

had acquired the size of a couple of eggs, from contraction, but the next day the patient could shut his mouth, and by the following day the tumefaction of the temporal muscles had also disappeared, and the restoration of the functions of the mouth was complete.

Malgaigne, to whom I am indebted for the above case, relates two others, one in the person of the surgeon Mothe, and the other in a young man who was suffering from paralysis and spasmodic contractions of the muscles. Mothe observes that it had occurred to him very often, and that it still continued to happen sometimes, and when he gaped pretty widely, the genio-hyoid and mylo-hyoid muscles contracted with so much force as to render it impossible for him to close his mouth; these muscles being thus in a state of cramp, their bellies became hard under the chin, and so painful that he was obliged immediately to press upwards against the under surface of the chin in order to oppose their action. This condition would last from one to three minutes, and was relieved, generally, by frictions made with the hand over the contracted muscles. Sometimes he actually believed that the lower jaw was dislocated, although the result always convinced him that it was not.

Treatment.—In most or all of the cases of this peculiar derangement of the temporo-maxillary articulation, which have come under my notice, a spontaneous cure has been soon effected. It will be proper, however, in all cases, to instruct the patient to avoid using the jaw in a manner to produce the sensation of slipping; and if the general health is impaired, to adopt suitable measures to improve his condition. Cold water affusions to the side of the face and jaw would seem also to be rational measures, and I have generally recommended their use.

CHAPTER III.

DISLOCATIONS OF THE HYOID BONE (THYRO-HYOID ARTICULATION).

So far as I know, Dr. Ripley, of South Carolina, and Dr. Gibb, of London, have alone furnished us with examples of this accident, but as I am unable to consult the original communications of either of these gentlemen, I will take the liberty of reproducing the brief summary of their papers contained in Mr. Durham's contribution to Holmes's Surgery.¹

Gibb² has recorded in the following words a case of dislocation of the hyoid bone in a patient under his care: "The patient, a man, *æt.* 45, would feel a sudden click in the left side of his neck, which produced a sensation as if something was sticking in his throat. On examination, this appeared to me to depend upon a displacement of the left horn of

¹ Holmes's Surgery, 2d Amer. ed., vol. ii. p. 460. Art. Injuries of the Neck.

² Gibb, on Diseases and Injuries of the Hyoid Bone, by G. D. Gibb, M.D., Churchill, London, 1862, p. 20, and Trans. Path. Soc. London, vol. x. p. 66.

the hyoid bone, and was generally reduced by throwing the head backwards, toward the right side, so as to stretch the muscles of the neck, and then suddenly depressing the lower jaw, and so putting the depressors of the hyoid bone into operation. He died some years after of pulmonary consumption. On examining his throat after death, I found a sort of pouch, which answered the purpose of a synovial capsule, embracing the horns of the left thyro-hyoid articulation. It was filled with a clear fluid, had a comparatively large rhomboid sesamoid bone developed in its outer wall, and permitted an extraordinary amount of motion. This was the fourth case of the kind which had come under the notice of Gibb. All the patients were males. He subsequently met with a fifth case in which the patient was a female.

Reference is made in the work quoted to a paper, read in 1848 before the Parisian Medical Society, by Dr. Ripley, of South Carolina, on 'Dislocations of the Os Hyoides, especially illustrated in his own person, and the manner of reducing them.' The latter process consisted in throwing the head backwards as far as possible, so as to place the muscles of the neck on the stretch, then relaxing the lower jaw, at the same time gently pressing or rubbing over the displaced part, when the displacement becomes reduced after a few attempts with a click.

"Two cases of dysphagia described by Abercrombie are considered by Gibb to have been examples of double displacement of the thyro-hyoid articulation."

CHAPTER IV.

DISLOCATIONS OF THE SPINE.

DELPECH and Abernethy denied the possibility of a dislocation of the spine, either in the cervical, dorsal, or lumbar region, without the concurrence of a fracture.

Says Sir Astley Cooper: "I have never witnessed a separation of one vertebra from another through the intervertebral substance, without fracture of the articular processes; or, if those processes remain unbroken, without a fracture through the bodies of the vertebrae." He would not, however, be understood to deny the possibility of a dislocation of the cervical vertebrae, their articular processes being placed more obliquely than those of the other vertebrae.

The accident is, no doubt, exceedingly rare, at least without the complication of a fracture, and it is not improbable that the actual number is smaller than the reported examples would indicate. Those who make autopsies do not always perform their duties with that exact fidelity which might be necessary to determine so nice a point as a fracture of an oblique process, and it is quite likely that the circumstance may have been overlooked in some cases; but a considerable number of well-authenticated examples of simple dislocations of cervical vertebrae have accumulated within the last fifty years. The reported examples of

simple dislocations of the other vertebræ are not so numerous, nor as well attested.

