

## LECTURE XXVI.

## DEFORMITIES OF THE SPINE.—ROTARY-LATERAL CURVATURE.

The Term Rotary-Lateral Curvature explained.—Pathology of the Deformity.—Class of Persons in whom it occurs, and how it is developed.—Additional Causes.—Special Cause when the Deformity is developed in the Dorsal Region.—Symptoms.—Treatment.

GENTLEMEN: To-day we continue the study of deformities of the spine. The next in order is what is commonly known as lateral curvature, but, for reasons which will be given a little farther on, I prefer to call it the rotary-lateral curvature.

There has been vastly more written upon this deformity, and more instruments devised for its relief, than for almost any other deformity that may occur in the human body.

Lateral curvature of the spine is always accompanied by a rotation or twisting of the bodies of the vertebræ upon themselves. In children, the spinal column is nearly straight, and remains in that condition until they begin to assume the erect posture. When, however, they begin to assume this posture, the psoas magnus and iliacus internus muscles begin to act upon the lumbar spine and pelvis, and draw the pelvis forward into the angle it normally occupies relative to the long axis of the body in the adult, at the same time giving to the sacrum its peculiar curve. The muscles of the back, in addition, develop a backward compensatory curve in the dorsal region, in order that the centre of gravity in the body may be properly maintained.

The spinal column is held in its normal position by the contractions of muscles situated upon either side of it, which exactly balance each other. If, for any reason, one set of muscles overcomes the set upon the opposite side, the spine yields, and a curve is produced with its concavity toward the side upon which the stronger set of muscles is situated.

Rotary-lateral curvature depends entirely upon abnormal muscular contraction, and occurs independently of softening and disintegration of the vertebræ and intervertebral cartilages; for these are rarely, if ever, affected in this disease. The rotary curvature is developed first, and sometimes takes place to such an

extent that the angles of the ribs may be mistaken for the projecting spinous processes in Pott's disease, as seen in this specimen. (See Fig. 233, page 395.)

In all these severe cases, however, the bodies of the vertebræ remain of normal thickness, and the deformity is due to abnormal muscular contraction, accompanied by a rotation of the bodies of the vertebræ one upon another.

There is simply compression of the posterior and expansion of the anterior portion of the intervertebral disks, but no disease of these disks or of the vertebræ.

The true pathology, therefore, of rotary-lateral curvature of the spine is abnormal muscular contraction. This contraction produces at least two curves, which occur most commonly in the lumbar and dorsal regions. The secondary curve, whichever it may be, is called compensatory.

Sometimes the lumbar curve is developed first, and then the dorsal curve becomes compensatory; and *vice versa*. It is important, however, to ascertain which curve made its appearance first, for it is in the pathological condition which has produced the *first* curve that the surgeon is chiefly interested, for the secondary curve is merely compensatory, and is produced in consequence of the presence of the first.

It is a noticeable fact that this deformity never occurs in those persons who are compelled to maintain an erect position. For instance, those who are accustomed to carry weights upon their heads, such as baskets of clothes or pails of water, do not get lateral curvature of the spine, simply because they are obliged to maintain the body in a perfectly erect posture, and that is done by causing the muscles of the trunk to contract with equal force upon both sides.

Half of these deformities are the result of want of energy, want of life enough to sit up straight; consequently are most commonly seen among that careless, lifeless class of persons who are in the habit of sitting the greater share of the time with their backs twisted and bent in a half-curved position. Indulgence in such careless habits of sitting not infrequently develops a curve in the spinal column at some point, which is sufficient to establish the deformity; and then in a very short time a second curve will be developed, which is compensatory. Again, fracture of the femur or tibia, when followed by considerable shortening,

causing the body to lean toward the side upon which the fracture took place, may be sufficient to establish lateral curvature of the spine.

Shortening of one of the lower extremities may be the result of paralysis followed by arrest of development. The consequence is, an unequal support to the sides of the pelvis; hence one side drops down, and with this depression comes a lateral curve in the spine. These are the more prominent causes that give rise to this deformity when it exists in the lower portion of the spinal column.

When the first curve in the spine is developed in the dorsal region, it depends upon an entirely different cause, and is due to the action of the inspiratory muscles.

As you all know, the great serrati muscles are the most important external inspiratory muscles in the body, and when the shoulders are fixed these act in such a manner as to elevate the ribs and increase the capacity of the chest.

