This mass of gratuitous medical relief would doubtless be largely added to were it not for the fact that the Salford and Pendleton Royal Hospital, with its staff of twenty physicians, surgeons, assistant-surgeons, and apothecaries, make no report of the good work they are supposed to do.

In confirmation of the opinion I have advanced, that the imperfect system of district medical relief lays at the root of out-patient hospital abuse, I will quote from a return, moved for by the then President of the Poor-law Board, Mr. C. Villiers : it refers to sick cases in metropolitan districts, 1866—the year before the Metropolitan Poor-law Act, 1867, was passed. This return gives the number of cases of fever and zymotic disease, acute disorders, and chronic disorders, which were under treatment on January 7th and July 17th of that year. Having been at that time the medical officer of the Strand Union Workhouse, the population of which union was then 42,000, I had a personal knowledge of this union. On January 1st, Mr. H. Jones, district medical officer, had 2 cases of zymotic disease; 3 of acute disorders, and 18 chronic. On July 7th, no zymotic cases; 3 acute, and 14 chronic disorders. On January 7th, Mr. Brookes had 4 zymotic cases; on July 7th, none; on January 7th, 1 acute case; July 7th, none; on January 7th, 4 chronic cases; on July 7th, 1.

Now, it will be asked, where were the sick poor of this union? Why, with the exception of those in the workhouse infirmary, they were under treatment at the dispensaries and out-patient departments of the various medical charities which abound in that union.

That I may not be supposed to deal unfairly with this return, I may state that in the Paddington Union, Mr. R. Harper only had one patient on July 7th, and none at all on January 7th; similarly, Dr. Cook of Hampstead had only four. Now, there is no error in this return, for it was made by the medical officers themselves.

Passing from the general consideration of medical relief in the counties I have above referred to, let me contrast the population, number of district medical officers and apothecaries, of workhouse medical officers and apothecaries, the total cost of medical relief, the gross amount of poor relief, and the relation between the expenditure on medical relief and gross relief in the four Irish unions—viz., the North Dublin, South Dublin, Belfast, and Cork—and the three unions of Chorlton, Salford, and Manchester for the year 1871. Thus, Chorlton, with a population of 211,357, had 9 district medical officers, 2 workhouse medical officers; the cost of medical relief was £1,391; the cost of gross relief, £40,760; and the proportion of medical to gross relief, 30. Salford : population, 128,894; district medical officers, 4; workhouse medical officers, 2; cost of medical relief, £952; cost of gross relief, £30,308; proportion of medical to gross relief, 31¼. Manchester : population, 173,965; district medical officers, 5; workhouse medical officers, 4; cost of medical relief, £2,587; cost of gross relief, £73,457; proportion of medical to gross relief, 28½. Contrasted with North Dublin population, 135,146; district medical officers, 10, and 3 apothecaries; workhouse medical officers, 4, and 7 apothecaries; cost of medical relief, £4,360, of which £987 is cost of medicine; cost of gross relief, £30,762; proportion of medical to gross relief, 7. South Dublin : population, 206,026; district medical officers, 10, and 3 apothecaries; workhouse medical officers, 4, and 1 apothecary; cost of medical relief, £4,718, of which £620 is cost of medicine; cost of gross relief, £51,648; proportion of medical to gross relief, 11. Belfast : population, 130,668; district medical officers, 14, and 3 apothecaries; workhouse medical officers, 4, and 1 apothecary; cost of medical relief, £4,317, of which £1,355 is cost of medicine; cost of gross relief, £38,747; proportion of medical to gross relief, 9. Cork : population, 168,590; district medical officers, 19, and 3 apothecaries; workhouse medical officers, 3; cost of medical relief, £4,177, of which £733 is cost of medicine; cost of gross relief, £37,075; proportion of medical to gross relief, 8¾. Now, one of two things must be obvious : either the number of medical officers and expenditure on drugs and appliances must be vastly in excess of what is requisite in the three Irish unions; or the small number of medical officers and limited expenditure on medical relief in the three English unions must be far below what should be the rule if the English sick poor are to be properly attended to and poor-relief expenditure kept down.