The causes are in general the same as those which produce fractures of the vertebræ, such as falls upon the head, feet, or back, and violent flexions of the spine backwards or to the one side or the other.

Several examples are recorded of "spontaneous" dislocations, the result of some morbid changes in the bones or in the ligaments of the spinal column; which accidents seem to belong more properly to general treatises upon surgery.

The symptoms, also, partake of the same general character with fractures; the accident being accompanied with more or less complete paralysis of those portions of the body which receive their nervous supply from below the point at which the dislocation has occurred; the spinal column presenting at the seat of displacement an angular projection or some form of irregularity; and the distortion being attended with pain, especially when an attempt is made to move the body.

In very many cases the symptoms are so nearly like those presented in a case of fracture, that the diagnosis is rendered exceedingly difficult. The presence or absence of crepitus may aid in the diagnosis, and yet it is well understood that this symptom is often absent in simple fractures, and that it may be present in all those examples of dislocation which are accompanied with a fracture of an oblique process, or of any other portion of the vertebræ, which class of examples constitutes a large majority of the whole number.

There is usually present, however, in the dislocation, whether partial or complete, a peculiar fixedness or rigidity of the spine, which serves to distinguish this accident from a fracture of the spine as plainly as the preternatural rigidity of the limb in dislocations of the long bones. The head or upper portion of the spinal column is bent forwards, or backwards, or more commonly to one side, and in this position it remains immovably fixed until the reduction is accomplished. Sometimes, also, the surgeon may feel distinctly the lateral deviation of the spinous process, and, in the neck, the transverse processes become an important guide in the diagnosis.

After these few general remarks, I shall proceed to speak of dislocations of the spine in the same order in which I have treated of fractures of the spine.

§ 1. Dislocations of the Lumbar Vertebræ.

Sir Astley Cooper plainly intimates that he does not believe a dislocation can occur in either the dorsal or lumbar region without the concurrence of a fracture, and Boyer affirms positively that it is "entirely impossible."

Without wishing to insist upon the actual impossibility of these accidents, I am prepared to affirm that no well-authenticated case has yet been reported—at least of a complete dislocation, unaccompanied with a fracture of the articulating apophyses. I can conceive it possible that a lumbar vertebra may be dislocated forwards or backwards, and that a

dorsal vertebra may be dislocated laterally, without a fracture; but neither of these events can be considered probable. It is certain, however, that no evidence has yet been furnished of the actual occurrence of such a dislocation.

Colquet mentions the case of a "tiler" who fell from the roof of a house backwards, and dislocated one of the lumbar vertebræ. This patient lived many years after the accident, and at the autopsy it was found that the second lumbar vertebra had been dislocated to the right by a movement of rotation about the left articular process, the two oblique processes of the left side preserving their connection, while those of the right were separated quite half an inch. The right vertebral plate was broken, and the canal of the vertebra was thus thrown open and widened.¹

Dupuytren says that a man was crushed by the falling of a bank of earth upon his loins, when in the act of bending forwards. On the third day he was brought to Hôtel Dieu, when it was observed that his lower extremities were completely paralyzed; and that there existed in the upper part of the lumbar region a hard tumor, by pressure upon which a crepitus was manifest. A second tumor could be distinctly felt in front through the abdominal parietes, and the length of the spine was evidently diminished. This man died on the sixth day from a gradual asphyxia. When the body was examined it was found that the last dorsal and first lumbar vertebræ had been pushed forwards more than one inch, lacerating the spinal marrow, breaking the transverse and oblique processes of the last dorsal and first two lumbar vertebræ, and tearing off a small fragment of the body of one of the vertebræ where the intervertebral substance adhered to it.²

Vincent³ presented in 1850 to the Anatomical Society of Paris a complex dislocation of the first lumbar vertebra, with destruction of the extremity of the spinal marrow, and interruption of the nervous function of the cauda equina. Despite the most complete paraplegia the fracture became consolidated, and the patient survived eight months.

These are all the cases of dislocation of the lumbar vertebræ of which I am able to find any record. All were accompanied with fractures. In neither case was any attempt made to reduce the dislocation. In the second, it is scarcely probable that any means could have been employed which would have succeeded in restoring the bones to their places; nor is it probable that, if the bones had been restored to place, the patient would have survived the accident a day longer, probably not so long. The cord was greatly lacerated, and the diaphragm torn up and displaced, rendering a recovery almost impossible.

