THE IMPORTANCE OF PHYSIQUE AND CORRECT POSTURE IN RELATION TO THE ART OF MEDICINE.

BY

W. A. COCHRANE, M.B., F.R.C.S.E.,

ASSISTANT TO THE PROFESSOR OF CLINICAL SURGERY, UNIVERSITY OF EDINBURGH.

It is the thesis of this paper that man's special anatomic structure or physique in respect of its variations from the anatomic normal and the way in which the body is used in respect of posture have a practical bearing on medical problems. Especially is this so with regard to the chronic class of patient, the subject of intestinal stasis and visceroptosis as manifested by neurasthenia, gastro-intestinal disturbances, chronic arthritis, and all the other features of auto-intoxication. It will be one of the purposes of this paper, however, to show that in an anatomic and mechanistic conception of disease (Goldthwait¹) nearly all the chronic conditions have what may be termed an orthopaedic facet to their solution in the need for correcting the poor posture

of the body as whole, so frequently present. The study of the chronic patient seems to emphasize more and more the importance of establishing the physical conditions for health.

The fact that a careful study of such patients from the pathological, biochemical, and bacteriological sides had failed in many cases to show more than the nature of the lesion, led Goldthwait to the study of the anatomical conditions existing, in the hope of reaching conclusions regarding treatment along lines of physical reconstruction. The hypothesis of the study was that many of the manifestations of chronic disease and ill health are due to the lack of the right elements of metabolism, or to absorption of the wrong elements of deranged metabolism, resulting, directly or indirectly, from faulty function of the viscera due to improper use of the body in respect of posture. Such

FIG. 1.—The normal human type. (Goldthwait.)

incorrect posture acts fundamentally by invalidating the normal supports of the viscera. To take one instance, stasis in the duodenum in the condition of chronic duodenal ileus, besides leading to toxic phenomena, may, by allowing bacteria to multiply, be a source of infection to its own wall and to adjacent viscera which communicate with its lumen—namely, the liver and pancreas (Wilkie²). Swaim declared that he saw no more than twenty well postured individuals among 3,000 patients at Clifton Springs Sanatorium. Whether the element of poor posture so commonly met with in the chronic patient is to be regarded as the cause or effect of a combination of other factors concerned in a functional breakdown of health is perhaps not clear, but that it forms part of a vicious circle and that its correction offers one of the most encouraging lines of attack in treatment in many cases seems proved by clinical experience.

The result of the anatomical analyses are so suggestive as to warrant attention at the present time, and what follows is to be regarded in the main as a short presentation of such study as Goldthwait has engaged in, by one who had the opportunity of being associated with his clinic for chronic patients for nearly two years.

The first point of importance revealed by the anatomical study was the rarity amongst these patients suffering from chronic conditions of the structure described in the textbooks of anatomy as normal. In the second place, it was

evident that the variations from the normal group themselves into two general types, easily recognizable when the physical characters of the normal are appreciated.

POSTURAL TYPES.

The Normal Human Type (Fig. 1).

The torso is of moderate length and breadth. The upper abdomen is full and rounded and the subcostal angle is formed in an angle of 70 to 90 degrees. There is a generous space beneath the diaphragm and ribs for the viscera of the abdomen, all of which, with the exception of a few coils of small intestine and part of the colon, are situated above the level of the umbilicus. Around the viscera and representing a definite part of their support, as well as giving protection along with the viscera to the sympathetic nerves, ganglia, and blood vessels, are well defined masses of fat. The normal lumbar lordosis results in a general inclination of the body cavity of 30 degrees downwards and forwards from the perpendicular. The pelvis in the axis of its cavity is inclined downwards and backwards about 60 degrees from the perpendicular. If we are to suppose that the manifestations of chronic disease are due directly or indirectly to faulty function of the viscera from ptosis and bad habits of posture, it becomes necessary to inquire into the factors concerned with their normal support. The inclination of the spine backwards from the fourth lumbar vertebra provides, not a perpendicular plane for the attachment of the viscera, but an inclined plane on which they rest, supported by ligaments and by natural shelves and pockets formed by the adjustment of contiguous structures. For the same reason the resultant of the downward thrust of the viscera is received by the lower part of the anterior abdominal wall.

