TREATMENT IN GENERAL PRACTICE

This article is one of a series on the management of some diseases of the nervous system met with in general practice.

CEREBRAL HAEMORRHAGE AND THROMBOSIS

BY

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Cerebral haemorrhage and cerebral thrombosis are vascular accidents due, in the majority of cases, to disease of arteries in the brain or, more rarely, to arterial embolism resulting from a distant pathological process.

From the clinical point of view it is often impossible to distinguish between the haemorrhagic and thrombotic accident, nor is this discrimination a matter of great importance so far as treatment is concerned. It is probably true to say that most patients who survive an attack of apoplexy have suffered from cerebral thrombosis, and that fatal apoplexy is generally haemorrhagic in origin.

Disease of the arterial wall, except it be due to syphilis, is not amenable to treatment, and when a doctor is faced with non-syphilitic apoplexy therapeutic measures must be directed towards the preservation of circulation in those parts of the brain which have not undergone immediate and permanent destruction. And it is often impossible in the first few days following a "stroke" to determine how much the impairment of cerebral function is due to tissue destruction and how much to a temporary disturbance of circulation in healthy areas, the result of secondary oedema and increased intracranial pressure. For this reason the doctor may often commence treatment with a measure of greater hope, in regard to recovery, than the initial condition of his patient seems to justify.

The Apoplectic Stage

From the first moment when a disturbance of the cerebral circulation is suggested absolute rest in bed with skilled nursing is essential. Whether the patient is conscious or unconscious, all physical and mental efforts must be avoided and every endeavour made by his attendants to conserve the strength of his heart's action and an unimpeded flow of blood to his brain. The patient's head and shoulders should be slightly raised, and, if unconsciousness and stertor are present, turned to one side so that the tongue does not fall back and so interfere with respiration.

Deep cyanosis is an indication for venesection, and the removal of 10 to 20 ounces of blood is often a useful stimulant to the circulation. A slow pulse and rhythmic respiration in an unconscious patient should be met by free drainage of cerebro-spinal fluid from the lumbar region of the spine. The presence of any considerable quantity of blood in the fluid is, generally speaking, of grave significance.

Active purgation should be avoided, and the bowels are better relieved by means of daily enemata. The question of feeding in the early stages must be decided by consideration of the patient's general condition. The conscious but feeble patient with low arterial tension may be given liquid food with small quantities of alcohol or other diffusible stimulant at regular intervals from the beginning, but the comatose patient with bounding pulse may well be

starved for twenty-four to forty-eight hours before light nourishment is commenced. In the presence of difficulties with swallowing, the food must be administered through a nasal tube. A careful watch must be kept on the bladder, and, in the event of retention, urine drawn off by means of a catheter, with scrupulous attention to cleanliness and to keeping the patient's perineum dry and healthy.

Physical or mental restlessness is best controlled by a quarter of a grain of morphine hypodermically or by half an ounce of paraldehyde mixed with olive oil and introduced into the rectum.

The length of time during which the patient should be kept at complete rest in bed will naturally vary in accordance with his age, with the severity of the apoplexy, and particularly with the condition of his heart. In any case no exertion should be allowed until the cardio-vascular system is working reasonably well.

If the vascular accident is known or suspected to be the result of syphilitic arteritis, and this is usually in patients who have not reached the age of atheroma, anti-syphilitic treatment should be started without delay. Mercury is invaluable, and its influence may be brought to bear very quickly by the immediate intramuscular injection of a grain of the metal in some form of cream. Such injections may be repeated at weekly intervals, or daily inunctions of a drachm of blue mercurial ointment or of the oleate of mercury may be substituted. The site of such inunctions should be varied from day to day, and hairless parts of the skin chosen for the purpose. Potassium iodide in increasing doses, from 10 to 30 grains three times daily, may be given by the mouth at the same time, and this treatment may be followed later by courses of arsenic or bismuth.

Hemiplegia

In the majority of cases of cerebral haemorrhage and thrombosis the resulting disability takes the form of some degree of hemiplegia, and, as has already been pointed out, it is impossible in the early stages to determine how far the symptoms are due to destruction of nerve tracts or how far they are the consequence of oedema and compression. This ignorance justifies the adoption of a hopeful attitude, and necessitates the employment of every measure likely to facilitate recovery even in the most unpromising cases.

Success in dealing with hemiplegia depends largely on an intelligent anticipation of the difficulties which are usually met with and on enlisting the patient's active co-operation in his treatment.

Armed with the knowledge that the patient's paralysed limbs will tend, if left to themselves, to assume certain fixed positions, it should be the object of the doctor and nurse in attendance to counteract this tendency from the beginning. Even when coma is present the nurse should see that the paralysed arm and leg, particularly the former, are never allowed to lie for long periods in one position. The upper arm should be kept away from the chest wall by means of a pillow in the axilla, the forearm should be frequently supinated and placed in the extended position, and the wrist and fingers may from time to time be placed for a few hours in some form of splint to oppose

spontaneous flexion. Passive movements should be carried out at least two or three times daily at every joint, and all muscles subjected to gentle massage.