In the first example, where the dislocation was less complete, and the complications less grave, could reduction have offered any reasonable chance for relief? By extension, combined with a movement of rotation in a direction opposite to that in which the displacement had taken place, it is possible that a reduction might have been accomplished.

¹ Cloquet, Malgaigne, op. cit., t. 2, p. 390, from Journ. des Différences de Maison, tom. i. p. 458.

² Dupuytren, Injuries and Diseases of Bones, Syd. ed., p. 340.

³ Vincent, Bull. Soc. Anat., 1850 (Poincot).

The attempt certainly would have been justifiable; but since the man lived "many years" without the reduction, it is doubtful whether the result of a reduction would have been more fortunate.

§ 2. Dislocations of the Dorsal Vertebrae.

Malgaigne enumerates twelve examples of dislocations of the dorsal vertebrae. I have found reported by American surgeons, at dates too recent to have been included in his analysis, two other examples (Poincot has added three more cases, one reported by Thompson, of Dublin,¹ a second by Socin, of Bâle,² and a third by himself.³ In Thompson's case there was a complete dislocation of the twelfth dorsal upon the first lumbar, with fracture of the spinous process, accompanied with rupture of the aorta and spinal cord. In Socin's case it was the eleventh and twelfth; and in Poincot's case there was dislocation forwards of the twelfth dorsal upon the first lumbar. A portion of the anterior and superior border of the first lumbar was torn off; the left articular and right transverse processes were also broken. The patient survived the accident twenty-four days. I am unable to subject them to a more complete analysis; but of this number only three are claimed to have been simple dislocations, unaccompanied with fracture. One of the fourteen was a dislocation of the fifth dorsal vertebra upon the sixth, one of the eighth, two of the ninth, five of the eleventh, and five of the twelfth; the relative frequency of their occurrence in the different vertebrae corresponding with the observation of Weber, as to the points of the spinal column which allow of the greatest freedom of motion, and are consequently most liable to dislocations. The direction of the displacement in ten cases was observed to be six times forwards, twice backwards, and twice to the one side.

Two of those which were unaccompanied with fracture, occurring respectively in the tenth and sixth dorsal vertebrae, were examples of a dislocation forwards, and the third, belonging to the ninth vertebra, was a dislocation backwards. A lateral dislocation without fracture has not been recorded. It is worthy of remark, also, that these three examples of uncomplicated dislocations, being all which our science up to this moment possesses, have happened in the experience of the same surgeon.⁴

A moment's consideration of the anatomy of these processes will render it apparent that even a partial dislocation forwards without a fracture of the oblique apophyses is impossible; and that in the direction backwards the dislocation can only occur to the extent of about one-quarter of an inch, constituting only a species of articular diastasis, without breaking off the articulating apophyses of the lower corresponding vertebra. The first two examples, therefore, notwithstanding they have been received without question by Malgaigne, I shall unhesitatingly reject. The third, which alone carries evidence of its having been correctly reported, and which was only a partial dislocation, is related as follows: "A mason, having fallen from a height in such a manner that

¹ Thompson. Dublin Journ. of Med. Sci., Oct. 1880.

² Socin, 1880.

³ Poincot, *op. cit.*, p. 754.

⁴ Melchiori, *Gaz. Medica, stati sardi*, 1850.

the lower part of his back struck upon the angle of the upper step of a ladder, died on the following day. After death it was observed that the spinous processes of the dorsal vertebrae were prominent down to the tenth; and that the tenth process with all of the processes below were depressed. It was also noticed that this depression, very marked when the trunk was thrown backwards, gradually diminished and finally disappeared altogether when the body was bent forwards. On removing the soft parts it was found that the ligaments were extensively torn asunder and detached, so as to permit the articulating apophyses of the tenth vertebra to be carried into contact with the back of the ninth. The spinal marrow had undergone no visible alteration."¹

Malgaigne thinks he has once observed the same thing in a living subject, and that by simply bending the body forwards he accomplished the reduction and effected a perfect cure, except that a slight curvature remained at the point of injury.

Among the cases reported as having been complicated with fracture, the following example, reported by Dr. Graves, of New Hampshire, to Dr. Parker, of this city, possesses unusual interest:

On the second day of January, 1852, a man, æt. 25, was struck on the back while in a stooping posture by a falling mass of timber, causing a dislocation of the last dorsal upon the first lumbar vertebra. His lower extremities were completely paralyzed, and priapism continued for several hours. The surgeon determined to make an attempt at reduction, and for this purpose he placed the patient upon his face, and secured a folded sheet under his armpits and another around his hips, directing four strong men to make extension and counter-extension by these sheets. Chloroform was administered, and when the patient was completely under its influence the extending and counter-extending forces were applied, and in a few minutes the vertebrae glided into place with a distinct bony crepitus. The restoration of the line of the vertebral column was found to be nearly but not quite perfect.