Now, it will be asked what alteration do I advise? In reply, I state that which has been found to work well in Ireland, in the metropolis, and those other parts of England where it has been tried, viz., the provision of all medicines and appliances by the Boards of Guardians, and the appointment of dispensers in all populous places where sufficient work can be found for them to do. In the annual report 1870-71

will be found the following : "We have made inquiries through our inspectors as to the existence of dispensaries, exclusive of the metropolis, and we find that the system of providing dispensaries has only been established in about nine unions, in some of which it is merely for the supply of medicines for the workhouse. Where, however, it has been tried, it has been found to be working satisfactorily." In the appendix of the same report will be found the detailed reports of Mr. Peel, Mr. Basil Cane, and Mr. Farnall, who had been deputed to inquire into this subject. All three, in language more or less forcible, advise the introduction of the dispensary system, Mr. Farnall most forcibly; nor is the approval of an alteration, and therefore the disapproval of the present system, confined to officials of the English Local Government Board. The chairman of the Scotch Board of Supervision, Mr. Walker, in his evidence before the Select Committee on Scotch Poor Relief, thus expresses himself : "I think that their being called on, for a certain fixed salary, to supply whatever amount of medicine may be required throughout the year is a great mistake." And further on he again states that the salary should be exclusive of the cost of medicines. Ultimately, that Committee reported in favour of the introduction of the dispensary system into Scotland.

As, however, by the regulations which guide the reading of papers in this Section, our time is limited to twenty minutes, I feel I must now conclude, simply contenting myself with showing that the future of this question rests with the profession and the public. To the first, I would say that, if we are to succeed in bringing about reform, it will be necessary that there should be a diminution of that insane desire on the part of the younger members of it to take these pecuniarily worthless appointments; and on the part of those engaged in out-patient hospital work, not to exhibit such great zeal and anxiety to undertake their thankless labour for nothing. And to the public I would say that, if they desire to see the administration of the Poor-laws carried out on humane, Christian, and economic principles, it will be necessary for them to insist on modifications in our medical relief system on the lines I have indicated, seeing that sickness among the poor is the greatest factor in the production of the curse of pauperism.

THE USE OF DIGITALIS IN DISEASE OF THE AORTIC VALVES.*

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THE subject which you have kindly given me the opportunity of bringing before your first meeting to-day is one of great practical importance. The consciousness that many of the diseases of the heart can be subjected to treatment, with more or less benefit, it must be said, is now becoming pretty general. The hopelessness of producing any effect upon injured and distorted valves deterred the early investigators of the diseases of the heart from any attempt at systematic treatment; consequently, they confined themselves to such merely palliative measures as relieved unpleasant symptoms, and especially palpitation. But the treatment, which was at first merely palliative, gradually gained ground and grew, until now our treatment is not only capable of affording relief, but of something more; and the measures which were once but empirical guesses, or little more, have been so transformed that they have become a systematic line of treatment at once the most intelligible and complete of all our therapeutic measures. Now we do not wield digitalis—the most pronounced of all medicinal agents in its action upon the heart—in a haphazard sort of way, but with a clear and distinct conception, not only that its administration will do good, but how it will achieve such results. Much has been written upon the action of this remedial agent since Withering's famous treatise published in 1785, and even more will yet be written about it ere the subject is finally set at rest.

Withering observed that, in using this agent for the treatment of dropsy, "it seldom succeeds in men of great natural strength, of tense fibre, of warm skin, of florid complexion, or in those with a tight and cordy pulse; while, on the contrary, if the pulse be feeble or intermitting, the countenance pale, the lips livid, the skin cold, the swollen belly soft and fluctuating, or the anasarous limbs readily pitting under the pressure of the finger, we may expect the diuretic effects to follow in a kindly manner." Withering's observations are in strict accord with those of the most careful observers of the action of digitalis at the present day, and an experience of ninety years has corroborated the opinion of this acute observer. Many years after this, Dr., afterwards

* Read before the Thames Valley Branch.

