of such cases, when seen sufficiently early, muscular tone, whether gastric or intestinal, can be restored and the patient made perfectly comfortable without there being any alteration in the length of the stomach or the redundancy of the colon. So that one is forced to believe that a long stomach or redundant colon is no more pathological in the beginning than a long back. It is only when muscular tone is lost either in the back or in the alimentary tract that evil happenings arise.

In cases where the vagus control is weak the primary fault may be nervous and inborn—that is to say, a patient may start life with vagus centres which, even if properly fed, may be unequal to a normal strain. In others the centres may be equal to a normal strain but incapable of satisfactory emergency work, and this again may be due to an inborn incapacity apart from bad or insufficient feeding. In many cases, however, one is forced to believe that the patient starts with a nervous outfit which is completely normal, but which is weakened as life goes on, either by some definite deprivation or excess, whether endocrine or chemical. Many of the cases which I have described are found to be deficient in calcium, and are easily poisoned with sodium, and it is very hard to say whether their weakness is due to a primary fault in the glands which deal with absorption and assimilation, or whether these glands do not do their work properly from lack of the normal stimulation by certain endocrines. The only observations that I have been able to make are that many of them are directly benefited by the administration of pituitary and parathyroid, while to others the administration of adrenalin is positively harmful.

BACTERIAL TOXINS.

Another cause of the condition is the circulation in the blood of bacterial toxins, whether derived from the alimentary tract or not, these having the effect of upsetting the action of the glands concerned in absorption, the endocrine glands, and the autonomic nerve centres themselves. It is for this reason that in the case of a person suffering from indigestion one cannot neglect to examine the nose, the tonsils, the teeth, and gums, because toxins derived from these are not only absorbed into and distributed by the blood stream, but may act directly on the mucous membrane of the stomach and intestines, and there cause serious damage.

It is probable that all ulcers in the stomach and intestines, apart from those of typhoid, tuberculous, or malignant origin, are due, first to a constitutional weakness, secondly to an unusual local vulnerability of tissue, thirdly to poisoning of nerve centres and endocrine deprivation, with, in addition, a definite infection. It is not always easy to demonstrate all these causes at work.

I do not wish in this opening to dwell on treatment, but I would say this. Where one has

evidence of a recurrent ulcer with hæmorrhage, whether in the stomach or duodenum, the case should be regarded for the moment as surgical and handed over to the secular arm forthwith, on the distinct understanding, however, that, if the local lesion once dealt with, the patient should be handed back to the physician as soon as possible so that he may have the opportunity of so handling the patient that he may endeavour to correct faults, constitutional, dietetic, and infective, and thus prevent as far as possible the danger of further local breakdown.

MINOR DEGREES OF SPINAL CURVATURE.*

BY

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THE spinal column, consisting as it does of numerous vertebræ jointed together, may be looked upon as a plastic rod. This plastic rod has a peculiar shape. Viewed from the front of the body it is straight, viewed from the side it presents three curves, one convex backwards in the thoracic region, two convex forwards in the cervical and lumbar regions respectively. At birth there exists only one curve, a forward convexity involving the whole spine; the curves in the opposite direction, in the cervical and lumbar regions, are acquired and enable the child to gain the erect posture.

THE PLASTIC ROD: VARIATIONS IN SHAPE.

We have to consider now the minor variations from the normal in the shape of this rod. The plastic rod supports the weight of the trunk, the head, and the upper limbs and transfers it to the pelvis. The normal shape of the rod is maintained by muscles, symmetrically placed around it, which are controlled by a delicate coördinating mechanism. It is obvious that there are many causes that might make this plastic rod deviate from its normal shape, such as: 1. Disease, injury, or maldevelopment of one of the segments of the plastic rod (tuberculosis of the vertebral bodies, scoliosis due to a wedged vertebra, &c.). 2. An uneven distribution of the weight of the head, trunk, and upper limbs (a paralysed arm, torticollis). 3. An alteration from the horizontal of the pelvis, the base on which the spinal column rests (tilting of the pelvis due to a short leg or to an adducted hip). 4. Unilateral paresis of the trunk muscles (scoliosis due to infantile paralysis). But when we try to attribute to one of these causes the minor spinal deformities so commonly seen during school inspections we find that only about 1

* A Lecture delivered at the Royal National Orthopædic Hospital on Sept. 21st, 1926.

