TREATMENT IN GENERAL PRACTICE

This article is one of a series on the management of some of the metabolic diseases met with in general practice. The first group of articles on Treatment in General Practice, thirty-five in number, was republished in book form last March by H. K. Lewis & Co., and a second volume will appear in the autumn.

TREATMENT OF SOME COMPLICATIONS OF DIABETES MELLITUS

BY

O. LEYTON, M.D., D.Sc., F.R.C.P.

PART I

Before giving details of the treatment of the complications of diabetes mellitus it should be stated that once some of the lesions have developed they cannot be cured. Prophylactic treatment is therefore of paramount importance, and consists in keeping the patient's metabolism as near normal as possible; when complications have developed maintenance of normal metabolism is the treatment essential to prevent further degeneration of tissue.

It has been found that the average diet of Europeans consists of six parts of carbohydrate, two parts of protein, and one part of fat. If we assume that insulin is the only substance which the patient suffering from pancreatic diabetes fails to make in sufficient quantity, his metabolism should be normal when he consumes a diet approximating to this ratio and is provided with adequate insulin. In a diet designed to supply sufficient energy to maintain weight and permit normal activity while keeping the metabolism normal, the carbohydrate cannot be limited to 150 grams a day as is advised by some authorities. Metabolism will probably be nearer normal when the concentration of sugar in the blood is kept between the limits found in health than when it is kept below the level at which glycosuria occurs. This means that sufficient insulin should be given to prevent the sugar rising at any time above 0.15 mg. per 100 c.cm. of blood. Possibly in pituitary diabetes mellitus the anterior lobe of the pituitary secretes simultaneously an excess of the diabetogenic factor and an abnormal substance which causes arteriosclerosis. This possibility does not, however, diminish the advisability of attempting to keep the metabolism close to the average normal.

Arteriosclerosis¹

Before the advent of insulin arteriosclerosis, along with a raised blood pressure, was recognized as a common sequel to long-standing diabetes mellitus. The fact that females were affected as often as males made it probable that it was the disease, or the treatment of the disease, that led to this condition. Evidence has been accumulating that the diet containing much fat and little carbohydrate at one time customary was, in fact, responsible for the changes in the arteries; but even if this had been known then it would not have affected treatment, because in those days the physician had no choice. If the patient was to survive he had to be supplied with a certain amount of energy in a form which he could utilize. Insulin has changed this, and subsidizing the pancreas allows us to give the patient a suitable balanced diet.

For many years iodine has been prescribed in hypertension and arteriosclerosis. Any improvement following its administration has been attributed to its anti-luetic properties, but recent animal experiments have shown that iodine inhibits the production of arterial changes by

high fat diets. Either iodides or some compound of iodine and oil should be prescribed in doses sufficient to ensure the absorption of 5 grains of iodine daily. At least 7 grains of potassium iodide, or iodinol (20 per cent. iodine) one six-minim capsule four times a day should be given.

Coronary Thrombosis and Angina Pectoris

Coronary thrombosis may follow arteriosclerosis of the coronary vessels, and is treated by rest and analgesics. The analgesics morphine, 1/4 grain, and its derivatives, diamorphine (heroin), 1/6 grain, and dihydromorphine hydrochloride (dilaudid), 1/32 grain, may be given in diabetes mellitus. The obstruction of the artery renders that part of the heart muscle supplied by it ischaemic. This, in turn, leads to fibrosis, and during this process substances are liberated which interfere with the action of insulin, necessitating a temporary increase in the dosage.

Angina pectoris is due to a transient ischaemia of the heart caused by a spasm of the coronary artery. The recurrence of anginal attacks depends upon factors about which very little is known, so it is difficult to decide whether hyperglycaemia or hypoglycaemia increases the frequency and intensity of attacks. That the T wave is depressed during hypoglycaemia is part of the evidence cited in favour of the hypothesis that the heart becomes accustomed in long-standing diabetes to an excess of sugar in the blood supplying it, and that its action may be impaired by a sudden reduction in that concentration. On the other hand, many observers have seen diabetic patients with frequent anginal attacks improve considerably after the adoption of adequate treatment. It seems advisable, however, to prevent any sudden change in the concentration of sugar in the blood of these patients, and therefore when treatment with insulin is adopted the doses should only be increased very slowly.²