The third factor in their support is intra-abdominal pressure, which, according to Haven Emerson, is positive within the abdomen, equal at all levels and exerted equally in all directions. The chief factors in its maintenance are the tone of the diaphragm, of the anterior abdominal wall, and the muscles of the pelvic floor. Lastly, the stomach and liver, and therefore the other abdominal viscera indirectly, are attached to the diaphragm, whose suspensory ligament is the fibrous pericardium. The pericardium is finally attached to the low cervical spine through the intermediary of the deep cervical fascia. When the tone of the abdominal muscles is lost, the strain of the supporting viscera must ultimately be taken by this sling of deep cervical fascia. To keep this sling taut, the head must be held erect with the chin held in, and equally important is an elevated position of the chest, without which the diaphragm is at its lowest and its excursion reduced to a minimum.

Splanchnoptotic Type.

In this type of structure, variously called splanchnoptotic (Glennard), congenital visceroptotic (Goldthwait,¹ Smith³), carnivorous (Treves,⁴ Werner,⁵ Bryant⁶), narrow-backed (industrial) (Fig. 2), the whole figure and skeleton are more slender in form. The torso is longer in proportion than the normal and narrower. The lower ribs have a marked downward inclination and at times may almost touch the iliac crests. The thorax is of fair size, but the lungs and heart are smaller than the normal. The subcostal angle may be so small as barely to admit two fingers. The abdominal viscera have peculiarities of shape and attachment. The stomach is long and tubular and its attachments are less firm. The small intestine is shorter than the normal and may be only 15 feet or less in length (Bean⁷ and Swaim⁸).

FIG. 2.—The slender congenital visceroptotic type, showing the proportionately greater length of the body, the increased low lumbar curve, forward inclination of the pelvis, forward position of the shoulders, flat chest, prominent lower abdomen, narrow upper abdomen, etc. (Goldthwait.)

Its mesentery is longer than normal, so that in standing the small intestine occupies the lower abdomen or pelvis. The large intestine is also more mobile. The caecum is unusually free and not infrequently the ascending colon is provided with a mesentery. Its association with vague right-sided abdominal conditions referred to the right kidney, gall bladder, stomach, and appendix has been emphasized by [Vaugh⁹ and Quain.¹⁰ The association of this general type of structure with chronic duodenal ileus has been noted by [Wilkie² and others.

There is very little retroperitoneal fat in this type and the kidneys are less well supported. The subdiaphragmatic space is less generous than in the normal and the diaphragm may occupy a very low position.

Herbivorous.

On the other side of the normal type and in contrast to the slender type is the heavily built sthenic type of human structure called herbivorous by Treves,⁴ Werner,⁵ and

FIG. 3.—The heavy human type. (Goldthwait.)

Bryant,⁶ and spoken of also as broad-backed (industrial) (Fig. 3). The torso is broad and relatively short. The chest is broad and deep, the subcostal angle rarely less than 90 degrees; the diaphragm occupies a relatively high position and the space beneath the ribs for the viscera of the abdomen is generous. The mesenteries and ligaments of the viscera are short and strong, so that there is not the same tendency to ptosis as in the slender type. The large intestine in its ascending portion is rarely possessed of a mesentery. There is much general and retroperitoneal fat,

so that the kidneys are well held in place. The spine is broad and heavy and all the joints are less flexible than in the slender type, so that the erect position is more easily maintained in the heavy type of structure than in the slender.

HABITS OF POSTURE AND THEIR EFFECT UPON THE PHYSIOLOGY.

The way the body is used is of quite as much importance as its structure. Practically none of the persons suffering from chronic disease investigated in the anatomical analysis was seen to use the body in proper posture with reference to the mechanics of the physiology.