On the sixteenth day he began to have slight sensation in his feet, and at the end of six or eight weeks he was able to control the evacuations from the bladder and rectum. Several months later he had recovered so completely as to walk with only the aid of a cane.²

I know of only one similar case. Rudiger has published an account of a dislocation obliquely backwards and to the right side, which occurred at the same point in the spinal column. The subject was a musketeer, who had been struck upon his back by a falling wall which he was endeavoring to pull down. Rudiger laid him upon his belly, and with the assistance of others he was able, but not without causing pain, to reduce the bones. Immediately, however, when the extension was discontinued, the action of the muscles caused the displacement to recur. The surgeon then directed four men to make extension, while another man retained the bones in place by pressing upon them with his hands. After several hours this method of pressure was replaced by a board underlaid with compresses and sustaining a weight of more than fifty livres. On the

¹ Melchiori, *loc. cit.*

² Graves, *N. Y. Journ. Med.*, March, 1852, p. 190.

following day it was found sufficient to bind compresses over the projecting bone, and in this condition the patient remained fifteen days; during all of which time he lay upon his belly with his shoulders more elevated than his pelvis. On the twentieth day he could lie upon his back, and in about six weeks he was so completely restored as to be able to pursue his trade as before!¹ This is certainly a very extraordinary case, whether considered in reference to the means employed to restore the bones to place, or to its results; and if the statements are to be received at all, it must be with some hesitation and allowance.

On the other hand, we are able to present at least one example in which, although no reduction has been accomplished, the patient has survived the accident many years; yet it must be admitted that his recovery is far from having been as complete as in the two cases just mentioned.

Joseph Stocks, æt. 11, in the spring of 1826, was crushed under the body of an ox-cart in such a manner as to produce a dislocation of the last dorsal from the first lumbar vertebra, causing immediately almost complete paralysis of all the parts below. This young man was seen by Dr. Swan, of Springfield, Mass., in the summer of 1834, at which time he was occupied as a portrait-painter. His lower extremities remained paralyzed and of the same size as at the time of the receipt of the injury. He was unable to sit erect, owing to the mobility of the spine at the seat of dislocation, and he had therefore lain constantly upon his side. The upper portion of his body was well developed, and his intellectual faculties were of a high order.²

It is not, however, with a life of perpetual deformity that the two examples of reduction already described are to be contrasted. A result so fortunate as this, where the bones remained unreduced, is unique; in all the other cases reported the patients died miserably after periods ranging from a few days to one year or a little more.

Charles Bell has related the case of an infant who was run over by a diligence, and who died thirteen months after the accident. On examination after death, the last dorsal vertebra was found to be completely dislocated backwards and to the left, upon the first lumbar vertebra.³

With these facts before us, I think we cannot hesitate, when the nature of the accident is fully made out, and especially when the dislocation has occurred in the lower dorsal vertebrae, to attempt the reduction by forcible extension, united with judicious lateral motion, or with a certain amount of direct pressure upon the projecting spines.

§ 3. Dislocations of the Six Lower Cervical Vertebrae.

It is much more common to meet with simple dislocations of the vertebrae of the neck uncomplicated with fractures, than of either of the other vertebral divisions. This is doubtless owing to the greater extent of motion which their articulating surfaces enjoy.

They may be dislocated forwards or backwards. The forward dislocation

¹ Rudiger, Journ. de Chir. de Desault, tom. iii. p. 59.

² Swan, Boston Med. and Surg. Journ., vol. xxii. p. 102, March, 1840.

³ Charles Bell, on Injuries of the Spine, 1824.

may be complete or incomplete; with both sides equally advanced ("bilateral" of Malgaigne), or one of the articulating apophyses may be dislocated forwards, holding the opposite apophysis in its place ("unilateral" of Malgaigne).

Schrauth¹ has collected twenty-four examples of dislocation of the cervical vertebrae, of which four are recorded as dislocations forwards, two back, and six to the one side or the other. Three of this number were dislocations of the atlas, two were dislocations of the second vertebra, five of the fourth, two of the fifth, two of the sixth, and one of the seventh. In the other cases the seat was not stated.