Sir Henry, Holland wrote (1839): "The enlarged and flaccid heart, though, on first view, it might seem the least favourable for the use of this medicine, is not so; at least we have reason to believe that, in dropsical affections, so often connected with this organic change, the action of digitalis as a diuretic is peculiarly of avail". In spite of the prevalent opinion that hypertrophy was a morbid and undesirable overgrowth of the heart, and that palpitation was due to a too powerful ventricular contraction, and that, therefore, the indications for treatment were to lower the heart's action, true and accurate views of the action of digitalis have established themselves. This was chiefly due to the fact that digitalis, though a powerful diuretic in dropsy due to failure in the circulation, was not a diuretic when administered to healthy persons. The conviction steadily grew that this diuretic action of digitalis was the result of its effect upon the circulation. It stimulated the heart into more vigorous contraction, the consequences of which were, first, the filling of the arterial system with blood, and with this a better blood-pressure on the glomeruli of the kidneys and a better flow of urine. In the meantime, however, advancing physiology had done much to elucidate the working of the circulatory system, and enabled different observers to note more carefully the exact condition of the circulation under varying circumstances. We now know that digitalis raises the blood-pressure, and that one of its chief factors in the production of this result is its effect in inducing more powerful and more perfect ventricular contraction. Our views, too, have undergone much modification as to palpitation and hypertrophy. We now know that palpitation is usually a laborious stroke of the ventricle, and that, when it is not a mere neural affection, it is the evidence of the ventricle being overtaxed, instead of its possessing superfluous energy. Hypertrophy, too, is not a disease *per se*; it is a growth secondary to some obstruction to the blood-flow, and is thus a beneficial and compensatory change, to be conserved instead of being regarded as hostile to life.

The means by which digitalis is useful in diseases of the mitral valve, where its utility is almost universally admitted, cannot detain our attention at present. Its use in disease of the aortic orifice is the division of the subject with which we are engaged to-day.

The power of digitalis to induce more powerful contraction of the muscular walls of the heart is now generally admitted. The evidence does not rest merely upon careful clinical observation, but upon the less complex and more valid testimony of direct experiment. The weight of evidence thus furnished from these two sources is such as to be irresistible with the majority of medical men; a few, however, are still unconvinced. My own attention has been very powerfully attracted to the action of this drug for a number of years; and the more extensive my experience, the greater is my confidence in digitalis in all cases where it is desirable to induce more powerful ventricular contraction. It relieves palpitation by substituting a normal and comparatively unfelt contraction for the sensible stroke of laborious effort.

Before proceeding to explain the action of digitalis in disease of the aortic valves, we must first glance at the pathology of aortic valvulitis. The function of these valves is to close the aortic orifice and prevent the regurgitation of blood into the ventricular chamber on the aortic recoil. The ventricle at each systole throws so much blood* into the aorta, which, being elastic, is distended; the recoil or systole of the aorta closes the aortic valves, which prevent reflux of the blood, and so the blood is driven forward by the aortic recoil into the smaller arteries. When the obstruction to the blood-flow from the aorta is increased, two different actions or morbid processes ensue. First, the blood-pressure is raised and the obstruction to the flow forward of the blood on the ventricular systole is increased, and hypertrophy of the muscular walls follows. Then the ventricle is enabled to cope with the increased obstruction to the blood-flow, and the ventricle can empty itself completely at each systole. Such is the simple hypertrophy of Bright's disease in its earlier stages, and these are the patients who afford us most of the aortic valvulitis of advanced life; the aortic valvulitis induced by muscular effort is chiefly found in young men. We have then an obstruction to the blood-flow, an increased blood-pressure, and a powerful ventricle, and the result is, that the aorta is unduly distended at each ventricular systole. The rebound of the elastic aorta, commonly termed the aortic recoil, is in strict proportion to the amount of distension, and consequently, with an abnormally powerful recoil, the valves at the base of the aorta are violently closed. This gives the accentuated aortic second sound so significant of this condition. Not only that, but the powerful closure leads to valvulitis and a growth of connective tissue corpuscles in the valvular tela. Distortion, then, is thus produced, and the valves either present

an obstacle to the forward flow of the blood, or they fail to arrest regurgitation on the aortic systole; or these conditions may be found combined. Hayden gives aortic obstruction and regurgitation as the most common of combined valvular lesions. Whether contraction of the valves will follow this growth of connective tissue or not, cannot be foreseen; it is certain, however, that regurgitation from insufficiency is more common in young persons, while thickening of the valvular tela so as to constitute obstruction is more common in elderly persons.