When used rightly (Fig. 1), the body is held splendidly erect. The head is erect, with the chin in, the chest elevated, the subcostal angle opened up and the space beneath the ribs for the viscera the most generous possible. Reference must also be made to the relationship of proper excursion of the diaphragm relative to the fully erect position and to respiration as a whole. Only with the chest elevated is proper excursion of the diaphragm possible. A diaphragm that is stationary or that shows reversed action lessens the negative pressure in the thorax and the positive pressure within the abdomen, thereby diminishing both the aspirating and pressure effects. There is also to be considered the effect of proper diaphragmatic breathing on the vital capacity, complementary, supplemental, tidal, and residual air relations, and, with this, alterations in the coefficient of utilization of oxygen, basal metabolic rates, and hydrogen ion concentration (Heald¹¹). Good tone in the abdominal muscles is also necessary for proper action of the diaphragm, as its piston-like drive requires the counter-pressure of a strong abdominal wall.

The normal supports of the viscera have been described, but it is to be noted that such are only valid with good posture in standing, sitting, and walking. The relationship of the position of the head and chest to the problem of visceroptosis is especially stressed. Merely to attend to one factor in supporting the abdominal viscera by a belt shows a lack of appreciation of the problem as a whole. By appre-

ciating the fact also that posture bears a definite relationship to muscle tone (Sherrington¹²) one is able to demonstrate clinically in the physical reconstruction of the chronic patient that, if habits of proper posture are maintained over a short period of time, the increase of reflex tonus obtained by such posture will serve to maintain the correct attitude without conscious effort thereafter. In the drooped relaxed attitude a progressive lowering of reflex tonus is inevitable.

The Relaxed Position.

In the relaxed attitude (Fig. 2) of bad posture, the weight is thrown imperfectly on the feet. The knees are commonly in the position of slight flexion and knock-knee. The pelvis is altered in its inclination, with increase of the potential of possible strain of the sacro-iliac and lumbo-sacral joints. All the antero-posterior curves of the spine are increased. Kyphosis offers a mechanical impediment to adequate movements of the chest, and its association with hypertrophy of the tonsils and adenoids has been noted by Lane. The shoulders are forced forwards on the chest wall, the back of the hands look to the front, the venous return is impeded, and they sweat unduly. The action of the diaphragm is reduced to a minimum; the subcostal angle and the space beneath the ribs for the viscera are reduced to a greater or lesser degree. The abdominal viscera are forced out of position, their normal supports being invalidated, and it apparently becomes a matter of chance, together with special structure, in what direction the possibility of mechanical interference with their function shows itself—chronic duodenal ileus, orthostatic albuminuria, chronic constipation, movable kidney, and the like. There is a second type of faulty posture, where the combination of relaxed muscles and a flattening of the lumbar spine is met with.

From the foregoing it is obvious that no part of the body can be used wrongly without the body as a whole suffering, and that if one group of symptoms, whether referred to the foot, knee, hip, back, shoulder, or abdomen, is to be regarded as local only, treatment is not likely to be satisfactory.

With the other two types, the disturbances of posture are characteristic. With the slender type (Fig. 2) the position of good posture is more difficult to assume, and more patience is required in their training. The subcostal angle and subdiaphragmatic space may be extremely small. With the loss of protection normally afforded by the viscera to the large sympathetic ganglia in the upper abdomen, together with the drag upon the solar plexus which pathologic ptosis of the proximal colon can produce, there is present a greater factor in causing neurasthenia in the visceroptotic than in the absorption of toxin from stasis (Quain¹⁰).

In the heavy type of structure the harmful effects of poor posture develop much later in life than in the slender. They begin to show themselves with increasing weight and the development of an acquired ptosis. The heavy abdominal viscera cause a backward inclination of the body, so that the strain at the lumbo-sacral region is possible, attended sometimes by pain along the lumbo-sacral cord.

DEDUCTIONS.

If the facts stated are correct, such study seems to show that the teaching of anatomy should be put on a basis to include all the types of anatomical structure. The need for this is apparent when it is appreciated how often the physician is consulted by patients who have not the normal structure. A study of physiology with reference to special structure should also be made. In the make-up of creatures so markedly different as the slender and heavy, there is sufficient of interest to note that the types apparently carry their own potential of disease. In the study referred to, made with a large group of chronic patients, it was noticed that tuberculosis and mental disorders of the acute type, the hyperglandular disturbances, chronic arthritis of the atrophic type, sympathetic hypertonus and neurasthenia, were commonly associated with the slender type. Arteriosclerosis, hypertrophic arthritis, chronic diseases of the kidney, gall stones, degenerative mental disorders, and vagus hypertonus went with the heavy type of structure.