Malgaigne has brought together forty-five examples; of which twenty-one were complete forward dislocations, nine incomplete forward dislocations, nine unilateral and forwards, and four were backward dislocations. Three were dislocations of the second vertebra upon the third, four were dislocations of the third vertebra, ten of the fourth, eleven of the fifth, fifteen of the sixth, and two of the seventh.²

Causes.—The bilateral forward dislocations are generally caused by a fall upon the top and back of the head, or upon the top of the head while the neck is very much flexed forwards.

The unilateral is caused sometimes by a direct blow upon the back of the neck, the blow being probably directed somewhat to one side or the other.

It may also be caused by muscular action, and especially by the action of the sterno-cleido-mastoid, as in a sudden movement of the head to one side. Malgaigne has found this to have been the cause in six of the cases collected by him. Such also was the fact in the cases reported by Rotter,³ Foelker,⁴ Koch,⁵ Schuh, Moxon, Berthold, and Wyeth, to the four latter of which I shall again make reference.

The number of backward dislocations which have been reported are too few to enable us to indicate very accurately the general causes, but it seems probable that they are most often occasioned by a fall upon the fore and top part of the head, received while the neck is bent forcibly back.

Symptoms.—In dislocations of the cervical vertebrae forwards the head is usually depressed toward the sternum, in dislocations backwards the head is thrown back, and in unilateral dislocations the head is turned over one of the shoulders. Neither of these malpositions of the head is uniformly present in these several dislocations, and indeed not unfrequently, especially in case the system is greatly shocked by the accident, the head and neck assume a preternatural mobility, and may be turned easily in any direction.

The spinous process, unless the patient is very fleshy or considerable swelling has supervened, can easily be felt, and its deviations to the right or to the left, forwards or backwards, furnish us with the most valuable and important sign of the dislocation. Even the transverse processes may be felt sometimes, especially in the upper part of the neck, with sufficient distinctiveness to render them useful in the diagnosis.

¹ Schrauth, Am. Journ. Med. Sci., May, 1848, from Archiv für Phys. Heilkunde.

² For additional cases see Dublin Journ. Med. Sci., March, 1879, p. 260.

³ Poincot, op. cit., p. 758.

⁴ Ibid.

⁵ Ibid.

To these circumstances we may add paralysis of the body below the seat of injury, with pain and swelling at the point of dislocation. In some cases also the patient has himself distinctly felt a cracking or sudden giving way in the neck at the moment of the accident.

Prognosis.—The complete bilateral dislocations, whether backwards or forwards, have in most cases terminated fatally within a short time, generally within forty-eight hours. Unilateral dislocations are less speedy in their results, but when the dislocation remains unreduced, death generally takes place in a month or two. Lente relates a case of incomplete dislocation of the fifth cervical vertebra backwards, unaccompanied with fracture, which accident the patient survived five days.¹ A patient of Roux's lived eight days; but in the case of a second patient mentioned by Lente, with a complete dislocation, without fracture, of the fifth vertebra, the patient survived the injury only two hours.²

On the other hand, occasional examples are presented of partial or complete recovery with the dislocation unreduced.

Horner, of Philadelphia, presented to the class of medical students of the University of Pennsylvania, in 1842, a lad, æt. 10, who had fallen a distance of twenty feet, alighting upon his head. He was found senseless and motionless, with his head bent under his body. He gradually recovered from the shock, but his neck was stiff, distorted, and motionless, his face being inclined downwards to the right side. Two days after, his "common and accurate perceptions returned, but he was affected for some time with tingling and numbness in his left arm." When presented to the class the transverse processes, from the fifth upwards, were about half an inch in front of those below, showing that the left oblique process of the fourth was dislocated forwards upon the fifth. The rotary motions of the neck could not be executed to some extent, but much more freely to the right than to the left. Professor Horner refused to make any attempt to reduce the dislocation.³

Dr. Purple, of New York, has reported a case of what was called a dislocation of the fifth and sixth cervical vertebræ, producing complete paralysis of the lower part of the body, in which the patient survived the accident many years; but his lower extremities were so useless and cumbersome as to induce him, in the year 1851, six years after the injury had been received, to submit to the amputation of both at the hip-joint. In 1852, having become very intemperate, he died, but no autopsy was obtained, so that the exact character of the injury was never ascertained.⁴

Sanson, of Paris, has reported also a case which came under his observation at Hôtel Dieu, of dislocation of the "third cervical vertebra backwards," from which, although unreduced, the patient partially recovered. The character of this accident was not much better determined; for, although he felt a severe and sharp pain at the moment of the injury, which was greatly aggravated by motion, and his head was bent forwards and to the left, "the chin being fixed on the upper part of the sternum," there was no paralysis of either the motor or sentient nerves. After

¹ Lente, New York Journ. Med., May, 1850, p. 284.