In aortic stenosis or obstruction, the valves are not only thickened and rendered much stiffer than they are normally, so as not to yield readily to the pressure of the blood on the ventricular systole, but the process of chronic inflammation involves the base of each segment or cusp, and the growth of connective tissue there leads to contraction of the conus, and so stenosis is induced; consequently, the ventricular wall has in its contraction to overcome a new resistance in the form of stenosis with rigid valves, as well as the normal resistance of the elastic aortic walls or the blood-pressure. Under these circumstances, simple hypertrophy without dilatation is found; in aortic regurgitation, the centrifugal distending force of the aortic reflux produces enlargement of the ventricular chamber. In aortic stenosis, we have a narrowed orifice with an increase in the driving power, and thus a new balance is maintained. Pure aortic stenosis is a disease which often exists a long time ere it is discovered, and commonly its recognition takes its origin in an examination for insurance. There is usually no enlargement of the ventricular chamber, and the hypertrophied heart secures a normal circulation of blood. At other times, medical aid is sought and relief is furnished by the administration of digitalis. A first, Sir Dominic Corrigan explained this beneficial result as being due to the slower contractions induced by digitalis; and that a longer systole gave more time for the blood to pass the narrowed orifice. If this were the case, the arteries would still remain unfilled as before; and, if the ventricular contractions are more complete, they would be so many fewer in the minute, and the amount of blood passing the aortic orifice in a given time would remain the same. But digitalis does not so lengthen the systole, and Balthazar Foster says: "The diminution in the frequency of the heart's beats under digitalis always means an increase of the period of the dilatation of the ventricles. Pulse-traces readily show this." In aortic stenosis, Nature, when her efforts are sufficient for perfect compensation, does not achieve a new equilibrium by retarding the ventricular contractions, but by hypertrophy of the ventricular walls. So with the beneficial effects of digitalis, these are not the outcome of a prolonged systole, but of an increase in the driving power, brought about by more active ventricular contraction. Where, then, a left ventricle is found faltering before, or rather behind, an aortic stenosis, digitalis will restore the lost equilibrium, and, by enabling the ventricle to drive an equal quantity of blood through a narrowed orifice in an equal time, a new balance is attained, and a normal blood-flow is secured. It may be urged, and with justice, that the effect of digitalis is to produce contraction of the peripheral arterioles, and so raising the blood-pressure to create a new or additional obstruction to the blood-flow; but, practically, this is of no moment; it is not the blood-pressure in the arteries which taxes the powers of the left ventricle; it is the tight stenosis against which it has to struggle. The effect upon the heart more than counterbalances the action upon the peripheral vessels when digitalis is given.

The changes which lead to aortic regurgitation, and the subsequent alterations in the muscular walls of the heart, and the indications for treatment furnished by them, will now engage our attention.

In the form of aortic valvulitis which leads to insufficiency rather than stenosis, though very commonly these two forms are combined, it seems that the free edges of the semilunar valves are affected rather than the base. The consequence is, that the valves shrivel along their free edges, and, though not presenting the same obstruction to the blood-flow as is the case with rigid and thickened valves, they are incompetent and insufficient to completely arrest the backward flow of the blood on the aortic rebound or systole. The changes in the walls of the heart which follow aortic regurgitation are worthy of careful consideration, and teach us a most instructive lesson in the study of cardiac pathology. This hypertrophy of the heart is the means by which dilatation is arrested rather than a measure to increase the power of the ventricles, and enable it to overcome some obstruction. We are much too apt to assume that the latter is essentially the condition which evokes hypertrophy. I will arrange the evidence as briefly and tersely as the subject permits. 1. Hypertrophy does not always follow an obstruction to the flow forward of the blood on the ventricular systole. Though it is the common result, it does not always form the result. In anæmic systems, in chronic Bright's disease, dilatation is found instead of hypertrophy; this is especially seen in women. 2.

* From 150 to 190 grammes (Hermann's *Physiology*, translated by A. Gamgee, page 62).

