In the present investigation, though many of the patients were elderly, none of the 70 from whom the first series is taken had pain which could be confused with that of myocardial ischaemia. The seven patients in the second series were referred privately to a cardiologist, as their symptoms were thought to be due to heart disease. In Case 1 pain and "wind in the chest" on walking, and relieved by stopping to belch, was suggestive of cardiac effort pain. However, the exertion necessary to provoke an attack varied considerably from day to day. This with the history of dyspepsia and the normal cardiologistical finding led to the correct diagnosis. Pain in the chest (Case 5), in the chest and left arm (Case 4), and at the xiphisternum (Case 6) could have been mistaken for the pain of myocardial ischaemia, had the patient been seen in the first attack only. Again, diagnosis was assisted by the variation of the attacks over a period of time, the dyspeptic symptoms, and absence of significant cardiac disease. In Case 7 a history of genuine cardiac effort pain was related to anaemia and disappeared following iron treatment. No confusion arose in Cases 2 and 3.

It would appear, therefore, from the present study and from the literature reviewed here that hiatus hernia (in the absence of associated anaemia) may only rarely be responsible for pain in, or spreading to, the chest, arms, neck, and jaw. When this does occur it may have the same distribution as the pain of cardiac ischaemia, and the type of pain may be similar. Direct relationship to exertion, however, is very inconstant, and when present the effort required to produce the pain varies much more than in myocardial disease. Furthermore, it often lasts for hours. The predominant aggravating factors are the taking of food, the horizontal position, and, as most authors stress, anxiety. Its relief with belladonna and antacids is usually better than with nitroglycerin.

Summary and Conclusions

In 54 of 70 consecutive cases in which a hiatus hernia was found this was the only detectable lesion. The symptoms in this group were epigastric pain, heartburn, acid regurgitation, flatulence, vomiting, and waterbrash. Postural aggravation frequently occurred. The relation to trauma in two patients is described and the presentation of eight patients with attacks of vomiting is stressed. In none of these 70 patients did pain occur which could be confused with that of myocardial ischaemia.

A further seven patients referred with cardiac symptoms are analysed and the occurrence of pain in hiatus hernia simulating that of myocardial ischaemia is discussed with special reference to the literature. It is concluded that this is a very rare feature of hiatus hernia.

I wish to thank the physicians and surgeons of the Bristol Royal Infirmary for allowing me access to patients under their care, and Dr. F. M. Ross for his assistance with the x-ray findings. I should particularly like to thank Dr. D. H. Davies for allowing me to study case reports of patients seen by him in private consultation; and Dr. Davies, Professor C. Bruce Perry, and Dr. J. E. Cates for their valuable criticism and advice in the preparation of this paper.

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TREATMENT OF HEART FAILURE*

BY

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It is natural to expect that advances in treatment should follow a better understanding of the mechanism and dynamics of heart failure, and during the past decade there have been notable advances in practically all branches of medicine. A year or so ago I listened to a physician returning thanks for a presentation on his retirement, and the theme of his valedictory speech was that he was sorry to go because he felt that the Golden Age of medical treatment was just beginning, but that perhaps it was as well, for a knowledge of Latin and Greek no longer helped him to keep pace with the bewildering names of new drugs; and, if he bothered to open his morning mail, there was apparently one new preparation a day, although some differed only very slightly from drugs he was already using.

In the treatment of heart failure, however, digitalis, introduced in 1785 by William Withering of Stafford, a great physician and medical botanist, still reigns supreme, and Wenckebach's statement made in 1910 needs no modification to-day. "Digitalis therapy," he remarked, "is one of the most important and serious duties of the general physician. It demands a great deal of skill, power of observation, keen interest, and experience. A long life is too short to learn enough about this wonderful drug." The mode of action of digitalis was one of the first problems to be tackled by the new technique of measuring the output of the heart by cardiac catheterization, and one long controversy has now been settled. It has been proved that digitalis does indeed increase the efficiency of the failing ventricle, a view long held by the older clinicians and pharmacologists. This particular action is more impressive in left ventricular failure than in right heart failure caused by mitral stenosis, for in mitral stenosis the haemodynamic circumstances are complex and variable and not yet completely understood (McMichael, 1952).