² Lente, *Ibid.*, p. 297.

³ Horner, Amer. Journ. Med. Sci., April, 1843, from Med. Exam.

⁴ Purple, New York Journ. Med., May, 1853, p. 319.

the lapse of about four months he left the hospital, still unable to lift his chin more than four inches from the sternum; after which he resumed his usual occupations, suffering no further inconvenience than what was occasioned by the unnatural position of his head.¹ Notwithstanding the authoritative testimony of Sanson that this was a dislocation backwards, one cannot avoid the conclusion that it was either an incomplete unilateral dislocation, or perhaps a mere diastasis of the articulation, or else that it was an example of sprain of the muscles, and consequent contraction of one set, or paralysis of the opposing set of muscles. It is certain that it was not a complete dislocation; nor, since there was no paralysis of the body below the point of injury, can it be properly made use of as an argument for non-interference where such paralysis does actually exist.

Poinsot saw, in 1883, a case almost identical in the phenomena which it presented with that of Ayres, to which I shall hereafter refer, occurring in a man aged 35 years, caused by the fall of a heavy weight upon his head while it was in a position of extension. He lost his consciousness at once, but when he recovered his senses after a few moments there was no paralysis. On the following day when examined by Poinsot, the symptoms seemed to point to a dislocation of the fifth cervical vertebra upon the sixth, but no attempt at reduction seems to have been made. Gradually the head regained its position and motions, but after a time, and at the date of the last observation, more or less of the deformity and immobility continued to exist.²

Treatment.—Let us see now what encouragement attempts at reduction may offer, in cases which present so little ground of hope where the reduction is not accomplished.

Dr. Spencer, of Ticonderoga, N. Y., relates that a man, æt. 50, fell backwards from a board fence, striking upon the superior and anterior portion of his head, dislocating the second from the third vertebra of the neck. His head was thrown back so far as to prevent his seeing his own body, and all below the injury was completely paralyzed. Repeated attempts were made to reduce the dislocation, "but the transverse processes had become so interlocked that every effort proved abortive," and he died forty-eight hours after the injury was received.³ Gaitskill also attempted reduction in a case of dislocation of the seventh cervical vertebra, but failed.⁴ Boyer failed in two cases. It is related by Petit Radet, that a young patient at La Charité expired in the hands of the surgeons, upon such an attempt being made a few days after the accident;⁵ and Dupuytren says "the reduction of these dislocations is very dangerous, and we have often known an individual perish from the compression or elongation of the spinal marrow which always attends these attempts."

Dr. Schuh, of Vienna, relates that a man, æt. 24, while engaged at his work on December 5, 1838, twisted his head suddenly round, in consequence of one of his companions roaring into his ear, when he in-

¹ Sanson, Amer. Journ. Med. Sci., Feb. 1836, p. 514, from Gaz. des Hôpitaux.

² Poinsot, *op. cit.*, p. 761.

³ Spencer, Boston Med. and Surg. Journ., vol. xv. No. 11.

⁴ Gaitskill, London Repository, vol. xv. p. 282.

⁵ Petit Radet, Note to Boyer, Malad. Chir., vol. v. p. 118.

stantly felt something give way in his neck, and found it impossible to move his head. Next morning his head was turned to the right and bent down toward the shoulder. Every attempt to move his head caused great pain. He complained of weakness in his right arm, but all the other functions of his body were perfect. An attempt was immediately made to reduce the dislocation by lifting him by the head, but without success. On December 7th, the weakness and numbness of the right arm had increased, and the attempt to reduce the bones was renewed. The patient was laid horizontally upon a bed, and extension made from the chin and occiput while counter-extension was made from the shoulders. The force thus employed was gradually increased until the patient and assistant felt a snap as of two bones meeting, when it was found that the head was restored to its natural position, and the power of moving it had returned. The next day his arm was more powerless than before, and on the following day he had vertigo, but these symptoms soon yielded to copious bleedings, and he left the hospital cured on the 13th.¹

