Original Articles.

THE EMPLOYMENT OF MECHANICAL FORCE IN TREATMENT OF LATERAL CURVATURE.¹

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THE treatment of lateral curvature is simple in theory. Briefly stated, it is to overcome as much as possible, the distortion of the spine and to maintain the corrected position until the spinal column can remain straight without artificial aid; but, in practice, difficulties are met from the osseous and ligamentous resistance in the distorted spine. The amount of flexibility in these cases of curved spines will be found to vary; and it is advisable for clinical purposes to

ing along the front of the vertebral column. The younger the spinal column the greater the flexibility.

An examination of the bones of a specimen of lateral curvature shows the fact that the vertebral bodies are altered in shape, the most noticeable being in the thickness of the sides of the vertebræ, and this condition is constant in all well-marked cases of lateral curvature with rotation. It exists in a less degree in a number of cases where no lateral curvature is noticed; and this in all probability explains the tendency in many instances to the development of the curve, and which is analogous to the tendency to aggravated knock-knee which follows the lengthened condition of the internal condyle. In addition to the osseous deformity it will be found that the shape and attachment of the ligaments are such as to hold the spine in its distorted posi-

FIG. 1. Modified Zander appliance for stretching curves.

distinguish between cases of simple deviation of a flexible spine from whatever cause, curves which the patient can entirely correct by voluntary effort, and those cases of true scoliosis in which the curve is pronounced and in which it will usually be found that the back cannot easily be made entirely straight, a portion of the curve being found to remain uncorrected during either recumbency or suspension and the application of considerable manual force.

If a dissected spinal column is examined, it will be found that not only are spines different in the amount of resistance on bending or twisting them, but the different parts of the same spinal column vary in their resistance. This will be found largely due to the ligaments; for example, the check to backward flexibility is chiefly the strong anterior ligament pass-

tion, so that there exists both an osseous and a ligamentous resistance to the correction of the distortion.

It may, therefore, be assumed that in the treatment of pronounced scoliosis there are two problems that present themselves to the surgeon: first, that of increasing the flexibility of the spine in the portions which resist correction, in order that it may be placed in as straight a position as possible; and, second, of retention in this position for a sufficient time to overcome or diminish the unsymmetrical shape of the various vertebræ affected.

An increase in the flexibility of the spine is to a certain extent possible by practice. The practice that is necessary is not the ordinary gymnastic exercise devised for the purpose of strengthening muscles, but movements destined to act for stretching certain ligaments, and is similar to that which is carried out by those training themselves as contortionists or

¹ Read before the Orthopedic Section of the Academy of Medicine, Philadelphia.

dancers. Without attempting to describe the physiology of this practice, it can be roughly stated that it consists of daily practice in stretching, never carried on beyond the point of pain, yet persistently and continuously practised with a gradual increase of motion attempted, allowing where it is possible, gravity to act as a force to stretch the ligaments and resistant structures.

It is manifest that no exercise or set of exercises devoted to the strengthening of the muscles can directly affect the shape and size of the bones. In order to correct a faulty shape, treatment to be desired should be similar to the treatment that is successful in such cases of knock-knee as are amenable to conservative or non-operative treatment. This treatment consists

FIG. 2. Modified Zander's stretching apparatus.

of removing or diminishing the weight falling on the non-developed portion of bone that it may grow normally. That this can be done successfully in knock-knee has been abundantly proved by clinical facts; and there is no reason why if the same conditions were applied to the vertebrae during the growth period of the spinal column that a similar change could not be effected in the shape of the vertebral bodies.

The rational treatment, then, of lateral curvature would seem to consist in a preliminary attempt to increase the flexibility of the spinal column, especially the backward flexibility, followed by efforts to throw the weight of the trunk largely upon the articulating surfaces or crowded portion of the bodies. That this cannot be done absolutely may be admitted. That it can be done measurably is certainly true. That it must be done in such a way as will allow the patients exercise and activity is self-evident. The defects of

the old treatment by recumbency, otherwise rational and scientific, carried out for years were manifest. The treatment was to the majority of patients worse than the affection itself.