In thoracic conditions attention to the postural aspect of

the problem means that with the tuberculous patient it should be part of the work to see that the body is so supported that the chest is raised and the drag on the diaphragm removed, so that the normal rhythm and mechanics of respiration are possible. Similarly in relation to the action of the heart, Herz¹³ has pointed out the close relation between the shape and size of the heart and good and bad posture of the body.

Abdominal conditions must be given anatomical and mechanistic consideration. The function of an organ may be right or wrong in proportion as its structure is normal or its position is correct. Underlying visceroptosis and its manifestations is the general physical or functional condition of the patient, due undoubtedly to contributory factors of bad posture in standing, sitting, and at work, and the occupational postures. Poor posture invalidates all the four factors on which the normal position and function of the abdominal viscera depend, and not one but all four factors must receive consideration in ptosis. It seems irrational to provide an abdominal support and to leave the chest at the low point. In that case the subdiaphragmatic space is not capable of accommodating the viscera, and the action of the diaphragm, on which their function in part must depend, cannot be free. Predisposing factors in visceroptosis are overeating, sedentary life, and malnutrition from too many pregnancies destroying the tone of the abdominal wall. Psychological causes such as worry, anxiety, disappointment, and the like are fundamental, and in the last analysis are responsible for the poor posture. Treatment has to do with all of these. Operations may sometimes be necessary, but they should be preceded and followed up by orthopaedic measures of relief to correct the element of bad posture of the body as a whole. Otherwise, surgery simply forges a strong link in a weak chain. After all, the state of affairs present in the abdomen in a visceroptotic when the normal supports of the viscera are invalidated is comparable to the condition existing in a derangement of a knee-joint, and the same principles of anatomy and statics apply in each case. Drainage of the dilated duodenum by operation is necessary in fully developed cases of chronic duodenal ileus, but the element of poor posture should receive attention in planning the general postural treatment of the finer gradations of the condition and of the operated cases. The same remarks apply to the vague right-sided abdominal conditions to which a congenital lack of fixation of the proximal colon can give rise. It is in all such conditions that co-operation between the physician, surgeon, and orthopaedist trained in such work is especially desirable.

In respect of the kidney, when excessive mobility requires surgical interference, postural training and physical reconstruction of the patient as a whole is required, since all the mechanics tend towards redisplacement. Scholder and Weith¹⁴ have shown also that in 1,254 children examined, in over 20 per cent. they were able to produce albuminuria simply by putting them in special postures. Rieser¹⁵ has shown that orthostatic albuminuria is due to renal stasis from compression of the left renal vein in arterial pincers, composed of the aorta and superior mesenteric artery. These pincers become operative when the aorta is projected forwards by an increased lordosis or when the superior mesenteric artery is pulled to tautness by ptosis.

In mental and nervous disorders it is probable that the anatomical form and the element of poor general statics and posture are of importance.

In orthopaedic conditions an appreciation of what bodily mechanics and posture mean is essential. Not only must the special joint or part be studied, but good posture must be attained. This should be especially considered in the treatment of scoliosis and in the fitment of apparatus. In the treatment of the common strains of the lumbo-sacral and sacro-iliac joints, the abnormal forward tilting of the pelvis must be corrected. In the treatment of chronic arthritis the local treatment of the joints is but part of the problem, and general methods of physical reconstruction along postural lines, by the orthopaedic surgeon, have much to offer in controlling the disease itself. The correction of round shoulders is essentially a problem of restoring conditions of proper posture of the body as a whole.

Lastly lies the great responsibility and opportunity of those in charge of our educational system. As a result of the medical profession's endeavours in preventive medicine, the slender type of human being, which used to add so much to the mortality of infancy and childhood, is now being saved. The great duty of the medical profession and of educators is to see that they develop properly. Whatever else be taught, insistence must always be put upon poise, with its resulting efficiency. Judged by the test of posture, as shown in the way the child bears himself in standing, sitting, and walking, the present system is inadequate. The instructor in physical education in our schools must be one who is trained to understand the body as a whole, with an appreciation of posture in all its phases as an influence upon the physiology and general development. A boy or young adult may carry out his athletics in good physical form, but how rarely does he show good posture and carriage in the long intervals between. At a training camp for youths and young men held in 1921, 75 per cent. were physically inefficient and nearly all of these were of the slender type of structure.