10 can be thus accounted for. In the remaining nine the bones are normal, the weight distribution is even, the pelvis is horizontal, and no muscle paresis can be discovered. So that some other cause must be found to account for the deformity in 90 per cent. of patients; and one is forced to assume that the cause lies in some fault in the mechanism that coördinates the activity of the muscles responsible for maintaining the normal state of the spine.

It must be remembered that muscle exhibits two types of activity: "phasic activity" consists of a short clonic contraction; "postural activity" of a prolonged tonic contraction. In the one type, the phasic, the muscle shortens; in the other type, the postural, the muscle remains motionless but maintains itself in its shortened state. It is this postural activity of muscle that enables the body to maintain its posture against gravity. Its nature is not well understood; it has certain characteristics; for instance, the muscle during postural activity develops a low degree of tension, it is capable of maintaining itself for a long period without fatigue, and nothing resembling it can be obtained by electrical stimulation of muscle. It has been suggested that the two types of activity depend on different sources of nerve supply, the phasic being supplied by the somatic nerves, and the postural by the sympathetic nerves; this, however, is only an hypothesis and need not concern us here. From a practical point of view it is sufficient to realise that the erect posture—that is, the preservation of the normal shape of the spinal column—is brought about by a peculiar type of muscle activity, in which the muscles preserve their same length, under a low tension, for prolonged periods without fatigue. This postural activity of muscle has to be acquired. The newborn babe does not possess it; he does not learn to walk or to stand unsupported for 12 months or more.

Thus far I have tried to show that the spinal column is a plastic rod, of a particular shape, the function of which is to support the weight of the trunk, head, and upper limbs, and to transfer it to the pelvis. The shape and position of this plastic rod are maintained by the postural activity of the skeletal muscles, controlled by a delicate coördinating mechanism. We know little about the nature of postural activity of muscle or about the coördinating mechanism. If, however, the controlling mechanism fails or if postural activity is faulty, the plastic rod will bend under the load it is carrying and become deformed.

THE SAGITTAL AND THE CORONAL PLANES.

The resulting deformity must be studied in two planes: the sagittal, as viewed from the side; the coronal, as viewed from the front or back.

In the sagittal plane, since there is a much greater load in the front of the spine than behind, one would expect a forward bend of the spinal column—i.e., an increase in the normal kyphosis.

But this increase in the kyphosis would tend to move the centre of gravity in front of the lower supporting lower limbs. To avoid this and to bring the body back over the supporting legs the pelvis is tilted down in front, and the lumbar lordosis is increased. So that the usual deformity is a kypho-lordosis—an exaggeration of the normal curves.

In the coronal plane one would not expect a deformity so frequently or one so gross because the load on both sides of the spinal column is the same. A mild degree of lateral curvature to one side or the other, however, is frequent. But the normal curve of the spinal column adds a complication because a plastic rod curved in one plane cannot be bent in another plane at right angles to it without twisting. And so, whenever there is a lateral curve, a rotation of the bodies of the vertebræ is also present.

One sometimes sees a patient in whom the rotation deformity appears much more marked than the lateral. This is a deceptive observation. The amount of the lateral deviation is judged by the deviation of the spinous processes, while the amount of rotation is judged by the prominence of the ribs or the erector spinæ muscles. The degree of the deformity of the vertebral bodies is therefore estimated, for of course they can be neither seen nor palpated. The spinous processes deviate in the same direction as the bodies but not always to the same degree, so that palpation of their tips under the skin is not a true guide to the position of the bodies of the vertebræ. Probably the amount of rotation of the spinal column is directly proportional to the amount of lateral deviation.

In the breakdown of postural activity of muscle one may therefore get two main types of deformity: 1. An antero-posterior deformity—a kypho-lordosis or round shoulders. 2. A lateral deformity with rotation—scoliosis or lateral curvature. The deformity at first is not fixed; the patient can of his own accord, if told to do so, correct the deformity and hold his body erect. Soon the vicious position becomes fixed; the muscles and ligaments and finally the bones accommodate themselves to the new position, and the patient can no longer correct the deformity. Many a patient arrives in this condition, and it is useless to tell him to hold himself straight because he is unable to do so.

TREATMENT.