There also remain many other problems to be solved in relation to digitalis action. Nevertheless, while mindful of Wenckebach's advice, digitalis should be given in all cases of heart failure and continued thereafter for the life of the patient when there is auricular fibrillation. Digitalis also has a place in the treatment of heart failure with normal rhythm, and there is a gathering opinion that it should be given and continued indefinitely whether the pulse is fast or slow. Some patients respond best to the folia tablets, which may have a cumulative action, some to digoxin, which is excreted more rapidly and is more expensive, and a few patients who prefer a bottle of medicine continue to take the tincture, which may lose its potency. A careful watch should be kept for signs of overdosage or individual refractoriness or idiosyncrasy. In short, digitalis therapy to date remains an art rather than a science.

A new drug, procainamide ("pronestyl"), has recently been introduced for the treatment of the cardiac arrhythmias or an attack of paroxysmal tachycardia which may precipitate heart failure. It has a quinidine-like action, depressing the heart, and it does not work

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through the vagus. After a test of 250 mg., 1 g. can be given by mouth every three to four hours, making a total of 6 g. a day until the irregularity is abolished, when it should be tailed off. It is most valuable in the ventricular tachycardias, and also works in a high percentage of the supraventricular tachycardias and occasionally in paroxysmal auricular fibrillation. Unfortunately it is unlikely to be successful in prophylaxis (Lucas and Short, 1952), and quinidine sulphate still holds its place as a valuable drug to diminish the frequency of the attacks, or even to abolish them. Procainamide, however, is a valuable addition to the pharmacopoeia and deserves a trial in heart failure resulting from a prolonged attack of paroxysmal tachycardia. If it fails we rely once again on digitalis.

Mercurial Diuretics

Although the primary defect in heart failure is impaired cardiac function, the ultimate result is disturbed renal function with salt and water retention. It is the water retention that accounts for many of the subjective and objective features of congestive heart failure, and oedema of the lungs contributes to the respiratory difficulty and puts further strain on the heart. The use of mercurial diuretics (first introduced for the treatment of syphilis) as a means of getting rid of oedema in heart failure is the greatest advance since digitalis and has provided the practitioner with many of his moments of triumph. The relief of a swollen uncomfortable patient by a few injections of, say, mersalyl or "unephral," is very satisfactory, but the search goes on for an oral preparation and one free from the dangers of mercurialism. It is well known that mercury can cause a toxic nephrosis, and, if renal excretion is impaired, symptoms of mercury poisoning such as diarrhoea, vomiting, and gingivitis may occur. So far, my personal experience of oral mercurial diuretics has been limited to chlormerodrin ("mercloran"), and I still prefer parenteral therapy in grossly oedematous patients. However, the oral preparations are useful in maintaining a patient in a relatively dry state, and they have obvious advantages for children and others who dislike injections.

Restriction of sodium as a means of treating oedema is perhaps carried out more rigorously in the U.S.A. than in England. To ensure success, the daily intake of sodium should not exceed 500 mg., and unless considerable care is taken in planning the diet and the services of a dietitian are available the result may be so unappetizing that a sick patient cannot eat it. In addition, painstaking adherence to low-sodium diets may result in vitamin deficiencies as well as inadequate general nutrition unless a wide range of low-sodium foods are available and vitamin supplements prescribed (Nutritional Implications of Sodium Restriction, 1952). I do not subscribe to the view that fluid restriction is unimportant when the sodium intake is limited, and the total fluids should not exceed 2 pints (1 litre) or so a day.

A word of warning regarding the combination of mercurial diuretics with a too severe restriction of salt intake has been given by Black and Litchfield (1951). They reported eight cases, including five fatalities, in which uraemia developed during the treatment of congestive cardiac failure with a low-sodium diet of 0.2 g. a day combined with frequent injections of a mercurial diuretic. They thought that this complication was the result of salt depletion rather than mercurial damage to the kidney, and recommended that patients placed on a diet very low in sodium and also receiving injections of mercurial diuretics for heart failure should have frequent blood urea estimations.

