occurred with such a heavy excretion of sugar *per se*, whether the insulin acted or not. The essential criterion, the unvarying ketosis, showed that no appreciable insulin action took place.

The clinical condition and the post-mortem findings indicated no important abnormality, except the cardiac condition. To this, therefore, the failure in insulin action might be ascribed. But the pulse pressure, the absence of oedema, hepatomegaly, and venous congestion, and the high volume of urine showed that a reasonably adequate circulation was being maintained until just before death. We feel, therefore, that the heart condition does not explain the failure of insulin action, and the case seems worth recording.

Summary

A case of diabetes is recorded which failed to respond to hundreds of units of insulin a day.

SOME EFFECTS OF ARTIFICIAL HEAT ON THE CIRCULATION IN COLD TEMPERATE CLIMATES*

BY

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From observations on the effects of cold and heat in chronic rheumatism it seems clear that in a warm-blooded animal a small permanent deficiency of heat may be a factor in the production of disease. The delicate mechanisms of heat production and loss which protect the body against a deficiency of heat may break down. The production of heat cannot always keep pace with its loss, and exposure to cold is followed by a fall in body temperature, first on the surface and afterwards in deeper parts. The thermostable animal has become thermolabile. At the other end of the scale it seems equally clear that upon exposure to extreme heat in the Tropics, and in some fevers, heat loss cannot keep pace with heat production, and that there is an accumulation of heat in the body which may lead to fatal results.

Here are two categories of disease arising from uncompensated exposure to cold or heat. They show a break in thermo-regulation in one direction or in the other. Micro-organisms may also be concerned in these diseases, but chilling or overheating plays an essential part in their causation. The climate of the northern temperate region has for its chief characteristic an incessant conflict of polar and Atlantic currents, and consequent abrupt changes in temperature. This is, therefore, the region in which the effects of sudden changes of temperature should be looked for in sensitive subjects, and especially the effects of repeated and chronic chill.

One lesson which may be learned from the study of rheumatism is that the effects of cold are shown very quickly, and perhaps first of all, in the circulation. Subnormal temperatures are common in rheumatic limbs. It seems that the capillary bed is greatly reduced, and that an abnormal number of capillaries in the cutaneous network are closed. It is known that rheumatism is frequent in exposed parts; rheumatic joints are very near the surface of the body, and the articular cartilages (*loci minoris resistentiae*) are ill supplied with blood. This has led to the hypothesis that a large and prevalent type of rheumatic disease is connected with deficiency of blood supply, the result of external cold. Certainly the beneficial effects of protection against chill and the removal

of pain, stiffness, and swelling by heat give support to this hypothesis.

The gradual effects of cold on the circulation in the skin and extremities need no description, nor yet the immediate effect of, say, a brief hot bath (three minutes at 100° to 105°). The skin, which was the coldest organ of the body, becomes the hottest; it changes in colour from a dull white to bright red. The pulse is accelerated, soft, and large, the muscles relaxed, and perspiration breaks out. The observation of this sequence of events is particularly instructive in men who have been subjected to hard labour and exposure. Chill, fatigue, pain, and stiffness give place to a sense of warmth, comfort, and vigour.

Degree and Duration of Heat

The cardinal twofold reaction to heat, not unlike the reaction to many drugs, is shown in the restorative effect of brief baths and the injurious after-effects (the "thermal debility") of prolonged heat. The medical importance of these physiological facts and their bearing on the treatment of many chronic disorders are insufficiently realized. But even rough-and-ready rules are of some service. Baths over blood heat, prolonged for more than ten minutes, are always injurious in health. In cases of low blood pressure or myocardial weakness only a few seconds' immersion in a bath at blood heat can be allowed. There are great individual differences in the twofold reaction both to heat and to cold. Fairly robust persons may, by training, greatly increase their power of accommodation. Even when it has been considerably diminished, as in chronic disease, it may often be re-educated by judicious thermal applications.

Those who have prescribed medical baths for many years must realize the governing importance of the dosage of heat. Sometimes it must be very precisely measured. In effervescent baths for circulatory cases a single degree may make the difference between a stimulant or a sedative effect. In addition to temperature, there is always the "fine adjustment of duration." Where the patient is progressing well a minute may often be added every two or three days. In each case the duration of the bath must be regulated by the circulatory reaction which it evokes. The disregard of dosage in hot baths in the last century caused a strong aversion to their use, and as a result baths of all kinds were forbidden in heart cases. Similar mistakes were made with baths of low temperatures. Even iced baths were given in typhoid fever, in ignorance of the fact that in febrile diseases external cold below 65° is a dangerous depressant. Such a use of powerful agents, which are really invaluable stimulants or sedatives, did much to bring hydrotherapy into disrepute. [But if no guidance had been given in the use of morphine and strychnine they would certainly have also been banned.]

To their credit practitioners at spas have carefully studied the administration of baths. Good effects often follow their precise use in circulatory disorders—for example, in high blood pressure and hyperpiesia, as described in Dr. Edgecombe's paper presented at the annual meeting of the British Medical Association at Eastbourne.¹

Consensual Reaction to Heat

Popular medicine everywhere relies a great deal on the local use of heat carried by hot bottles, bricks, flatirons, poultices, fomentations, steam, warming-pans, foot-baths, *et hoc genus omne*. Everyone knows that hyperaemia induced by external heat is very soothing in a great variety of painful conditions. The rationale of such methods is now better understood. In addition to their local effects—relief of pain and circulatory tension, dilatation of capillaries and increased circulation—it is now

* Read before the South Essex Division of the British Medical Association, February 12th, 1935.

