

nervous palpitations, generally yield to this remedy. More general treatment is usually required; but when the conditions causing the disturbance are undetectable or irremovable, then aconite may be usefully employed.

The acute stage of gonorrhœa may be satisfactorily treated by a drop of tincture of aconite each hour; and it is even said to remove chordee.

DIGITALIS AND ITS PREPARATIONS.

LARGE doses of this drug excite nausea, vomiting and diarrhœa; the matters voided either from the stomach or bowels, being of a grass-green colour, due to the action of the gastric juice on some constituent of the digitalis. These symptoms and appearances may follow even a medicinal dose.

The digitaline passes unchanged, readily, from the intestines into the blood; for the same phenomena ensue whether the alkaloid is injected into the veins, or is swallowed.

The action of digitalis on the heart is the most noteworthy, and our knowledge of its influence on this organ, either healthy or diseased, is becoming daily more exact.

Drs. Fagge and Stephenson have published some interesting and important investigations concerning the influence of digitalis on the frog.

"Its effect on the frog is the production of irregularity of the heart's action, followed by complete stoppage of the pulsations, the ventricle remaining rigidly contracted and perfectly pale after it has ceased to beat, the muscular power of the animal at the time being unimpaired, and persisting as long as in frogs in which the circulation has been stopped by other means, such as ligature of the heart. The irregularity of the heart's action, which precedes its stoppage under the influence of the poison is peculiar. The rhythm is but little altered, and the beats are not necessarily diminished in num-

ber, as has been supposed. Sometimes, however, the ventricle makes only one pulsation for two of the auricles, the number of its contractions being therefore lessened by one half." "More frequently the irregularity consists in one or more portions of the ventricle (especially the apex) becoming rigid, white, and contracted, while the remainder of the organ continues to dilate regularly. When the yielding portions are small, a peculiar appearance, as if the wall of the ventricle formed crimson pouches or protrusions, is produced."*

In these experiments the digitalis certainly did not weaken but strengthened the heart's contractions and at last tetanized this organ; at the same time the contractions were rendered peculiar and irregular.

Dr. Fothergill finds, "that first the contractions became somewhat quicker and more complete; then the distension became less complete, especially at the apex, which remained white, and firmly contracted. Here and there were little sections apparently belonging each to a separate cardiac ganglion which did not seem affected, and in the general contraction pouched out, contrasting in colour with the contracted and whiter portions."

Two other experimenters, Eulenberg and Ehrenhaus, have ascertained the influence of solutions of digitaline, applied directly to the frog's heart after its separation from the body, in order to learn if the effects of digitalis are due to its action on the pneumogastric nerve. The still pulsating heart, when partly submerged in a solution of digitaline, composed of one-fourth of a grain of the alkaloid to the ounce of water, had its contractions increased in force, but every now and then a pause occurred in its beatings.

With a still weaker solution (gr. i. to \bar{z} viii.) the same phenomena were observed. The pulsations grew fewer and fewer, while the duration of each contraction was proportionately lengthened. The heart continued to pulsate two hours and a half.

* These authorities point out that "upas antiar, helleborus viridis, and perhaps other species of helleborus, the *Tanghinia venenifera*, the *dajaksch*, the *carroval*, and *scilla maritima* influence the heart in the same way."

From these investigations it appears that digitaline strengthens the contractions of the heart, and prolongs the systole, while it does not at all shorten the time the heart usually continues to contract after its removal from the body.

Dr. Nunneley has made numerous observations on the action of digitaline on frogs. The following, in his own words, is a summary of what he has observed.—

“The physiological action of digitaline on the heart of the frog would appear to be widely different from its therapeutical action on the dilated and weakened human heart in disease. In the former case the heart is thrown into violent and disorderly contractions, which quickly end in a cessation of movement.

In the latter, clinical examination of the heart and pulse appear to show an increase of contractile power, and a restoration of its regular performance.

“1. The first visible effects on the heart occur a short time after the injection of a moderate dose under the skin of the frog, and consist in a diminished range of the heart's movements, whilst the organ itself appears somewhat shrunken. The most marked alteration, however, is a certain embarrassment and want of smoothness in the contractions, as if the separate muscular fibres acted with undue energy, but in an irregular manner, or as if there was a want of co-ordination in the contractions of the individual fibres.

“2. The heart does not contract with greater frequency after a dose of digitaline, and no change at all occurs in this respect until its action becomes embarrassed, when the frequency of pulsation is diminished, and does not again increase.