Cerebral Haemorrhage and Thrombosis

In spite of these accidents being fairly common in long-standing cases of diabetes mellitus it is not safe to assume that sudden loss of consciousness is due to cerebral haemorrhage or thrombosis, even when it is associated with laboured breathing, muscular spasm, or even hemiplegia and extensor plantar responses. Hypoglycaemia may produce these effects and sugar will save the patient's life, while the usual treatment by starvation will prove fatal. If there be the shadow of a doubt half a pint of warm aqueous solution of glucose (10 per cent.) should be given per rectum and the sugar content of the blood estimated. Should the blood sugar be above 0.12 mg. per 100 c.cm. then the patient should be treated as described previously in this series,³ but with one essential difference. The non-diabetic may be allowed to go without food for several days, but the advanced diabetic will develop ketosis and die if deprived of carbohydrate for any length of time. If there is any acetone in the urine or in the blood the patient should be supplied with orange juice, about two pints a day, or glucose lemonade in quantities sufficient to ensure an intake of 100 grams of carbohydrate daily. Patients who are unable to swallow should have a 20 per cent. solution of dextrose injected intravenously; 125 c.cm. four times a day, along with

insulin, is enough to make certain that the carbohydrate is katabolized. The sugar content of the blood should be estimated often enough to guard against coma due to cerebral disturbance passing into hypoglycaemic coma.

Vitreous Haemorrhage

Haemorrhage into the vitreous humour is usually associated with the presence of a septic focus, in addition to diabetes and hypertension. Such a source of infection should be treated by extirpation or drainage when possible, while the metabolism of the patient is made to approach normal. An attempt to reduce hypertension may be made by giving sodium thiocyanate, 3 grains, well diluted with water, twice daily after meals, so long as it does not cause giddiness or nausea. If this fails the effect of reducing the daily intake of salt to 5 grains may be tried; patients who react satisfactorily to such treatment may be kept upon a low salt diet until their appetites flag.

Endarteritis Obliterans

Endarteritis obliterans and thrombo-angiitis obliterans both give rise to the characteristic syndrome of intermittent claudication; the onset is very slow when due to the former and comparatively rapid when due to the latter disease. Endarteritis obliterans is progressive, thrombo-angiitis may retrogress; both may cause pain, even while the limb is at rest. The diagnosis may be confirmed with the oscillometer, which will show that the pulse in the affected arteries is of very small volume or else apparently non-existent. An attempt should be made to arrest the progress of the disease by prescribing a diet consisting chiefly of carbohydrates. Auxiliary methods of treatment which may be of assistance include exercises (notably Buerger's), douches, diathermy, drugs, and perhaps, in some cases, sympathectomy.

BUERGER'S EXERCISES

The patient lies on his back in bed and the foot is supported on a padded hinged board at the greatest height that does not cause discomfort. The leg is kept in this position until it is blanched, but never for more than three minutes. Next the foot is hung over the edge of the bed until it has become a good red colour. The limb is then placed horizontally in a well-warmed cradle for two to five minutes. This cycle is repeated six to seven times.

The treatment is applied three times a day to begin with, and is gradually increased up to six times. The length of time for which the leg is elevated should be diminished if pain is caused by the postural ischaemia. In addition, hot and cold douches may be applied to the leg for one minute each and alternated three times.

DIATHERMY AND DRUGS

Short-wave diathermy has been used with encouraging results; in some cases an increase in the volume of the pulse at the ankle has been observed, and this increase has persisted for hours after the treatment has ceased.

In advanced endarteritis dramatic results cannot be expected from drugs, and their effect is less than in thrombo-angiitis obliterans because the collateral vessels are affected as well as the main arteries, so that inhibition or lowering of the arterial tone will produce only a small effect. Anti-spasmodics, such as acetylcholine 0.05 to 0.2 gram, adenosine 0.005 to 0.01 gram, and extracts of skeletal muscle, such as carnation, locarnol, myoston, and padutin, may be injected subcutaneously or intramuscularly four or more times daily; occasionally these will relieve pain, but curiously enough in the absence of pain they may cause it in the legs, and such pain is in no wise evanescent.

It is difficult to satisfy oneself that the effect produced by drugs in an advanced case of endarteritis obliterans is greater than that which might be expected from suggestion following the administration of a costly preparation. The oscillometer fails to show even the minutest increase in the volume of the pulse, but nevertheless some patients with threatened gangrene of the foot in which coldness and purple patches have led to anxiety have attributed the arrest of the disease to daily injections of adenosine and preparations containing that substance.