At the Scottish Universities no official attention is paid to physical education. Each student should be put through a combined medical and postural examination. He should be rated as to the way he uses his body, and taught the simple elements of bodily mechanics. Such a system would exert not only a wonderful influence on the students themselves, but would also enable them to educate their own communities and advise parents and schools on the kind of physical education required for the young. At some of the colleges in America the students are so rated and are actually not allowed to graduate until they demonstrate the elements of proper bodily mechanics. In this connexion McKenzie's¹⁶ paper is of interest and is a direct challenge to our own university authorities. To keep people well is the function of the health officer, and, since the best health is not possible unless the body is used rightly, the place of the orthopaedist is obvious. Most of the work of the orthopaedist is supposed to be in demand for treating established disease, but that this other work exists there can be no question. M. Andry is recognized as the father of orthopaedic surgery, and that by deformity he chiefly considered that which is classed as postural provides all the justification that is necessary for emphasizing this phase of the work of the orthopaedist.

CONCLUSIONS.

1. Problems relating to man's posture have a direct bearing on medical and surgical practice. Many of the chronic conditions requiring treatment represent a derangement of the mechanism which regulates and maintains the proper and correct posture of the body. The physical conditions of health must be established.

2. It is in the belief that in an anatomic and mechanistic conception of disease much can be offered by the orthopaedic surgeon along lines of physical reconstruction that this paper is presented. The rehabilitation of the chronic patient can best be accomplished by team work and co-operation by physician, surgeon, and orthopaedist. The place of the last named is recognized in America with reference to this problem.

3. The lack of physical education in the young of our communities, especially at colleges and universities, is to be deplored. The lines on which such education should be carried out are indicated in an appreciation of proper posture and its resulting efficiency. Such work by the orthopaedic surgeon and educator represents the best kind of preventive medicine and should have a place in the programme of those who have charge of the health of the country.

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SPIROCHAETOSIS ICTEROHAEMORRHAGICA IN EAST LOTHIAN.

BY

G. LOVELL GULLAND, C.M.G., M.D., P.R.C.P.E.,

PROFESSOR OF MEDICINE AND CLINICAL MEDICINE IN THE
UNIVERSITY OF EDINBURGH;

AND

GEORGE BUCHANAN, M.B., Ch.B.,

ASSISTANT CLINICAL PATHOLOGIST, ROYAL INFIRMARY, AND UNIVERSITY
ASSISTANT, EDINBURGH.

CLINICAL OBSERVATIONS.

By PROFESSOR GULLAND.

CONSIDERABLE interest has been excited by communications in the daily press with regard to an epidemic of spirochaetal jaundice occurring in East Lothian. The sufferers have been almost entirely young coal miners employed in the different pits, the earlier cases coming from one pit, the later from another. One farm labourer, however, has also suffered. The first cases occurred in April or May, 1923, so far as is known; two cases were in my ward at the time of the meeting of the Association of Physicians in Edinburgh last May, and one of them was demonstrated to the meeting. Probably about a dozen and a half cases in all have occurred. Some of the milder cases were treated at home; the severer ones have generally been sent to the Royal Infirmary, and six of them have been in my ward. Of these, two died. On the whole, the earlier cases have been more severe than the later. I have one case in my ward at present in which the duration of the jaundice and temperature was very short, and the haemorrhage was confined to a slight epistaxis, so that the diagnosis might easily have been missed had the man's doctor not already become familiar with the disease.