“3. The ventricular systole is lengthened, but it presents a very different appearance to the systole in health. The ventricle seems no longer to act as a single large muscle, but as if made up of numerous small ones, which contract energetically but in an irregular and disorderly way; hence there are projected bundles of contracted muscular fibres which give the ventricle a rough and uneven surface and an irregular out-

line. During the diastole the ventricle does not everywhere assume a red colour, but one or more red spots appear, as if the ventricle were so tightly compressed that only a small quantity of blood could enter it by chance. Sometimes a red spot is elevated a little above the general surface, forming a kind of pouch. These spots become smaller and smaller, until at last the ventricle is left very pale, strongly contracted, and motionless, while the auricles are distended with blood.

“4. The rhythm of the contraction of the three cavities is generally little interfered with. Two contractions of the auricles sometimes occur to one of the ventricles, but often there are also two ventricular contractions, one of them being very slight and transient.

“Sometimes, after the injection of a dose under the skin, the frog has paroxysms of gasping movements, in which it remains perfectly still, leaning on its fore-paws which are widely separated, and holding its head up, and opening its mouth widely. Whilst in this state, which lasts from about half a minute to a minute and a half, or more, the frog scarcely notices irritation of its skin, or shaking of the dish containing it, and the mucous membrane of the tongue and mouth are seen to be extremely pallid in consequence of the small quantity of blood sent from the heart. When the paroxysm has passed off, the frog jumps about with energy. It is worthy of remark that whilst the embarrassment to the action of the heart is continuous, the gasping movements are paroxysmal, as in human beings where the cardiac dyspnoea occurs in fits, whilst the condition of the heart remains constant. The posture and appearance of the frog are chiefly noticeable, however, from the vivid picture they present of extreme and urgent dyspnoea.”

It thus appears that in the main all these experimenters agree as to the action of digitalis on the frog's heart.

Messrs. Bouley and Reynal in giving large doses to horses found the circulation became more rapid, the heart beats more abrupt, their energy much increased and accompanied

after a certain time with a vibratory thrill, with a decided metallic tinkling; and as poisoning went on a distinct bellows' murmur was heard, becoming more audible on exertion; the heart-beats then show a decided intermittence and the pulse is small, thready and intermittent.

In doses less rapidly fatal there is at first slight excitement of the heart, with a little quickening of its beats. Soon they grow less frequent and fall to 25 or 20 a minute. The cardiac sounds are more clearly heard, more distinct from each than normally, and with a different rhythm, there being occasional intermissions occurring regularly, or irregularly, and after a time a vibratory thrill is detected, followed by a bellows' murmur. As death approaches the beats become rapid, 90, 100 or 141. Dr. Brunton who has heard the blowing murmur several times, says, it occurs in horses, dogs and the human subject, and that it is probably due to mitral or tricuspid regurgitation from irregular contraction of the columnæ carneæ.

Dr. Fothergill found that when introduced into the circulation, digitalis contracted the heart of minnows till no cavity could be seen, the heart being hard and glistening like gristle; the auricle was distended and could not drive the blood into the firmly contracted ventricle; hence the blood regurgitated into the venous sinus behind, which on being pricked, the auricle drove out the blood and became firmly contracted showing that in these animals at least this agent affects the auricle in the same way as the ventricle. Dr. Fothergill likewise found that digitalis given to sparrows contracted the left ventricle, the right side of the heart being very distended and the lungs congested; showing that this drug affects exclusively the left side or affects it earlier and more powerfully than the right side, otherwise the right cavities should become as contracted as the left.

Dr. Fothergill records likewise the following curious and important observations, showing the opposite action of digitalis to aconite on the heart under certain circumstances. On poisoning a frog with aconite, the ventricle became gra-

dually more and more distended, its contractions slower and more feeble, until each contraction drove only a small quantity of blood off the top of the distended ventricle, and at last the greatly distended heart ceased to beat; at this crisis he administered digitalis, and soon contractions at long intervals imperfectly took place, the gaps becoming shorter and shorter and the contractions more and more complete till the heart beat naturally. Then on poisoning a frog with digitalis he found that aconite acted but little on the heart and was incapable of dilating it.

Many modern writers as Handfield Jones, Fuller, Winogradoff, Traube, Brunton, Balthazar Foster, in opposition to the views formerly held, consider that digitalis strengthens the heart's contraction; for it strengthens a feeble dilated heart, and as we have seen the ventricles are found strongly contracted in frogs, minnows, sparrows, and occasionally in mammalia. In addition to this effect it produces irregular and disorderly action in frogs; different parts of the ventricle appearing to act without any relation to each other, and a similar disorderly action probably occurs in the hearts of other animals.