Hypertrophy is found under circumstances where there is no obstruction to the blood-flow, notably in the hypertrophy of the left ventricle so commonly seen in mitral regurgitation (Niemeyer, vol. i, p. 318, ed. of 1870). Again, as the same authority tells us, hypertrophy is frequent in cardiac dilatation, the result of partial myocarditis accompanying pericarditis (p. 298 of same edition), by which the dilatation is limited. In both these instances, there is no obstruction to overcome, but in each there is a dilating process to be arrested. In mitral regurgitation, the blood rushes into the left ventricle with unwonted force from the distended auricle and veins behind it, and a dilating process is so set up, which, in well nourished organisms, is limited by a growth of muscular fibre. There is no similar enlargement of the left ventricle in mitral stenosis, though there the auricle and pulmonary veins are equally distended; but then there is an abnormally small, and not an unnaturally large orifice, through which the blood can flow furiously into the left ventricle. In the case of softened walls, leading to dilatation by the normal inrush of blood, the dilating process sets up hypertrophy sooner or later: sooner in well nourished organisms, later in debilitated systems. How dilatation induces hypertrophy, cannot be given here. It is not the place, even if the time could be spared.

This brief digression will enable us all the more readily to see that, in pure aortic regurgitation, the growth of the walls of the heart is not the result of any obstruction to be overcome; for none such exists, or, if so, only to a trifling extent. But there is a dilating process to be arrested. When the aortic valves are rendered incompetent, the left ventricle is no longer filled solely by the blood coming in from the auricle and pulmonary veins—a comparatively calm current—it is also filled by a second blood-current—the blood driven backwards by the aortic rebound through the insufficient aortic valves. The distending power of this new current is a very different matter from the normal current, which is itself undiminished. There is, indeed, no diminution in the normal distending force, while there is added to it a new force of unusual and unwonted power. The ventricle is now, in fact, distended by the aortic recoil, and the regurgitant current possesses great distending force. The ventricle yields before this new force, and dilatation would soon become marked and the ventricle be placed *hors de combat*, if it were not for the hypertrophy which, coming to the rescue, arrests the dilating process and limits the dilatation. It is under these circumstances, indeed, that we find the most massive hypertrophy—the *cor botinum* in fact. The hypertrophy is not to overcome obstruction here, but to arrest dilatation. It is necessary to be clear about this, in order to comprehend the indications for treatment. We do not, under these circumstances, require more forcible ventricular contraction—the effects of digitalis; for the powerful and enlarged ventricle is already working ruin in the arterial walls, which, at every systole, are distended by the contraction of a ventricle, not only much more powerful than a normal ventricle, but holding a larger quantity of blood. The overdistension to which the arteries are subjected produces chronic parenchymatous inflammation of their walls, or atheroma (see an article by the writer in the *Philadelphia Medical Times*, August 7th, 1875 on "Atheroma"), and to administer digitalis here is to aggravate the evil. Already the contraction of the enlarged ventricle overdistends the arteries, so that the pulsation may be seen in the arteria centralis retinae with the ophthalmoscope; and, to administer an agent like digitalis, which, as Balthazar Foster tells us, prolongs the diastole, would be injurious. By delaying the diastole, the ventricle will be all the fuller, and all the longer exposed to dilating forces; while the action of digitalis in producing a more vigorous contraction of the ventricle will only tend to all the sooner ruin the arterial walls. The agent here, if we possessed a drug of such properties, would be one which should lessen the diastole and limit the force of the ventricular systole; the antagonist, indeed, of digitalis. In the early stages of aortic regurgitation, then, digitalis is contraindicated. Such, however, is not the case in the more advanced or later stages.