This can be easily understood, when we refer to the relations of these muscles a little more in detail. The serratus magnus arises, by eight or nine fleshy digitations, from a corresponding number of ribs, and passes in different directions, backward, and upward and backward, until it reaches the posterior portion of the scapula, when it is inserted into the entire extent of its base. Now, in order that the scapula shall be a firm point of support, from which the serratus magnus may act, it is fastened to the spinal column by means of the rhomboidei muscles; so that, so far as acting upon the ribs is concerned, for the purpose of increasing the capacity of the chest, and also upon the bodies of the vertebræ, these two sets of muscles become practically a single set, with the movable scapula between them.

With such a muscular arrangement what do we have? We have a means of applying a force which, every time an inspiration is made, acts upon the vertebræ through the ribs, which play the part of levers of greater or less length. When a full inspiration is taken, this action is much more marked.

Now, you will observe that the ribs, bending at their angles, rest against the transverse processes of the dorsal vertebræ. The head of the rib, an inch or inch and a half from this angle, rests against the bodies of two of the vertebræ, slightly sloping upward. We thus have the ribs, at their angles, resting against the trans-

verse processes of the vertebræ, like a fulcrum, the short arm running to the head of the rib against the bodies of the vertebræ, and the long arm being the body of the rib, and the power which moves this lever is the serratus magnus muscle, which is inserted into this long arm. Now, when the trapezius and rhomboidei contract and draw the scapula backward toward the spine, they thus make tense the serratus magnus muscle on that side, and give it full power to act upon the ribs, and by this leverage rotate the spine upon itself.

This is the starting-point of the so-called lateral curvature, but, as it begins in a rotary movement of the bodies of the vertebræ, I prefer to call it rotary-lateral curvature.

In the lumbar curve the bodies of the vertebræ are usually twisted to the left, while in the dorsal curve they are ordinarily twisted to the right. Why this is so I am not prepared to say. This order, however, may be reversed.

When a curve becomes established by the action of one serratus muscle, it is liable to become gradually increased on account of the progressive relaxation of the opposing serratus muscle. Sometimes this curvature becomes so great that one lung is almost completely compressed, and the angles of the ribs upon that side may become almost obliterated, while those upon the opposite side become correspondingly acute. (See Fig. 233.)

This deformity occurs much more frequently in girls than in boys. In its very commencement it may be due to apparently trifling affairs, those which favor the undue contraction of certain muscles; it may be due to the slight relaxation given to the muscles of one side of the trunk, by assuming an improper posture while sitting; standing habitually in a half-leaning, careless position, upon one leg, or frequently throwing one arm behind the body, thereby making the serratus magnus upon that side more tense than the other.

Any of these apparently trifling causes, approximating one scapula nearer to the spinous processes than the opposite one, render the serratus magnus on that side tense, and thus place it in a favorable position for undue action on the ribs of that side, and thus commence a distortion. As already stated, when the curve is once established, it is very liable to increase rather than diminish.

Rotary-lateral curvature of the spine may be corrected before

the bones, ligaments, and ribs become fixed in their abnormal position; but when that has occurred, the deformity will be permanent. It is important, therefore, to be able to recognize the deformity in its earliest development.

**SYMPTOMS.**—One of the earliest symptoms is an undue prominence of one of the scapulæ. If, therefore, this be present, always examine the spine; but even at this stage of the deformity if a curve is found, if you will remove the weight of the head and shoulders from the spinal column, by placing your hands in the axillæ and lifting the patient up, the curve will entirely disappear; or, if the patient is laid face downward upon a table, the spine will be found to be perfectly straight, or can be made so by a trifling amount of extension. But, if the patient stands without support under the arms, you can, by carefully noting the situation of the spinous processes (which can be done conveniently by rubbing the finger over them, thus producing a reddish line, or by dotting them with ink), detect a curvature, very trifling it may be, in the dorsal region.

Now, if the deformity is permitted to go uncorrected, it will gradually increase as the spine yields to the muscular contractions assisted by the weight of the head and shoulders, until finally, as the body sags over, it is fully developed. The deformity does not advance far in the dorsal before a compensating curve is developed in the lumbar region.

