this should be avoided not only for drinking, but also for all cooking purposes.

On the other hand, these patients should consume plenty of bodies containing abundance of (1) *cellulose*, such as cabbage, spinach, asparagus, carrots, onions, leeks, garlic, rye, oats and bran, either in bread or biscuits; (2) those containing *sugars* and aperient salines, such as apples (raw or baked), rhubarb, prunes, figs, treacle (the old-fashioned black or molasses), honey, and orange marmalade; (3) some bodies which stimulate the hepatic secretions, as salads; and (4) bodies rich in fats—butter, fat meats, etc.

The quantity of liquids taken should also be regulated. Many subjects troubled with constipation do not take nearly enough fluids in the course of the twenty-four hours, and an extra pint or two of plain water, with a lump of sugar if agreeable, hot or cold according to season of the year or individual taste, should be given, especially as far as possible on an empty stomach, the last thing at night or the first thing in the morning, or both night and morning.

B. Drugs. At the commencement of systematic treatment some medicines are important to make a good start, especially in getting rid of any old-standing accumulation, but the object should be to diminish and in time do away with these altogether as a routine treatment.

In deciding on the question of drugs, the following different therapeutic actions must be taken into consideration, which for practical convenience may be divided as follows:

1. Laxative: Such as aloin, aloes, cascara, rhubarb, senna, castor oil.

2. (a) Secretion stimulants: Salines, such as natural aperient waters (Apenta, Condal, Hunyadi, Rubinat), chloride of ammonium, sulphate of soda, and sulphate of magnesium. (b) Hepatic stimulants: Aloes, sulphate of soda, colocynth, jalap, rhubarb, podophyllin, ipecacuanha. (c) Chologogue: Calomel, blue pill, grey powder.

3. Peristalsis excitants: Strychnine and nux vomica.

4. Spasm relievers: Belladonna, bromides, valerian, and asafoetida.

5. Nerve tonics: Zinc valerianate, arsenic, silver nitrate, glycerophosphate of soda.

As to a choice in the multitude of drugs, old and new, probably many of the old-fashioned, such as calomel, rhubarb, magnesia, and senna, in various combinations are the most valuable, or rather, perhaps, are the least deleterious; but it is not every patient who will nowadays take a medicine which is not palatable or convenient, and so we have to resort to various tricks of the pharmaceutical trade to obtain the desired result. It is always very important not to allow patients to take the same form of aperient medicine for too long a period, and generally desirable to let them have more than one variety to be taken on alternate days. At the time of prescribing an aperient medicine or pill, it is necessary to add to it some drug which will have a tonic effect on the walls of the digestive apparatus, in addition to the simple aperient action. Valuable drugs of this nature are belladonna or strychnine, which in combination with aloin or ext. aloes, calomel, or cascara, not omitting a little resin as a valuable adjunct, will make a reliable pill. After a time the dose of the aperient drug should be decreased and the quantity of the tonic one increased. A very successful method in many cases of chronic constipation, especially in anaemic subjects, both young and old, is to prescribe a pill containing the dried sulphate of iron, with aloin, and possibly at first a small quantity of extract of aloes, two or three times a day after food. In the course of a few days the quantity of iron should be increased and of the aloes decreased, till a pill containing iron alone is found to be sufficient, and this should be continued for a long period, modified from time to time, according to circumstances. It is often better to commence by giving a milder aperient pill night and morning rather than a stronger one at night only, and from time to time to order a saline, or one of the natural aperient waters, to be taken the first thing in the morning. Saline waters in some cases will be sufficient by themselves, but in very obstinate ones they often only produce discomfort with watery evacuations, leaving large quantities of solid material behind. Of the natural aperient waters, those with a preponderance of salts of the sulphate of soda over magnesia are probably the best

to prescribe in most cases, as being less irritating to the mucous membrane.

C. Enemata. Great assistance, especially in removing recent or even old-standing accumulations in the large intestine, can be obtained by the judicious administration of an enema. In some cases injection of warm water and soapsuds acts well; if necessary, the addition of olive or castor oil or turpentine will greatly assist the result.

It is, especially in old-standing cases of constipation with accumulations, most important that the enemata are given with the patient in the knee-elbow position, or, if on the back, with the buttocks well elevated on pillows, and the foot of the bed raised on blocks. In some cases it may be desirable to shift the position of the patient to one side or the other according to the part of the bowel it is necessary to get the fluid to flow into by gravitation. By carefully regulating the position and elevation of the patient, it is often possible to inject large quantities of water high up as far as the caecum. In some cases a long, soft tube may be found advantageous over a short one, but this requires considerable skill in passing up satisfactorily.

The temperature of the fluid injected should be as nearly as possible the same temperature as the body if we wish it to be retained for any time, and should be injected by a continuous stream from a suspended irrigator, and not in an interrupted one forced in by a bell-pump syringe.