Sometimes after a large dose the pulse, as we shall see, becomes very frequent and feeble, but this does not show that the heart itself is weak, for at this very time the heart may be beating strongly. The weak pulse is due to dilatation of the arterioles whereby the blood passes quickly and easily from the arteries into the veins. Traube and Brunton, however, evidently regard digitalis as a heart- tonic only when given in moderate doses, for as will be shown presently, they consider that large doses paralyse the nervous ganglia of the heart.

Boehm's experiments tend to confirm the view that digitalis strengthens the heart's action. The isolated heart of a frog was made to pump serum through a glass tube; then on applying digitalis, the heart acted with greater force, but larger doses diminished its power. Finally the heart stopped with every drop of serum squeezed out of the ventricles.

Each individual beat of the heart was greatly increased in strength, in some instances nearly doubled. The loss of power after large doses appeared to be due partly to the great slowing of the heart, partly to the incompleteness of the diastole, and the consequent imperfect filling of the ventricles.

Blake, Brunton, Foster, and others find that digitalis increases arterial tension, sometimes considerably. Digitalis injected into a vein causes the tension to reach its maximum in four to ten minutes. This heightened blood-pressure Brunton attributes chiefly to contraction of the arterioles. Dr. Boehm finds as Traube has stated, that after section of the cervical spinal cord destroying communication between the arterioles and the vaso-motor centre, digitalis causes no rise in arterial pressure. Dr. Fothergill has seen the arterioles in the web of the frog's foot contract on the local application of digitalis; on the other hand, Dr. Nunneley carefully investigated this subject, and concludes that digitalis locally applied to the web of the frog's foot, produces no effect whatever in the calibre of the small arteries, nor any alteration in their size when it is injected under the skin, until the irregular and more or less persistent contractions of the ventricle diminish the blood stream to which the arteries then to some extent adapt themselves. Dr. Boehm, too, has often examined the small arteries of the frogs mesentery, studying for hours the action of digitalis upon them, but has never found them affected by it. Dr. Brunton having reinvestigated this question, with the aid of Traube's modification of Ludwig's kymographion, holds to his original conclusion, that digitalis causes contraction of the arterioles. For example, he paralysed a dog with morphia, and inserted a canula into the crural artery, and then compared the curves indicating the blood-pressure before and after the injection of digitalis. After the injection the pulse grew slower, and an increase in the mean blood-pressure occurred, while the height of the wave due to each cardiac pulsation remained much the same; and the blood-pressure continued to rise, although the pulse grew

slower and slower, and the oscillations of the mercurial column at each pulsation diminished in extent. This increase of blood-pressure may be due either to the heart propelling at each pulsation a great quantity of blood into the aorta, or to the contraction of the arterioles, lessening the facility of the blood-flow from the arteries, through the capillaries, to the veins.

A study of the form of the pulse wave proves that the increased pressure is due to contraction of the arterioles, since a much longer time was occupied in the descent of the pulse wave after digitalis, showing that the blood passed more slowly out of the arteries into the veins. With heightened blood-pressure, the arterioles remaining unchanged, the blood would pass quicker into the veins, and consequently the descending line of the pulse wave should occupy a shorter instead of a longer time.

A poisonous dose of digitalis after a time paralyses the arterioles, which therefore dilate, and the arterial tension falls.

According to Saunders, Jörg, Hutchinson, and others, digitalis, in moderate doses in the first instance, quickens the pulse. Other observers, however, deny this effect. But all agree that moderate doses render the pulse less frequent, and that if the drug is pushed the pulse becomes irregular, very frequent, and feeble; feeble, according to Brunton, owing to the paralysis of the arterioles, whence the blood passes more readily from the arteries into the veins; and quick and irregular as Traube apparently believes, owing to the previously stimulated vagi becoming paralysed.

Various and often opposing explanations have been advanced regarding the way digitalis affects the heart.

The following seem to be the phenomena requiring consideration:

1. Increased contraction, ending in tetanic contraction of the ventricles, as evidenced in the case of frogs and many other animals.
2. The slowing of the heart's action in man and the higher

animals, followed, after large doses, by very frequent and feeble pulse.