Dr. Hickerman, of Ohio, has reported also, in the *Ohio Medical Journal*, a case of dislocation of one of the cervical vertebræ, the original account of which I have not seen, but only an abridged statement published in the *Buffalo Medical Journal*. By exploring the pharynx a prominence was felt opposite the junction of the fourth and fifth cervical vertebræ; and the action of the heart was barely perceptible. Seizing the patient's head under his left arm, Dr. Hickerman in this manner made traction, while with the index finger of the right hand in the patient's throat, he made firm pressure obliquely upwards, backwards, and to the left; after continuing the pressure for about forty or fifty seconds, the part against which the finger was placed gradually yet quickly receded in the direction in which the pressure was made, and instantly, as quickly indeed as the act could be possibly executed, the patient opened her eyes, and natural respiration was established. She then also immediately became conscious of what was transpiring about her, and signified by signs, for she was yet unable to speak, that she had suffered pain in the epigastrium. Complete recovery took place.²

Schrauth received under his care a patient who had a dislocation of the "right transverse apophysis" of the fourth cervical vertebra, without lesion of the spinal marrow, which he reduced on the seventh day. The first attempt was unsuccessful; but the second, made with great caution, by the aid of four assistants, three of whom pulled the head upwards while the fourth pressed with his whole weight upon the shoulders, was completely successful. During the time that the traction was being made, the head was occasionally rotated slightly and moved laterally, and at the same moment the surgeon pushed firmly against the displaced apophysis. The reduction was attended with "various distinct crackings in the neck," which were loud enough to be heard. After some days of repose he resumed his occupation, no stiffness remaining in the movements of the neck.³

¹ Schub, Amer. Journ. Med. Sci., July, 1841, p. 207.
² Hickerman, Buff. Med. Journ., vol. x. p. 702, April, 1855.
³ Schrauth, Amer. Journ. Med. Sci., May, 1848.

According to Malgaigne,¹ Newman in 1814 and Seifert in 1831 have each reported one successful case, while Barny and Malgaigne have each met with two analogous examples successfully reduced.

Dr. Edward Maxson, of Geneva, N. Y., was called, on the 28th of Oct. 1856, to see a child about nine years old, who had met with a similar accident about forty hours before, namely, a dislocation of the right articulating apophysis of the fifth or sixth cervical vertebra, occasioned by suddenly turning her head around while at play. She at first complained only of pain and inability to straighten the neck; but whenever moved she became faint and irritable. A short time before the surgeon was called, the mother had, in attempting to move her in bed, turned the face a little more to the left, when a severe convulsion immediately ensued. On examining the neck, Dr. Maxson discovered the displacement of the transverse process. Having advised the parents of the danger necessarily incident to an attempt at replacement, and of the probable consequences of its being permitted to remain as it was, they consented that the trial should be made. "I grasped the head," says Dr. Maxson, "with both hands, and proceeded according to Desault's method, only I first carried or turned the face very gently a little further toward the left shoulder, to, if possible, disengage the process; then lifting or extending the head, I turned the face very gently toward the right shoulder, when the difficulty was at once overcome, and she exclaimed: 'I can move my eyes.' Her countenance soon acquired a more natural appearance; the faintness passed off; she rested quietly through the night; had no return of the difficulty, and needed only an emollient anodyne to soothe the irritation and slight swelling which remained at the point of injury."²

Dr. Berthold, of Nuremberg, reduced a dislocation of one of the oblique processes of the sixth vertebra in a boy, æt. 19, by extension with his hands and rotation.³

Dr. Wm. J. Morton, of New York, has reported a case of dislocation of the fifth oblique process in a boy twelve years old, reduced after the lapse of one week, by suspension of the head between the hands and rotation.⁴

Dr. John A. Wyeth, of this city, relates a case of dislocation of the right articular process of the fourth vertebra forwards, from muscular action, in the person of a lady who had turned her head strongly to the left side. Her head became fixed immovably; there was great pain at the point of this articulation; oppressed breathing and a numbness extending down the arm of the same side. Dr. Wyeth was immediately summoned, and attempted to rotate the head into position, but was unable to do so. He then seized the head and rotated it slightly to the left, then made strong extension and rotated to the right, when the head returned to and retained its natural position. During the next two days there was considerable pain along the spinal cord and in the right arm. Three months after the accident she was perfectly well.⁵

¹ Malgaigne, op. cit., t. 2. ² Maxson, Buffalo Med. Journ., Jan. 1857, p. 476.
³ Berthold, Month. Ab. Med. Sci., June, 1875.
⁴ Morton, Med. Rec., Oct. 4, 1879.
⁵ Wyeth, Hosp. Gaz., N. Y., Aug. 1879.

Rust,¹ Wood,² of this city, and others, have seen and reported similar cases attended with like success.