If cases of old-standing, hard, dry, faecal accumulation are being dealt with, much assistance will be obtained by injecting a few ounces of olive oil, and leaving this in for some hours before the bowel is washed out; by this means the hard, dry masses will be softened.

If it is only necessary to excite the rectum, injection of a drachm or two of glycerine or the insertion of a glycerine suppository is very efficacious.

In most cases after giving aperient remedies by the mouth for a few days, and having excited the upper region of the digestive apparatus into more vigorous action, an occasional simple enema greatly assists the treatment in the earlier stages.

In many cases of simple constipation, the injection of a drachm or two of olive oil into the rectum at bedtime will produce a satisfactory evacuation the following morning.

THE USE OF DIGITALIS IN VALVULAR DISEASE OF THE HEART.

By E. H. COLBECK, M.D., F.R.C.P.,

PHYSICIAN TO THE CITY OF LONDON HOSPITAL FOR DISEASES OF THE CHEST.

THE efficacy of digitalis in cases of aortic insufficiency and of some other forms of valvular disease has long been a matter of controversy. It has been pointed out, and no doubt with reason, that the discrepancy in the remedial effects of digitalis in cases of valvular disease is based on practical as opposed to theoretical considerations.

I have elsewhere¹ endeavoured to show, and it seems hardly possible to resist the conclusion, that the primary and essential feature in the production of dilatation and failure of the heart is a decrease, either absolute or relative, of the cardiac tonus.

The influence exerted by digitalis and its allies on the cardio-vascular system may be briefly stated to be a persistent and well-marked increase in the tonic contraction of the muscular tissue of the heart and arterioles whereby (that is, on mechanical and dynamical grounds apart from neuro-muscular and other considerations) the action of the central organ is rendered more deliberate and at the same time more powerful and effective. I wish more particularly to draw attention to the fact that digitalis increases the *cardiac tonus* in a very remarkable manner, and, although the tonus of the systemic arterioles and capillaries is simultaneously augmented, the balance of advantage, provided the cardiac parietes remain healthy, must always be with the heart, and this is more especially the case when the organ has undergone hypertrophy.

In aortic incompetence the left ventricle has to withstand during its diastole the distending effects of the regurgitant blood stream under the pressure of the arterial recoil. The total intraventricular pressure during diastole on a unit of surface is the resultant of the respective pres-

tures which prevail at the aortic and mitral orifices, and is of course enormously in excess of the normal. The magnitude of the pressure that is exerted by the arterial recoil is more readily appreciated under experimental conditions, for it has been shown in animals that if the aortic valve be suddenly rendered incompetent the aortic pressure is sufficient to produce aneurysm, or even rupture of the wall of the unprepared heart.

The strain imposed on the wall of the ventricle under the conditions ordinarily connected with the incidence of aortic incompetence comes into operation gradually, and its magnitude is ultimately determined by the extent of the lesion and the state of the arterial blood pressure, but in any event it constitutes the chief source of overwork which has to be performed by the heart. It is of course obvious that the resistance to progressive and unlimited diastolic distension of the left ventricle in aortic regurgitation must be and is provided by an increase of the tension of the muscle fibres of the ventricular wall, and this is initiated and regulated by the cardiac tonus. Did the regurgitant stream distend the ventricle "while it is relaxed and defenceless in diastole," as is so often stated, there would be little further to say about aortic incompetence. Fortunately, the heart is enabled to fall back on a second line of defence—to wit, the cardiac tonus, which, assuming valvular functions, staves off unlimited dilatation and maintains more or less adequately the systemic blood pressure. Dilatation would quickly get the upper hand of hypertrophy at the outset were it not that the ventricle falls back on its reserve power, which temporarily wards off the distending effect of the lesion. This increased display of functional activity leads, under favourable nutritional conditions, to hypertrophy, which restores and maintains the tonus of the ventricular wall up to the level of the requirements that are demanded by the increase of intraventricular pressure. There is no doubt a further cause for hypertrophy in that the ventricle has to propel a greater quantity of blood at each systole; but this factor must be unimportant compared with the task of maintaining the tonus of the cardiac wall.

From a theoretical standpoint the action of digitalis would appear at first sight to afford promise of considerable assistance in the treatment of aortic insufficiency; but a very little consideration is sufficient to banish this expectation.

In uncomplicated aortic incompetence, under the most favourable conditions of established compensation, the left ventricle is working in the face of diminished reserve power, and, consequently, of a lessened margin of safety. The exhibition of digitalis would no doubt augment the tonus of the ventricular wall, but concurrently the tonus of the peripheral vessels is heightened and the length of the diastole is increased. Provided the cardiac parietes were sound, and so long as the conditions of the circulation were fairly equable, the balance of advantage would doubtless rest with the heart; but the introduction of any further strain, in the shape of nervous or physical exertion and so forth, might seriously imperil or even overcome the integrity and resistance of the ventricular walls. The concomitant presence of mitral incompetence would sensibly diminish the risk of a cardiac breakdown, by enabling the distressed ventricle to discharge part at least of its contents along the path of lesser resistance provided by the imperfectly closed auriculo-ventricular opening. The administration of digitalis is absolutely contraindicated by the presence of degeneration or disease of the ventricular wall.