The pits affected were "wet," and rats were numerous. I endeavoured in vain to get rats from the first pit affected, though, on my representation to the manager, the rats were destroyed. It is only within the last three weeks that, by the kindness of the owner of the other pit, I received rats. Though there was no doubt about the diagnosis of the earlier cases—spirochaetes were found in the blood of one of the first cases—I delayed publication of any of the cases till the chain of evidence could be completed from both the human and the rat side. It happens that the case which I am about to describe shortly is the first in which we have been able to find the typical spirochaetes in the urine both microscopically and by animal inoculation. The symptoms of the other cases, which I shall publish later, followed the course described in Lord Dawson's classical account of the epidemic in

France, and the pathological findings in the fatal cases were of the usual type. The following case is typical of the milder form.

T. W., aged 18, a miner, was perfectly well till November 23rd, 1923. On his way home he had a rigor, with headache and pain in the abdomen. That afternoon he vomited a small quantity of brownish fluid—probably a haematemesis. He was markedly prostrated—this is a feature of all the cases—the headache continued, and he suffered from dull aching pains in all his muscles. There was apparently melaena from the first, with diarrhoea followed by constipation. He had slight epistaxis. Jaundice appeared gradually, but on his admission to the ward on November 29th was already well marked. The conjunctivae were injected and the eyes watery. He was dull, listless, and stupid. Temperature 101° F., pulse 84, respirations 32. The lips were dry, and the tongue furred and fairly moist. The lungs were normal, the heart not dilated, blood pressure 128/80. The abdomen showed no abnormality except that the liver region was tender; the liver was easily palpable at first, later it extended to 1½ in. below the rib margin. The spleen was not enlarged. The urine contained bile, albumin in small quantity, and microscopically red corpuscles, a few pus and "kidney" cells, and a few epithelial and granular casts. The blood count was: red cells 5,400,000, haemoglobin 70 per cent., and white cells 10,800. No spirochaetes were seen. The muscles were tender all over the body, and there was great muscular weakness; knee-jerks were absent. Bile was present in the faeces, which gave a definite blood reaction.

The temperature fell by lysis, being only 99° F. on the evening of December 2nd—a duration of nine days; soon after admission the pulse fell to about 70 and the respirations to about 25. Jaundice was at its height about December 5th, the twelfth day; thereafter it gradually diminished, but did not disappear till about the beginning of January. No further haemorrhage occurred.

As in some of my other cases, there was a rise of temperature of very remittent type—reaching 103° F. on one evening—from December 18th to 26th. This was not associated with any symptoms or change in the results of physical examination; the pulse remained slow throughout, seldom over 70. Thereafter his convalescence was uneventful, the urine gradually cleared up, the slight leucocytosis disappeared, but about the end of December his hair began to fall out, and is only now coming again as a soft and fluffy growth.

Spirochaetes were first found in the urine on December 24th, about a month from the beginning of his illness. In the second part of this note Dr. Buchanan reports on their nature, and on those found in the rats we received.

The fatal cases differ from the milder ones mainly in the much greater amount of haemorrhage, weakness, and toxæmia. Bleeding may occur from the nose, lungs, stomach, bowel, kidneys, and into the skin. One of our fatal cases died with a temperature which had been subnormal for several days previously.

The original source of the rat infection and the reason for the occurrence of the epidemic at this time are difficult to explain. One can imagine a miner returned from the war starting a rat infection, as the men often micturate in the pits, but it is not easy to see why in that case the infection should have remained latent so long. The method of transmission from rat to man can be surmised. Some of my patients were careless in leaving their food on the ground where it might have been infected; others admit drinking water in the pit. It remains to be seen whether the energetic campaign of destruction of the rats will stop the epidemic. It is evident that the rats, both above and below ground in that neighbourhood, are widely infected, as two out of three captured by chance were found to contain spirochaetes.

LEPTOSPIRA ICTEROHAEMORRHAGIAE.

FIG. 1.—In urine of patient. Fontuna's stain. The characteristic hooks at the ends are seen, but not the elementary spirals.

FIG. 2.—In liver of guinea-pig inoculated with urine of patient. Stained by Levaditi's method.

FIG. 3.—In smear made from kidney of wild rat. Unfixed and stained by Giemsa's method.

FIG. 4.—Dark-field view of leptospira in culture six days old. Note the characteristic small elementary spirals and hooked ends.

The figures have been drawn approximately 1,000 diameters.