Lectures ON ORTHOPÆDIC SURGERY.

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LECTURE VII. ON CURVATURES OF THE SPINE. (Continued.)

Pathological Anatomy.

THE *intervertebral cartilages* are compressed unequally, and consequently they become wedge-shaped, the thin edge of the wedge corresponding to the concavity of the curve.

It was shown in the first lecture that the physio-

deavour to maintain equilibrium. This compression is so great, that a man of middle stature who has been in the upright position during the whole day loses nearly one inch in height. Such is the case with the normal—antero-posterior—curves. And, when lateral curvature takes place, a somewhat similar course is observed. A slight lateral curve is first formed: one shoulder sinks below the level of the other. The curve is not yet persistent, however, but it is again effaced after the horizontal position has been for some hours maintained; just as in the antero-posterior curves the height is restored after the recumbent position has been observed for some hours. At length, however, the lateral curve becomes permanent, the *intervertebral cartilages* remain compressed, and rotation of the *vertebræ* begins to take place.

Rotation of the vertebræ on their vertical axes commences so soon as curvature becomes permanent, and it gives rise to a very curious formation of curves, the pathological characters of which have been for the most part overlooked. The posterior curves—those formed by the spinous processes, and the anterior curves, or those which are formed by the bodies of the *vertebræ*, are wholly different. Thus, in the specimen before us, from which Fig. 20 is taken, the curve may be said to commence at the seventh dorsal *vertebra*, and to terminate with the first lumbar, and it appears to be,

Fig. 20.

Fig. 21.

Fig. 22.

Fig. 23.

logical spinal curves do not exist at birth, but that they are due to the erect position; and it was moreover shown that thinning of the *intervertebral cartilages* is due to unequal pressure in the en-

judging from the spinous processes, a single curve. Fig. 21 represents, however, the view of the bodies of the *vertebræ* from the same specimen. Here will be seen three well marked curves; namely,

lumbar, lower dorsal, and upper dorsal. And in a second specimen, for which, equally with the former, I am indebted to my friend Mr. Wheeler of Bexley, the difference between the anterior and the posterior curves is yet more remarkable. In contrast to these, I have to show an articulated spine (Figs. 22 and 23), where the anterior and the posterior surfaces agree perfectly; where the vertebræ are piled one above another with great care after the fancy of the constructor, and without the slightest regard for truth. And such is the manner in which the articulated spines are invariably put together. Thus, there is not, in the museum of the College of Surgeons even, an articulated spine where the characters of the distortion are preserved. It is only fair to say that, the vertebræ having been taken asunder, and the intervertebral cartilages having been removed, it is no ordinary puzzle to put the several parts together again as they had grown.

In the specimens which are now presented, it will be seen how the bodies of the vertebræ are rotated towards the convexity of the curve, and how in the concavity the bodies through pressure become wedge-shaped; that vertebra which is the most central is also the most compressed—it may lose more than half of its thickness. Also, through pressure, the cancellous structure of the vertebræ becomes somewhat consolidated, and the outer surface of the bone is thickened and rendered more dense. It will further be seen that the spinous processes are not curved in the same manner as the bodies of the vertebræ; and that even in the lumbar region they describe a straight line, while the bodies themselves are immensely curved.

This rotation of the vertebræ is a fact of the greatest importance; it is not generally acknowledged; and the manner in which curved spines are articulated in our museums tends to perpetuate an error. Rotation has been spoken of by many, as Dods, Guérin, Brodie, and others; but it is not understood that spinal curvature can exist without the apices of the spinous processes also describing a curve. Thus, many become hopelessly deformed through inattention to commencing distortion, and to the modes of formation of spinal curves.

This unequal pressure which is caused by rotation, produces at length absorption of the intervertebral cartilages, as well as partial absorption of the bodies of the vertebræ. Ankylosis then takes place, and an immovable and solid condition of that portion of the spine results.

It is clear, from the previous statements, that, in defining a spinal curve, we should not be too rigidly guided by the spinous processes; but that the condition of the entire trunk should be considered. The line of the spinous processes is often such, that, if they alone be considered, the diagnosis as well as the prognosis of the affection must be wrong.

The *transverse processes* of the lumbar vertebræ on the side of the convexity of the curve are rendered prominent, causing the erector spinæ to project; while, on the opposite side, the processes cannot be felt. And through rotation of the vertebræ, the articulating processes become partially absorbed by undue pressure, and their articular facets are lengthened.

But the most important result to the skeleton of torsion of the spine is the changed form and direction of the ribs.

The ribs necessarily follow in the altered direction of the vertebræ; they undergo, therefore, a movement of rotation backwards on the side of the convexity of the curve; their angles are rendered sharper, and the intercostal spaces become somewhat wider; while, on the side of the concavity, the ribs are carried forward; they are depressed and flattened; and some of the intercostal spaces may in advanced, distortion be effaced, and the ribs may overlap one another. The capacity of the thorax is thus materially diminished.

The scapulæ follow the course of the ribs; being raised on the side of the convexity, and depressed on the side of the concavity.

The *pelvis* is always rendered oblique by a lumbar curve. This is the chief distortion of the pelvis consequent on lateral curvature of the spine. Other distortions of the pelvis are induced by rachitis; but obliquity is that which is especially observed together with scoliosis.

When, however, distortion of the spine is excessive, and it has been of long duration, slight flattening of the pelvis ensues, probably in consequence of the unequal transmission of the superincumbent weight. Thus, the ischium and os pubis become somewhat flattened on that side on which the weight of the body is most thrown. This differs according to circumstances. Where both extremities are of the same length, in a straight line from the trochanter to the heel, the flattening will be found on that side on which the ilium is the highest—on the side of the concavity of the lumbar curve; but when difference in length of the extremities has given rise to curvature, such difference as is occasioned, for instance, by a rickety femur or tibia, by genu valgum or any other such cause, flattening will probably take place on the side of the shortest limb—the convexity of the lumbar curve. This flattening which occurs, except in a rickety pelvis, is slight; and, as far as the performance of functions is concerned, it is unimportant.

In addition to cervical, dorsal, and lumbar curves, the sacrum may be curved in a sense the reverse of the lumbar curve; and the ilium on the side of the sacral concavity is then carried forwards. The anterior superior spinous process of the ilium is thus inclined inwards and forwards, and the ischium and pubic bone of the same side are inclined inwards and backwards. These changes induce a slight narrowing of the pelvis. Also, through these changes, together with the torsion of the spine which has occurred, the promontory of the sacrum encroaches slightly on the pelvic cavity.

Distortion of the spine is never stationary, but it is always advancing slowly; until, at length, ankylosis takes place between the bodies of the vertebræ, and also between the articulating processes. Ankylosis may ensue after absorption of the cartilages, or it may occur through deposition of bone along the bodies of the vertebræ, in riband-like masses or in the form of nodosities—stud-like masses, connecting two or more vertebræ, without the previous removal of the intervertebral cartilages.

A FEMALE PHENOMENON. The *North British Review* contains a memoir by Dr. J. Brown, author of *Horæ Subsecivæ*; it gives an account of a female phenomenon of six years old, whose genius was much admired by Sir W. Scott.