On the other hand, it is readily conceivable that in the course of aortic incompetence a comparatively sound ventricular wall may be temporarily overpowered by exposure to inordinate extraneous strain, such as may be entailed, for instance, by undue physical exertion, intercurrent disease, and so forth; under circumstances of this kind digitalis should be invaluable for the purpose of restoring the vigour of the heart. The simultaneous action of the drug on the right side of the heart is not without influence in the restoration of compensation; but the consideration of the operation of this factor, which is not altogether favourable in aortic disease, will be discussed under the head of mitral incompetence.

In practice, then, it may be inferred that digitalis should seldom, if ever, be given in cases of aortic regurgitation which have developed during or after middle life, since the ventricular wall is seldom perfectly sound under

these circumstances; and never in cases which give evidence of myocardial degeneration or disease. If complete rest is obtained, digitalis is permissible and beneficial up to a certain point in young, otherwise healthy adults showing signs of circulatory failure, more especially when the aortic lesion is combined with mitral incompetence. The drug should be discontinued for some time before exercise is resumed, and for reasons which I have already advanced this rule should be rigidly observed. Neglect of this precaution might be followed by rapid failure of the ventricle and sudden death.

Theoretical considerations, then, suggest that the utility of digitalis in aortic incompetence is strictly limited. It may be accepted as a good working rule that digitalis is beneficial in cases of aortic incompetence proportionally to the magnitude of the stress which has led to failure of the heart, and *vice versa*. These conclusions are, I believe, in accord with sound medical practice.

The problem connected with the administration of digitalis in aortic stenosis presents very little difficulty. In this lesion an augmentation of the tonus of the heart and peripheral vessels could but increase the work with which the left ventricle has to contend. Failure of the heart and the establishment of mitral incompetence may arise in the course of the disease, and, provided this result is due to extraneous stress and not to myocardial degeneration, digitalis would assist in the restoration of the cardiac tonus and the re-establishment of the systemic circulation. Digitalis, therefore, is contraindicated in aortic stenosis apart from the occurrence of cardiac failure. Practical experience endorses these conclusions with respect to the use of digitalis in aortic stenosis.

In mitral incompetence all observers bear testimony to the beneficial results invariably obtained from the administration of digitalis. The theoretical explanation of the efficacy of digitalis in mitral incompetence is of considerable interest. On the left side of the heart, a rise of cardiac tonus resists the overfilling of the ventricle, which is the initial effect of the valvular insufficiency; while subsequent hypertrophy maintains the tonus of the ventricle and promotes the expulsion of its increased content. On the right side of the heart, a rise of tonus and consequential hypertrophy enable the right ventricle to cope with the increased resistance in the pulmonic circuit, and, by maintaining the blood pressure in the pulmonary veins and left auricle, it resists the reflux through the mitral opening and ensures an adequate supply of blood to the left side of the heart. Under the most perfect conditions of compensation in mitral incompetence there must always be a sort of see-saw relation with respect to the pressures that are kept up between the right and left sides of the heart through the pulmonic circuit, so that the supply of blood to the left ventricle and hence to the systemic circulation is liable to considerable variation. A rise of tonus in the arterioles and capillaries would no doubt greatly minimize the disturbance in the systemic circulation due to this cause, though the increased resistance to the discharge of the ventricular contents would augment the reflux through the mitral opening. It will, therefore, appear that the action of digitalis in mitral incompetence is almost wholly beneficial, and this is found to be the case in practice.

Mitral stenosis offers a striking contribution to the value of theoretical considerations in the matter under discussion. In uncomplicated examples of this lesion the supply of blood to the systemic circulation tends to become increasingly restricted. A rise in the tonus of the left ventricle and peripheral vessels would still further diminish the charge of blood delivered to the aorta. No doubt the effect of increased cardiac tonus on the right side of the heart would be of benefit provided the blood supply to the left ventricle could be thereby augmented. It may be inferred, therefore, that digitalis can be of no benefit to mitral stenosis in the absence of failure of the right ventricle, and in this event, so soon as the pulmonary blood pressure has been raised to the point at which the maximum charge of blood is delivered to the left ventricle, the drug would again act prejudicially. Clinical experience lends support to the employment of digitalis in mitral stenosis along the lines indicated by theoretical considerations.

REFERENCE.

- 1 Dilatation of the Heart, *Lancet*, April 9th, 1904.