3. Irregular action of the heart.

4. Increased arterial tension.

It has been proved that moderate stimulation of the vagus slows the heart, but if the vagi are divided, it beats quickly, and tumultuously, and irregularly. We have just seen that in the higher animals, digitalis at first slows the heart, but that poisonous doses make the heart beat very quickly and irregularly. These facts induced Traube to conclude that digitalis at first stimulates, but afterwards paralyzes the vagi; thus, he found a moderate dose injected into the veins of dogs, greatly reduced the frequency of the pulse, but a larger dose increased it in one case from 32 to 160 beats, and in another case from 33 to 202 beats. Seven further observations he made to learn if this effect were really exerted through the vagus. After slowing the pulse by digitalis, he cut the vagi when the pulse at once became very frequent. Further, after dividing the vagi, the digitalis in most cases reduced the pulse very little. Subsequently it was shown that whilst stimulation of the vagus reduced the blood-pressure, digitalis greatly heightened it; showing that the effects of digitalis are not applicable without admitting the influence of the cardiac ganglia ("musculo-motory") as well as the vagi ("regulatory")*. This led Traube to reinvestigate this question. After paralyzing the vagi by the injection of woorari to obviate the effects from their section, and performing artificial respiration, he divided the vagi and injected infusion of digitalis into the veins, and found that a great increase of the blood-pressure (arterial tension) took place; a result which led him to the conclusion that digitalis at first stimulates the vagi and the nervous ganglia of the heart itself, but afterwards paralyzes both.

Dybrowsky and Pelekan maintain that digitalis affects solely the regulating and musculo motory (ganglia) appa-

* But this increased arterial tension may, and certainly is, in large part due to the contraction of the arterioles by digitalis.

tus of the heart itself, and not through the vagi, as its action is not affected by destruction of the medulla oblongata, or division of the vagi, nor by their paralysis by woorari.* Eulenburg and Ehrenhause have shown that digitalis will produce its effects through its action on the heart itself, for as we have seen, when the lower third of the extirpated heart of a frog is placed in a strong digitaline solution, its contractions are arrested; whilst a weaker solution renders the movements slow and intermittent. Brunton, from whose excellent monograph a greater part of these remarks are taken, considers that Traube's experiments prove that digitalis likewise acts through the vagus, and that after division of the vagi, digitalis acts on the terminations of this nerve, but less energetically than on the trunk, and consequently produce less effect than when the vagi are intact. Brunton believes that digitalis "acts on the regulating apparatus of the heart chiefly through the vagus, thus causing slowing of the heart, and stimulates the musculo motary apparatus (ganglia and nerves of heart), causing increased force of the cardiac contractions. This primary stimulation then gives way to paralysis at first partial then complete." Subsequent observations lead him to conclude that digitalis slows the heart in part by its contracting influence on the arterioles, thus heightening arterial pressure, and not altogether by direct influence on the vagus, for after slowing the heart-beats by the drug he administered nitrate of amyl, and thus induced dilatation of the arterioles and diminution of the blood-pressure. Whenever the blood-pressure fell after the inhalation of amyl, he found that the pulse became quick. On the other hand, Traube finds that cutting the cervical spinal cord of a frog, thus separating the arterioles from the vaso-motor centre, digitalis induces marked slowing of the pulse simultaneously with great diminution of arterial pressure, this proving, as he believes, that this slowing is not due to increased arterial pressure. Dr. Boehm likewise finds that after section of the cervical spinal cord of

* The heart is made to contract by stimulation of these ganglia, whilst its action is controlled and regulated by the vagi.

rabbits, digitalis produces no increase of arterial pressure, showing that this drug affects the arteries through the vaso-motor centre.

Brunton, Foster, and others, are led to conclude from sphygmographic observations, that in the healthy human subject digitalis, while diminishing the frequency of the heart's beats, increases the force of each beat, and increases arterial tension.

We can conceive that in a given disease digitalis may afford relief in one of the four following ways:—

- I. By strengthening the action of a weak heart.
- II. By reducing the strength of the beats of a heart acting too powerfully.
- III. By lessening the frequency of the heart's beats.
- IV. By correcting irregular action of the heart.

It is possible, that in different affections, digitalis may give relief through each of these effects, or through one or more of them in combination. Then, further, it is a question of interest whether digitalis affects both sides of the heart or the left only, and whether it affects both auricles and ventricles, and if so, whether in an equal degree. These questions cannot be solved satisfactorily, but from the narrated experiments on animals, and from the fact that digitalis equally reduces the frequency of the contractions of the different cavities of the heart, it is probable that it affects the whole heart, but especially the ventricles.