In order to make this clear, it is necessary to trace the further progress of aortic regurgitation. We stopped the inquiry above at the point of massive hypertrophy; we must now follow the downward progress of this pathological process. The arteries, as we saw, became atheromatous from the overdistension to which they are subjected, and they lose their elasticity, and so the arterial recoil is diminished. This would be beneficial in reducing the dilating power of the regurgitant current, if it were not also the fact that the aortic systole is the force which fills the nutrient vessels of the heart itself. The coronary arteries, seated at the base of the aortic column, are filled by the backward flow of the blood on the aortic recoil arrested by the semilunar valves. When, then, the aorta loses its elasticity, and the recoil is lessened, this loss of arrest in the backward flow of

the blood leads to imperfect filling of the coronary vessels, and the nutrition of the heart-walls is impaired. Consequently, the hypertrophy of aortic regurgitation, though the most massive, is the least durable of all conditions of hypertrophy. Mauriac has pointed out the why and wherefore of this fleeting hypertrophy; and Balthazar Foster has given a still more brilliant illustration of the subject by showing that, when an aortic valve is ruptured by violence, the duration of the consecutive hypertrophy depends largely on which of the valves is affected. If the torn valve have a coronary orifice behind it, the compensatory hypertrophy is brief, and the downward progress of the case swift; but, if the valves behind which the coronary arteries spring are the uninjured ones, the complete valves arrest to some extent the backward flow, and so the integrity of the muscular walls is maintained and the hypertrophy is more lasting. (*Clinical Medicine*, and *Medical Times and Gazette*, December 1873.)

When the hypertrophy is being cut down by molecular decay, the consequence of impaired tissue-nutrition, the ventricle falters, and its contractions are wanting in vigour, the arteries are insufficiently filled, and the coronary flow is still further diminished, leading to still further mural decay. The muscular structure is being undermined, and the ventricle yields once more to the dilating forces of the incoming currents, and not rarely hesitates. The system is insufficiently supplied with blood, and the case progresses rapidly on its downward career. Under these circumstances, the administration of digitalis gives relief, and its use is not only permissible, but beneficial. By exciting more perfect contraction in the faltering ventricle, a fuller and better circulation is secured, and the case is tided on for a while. But that is all. When there is also intermittency in the heart's action, and there is a long diastole, during which the dilating forces are in action and the ventricle is almost paralysed by its long halt, then the administration of digitalis is very beneficial. It not only excites more powerful ventricular contraction, but it does away with the long diastolic halt, and with it the tendency to ventricular paresis. This I have seen in several instances, and notably in a case quoted by my friend Dr. Clifford Allbutt in his well known essay on the *Effects of Overwork and Strain on the Heart and Great Blood-vessels*. Here there was the common double aortic disease, where the regurgitation was marked, and at times the ventricle halted over as many as four beats. The man was already confined to bed, but the rest alone was insufficient to inaugurate improvement. Digitalis and steel soon made a marked difference: the man was up and about in a short time, and got so well that he once more went down the coal-pit to work; it must be said with the most disastrous consequences, for in a few days he was dead.

In advanced aortic regurgitation, digitalis may be given to delay the inevitable end, but more cannot fairly be expected from it. Its use in mixed or double aortic disease must be determined by the nature and indications of each case, and especially by the condition of the ventricular walls. When the ventricle falters, digitalis may be safely resorted to; till then it is better withheld. We may sum up as follows.

1. Digitalis is useful in aortic stenosis. By exciting a more powerful ventricular contraction, it enables an equal bulk of blood to be driven through a narrowed orifice in an equal time, thus establishing a new equilibrium.

2. In the earlier stages of aortic regurgitation, with massive hypertrophy, it is harmful rather than useful.

3. In the later stages of aortic regurgitation, where the heart is failing from mural decay, and especially when intermitting, digitalis may be given with at least temporary advantage.

POISONING BY NITRATE OF POTASH.

By RICHARD WOOD, L.R.C.P.Ed., Bromsgrove.

ON August 15th, about noon, I was called in a great hurry to see a woman who had intended to take two ounces of salts, but who, by mistake, had taken something that only looked like sulphate of magnesia. Whilst swallowing, she perceived the taste to be different from what it should be, but could not tell what she had swallowed. She complained of great burning pain in the stomach, and, in about five minutes, vomited some glazy fluid on the floor of the room. There was no time to be lost. I at once gave her a drachm and a half of ipecacuanha, followed by one ounce of chalk mixed with water. After this, I tried to pick up some of the vomit with a spoon; failing in my attempt, I wiped it up with my pocket-handkerchief to take home. The cup which had contained the draught was quite empty and clean. Upon rubbing my finger, however, round the bottom and applying it