With return of consciousness and the ability to appreciate his disabilities, the patient should be educated to understand that he is expected to play the chief part in his own progress towards recovery. It should be explained to him that his arm and leg are not the seats of his disease, that every return of voluntary movement will require his own initiation, and that the manipulations of the nurse and masseur aim only at keeping the limbs in good condition. It is equally important that the masseur should appreciate his own limitations, and that he should not pretend to possess any healing powers independent of the patient's co-operation.

The patient will quite naturally tend to practise and perfect those movements which come first and most easily to him, and he should be constantly reminded not to neglect those which he finds more difficult and even those which he is unable to carry out. It is a good plan to explain to him the various movements natural to each joint and to ask him to spend a certain amount of time daily attempting every movement in turn, even in the absence of any successful response to his efforts. He should do the same thing while the masseur is carrying

out passive movements, and the latter should engage his attention to that end.

Only by persevering in such methods will the patient overcome such obstacles in his progress as the tendency to spasticity, contractures, and deformities, and so attain the maximal amount of control over his voluntary movements. Equally important is the avoidance of bad habits when the patient begins to get about. If left to himself the patient will walk with an extended leg, which he circumducts and swings in order to prevent the toes catching the ground. No instrumental assistance is necessary, but he should be taught to advance his leg by flexion at the hip and knee. In sitting, too, he should avoid the tendency to adduction of the leg and inversion of the foot and toes.

Electricity has no place in the treatment of hemiplegia, and its application, even if not actually harmful, is a waste of time and money. It tends to make the patient believe that recovery is going to take place as the result of external applications, and so to minimize the value of his own all-important efforts.

Such are the principles governing the treatment of hemiplegic patients, and the medical attendant, having grasped them, can apply them to the solution of individual problems as they arise.

OXIDATION-REDUCTION POTENTIAL

A REVIEW OF THE POSITION TO-DAY

The subject of oxidation-reduction potential ("redox" potential) has for some years claimed considerable attention from biologists, and Dr. L. F. Hewitt has done a valuable service by reviewing the present position of the work on this subject in the third edition of his monograph *Oxidation-Reduction Potentials in Bacteriology and Biochemistry*.¹

Thirty years ago both chemists and biologists were familiar, in a general way, with the implications of the terms "acidity" and "alkalinity." These terms had, however, a qualitative rather than a quantitative significance, and (especially perhaps for the biologist) progress along certain lines was inhibited by vagueness and lack of definition when phenomena affected by changes in reaction were studied. The development and mathematical treatment of the theory of hydrogen-ion concentration, together with the recognition of "buffering" effects, has cleared up and defined the situation, and greatly accelerated progress. In like manner the terms "oxidation" and "reduction," which used to possess a qualitative significance only, have, by the development on quantitative and mathematical lines of the theory of oxidation-reduction potential, received a new significance and acquired a precision which will undoubtedly contribute much to the study of biological processes.

Definition of Terms

The term "oxidation" suggests a chemical reaction in which oxygen plays a part, but long ago the chemist had broadened its significance and had used it to cover changes in which oxygen played no part. He spoke, for instance, of ferrous chloride being "oxidized" to ferric chloride. In terms of the theory of oxidation-reduction potential the term "oxidation" signifies the loss, by an atom, of an electron, and the consequent acquisition of a positive charge; the term "reduction" signifies the gain of an electron, and the consequent acquisition of

a negative charge. Fe^{++} minus one electron becomes Fe^{+} ; H minus one electron becomes $\text{H}^{\cdot}$ (it will be observed that in these terms hydrogen atoms are *oxidized* to hydrogen ions). The electron can of course only leave its atom (we are not now dealing with the ionization of gases by high-tension discharges, where the electrons are actually freed) if another atom is ready to receive it—in other words, ready to be "reduced." Thus, oxidation cannot take place without simultaneous reduction of another portion of the system.

A simple example is afforded by a solution containing a mixture of ferrous and ferric chlorides. In such a mixture the proportion of the two salts does not change. If, however, electrical connexion is made between it and a concentration cell of some description, current will flow; if the direction of the current is such that electrons are conducted from the ferrous chloride-ferric chloride solution to another part of the system, ferrous chloride is oxidized; if in the reverse direction, ferric chloride is reduced. In the first instance, the electrons are "accepted" by some substance in the other "half cell," which is thereby reduced; in the second the electrons which reduce the ferric salt have come from some other substance, which has, therefore, been oxidized. The direction in which the current flows is, of course, determined by the electromotive force developed by the two half cells respectively. Its absolute value in the case of either can be measured by substituting a calomel half cell for the other, and employing the potentiometric method. The half cell with the higher E.M.F. gives off electrons at the higher pressure; it is the most negative, and its reduction potential is the greater. The magnitude of this potential depends: (1) on the nature of the substance; and (2) on the relative concentrations of the oxidized and reduced forms—not at all on their absolute amount. Reduction potential is thus a measure purely of intensity, not of capacity. If two or more oxidation-reduction systems are present together in the same milieu (for example, inside a cell) the system with the higher reducing capacity ought to reduce that of the lower reducing capacity; thus whether the chemical events inside a cell are chiefly oxidations, or chiefly reductions, should, in theory, be predictable from a knowledge of the systems present. To give a familiar example,

¹ L.C.C. *Oxidation-Reduction Potentials in Bacteriology and Biochemistry*. By L. F. Hewitt, Ph.D., D.Sc. Third edition. London: P. S. King and Son Ltd. (2s.)