SURGERY

Thrombo-angiitis obliterans has been treated successfully by lumbar ganglionectomy. Before submitting the patient to operation, observations must be made to determine the skin temperature of the limb before and during the inhibition of vascular tone, either by spinal anaesthesia or by artificial pyrexia, but this can only be done if the case is not too advanced, since neither spinal anaesthesia nor artificial pyrexia is completely devoid of risk. The difference of the skin temperatures at the wrist and the ankle may be from 10° to 20° F. If under spinal anaesthesia the difference in temperature falls to 4° F. or less, then operation is indicated. But in the majority of cases of endarteritis obliterans in which symptoms have developed the rise in skin temperature is negligible.

Peri-arterial sympathectomy appears to have been followed by a recession of the symptoms in several cases. If the improvement is due to the operation the explanation remains a mystery. Some attribute the effect to the absorption of products of damaged tissues, and assert that incisions at other sites would be equally efficacious.

Gangrene

When the lumen of the arteries is nearly obliterated the blood supply to the tissues may be just adequate to maintain life but unable to meet the emergencies of trauma or infection. Such an emergency often initiates gangrene in a foot which otherwise might have remained useful for months or even years.

The feet, therefore, must be protected from trauma and infection by the wearing of well-fitting shoes or, preferably, boots and woollen socks or stockings that diminish the chance of the development of blisters and callosities. Corns should be removed either by rubbing with a piece of shark's skin or by a sharp instrument in clean skilled hands, care being taken to avoid drawing blood. A chiropodist should be told that his client has diabetes, in order that stringent asepsis be adopted. The toe nails should be kept short. The feet should be washed with soap and water daily and kept at least as clean as the face. After washing they should be dried most carefully and powdered with finely divided boric acid. If the skin is scaly or sodden or the nails are deformed it is probable that a fungus is growing, and a compound benzoic acid ointment should therefore be applied daily:

R.	Salicylic acid	...	...	...	...	1 part
	Benzoic acid	...	...	...	...	1 "
	Coconut oil	...	...	...	...	12 parts
	Soft paraffin	...	...	...	...	16 "

Special attention should be paid to the skin between the toes, which is very vulnerable to infection, and is often the site of commencing gangrene.

HYPOTONIC SALINE BATHS

The treatment of gangrene in the London Hospital consists of immersion of the affected part in hot salt baths for periods of fifteen minutes three times a day. The concentration of salt is about 2 per cent. (two ounces of common salt to five pints of hot water), and the temperature as hot as the patient can stand it. It may be 105° F. at first and be increased by the addition of hot

salt water to a temperature not exceeding 120° F. A few patients find the hypertonic bath very painful, and for these the concentration of salt must be decreased. After the bath the foot is washed with hot water, dried, sponged with industrial spirit, dried with a warm towel, powdered with boric acid, covered with one layer of gauze to keep off flies, and placed in a cradle which is heated by electric lamps. The clothes over the cradle are arranged to allow ventilation; the size and number of lamps are chosen to keep the temperature as high as the patient can bear it without discomfort. When there is any discharge and the caked boric acid and pus do not come away in the hot salt bath, boric acid fomentations are applied to soften the mass.

HERRMANN'S "PAVAEX"

During the last few years Herrmann's "pavaex" apparatus has been used to increase the blood supply in cases of endarteritis and dry gangrene. The leg is placed in a rigid container, the air in which is rarefied to a negative pressure of 60 to 80 mm. Hg for about twenty-five seconds. A positive pressure of 20 to 40 mm. Hg is then applied for five seconds. An increase of the blood supply to the leg resulting from this treatment will be demonstrable by a rise in the temperature of the foot. The treatment should be applied daily for a period of up to one hour, provided the constricting cuff encircling the thigh does not cause too great discomfort. Cases in which emboli may be dislodged or sepsis may spread are unsuitable. If the gangrene is moist and there is no hope of saving a toe local amputation may be considered, but this operation succeeds so rarely when there is no pulse at the ankle that it is usually a waste of time.