Cation-exchange resins are sometimes an effective adjuvant to a low-salt diet in the treatment of oedema of cardiac failure. The early hope that the use of ion-exchange resins would allow a more liberal diet and an increased salt intake has not been realized (Greenman *et al.*, 1953), and many patients would rather restrict salt than take the resins, despite the makers' assertions that preparations are now available

in a palatable form. A large bulk must be ingested, the cost is high, and close chemical control is necessary during treatment. For these reasons the use of resins is usually restricted to cases of persistent cardiac failure when pitting oedema remains after two to three weeks' treatment by standard means, or when mercurial diuretics are contraindicated because of sensitivity, toxicity, or failure to respond, or during convalescence from heart failure to prevent the recurrence of oedema (Spencer and Lloyd-Thomas, 1954).

New Treatments

The latest diuretic on the market—namely, "diamox"—is the result of a new approach to the problem of salt retention and resultant oedema, suggested by the observation of Mann and Keilin (1940) that suphanilamide is a specific inhibitor of the enzyme carbonic anhydrase. This enzyme is present in many tissues, and if its action can be inhibited in the renal tubules, by causing a deficiency of hydrogen ions, an alkaline urine rich in sodium bicarbonate and potassium will result. Sulphanilamide proved too toxic and not powerful enough as a carbonic anhydrase inhibitor, but a related compound, acetazolamide has been discovered and marketed under the name diamox. A dose of 250 or 500 mg. by mouth will certainly produce a prompt diuresis in cardiac oedema, but its action is based on ionic exchange, and it remains to be seen whether the body will learn to accommodate itself to the continued use of diamox in other ways than by the desired one of excreting alkalis and water. My guess would be that diamox is unlikely to supersede the mercurial diuretics, but it will be useful on occasions in much the same way as resins have a place in the treatment of cardiac oedema. I would emphasize, however, that it is early days to judge any drug introduced as recently as diamox.

Those of us who were in Stockholm last year for the International Congress of Internal Medicine can testify to the excellence of the Swedish Pilsener beer, and it was therefore with special interest that I read a paper by Wallgren (1954) on the use of beer as a diuretic in heart failure. It is, of course, well known that beer is a diuretic, but in some countries there is a tradition that alcohol is unwholesome for cardiac cases. Dr. Wallgren has carried out some interesting studies with measured fluid and electrolyte intakes in 20 patients suffering from heart failure caused by valvular disease or hypertension and shown that the substitution of two bottles of Pilsener beer for an equivalent amount of water in a total daily fluid intake of 1.5 litres may have positive therapeutic value, since it has a slight diuretic effect and relieves the monotony of the saltless diet. The appetite is improved, and I can think of many patients who will welcome this news.

A Medical Emergency

The treatment of left heart failure resulting in cardiac asthma is a medical emergency justifying the night-call, and few emergency treatments in adult medicine are so immediately rewarding. Morphine should be administered without delay in order to calm the patient and also reduce the sensitivity of the cough reflex and so break the vicious circle of pulmonary engorgement, made worse by dyspnoea and coughing. For a patient of average weight, $\frac{1}{4}$ gr. (30 mg.) of morphine sulphate is required, and it is best to give half of this dose intravenously and the other half subcutaneously. It is unnecessary to give atropine, which induces dryness of the mouth and is of no value in drying up the lungs, since the oedema is not the result of excessive bronchial secretion.

An intravenous injection of 0.25–0.5 g. of aminophylline is given next, and, if it is known that the patient has not taken any digitalis for the past month and there is no reason to suppose that the attack of cardiac asthma is due to myocardial infarction, digoxin, 0.5–1 mg., may be injected slowly at the same time. This is one of the occasions, however, when the administration of a large dose of digitalis occasionally results in a fatality, and perhaps it is better employed later on to consolidate improvement won by other

means. The application of venous tourniquets round the thighs for a period of one hour helps the overloaded heart by lowering the venous pressure, and the ancient art of venesection should not be forgotten. This last measure, effective alike in left ventricular failure or congestive heart failure, has rather fallen out of favour; it takes a certain amount of time and may be messy, but the result is most gratifying, and it would be a backward step if venesection fell into abeyance.

Oxygen is of value in the treatment of heart failure and especially in heart failure caused by chronic respiratory disease or cor pulmonale. In England, our climate, the coal-mines, and the industrial cities are responsible for many cases of chronic respiratory disease, but the outlook is better, for much research is going on concerning the development of pneumoconiosis and the use of smokeless fuel. Meantime, methods of giving oxygen have improved, and we frequently see oxygen cylinders leaving the store in hospital for the treatment of patients in the home. Indeed, this has become so popular that the arrival of a cylinder of oxygen or an oxygen tent is no longer regarded by the patient's relatives as a tactful reminder that they should look out the name of an undertaker.