**TREATMENT.**—Almost an innumerable variety of instruments have been devised for the treatment of this deformity.

The use of all fixed apparatus in the earlier stages, as in the treatment of all deformities where we wish to restore lost muscular power, is positively injurious. The principle which should guide you is, *to place upon the stretch those muscles which have been inactive and relaxed, and approximate the origin and insertion of the muscles you wish to remain quiescent.*

The great serrati muscles are the ones chiefly affected by this principle.

What we wish to accomplish is, first, to place the serratus magnus, upon the same side as the dorsal curve, in such a position that its fibres will be at *rest*. This can be done by carrying the arm of that side across the chest, in such a manner that the hand meets the upper portion of the lapel of the coat.

Second, we wish to place the fibres of the opposite serratus

magnus in as *tense* a condition as possible. This can be done by carrying the arm, upon this side behind the body, as in the act of placing the hand in the back coat-pocket. When the arm is placed in this position, the scapula is drawn backward, and the serratus muscle is in the most favorable position for contracting with all its power, thereby rotating the bodies of the vertebrae back to their normal position. In this manner the patient is unrolled, as it were, and this must be done before any benefit will be obtained by treatment.

You will therefore instruct these patients to habitually carry the arms in the positions mentioned, and at the same time practise taking full inspirations. The result is that, by fastening the scapulæ in this manner, the lung upon the side of the relaxed serratus is changed very little in size when the full inspiration is made; but, the fibres of the opposite serratus magnus now placed upon the utmost stretch, the full inspiration has a tendency to lift up the angles of the ribs upon this side, and curve them back to their normal position, and thus gradually unfold the deformity.

There are several aids in carrying out this principle, which are of great service. One is to cause the patient to sit upon an inclined plane, the lower side of which corresponds to the depressed shoulder, which is placed at such an angle as will necessitate a constant muscular effort to keep from falling off. Such an inclined plane can be attached to any chair, and in such a manner as the ingenuity of the surgeon may suggest.

In some cases, in the early stages, the benefit derived simply from sitting upon such a stool a certain number of hours, every day, is sufficient to overcome the deformity. The patient should never sit upon the inclined plane long enough to produce muscular fatigue, and should immediately resume the horizontal posture when not thus sitting.

But, when the inclined plane is used in connection with the position of the arms already described, still greater effect can be produced by an elastic force so applied as to assist the muscles in unfolding the deformity. This can be accomplished by fastening elastic bands, which have handles attached to their free extremities, to hooks in the wall on either side of the patient. The bands should be of such a length that, when the patient sits with the arms in the position before described, she can just grasp

the handles. Now, while she is sitting in this position, direct her to inflate the lungs as much as possible, and at the same time make traction upon the elastic bands, and then let the expiration be gradual. The elastic bands should be stiff enough to give quite firm support to the arms.

These simple adjuvants to the general treatment are worth more than all the appliances I have ever seen devised for the correction of this deformity in its earlier stages, i. e., before the bones have become changed in form.

Another elastic apparatus that can be used with benefit is one devised in accordance with an idea I first obtained from Mr. Barwell, of London. It is more of a reminder to the patients what they are to do than anything else, but at the same time furnishes considerable aid in the efforts made to straighten themselves by means of muscular contraction. (See Fig. 230.)

It consists of a piece of sole-leather four or five inches wide,



FIG. 230.

and six or eight inches long, with its upper end hollowed out like a crutch; this is placed under the axilla of the depressed shoulder; a band going over the opposite shoulder is buckled to the

lower end of this leather crutch in front and behind. This band on either side has a few inches of elastic inserted, so that it has a constant tendency to lift the depressed shoulder, which is, in fact, suspended from the opposite one. Two other bands, one in front and one behind, descend from the top of the crutch to the opposite hip, and are there secured to a piece of leather, which is retained in place by a perineal band going around the thigh. From the centre of the crutch, two elastic bands, one in front and one behind, go around the body to another piece of leather placed over the projecting portions of the ribs upon the opposite side of the body. This leather pad is retained in position by straps descending from the first-mentioned strap over the shoulder, and also has elastic bands extending to another piece of leather over the opposite hip, which is secured like the first hip-piece by a perineal band going around the thigh.

All these bands are made partially of elastic webbing, and by their constant contraction have a tendency to twist the body straight, or rather to untwist it from its distorted position; but their practical object is to act as a reminder to the patient of the necessity of his making voluntary action of his own muscles for the purpose of keeping himself straight.

In the very early stages of this deformity the distortion can be rectified by instructing the patient to use his muscles, so as to cause their development in exactly the opposite direction to that which has produced the deformity.