SYME'S AMPUTATION

It is difficult to believe, but nevertheless it is true, that Syme's amputation succeeds in a sufficiently large number of cases to make it not only justifiable but preferable to amputation below the knee, even when the obliterative process is so advanced that ligation of the vessels is unnecessary. It is usually wise, therefore, to delay operation for just so long as a Syme's amputation is still possible, but no longer. The anaesthetic must be chosen carefully: chloroform and ether must not be used, but nitrous oxide is harmless to most diabetics, and may be employed in conjunction with evipan, avertin, or nembutal. It is unwise to try to make a patient give consent to an amputation by telling him that he may lose his leg, if not his life, by refusing, because occasionally the most unpromising feet heal when subjected to the treatment detailed above, provided the blood sugar is kept within the limits of 0.08 to 0.15 mg. per 100 c.cm. of blood. It is safest to say that operation will probably save time, but that no one can prophesy how long the stump will take to heal.

REFERENCES

- ¹ *British Medical Journal*, 1935, i, 1034.
- ² *Ibid.*, 1935, i, 989.
- ³ *Ibid.*, 1935, ii, 464.

(To be continued)

P. Fischhof (*Med. Klinik*, June 12th, p. 807) records his observations on six sporadic cases of exanthema subitum, which he saw in a relatively short time (October, 1934, to January, 1936) in infants aged from 6½ to 17 months. No epidemiological relations could be found between the exanthema and attacks of influenza occurring in adults at the same time. Some of the cases had catarrhal symptoms, while others had none. The common feature in all was the characteristic rash on the trunk and the typical blood picture, leucopenia with relative lymphocytosis, after the temperature had become normal.

AIR RAID PRECAUTIONS AND THE MEDICAL PROFESSION

National schemes for the protection of the civil population of this country in case of hostile air attack are being prepared by the Air Raid Precautions Department of the Home Office (5, Princes Street, London, S.W.1) in close co-operation with local authorities. These precautions must be taken in time of peace, not because there is any immediate threat of war or because war is considered to be inevitable, but because the range, speed, and capacity of modern aircraft are such as might enable sudden attacks to be made on a very heavy scale—attacks which would cause great damage and suffering if no previous organizations had been thought out to help to deal with them—and, in view of the speed with which air attack could be delivered, last minute improvisation would be impossible.

Air raid precautions are an essential corollary to the active defence of the country. They can in no way supersede it, but have as their object the devising of measures to maintain the morale of the population and to enable the life of the country to be continued, even though on a modified scale.

Need for Medical Co-operation

The Air Raid Precautions Department attaches the greatest importance to an understanding of the problems associated with air attack by members of the medical profession. Although a convention exists prohibiting the use of gas offensively in time of war, the possibility of this weapon being employed cannot be entirely discounted, and its effects might be disastrous if no previous preparations had been taken. It is in this aspect that the interest of the medical profession is particularly desired, not only in regard to the clinical knowledge of how to deal with possible victims, but also in all the details of prevention and protection.

The training of the medical profession is regarded as a matter of first national importance, because if an emergency arose there could be little question but that the general public would turn to their medical advisers for help and assistance. In time of peace it is also conceivable that their advice might be asked on matters of this kind. The Air Raid Precautions Department has discussed the whole position with the General Medical Council, the British Medical Association, and the deans of the medical schools throughout the country. As a result a scheme has been devised which will, it is hoped, if it receives the support of the profession, achieve the desired result.

Courses of Instruction

The scheme is generally designed to cover the instruction of graduates, undergraduates, and members of the nursing profession. It consists in the provision of specially selected and trained medical men, who would conduct special courses under the auspices of the deans of the medical schools, the British Medical Association, and the General Nursing Council. The courses proposed would be both theoretical and practical; the latter representing approximately 50 per cent. of the instructional time, and including personal experience in wearing a modern type of respirator in actual gas. Courses would probably consist of some six or eight attendances, and would be arranged at suitable places, hours, and intervals to suit the convenience of those concerned. Since there is a good deal of new ground to be covered it is felt that these periods represent the minimum of attendances necessary to attain the required standard in all aspects of the subject.

The instructors provided by the Air Raid Precautions Department will arrange to travel about the country, and will be provided with special equipment to enable them to give the necessary practical instruction at convenient centres. Their operations will be within the respective areas of the British Medical Association Branches at selected centres.

Courses will not be confined to members of the British Medical Association, but will be open to any registered doctor, dentist, or nurse.