Lorenz was the first to show the advantage of using the weight of the body as a means for stretching the ligaments; the trunk being placed in such a position that the resisting muscles were relaxed or at a disadvantage. His measures have been variously modified and have been used extensively with advantage. The apparatus devised by Zander has elaborated the idea and carried it to greater perfection, giving more precision to Lorenz's method. The disadvantage of the appliances of Zander is their expense; and for that reason they are beyond the use of the average practitioner. The appliances shown in the accompanying illustrations will be found not to be expensive. They are designed for the purpose of increasing the backward and lateral flexibility of the spinal column, and by their means the flexibility of the spinal column at every part can be increased. The amount of force can be graduated in such a way that the patient is never subjected to violence, but a carefully-graduated amount of force can be used. The apparatus can be used as an appliance for passive exercise or for fixed position if desired.

Recumbent Exercise. — Two strong uprights of gas-pipe, three feet in height, and which are stayed by oblique bars, are placed two feet apart, and are connected by a rod of steel placed horizontally between the upper extremities. From this bar is hinged on either side a rectangular frame, so that the free extremity of each moves in a vertical plane. Across the point of union of the two frames is fastened a pad six inches in width, which is designed to make pressure at any point of the trunk that may be desired; and across the frames are stretched straps of broad webbing, on which the patient lies. On one side of each of the frames is attached a strong bar of steel, which projects beyond the joint of motion; and this carries a sliding weight which can be adjusted to counterbalance the weight of the patient, so that the apparatus may remain horizontal while the patient is in position. Each frame has hinged to its side, a vertical bar of iron which passes through a socket on one of the uprights of the frame and by a hand-screw is connected at any point, so that the frame may be held at any angle.

The object of the apparatus is to make pressure with bending of the trunk or spine at any point desired. The two portions of the frame are brought to the same level, so as to make a horizontal couch; and on this the patient lies either on the back or on the side, with the pad under the part on which it is desired to make pressure and increase the flexibility. If in the former position, both hands are made to grasp the upright at the head of the crutch of the couch or the straps attached to them; or in the latter position, the under arm is passed between the straps and allowed to hang down below the frame, and the upper grasps the strap attached to the uprights. The screw which fixes the lower frame is then loosened, and as the upper part of the body is held in position, the downward motion of the lower causes the bending with pressure at the point of the pad which is the centre of motion. The feet are lowered until the pressure is felt on the spine, when the frame is released and brought back by the weights to the horizontal position.

Sitting Exercise. — On either side of an ordinary chair is secured a firm upright of iron, placed at | secured to the upright is placed a flat pad, which is made to work on a screw attached to the upright, so

FIGS. 3 and 4. Modified Hoffa-Schede appliance for pressure correction.

FIG. 5. Recumbent pressure correction.

twenty inches apart, and extending three feet above | that these pads may be approximated, and so make the seat of the chair. On either side of the chair and | pressure on the thighs of the patient as to prevent

twisting. On the uprights are fastened semicircular bands of iron, which are made to pass behind the patient, which may be adjusted at any height on the upright, and on this bar is secured a screw-plate, which is placed against the back of the patient. To the back of the chair is fastened a rod of iron bent at a right angle, and secured by a pivot joint by the angle at the centre of the back of the chair. The upright of this right-angle rod extends to four feet above the chair, and the horizontal portion three feet. The horizontal portion carries a weight which may be adjusted at any distance from the point of motion. Straps connect the head and shoulders to the upright cord.

FIG. 6. Modified Beely appliance for stretching curves.

The patient is placed in position in the chair, and the plate adjusted to make resistance against the back at the point where it is desired to increase the flexibility. The straps are then placed over the shoulders and head, and by means of the sliding weight the force applied is regulated to the comfort and endurance of the patient.