We never see this deformity in that class of persons who use no restrictions to the full development of the muscles of their trunk by tight lacing or bad dressing, and who are in the habit of carrying baskets, pails of water, or other articles, evenly balanced on their heads. The servant-girl, walking with a basket of clean and well-ironed linen poised upon her head, is compelled to carry her head erect, or lose her balance, when down come the clothes in the mud, and with the loss of her balance she also loses her place, if she receives no further punishment. Take a hint, gentlemen, from this practical fact, and teach your young lady patients to walk about the room with a book upon their heads several minutes at different times during the day. This simple act alone will cause an equipoise of muscular power which will prevent the occurrence of this deformity, and even correct slight distortions when first commenced. Swinging from the arms, or

from the rings as in the gymnasium, is also very valuable exercise to accomplish this object.

A spiral corset may be worn with advantage. It is made by having spiral springs, a few inches longer than the corset, quilted into pockets, and forcibly pressed into these pockets and retained there, so that the corset is constantly making efforts to extend itself. (See Fig. 231.) As the patient is generally smaller at the waist than at the upper or lower extremity of the trunk, this corset is very much like a double cone in shape, and, the patient's trunk having been extended, it is placed upon him or her by first fastening the central point at the waist, and then the



FIG. 231.

slope of the corset above and below. On account of the constant action of the spiral springs, it will keep the patient extended, and prevent deformity.

In the majority of cases of the deformity in their earlier stages, before the bones and ligaments have become changed in form, the treatment above described, together with vigorous outdoor exercise, to improve the tone of the general system, will generally be found all that is required to correct it.

There are cases, however, like the one now before you (Fig. 232), in which the deformity has lasted so long, and the bones themselves have become so changed in form, that the deformity can never be perfectly rectified.

This man's deformity commenced as a lumbar curve on the left side, caused by his thigh on that side being one inch shorter than the other, and the dorsal curve has been produced as a compensating curve. This deformity has been greatly aggravated and made permanent by his avocation, which was carrying large baskets, by placing his left hand on his hip, making a resting-place on his left shoulder and arm, and holding the basket in place by throwing his right hand over his head and holding on to the top of the basket. You see that he has an immense muscular devel-



FIG. 232.



FIG. 233.

opment; the ribs of his left side are drawn down below the crest of the ilium, and that his body is rotated to the right, almost through one-quarter of a circle, an almost counterpart of the specimen here seen, in which the distortion was so great, that by many it was mistaken for Pott's disease, or posterior angular curvature, instead of lateral (see Fig. 233). In this specimen you observe a

line drawn at right angles with the anterior portion of the lumbar vertebræ, instead of being parallel to a similar line drawn from



FIG. 234.

the middle of the dorsal, is at right angles to it, although parallel to a line drawn from the cervical.

This shows that the vertebral column has been twice twisted upon itself; you see how admirably this specimen illustrates the deformity of this patient now before you.

When I place this man within a sling passing under his axillæ, and another band under the chin and occiput, and elevate his body by drawing upon the pulley (*see* Fig. 234), you immediately see this broad band of the latissimus dorsi muscle brought prominently into view, and it is an impossibility to bring him straight until this muscle is either cut or ruptured. While he is thus stretched out, I make pressure upon this muscle with my finger, and he instantly has a spasmodic contraction of nearly all the muscles of his body, thus proving that this muscle is *contractured*, and that no power, no matter how long continued, can stretch it to its normal condition, unless the fibres are severed, and this must be done either by force or with the knife. On the contrary, I have proved to you over and over again, in the many cases of contractured tendons and muscles which have been here, that, when this structural shortening has taken place, which is made evident by the reflex spasm which is produced in it by pressure upon its fibres when under extreme tension, continued stretching tends only to irritate that muscle and cause it to undergo stronger and stronger contractions, and that any attempt to stretch a muscle thus changed in structure excites additional irritation, rather than produces any elongation of its fibres.

If this rule, which I have laid down for some years, and followed in practice with the greatest success with almost all the other muscles of the body, be a correct rule, it should be applicable to this case. Believing it to be correct doctrine, I shall, therefore, proceed to divide the muscle.

You all see that this strong band, some three inches in height, which, with all my force, I can stretch no further, gives me a reflex spasm every time I pinch it. This fact seems to me to make section of it perfectly justifiable.