The first stage of treatment in these patients is to regain full movements of the spine. In the mild degrees of deformity this can be done by exercises, particularly by those that stretch the spine—the peculiar value of Swedish remedial exercises. Suspension of the body by the neck is another good method, the body-weight in this case being used as the stretching force. Some deformities demand more drastic treatment, such as a corrective plaster jacket put on under anæsthesia. The objection to this method of

treatment is that the plaster jacket for the time being supersedes the muscles in supporting the body, and in consequence the more important line of treatment—viz., the training of the postural activity of muscle—cannot be proceeded with.

Once the deformity is corrected treatment proper is commenced. Our aim should be to teach the patient to hold his body in the correct position—i.e., the patient has to learn a habit. A habit is acquired by constant repetition, so that something which at first was only performed by voluntary conscious effort becomes automatic. The patient therefore must be constantly striving to hold himself correctly until it becomes habitual for him to do so. Naturally, at the same time he must avoid bad postures, and attention must be paid to his attitude when sitting at a desk at school, and the seat and desk altered so that the most comfortable attitude will be the correct one. For the same reason fatigue should be avoided and, if practicable, children should be made to rest in the prone position for an hour two or three times a day. Games are not harmful because they strengthen the muscles, but they are not curative any more than muscle-building exercises are. One is aiming, not so much at strengthening the muscle, as at teaching it postural activity.

The rôle of the masseuse can now be defined. It is her task to mobilise the spine and to loosen it so that the patient is capable of holding himself correctly. Her second duty is to show the patient the correct posture. She can do no more. It is the patient who must by persistent repeated efforts train his own muscles to hold his body erect. Much, of course, can be done by a careful mother.

Artificial supports, such as jackets and round back braces, require consideration. In the minor degrees of spinal deformity they are to be avoided because they do more harm than good. If they give no support they are useless, and if they give support they usurp the function of the muscles, and as I have tried to explain the aim of treatment is to teach the muscles to function properly.

We have seen that the erect posture is maintained by the postural activity of skeletal muscle. If postural activity is faulty a spinal deformity results which may be of two kinds—round shoulders and lateral curvature. From the point of view of treatment it is important to know whether the deformity is fixed or not. Treatment consists in first mobilising the spine, then in strengthening the muscles and in training postural activity. Postural activity is encouraged by persistent voluntary maintenance of the correct position, by avoiding incorrect postures, and by avoiding fatigue.

Our publisher desires that readers of the JOURNAL should be informed that it would be possible to supply covers for binding the numbers for the year if there is a reasonably large demand for such.

EDITORIAL NOTES

POST-GRADUATE WORK IN PROVINCIAL CENTRES.

As will be remembered, reference to this matter has been made in the Editorial and Correspondence columns in our successive issues from September last. We gladly take this opportunity of reporting progress. Inquiries having reached the Executive Committee of the FELLOWSHIP OF MEDICINE from places outside London as to the feasibility of sending lecturers from the staffs of Hospitals associated with the FELLOWSHIP to give lecture-demonstrations, they decided that teachers should be encouraged to go to these centres in the provinces whenever at any particular centre 20 members of the FELLOWSHIP were enrolled. The Executive Committee next approached the lecturers, asking if they would be prepared to do such work if requested, and notifying them that the FELLOWSHIP would wish to defray travelling expenses incurred, but could not offer any special fee. Within a very short time some eighty acceptances of this invitation were received, and so provision is being made for provincial teaching in all departments of our work and obtainable in any district. A really fine panel of teachers is therefore available. The next step is for those concerned to send requests for this assistance in developing their own post-graduate opportunities.

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As a nation we have had happy experience of coördinated research and prevention of disease among our own colonies, if we may employ that word to-day, and at no time perhaps more happily than under the direction of the late Mr. Joseph Chamberlain as Colonial Minister. A similar remark applies to other European countries and notably also to the United States of America. But never, we believe, until to-day has a public health service for the world been coördinated as that from Geneva through the Health Section of the League of Nations. The Epidemiological Intelligence Department of the League now promulgates a weekly bulletin on epidemic disease, and has arranged to "broadcast," and from Jan. 15th, a daily report in regard to influenza. A medical correspondent in Geneva, where the victims of influenza have reached their thousands, writes that in his opinion the epidemic resembles in type that of the black year 1918, only less serious in degree.

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All this raises again the question of the unrivalled opportunities of the man in active general practice for research. We have for long held the view that a post-graduate institution—post-graduate university it might be—should include among its main aims the encouragement of research among medical practitioners, and to this matter we hope to return in a future issue. Among