Pressure Appliance.—Schede has said that the treatment of lateral curvature consists in the treatment of its most important feature, namely, rotation; and it is for this that a specially devised apparatus is employed, for ordinary gymnastic appliances are not devised to overcome the resistance of this distortion. The apparatuses of Hoffa and Schede are evidently efficient. Against the use of appliances of this sort, it is urged that pressure upon the ribs weakens the articulation between the ribs and the spinal column without twisting the spinal column itself; but that this statement is incorrect, has been shown by clinical experience and by experiments. No muscular exertion of the patient can directly untwist the distorted and

resistant rotated spinal column as efficiently as the mechanical pressure of a Hoffa, Schede, Lorenz or Zander appliance. That this can be used without pain is also true; and if they are applied daily with judgment, it will be found that less and less force will be needed to correct the rotation, until it becomes within the muscular control of the patient to assume by voluntary effort, a relatively undistorted position.

An objection to the appliances of Hoffa, Schede, Weigel, and the one previously used by the writer is that, in order to make use of it at its greatest mechanical advantage, it is necessary that the superincumbent weight be removed from the trunk. To do this thoroughly the patients are suspended, and this involves great discomfort on the part of the patient if carried out for any length of time. The superincumbent weight can be removed if the patient is placed in the recumbent position, and the accompanying illustration shows how the pressure correction of rotation can be carried out efficiently, and more comfortably to the patient, than by the appliances designed for pressure in the upright position. It will be found that Schede's suggestion of the application of a correction force by the means of adhesive plaster attached to a cord, passing over a pulley and connected with a weight, is a most excellent one, and will be found of great value. It will be noticed by those who use the rotation correction appliance that some of the correction force is not from the direct pressure alone used in the appliance, but this pressure is aided by the force em-

FIG. 7. Tracings of the back, before and after correction treatment.

ployed in breathing. In ordinary respiration the chest is expanded by the descent of the diaphragm and the action of the thoracic muscles. If pressure is used in such a direction that the expansion of one side is not possible, a greater force is applied to the expansion of the other side, or portion of the side.

Recumbent Frame for the Correction of Rotation.—The frame is made of three-quarters-inch galvanized gas-pipe, six feet in length and twenty-four inches in width.

Across this is stretched, with a space of four to six inches, broad webbing straps on which the patient lies, and which may be made tight or loose according as we may wish to make greater or less pressure over certain portions. The frame is fitted with heavy circular bands of iron, which are adjustable at any point in the length of the frame, and on these are carried the screws and pads by which the pressure is made on the projection portions of the thorax at any point in front and behind, and at any angle in the same manner as in the upright machine.

In addition to this, the plaster adhesive straps described by Schede are placed around the sides of the thorax, and are attached to weights by a cord which passes through a pulley at the sides of the frame, and in this way exerts a lateral pressure and at the same time a torsion pressure at the point desired. The advantages of the exercise in this position are that all the force from the superincumbent weight is removed, and the fatigue of the patient being less, the exercise can be carried on for a much longer time.

Of the treatment of scoliosis by the temporary use of fixation appliances nothing will be said in this paper. The subject has already been referred to in a paper in the *Boston Medical and Surgical Journal* of May 11, 1893, and will be again more fully treated in a subsequent paper. The same is true of gymnastic exercises.

The object of the present paper is to show that resistant cases of lateral curvature, up to the age of completest ossification, can be treated with precision, and that the stretching of ligaments and the increasing of the flexibility of the spine is possible, and can be done if proper means are used for the purpose.

The object of these appliances is clear — to stretch by means of pressure the shortened ligaments which maintain the distorted position and prevent correction. If flexibility is gained, the correct position can be assumed and maintained as the muscles gain their strength and are developed by gymnastic treatment, massage and electricity. For the subsequent treatment in the severe cases, fixation by means of appliances for a while, and developmental muscular exercises are needed. If the corrected attitude is maintained, the bones will be in a position to grow into a more normal shape. In the lighter cases only developmental muscular exercises are needed after the flexibility has been secured.