Dr. Balthazar Foster ascribes the effects of digitalis on most diseases of the heart to the reduction in the frequency of its beats, and explains the influence of the drug in certain heart diseases in the following manner. In most cases of aortic regurgitation it is well known that digitalis does harm, and effects it in this way; by slowing the heart more time is allowed the blood to regurgitate into the ventricle, and by increasing arterial tension it correspondingly increases the regurgitation and thus greatly aggravates the severity of the symptoms. In mitral obstructive disease it is serviceable, for "by slowing the action of the heart the period of time during

which the blood from the distended auricle can flow into the ventricle is increased, and as the extra time allows more blood to pass through the narrowed mitral orifice before the final effort of the auricle is made, that effort is made on a smaller quantity of blood, and is consequently more effective." He thinks that digitalis also strengthens the contraction of the auricle.

The author believes that we obtain better indications respecting the advisability of using digitalis, by considering all the symptoms rather than by confining the attention simply to the nature of the valvular affection, and therefore heart diseases in which the drug will prove useful, and those in which it will be found of little or no use, will be fully described.

Digitalis will be found of eminent service to a patient presenting the following symptoms and physical signs:—there is dropsy, which may be extensive; the breathing is much distressed in the earlier stages of this condition only periodically and especially at night; but when this reaches its worst stage, the breathing is continuously bad, although it becomes paroxysmally worse. The patient cannot lie down in bed,* and is perhaps obliged to sit in a chair, with the head either thrown back, or more rarely leaning forward on the bed or some other support. The jugular veins are distended, and the face is dusky and livid; the pulse is very frequent, feeble, fluttering, and irregular. The urine is very scanty, high-coloured, and deposits copiously on cooling. The heart is seen and felt to beat over a too extensive area; and the chief impulse is sometimes at one spot of the chest and sometimes at another. The impulse is undulating, and the beating very irregular and intermittent. The physical examination be-

* Patients thus afflicted, and those who from oppression of the breathing from other diseases of the heart are often unable to sleep, and become much exhausted, may obtain relief from the dyspnoea, and sleep more or less refreshing, by the hypodermic injection of small quantities of morphia (one-sixth or one-twelfth of a grain) without fear of any disagreeable consequences.

trays great dilatation of the left ventricle, with often a not inconsiderable amount of hypertrophy. A murmur is ordinarily heard having the characters of one produced by mitral regurgitant disease, and there may be also disease of the aortic valves.*

A case presenting these symptoms and physical signs will very generally respond quickly to digitalis, if given in the way here set forth. In all treatment, the object should be to obtain the greatest therapeutic effects with the smallest possible dose of medicine. This is particularly important with a powerful drug like digitalis; for large doses sometimes appear to increase the heart's embarrassment, and relief comes only when the dose is diminished. Further, it is important not to give a larger dose than is necessary, since it is very likely the patient may require to take it for a long period; for in a case like that just described, the patient after a time becomes accustomed to the medicine, and the dose which at first did good seems to partially lose its effect, and requires augmentation; but this could be done only with the greatest caution, and even then with some hazard, if the maximum quantity had been given in the first instance.

The writer believes that in giving digitalis the formula has much to do with the success of the drug. The fresh and well made infusion generally gives better results than the tincture. It is advisable to begin by using a drachm of the infusion twice, or not more than three times a day, and in many instances this quantity will suffice. The effects on the pulse, the urine,

* Dr. Foster ascribes the symptoms, in cases like the above, to mitral obstruction, and considers that digitalis affords relief by slowing the heart's beats; but this view fails to explain those cases in which, after digitalis has relieved the patients, the drug may be discontinued for a long time without a return of the symptoms. Dr. Foster says, that digitalis strengthens the heart, thus increasing arterial recoil, so promoting its own nourishment, and thus permanently strengthening the heart; but this hypothesis fails to throw light on those cases in which, after two or three days, the medicine may be discontinued without return of the symptoms; for in so short a time the heart can hardly have become permanently strengthened by increased nutrition.

and the dropsy, are to be carefully watched. When the drug is properly administered, the pulse grows considerably stronger, more regular, and much slower, till, in very many cases, all irregularity ceases, and it becomes natural in frequency and rhythm. At the same time the urine, which previously may not have amounted to more than half a pint in the twenty-four hours, increases to one, two, four, or even eight pints a day, and in proportion to this increased flow, the dropsy diminishes till it disappears. Should the influence of the drug be small or unnoticeable, the quantity may be increased in a few days; but it must be remembered that the good effects of digitalis may not become apparent for three or four days. A drachm may be given every three or four hours, as circumstances indicate, or one drachm may be given in the morning, two in the middle of the day, and two at night; and should the symptoms resist this additional dose, another augmentation must be made in a few days. A small dose often succeeds admirably at first in removing much of the dropsy, but fails to effect all that is desired; when a gradual increase in the quantity of the medicine is required.*