May I make a brief reference to thyrotoxicosis, which is often overlooked as a cause of heart failure. When I was a house-physician we talked about "masked hyperthyroidism" in cardiac cases, but the term went out of fashion because it was pointed out that it was the doctor who was masked and signs were there for all to see. That may be so, but they are sometimes confusing, especially when they develop slowly, and what may be obvious to a physician seeing the patient for the first time is not always easy to recognize when one has been attending the patient for several weeks or months. The treatment of thyrotoxic heart failure with anti-thyroid drugs or total ablation of the thyroid gland by radioactive iodine is usually most successful, but requires constant supervision, since excessive amounts of the antithyroid drugs may cause severe myxoedema with recurrence of heart failure.

Conclusion

I think it is fair to say that although recent advances in the treatment of the heart, apart from those contributed by our surgical colleagues, have not been as spectacular as in some other fields, notably the antibiotics, nevertheless there has been a steady gain in knowledge concerning the physiology of the human heart and the reasons why it fails. Cardiac catheterization was the technique for which everyone had been waiting, and the rich harvest is not yet fully gathered in. Meantime we approach the cardiac patient with more understanding and a bigger box of drugs, and our results are better. The patient with heart failure may look ill and may feel very ill, but there is much that we can do, not least by gaining the patient's confidence and dispelling any atmosphere of depression or despair, unjustified even with signs of severe heart failure.

Summary

Digitalis is still the most useful drug in the treatment of heart failure. Many problems remain to be solved regarding its mode of action, but it has been proved by cardiac catheter studies that digitalis is of benefit in all forms of congestive heart failure or left ventricular failure whatever the rhythm. A new drug, procainamide, has proved useful in the treatment of cardiac arrhythmias, but is less successful than quinidine in prophylaxis.

The ultimate result of heart failure is disturbed renal function, and methods of relieving salt retention and oedema are reviewed. Reference is made to the use of oral mercurial diuretics and ion-exchange resins. A new approach to the problem has been suggested by a study of drugs which inhibit the action of the enzyme carbonic acid anhydrase, and preliminary results with "diamox" are described.

The treatment of left heart failure is a medical emergency demanding prompt measures to break the vicious circle causing an overloading of the heart. In addition to the administration of drugs such as morphine and aminophylline, the application of venous tourniquets round the thighs or venesection is advised.

Oxygen is of especial value in the treatment of heart failure caused by chronic respiratory disease, and improved methods of giving oxygen have popularized this form of treatment in the patient's home.

Thyrotoxicosis is a cause of heart failure that is often overlooked, and the response to antithyroid drugs is gratifying.

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CONTROL OF SONNE DYSENTERY IN DAY NURSERIES: A TRIAL OF PHTHALYLSULPHATHIAZOLE

BY A GROUP OF MEDICAL OFFICERS OF
HEALTH IN ASSOCIATION WITH THE PUBLIC
HEALTH LABORATORY SERVICE SONNE
DYSENTERY COMMITTEE*

Sonne dysentery has been and still remains a troublesome infection in day nurseries. In spite of high standards of hygiene the infection often spreads widely. Symptomless excretors are common, and where symptoms are present they are often trivial. Many nurseries, however, accommodate babies, and in view of occasional fatalities among young children the presence of *Shigella sonnei* cannot lightly be ignored.

In an attempt to reduce the time and labour spent in controlling outbreaks of Sonne dysentery in day nurseries, the use of sulphonamides as a prophylactic has been suggested. A study of the published results (see Vollum and Wylie, 1946; Roberts, 1951) and personal inquiry from a number of medical officers of health showed that a number of different drugs in varying dosage have been used. Attempts at chemoprophylaxis were by no means invariably successful, but the results were generally regarded as encouraging.

It therefore seemed desirable to try to establish by a controlled trial whether sulphonamide prophylaxis would limit the spread of dysentery once infection had been introduced among children in a day nursery and whether it would reduce in any way the time and work involved in controlling an outbreak.

Plan of the Trial

Selection of Nurseries.—All day nurseries were included subject to the medical officer of health being satisfied that

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