Illustrative cases of correction were published in the *JOURNAL*, May 11, 1893. Accompanying (Fig. 7) is the cross tracing of the back of a child seven years old with scoliosis with rotation before treatment, and two years after correction treatment.

MODERN THEORIES AND TREATMENT OF ECZEMA.¹

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A GREAT diversity of opinion has prevailed among different schools and different authors from the earliest days of dermatology as to the proper conception of the term eczema, an affection that is so varied in its clinical manifestations, and so greatly influenced by many factors of both external and internal nature that to-day it is improbable that a definition satisfactory to the larger number of students of this disease could be formulated. Many writers have indeed abandoned all attempt at a strict definition, and have contented themselves with a discussion of the various clinical appearances and pathological features that are met with. Of late years much interest has been aroused by the doctrine of a parasitic causation for some of its forms, and certain authors have gone so far as to declare that every case, that is properly speaking an eczema, is of parasitic origin. My object is not an attempt to cover

¹ Read before the Warren Club, May 7, 1895.

the whole field of the pathology of eczema, but to describe some of the later theories that have been advanced, and to point out their strength or weakness, as they appear to me.

The chief writers in their conception of eczema may be divided broadly into three classes: (1) those who consider the clinical and anatomical features as of chief importance, (2) those who lay most stress upon the course of the disease, (3) those who base their conception upon the etiology.

In the first class, those who make the *form* of the disease their criterion, belong notably Hebra and the Vienna School. Hebra's definition of eczema is, "An affection of the skin, of mostly chronic course, characterized by the formation of grouped papules and vesicles, or by more or less deeply red patches covered with scales, or weeping; or in which, in addition to these features, yellowish or green or brown crusts are formed. This affection is continually accompanied by severe itching and therefore by excoriations, and is not contagious." Hebra, therefore, regarding the anatomical features as of chief importance in the conception of eczema, cleared the air by proving that many conditions that had been regarded as independent diseases were in reality but different stages or forms of an inflammatory process that had hitherto been recognized in a much more restricted way.

To this view the Vienna School has held fast, and Neisser declares his loyalty to the old definition of Hebra, which he would enlarge only by laying greater stress on the changes in the epithelium, changes which he regards as specific, and as essential to the formation of the clinical picture of eczema.

These epithelial changes have been especially studied by Leloir, and consist in (a) the immigration of pus corpuscles into the spaces between the prickle cells; (b) an edema of the epidermis, and particularly an edema of the basal horny layer; (c) a tendency to dekeratinization, shown by the disappearance or lessening of the eleidine, and of the granular layer; (d) the persistence of the nuclei of the horny layer, which in consequence of the dekeratinizing process are no longer coherent, having lost their normal adhesive attribute, and tend to exfoliate in the form of scales. At a later stage, begins the process of vesiculation, of the formation of the elementary lesion of eczema, which has its place usually in the middle or upper layers of the rete Malpighii. This process of vesiculation consists essentially in the formation of a clear space or cavity between the nucleus and protoplasm of the cell, and is due to a sort of dropsy of the epithelial cell. This "altération cavitaire" goes on increasing until a reticulum is formed of various sized meshes containing the nuclei. This is the vesicle or primary lesion of eczema.

Before the appearance of these epithelial alterations, however, Leloir was able, in cases of erythematous eczema, to detect a dilatation of the vessels in the papillary layer of the corium. These vessels were all dilated and filled with blood, and there was also observed a migration of the white corpuscles into the papillæ, which are filled with round cells, and also into the epidermis, where they appear as migratory cells. Besides this the papillæ were seen to be filled with an abundant serous exudation, one of the chief characteristics of eczema. This serous exudation it is, according to Leloir, that determines the epithelial alterations. Neisser, on the contrary, thinks that this is very im-