When a patient with the foregoing symptoms dies, the *post-mortem* examination reveals great dilatation of the left ventricle, with much true hypertrophy of its walls in most cases. Sometimes there is incompetence of the aortic or mitral valves, or of both; but by no means rarely both these sets of valves are healthy, and admit of no regurgitation when tested with water, although a murmur of a mitral character had existed during life.

Digitalis will be found especially useful when there is much dilatation and hypertrophy of the left ventricle without valvular disease, although a mitral murmur may have been heard during life; but unfortunately in many cases it is at present impossible to decide before death whether there is mitral disease or not.

Eminent authorities have asserted that in aortic disease

* The cases we are now treating of, require in most instances free alcoholic stimulation and the best agent, on account of its diuretic action, is gin.

digitalis is worse than useless, and will embarrass the heart still further, and increase the difficulty of breathing; but after a prolonged and careful investigation of this question the author is convinced that, in a case presenting the physical signs and symptoms above described, the existence of aortic disease, whether obstructive or regurgitant, or both, does not in any way contra-indicate the employment of digitalis.

The irregularity of the pulse is the most important indication of the necessity of giving digitalis.

Earlier stages of the foregoing condition are not unfrequently met with, when the symptoms, though troublesome, are not yet very severe. These forms are not uncommonly seen in children, some time, after an attack of rheumatic fever. In such cases the strong and heaving impulse of the left ventricle of the heart, sometimes strong enough to shake the patient, gives evidence of great dilatation and hypertrophy; and there is generally a systolic apex murmur (mitral), with perhaps systolic apex thrill. These patients at first are troubled only with palpitation on exertion; but after a variable time, perhaps many years, paroxysms of palpitation set in, accompanied by urgent dyspnoea, and the attacks may be so often repeated, that the child, unable to lie down at night, is obliged to be propped up with pillows. At a further stage the dyspnoea is continuous, but becomes paroxysmally worse, and the child is unable both night and day to assume a horizontal position. In all these stages of the disease the pulse is ordinarily quite regular,* but is generally very frequent and feeble, although at the same time the heart throbs violently against the chest. There is no dropsy, or it is slight and transient, appearing for a few days, and then passing away, till for some reason the heart again becomes embarrassed.

Now digitalis often speedily removes these symptoms, quelling the tumultuous strongly beating heart, at the same

* The heart rarely beats irregularly in children under twelve years old. This probably accounts for the fact that digitalis certainly is less useful for children than adults.

time strengthening the pulse, reducing its frequency, and improving the patient in every respect; it must be given till the pulse falls to 60 or 70 beats. In these cases very large doses are sometimes required, even two grains of the powdered leaf every three hours.

In cases such as we have just described, two important circumstances may be frequently witnessed; the pulse may be very weak and feeble, while the heart contracts with unnatural strength; and while the digitalis strengthens the pulse, it subdues the unnatural force of the heart's beats.

The first circumstance is of great importance, as in the cases now treated of, it is commonly thought that the weak pulse indicates a correspondingly weak heart, whence it is concluded that, as digitalis is eminently suitable for the cases in question, it is useful when the heart is feeble,—a conclusion certainly erroneous; for, as we have said, while the pulse is very weak, the heart can be felt to strike the chest with considerably increased force; and further, when these patients die, the left ventricle is found, largely dilated it is true, but also greatly hypertrophied.

This want of correspondence between the pulse's strength and the heart's contraction becomes still more apparent when these patients are seized with an attack of palpitation. The heart then sometimes beats with sufficient strength to make its movements visible through the clothes, or even to shake the bed, yet at the same time the pulse is very small and feeble. Where this discrepancy between the vigour of the heart's contractions and the strength of the pulse is permanent, it would appear as though patients were troubled with a perpetual palpitation, which, however, becomes paroxysmally worse. This discrepancy between the pulse and the heart, which may be viewed as a form of irregularity on the part of the heart, digitalis often corrects; hence, while under its influence the heart's action becomes quieter, the pulse grows stronger as well as slower, affording one illustration of the power of digitalis to control a heart contracting too strongly.