I take this long, strong tenotome (made especially for the purpose), and pass the blade under the anterior edge of the latissimus dorsi nearly opposite the angle of the scapula, and, passing it under the muscle, I now turn its edge toward the surface and cut with a short, sawing motion, while, with my thumb, I press upon this firm, tightly-drawn band. You hear the snapping of the fibres as they are being divided, and, now that they are all

cut, see how instantaneously the spinal column is rendered almost straight; I instantly turn the knife upon its side, withdraw it, and close the wound with my thumb, having pressed out a few drops of blood. I now dress the wound with adhesive plaster and a firmly-adjusted roller.

The patient states that the operation has given him but trifling pain, and that he feels very comfortable.

You all must observe the wonderful change in his form. The spinal column has become almost straight, the only distortion existing being at the angles of the ribs upon the right side, and this has existed so long that it may possibly be permanent.

We can now take the man down from the sling, and, as he lies

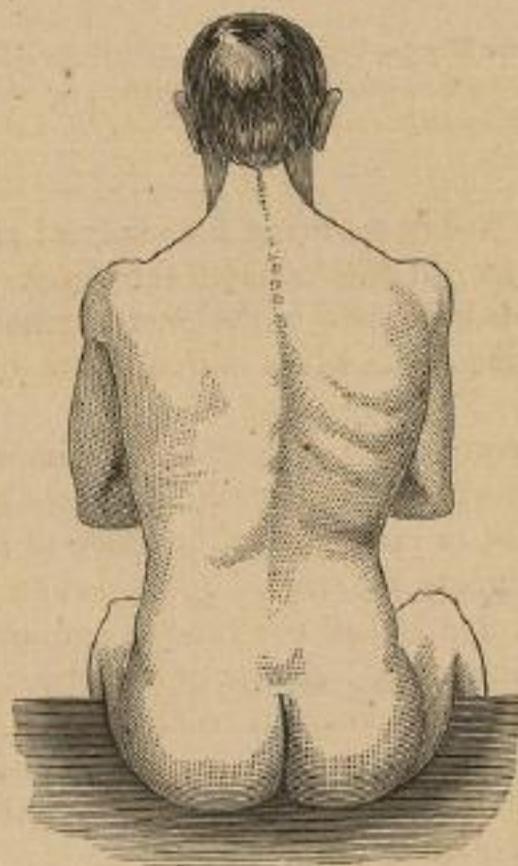


FIG. 235.

upon the table, he expresses himself as being free from pain. He will be put to bed, with a broad band passed around the upper portion of the trunk, secured by an India-rubber strap to a fixture upon one side of the bed, and a similar band around the pelvis, secured in a similar way to the opposite side of the bed. Between

these two elastic forces the body will be retained in the straight position, and we will show you the result at our next clinic.

By reference to Fig. 235, engraved from a photograph taken twelve days after the operation, can be seen the present condition of the patient while sitting unsupported on the side of his cot.

## LECTURE XXVII.

## ANCHYLOSIS.

Derivation and Use of the Word.—True and False Anchylosis.—Position of Limb when Anchylosis becomes a Necessity.—Mode of determining which Form of Anchylosis is present.—*Brisement forcé*.—Mode of dressing the Limb after the Operation.—Cases.

GENTLEMEN: To-day we begin the study of anchylosis.

Anchylosis is a word derived from the Greek (*ἀγκύλος*, *crooked* or *hooked*), and has been used to designate immobility of a joint, because most of the joints when stiffened are deformed in this crooked manner.

Although the true pathology is stiffness, immobility, or consolidation, no matter whether in a straight or crooked position, yet the term anchylosis, or crookedness, has been so long used by the profession to designate the pathological condition of which we are now speaking, that I shall continue to employ it.

Anchylosis is either true, osseous, or complete; or false, fibrous, or incomplete. True or complete anchylosis signifies the fixed and absolutely motionless state of a joint. False, fibrous, or incomplete anchylosis denotes a limited motion in the joint, no matter how slight that motion may be.

Anchylosis is more common in the ginglymoid articulations than in others, but may occur in every description of joint. In general, only one joint is anchylosed in the same individual; but I have seen one case, in a gentleman under thirty years of age, from Providence, Rhode Island, in which both hips, one knee, and both ankles, were apparently completely anchylosed, as the result of rheumatic inflammation. I have seen one other case, in a young