¹ *British Medical Journal*, 1931, ii, 319.

known that the effect of heat cannot be confined to the part where it is applied. It has been many times demonstrated by the plethysmograph that if one limb, an arm or leg, be heated in a bath the other members and the entire surface of the body are affected in the same manner. The old maxim that if one member suffers all the others suffer with it has found a new expression in what is known as the "consensual reaction" to heat. Local heat may unpleasantly excite the heart and circulation. Very hot packs of fango, peat, or estuary muds are commonly used in chronic arthritis to improve the local circulation and assist in the resolution of deposits. But these applications frequently disturb the heart, and, to avoid circulatory excitement and subsequent fatigue, it is necessary during the pack to allow iced water to flow through a Leiter's coil over the heart region.

The most characteristic and desirable effect of local heat on the general circulation is the relief of vascular and nervous tension. Consequently at many of the spas partial baths have for many years formed an important part of the cure. The most interesting baths of this kind are foot and arm baths at rising temperatures. These have been employed in conjunction with other physical methods in many spastic troubles, such as asthma, and in chronic respiratory disorders, angina pectoris, and arterial hypertension.

A CASE OF MEGALENCEPHALY SHOWING AN UNUSUAL TALENT FOR CALCULATING DATES

BY

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From time to time there appear in the literature reports of mentally defective children or adults who, against a general background of amentia, are yet able to display special talents in one or more directions.

In the case to be recorded there is an astonishing aptitude for dates. The patient remembers the date of death of various occupants of his ward, the arrival or transfer of doctors and nurses, and the dates of the examinations of his blood and cerebro-spinal fluid. He knows all the patients in his ward by their correct names and can tell the number of patients from day to day. The daily happenings are remembered in detail, also the names, date of entry, and promotions of the nursing staff. He readily recalls the dates of visits of different members of the medical staff. His chief ability, however, lies in the correct naming of the day of the week on which any given date falls.

Various degrees of hypermnesia are not particularly rare among the feeble-minded. Memory in this patient plays a more important part than appears at first sight, for there are grounds for believing that he has committed to memory the day of the week corresponding with some key-date. When given a date at random, he counts backwards and forwards to the nearest one corresponding with his initial key-date, making allowances for a leap-year. It has been observed that he is quicker at calculating future than past dates. Examples of his faculty in this matter can be seen from the appended table of questions which were put to him.

The mental imagery employed by this patient is thought to be of the auditive type. While making a calculation he displays constant rhythmical hyperkinetic movements, at the same time repeating the question aloud. But if the trunk is fixed and he is not allowed to repeat ques-

tions, he reckons less quickly and makes errors. There is marked poverty of ideation, which, in the mental defective's mind, tends towards an astonishing concentration of effort of his memory processes.

Family and Previous History

The patient was certified under Section 24 of the Lunacy Act on May 24th, 1915, and admitted to Leavesden Mental Hospital on January 17th, 1919. He was the fourth child in a family of six, and at the time of his birth his mother was 34 and his father 32. The unusual size of the child's head was first noted by his mother when he was 5 weeks old. The patient remembers, however, that his head was still increasing in size at the age of 6 years, and other children used to call him "big-head."

Since July 18th, 1933, the exhibition of luminal therapy has had a marked effect on the reduction of epileptic fits, and he now averages only three or four fits each month. Before epileptic fits he becomes abusive, obscene, and excitable; often refuses food, and is destructive and impulsive.

Present Condition

The patient is an extremely obese adult male, aged 32, whose height is 5 ft. 4 in., and weight 15 st. 2 lb. His head is enlarged in all diameters, ovoid in shape, and brachycephalic with an increase in the transverse diameter. The height of the forehead is exaggerated, but it does not bulge in the way that is ordinarily seen in the hydrocephalic. The maximum circumference of the head, $27\frac{1}{4}$ inches, is obtained at the superciliary margins; in this respect he differs from the ordinary hydrocephalic, whose maximum cranial circumference occurs in the temporal region. The patient's measurements are: length, 20.5 cm.; breadth, 19.7 cm.; circumference, 70.6 cm.; height, 190 mm.; cephalic index, 81; cubic content, 2,583 c.cm. by Lee's formula. X-ray examination of the cranium revealed nothing abnormal.

The patient is remarkable in that not only is the cranium enlarged, but the face also. The condition is therefore suggestive of a true megalencephaly rather than a hydrocephaly. There is marked growth of fine hair on the skull, which is tightly stretched, and the skin covering the face is coarse and pitted. In the neighbourhood of the nose are several small adenomatous masses. Percussion of the cranium yields a box-note, not quite the stony hardness associated with hydrocephaly. The palate is high, with a maxillary prognathism and marked spacing of the upper incisors. The face is symmetrical, and almost as broad as it is long; the nasolabial folds are poorly defined, and the expression is one of facile content. The hands are fat and dimpled, with slight saddling of the digits, the nails unduly curved from side to side, and slightly ribbed, and the fingers tapered. When the patient is stripped it is seen that he is enormously obese, the fat being evenly distributed over the trunk and limbs; there is marked generalized seborrhoea. The lower limbs are hairy, thickened, and indurated. The patient remains all day in a wheeled chair, and although he is unable to walk he can move himself from one chair to another.

Central Nervous System

The eyes show alternating strabismus and nystagmoid jerkings on looking to the right. The pupils are eccentric, equal, and irregular in outline; the fundi are normal. The right pupil is 3.5 mm. in diameter, and the left is 3.5 mm. Both pupils react sluggishly to light and convergence. The cranial nerves and articulation are normal. Dynamometer reading in right hand is 70; left hand 25.