So far, the cases of successful reduction to which I have referred were examples of dislocation of only one of the articulating apophyses, and they have been sufficiently numerous and successful to establish the value of attempts at reduction. I have now to relate a case in itself almost unique, namely, a successful reduction of a dislocation of the fifth cervical vertebra, in which both apophyses appear to have been thrown forwards. It occurred in the practice of Dr. Daniel Ayres, of Brooklyn, N. Y., and will be best understood by a reproduction of his own published account of the case:

"E. K., the subject of this accident, was a laboring man, thirty years of age, tall and muscular, but not fat, with a neck longer than the average among men of equal height. On the evening of the 2d of October he became intoxicated; was brought home insensible, and did not recover from the combined effects of the shock and his libations until the following morning, when he was supposed by his wife to be laboring under cold and a stiff neck. She made some domestic applications to the affected part, and administered a dose of cathartic medicine. When it was thought sufficient time had elapsed without obtaining relief, he was seen by Dr. Potter, of this city, and afterwards by Dr. Cullen, both of whom recognized a condition which was not only very unusual, but one which they had never before observed. I was then requested to examine the case, which I did on the ninth day after the accident. With some assistance and great personal effort, he was able to get out of bed, moving very slowly and cautiously. Desiring to expectorate, he was obliged to get down on his hands and knees, which he accomplished with the same deliberation. When seated in a chair, the head was thrown back and permanently fixed; the face turned upwards with an anxious expression. The anterior portion of the neck, bulging forwards, was strongly convex, rendering the larynx very prominent. The integuments of this region were exceedingly tense and intolerant of pressure. The posterior portion of the neck exhibited a sharp, sudden angle at the junction of the fifth and sixth cervical vertebrae, around which the integuments lay in folds. It was difficult to reach the bottom of this angle even with strong pressure of the fingers, and of course the regular line formed by the projecting spinous processes was abruptly lost. He complained of intense and constant pain at this point, which was neither relieved nor aggravated by pressure. With difficulty he swallowed small quantities of liquid, pausing after each effort, and could not be induced to take solid food, since the first attempt to do so after the accident was followed by violent paroxysms of coughing and choking. His breathing was obstructed and somewhat labored, being unable fully to clear the bronchi of their secretion. This, however, seemed rather an effect of the tense condition of the soft parts of the neck, than the result of pressure upon the spinal cord, since he presented no evidence of paralysis, either of motion or sensation, in parts below the neck. The

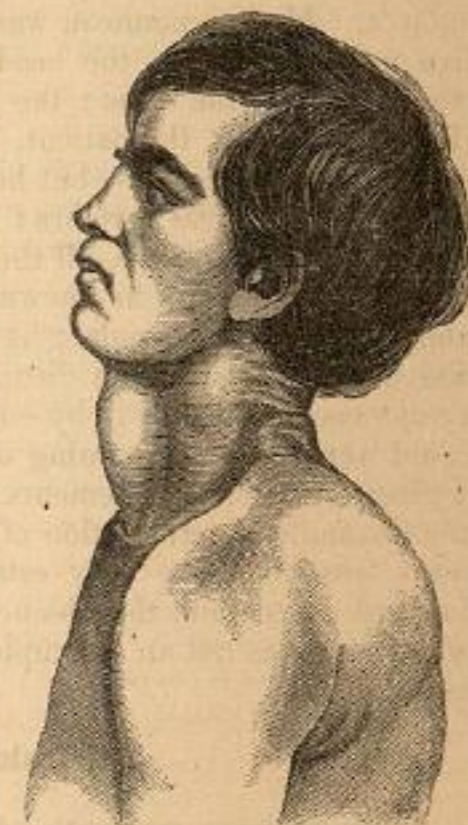
¹ Rust, *Chelius*, note by South.

² Wood, *New York Journ. Med.*, Jan. 1857, p. 13.

sterno-cleido-mastoid muscles of both sides were felt quite soft and relaxed.

"But one conclusion could be formed upon this state of facts, to wit: that the oblique processes of both sides were completely dislocated. The marked rigidity of the head seemed to preclude the probability of fracture through the vertebral bodies, and although the cartilage might be separated anteriorly, yet the body not pressing backwards sufficiently to produce paralysis of the cord, it was hoped that the posterior vertebral ligament remained uninjured; it was, therefore, determined to make an effort at reduction on the following day. In addition to those originally connected with the case, I am under obligations to Drs. Ingraham, Turner, Palmedo, G. D. Ayres, and a number of other medical gentlemen, who were present by invitation, all of whom confirmed the diagnosis, and rendered efficient services.

"The patient was placed upon a strong table, in a recumbent position, with a pillow resting under the shoulders, the head being supported by the hand during the administration of chloroform, of which an ounce was given before anaesthesia ensued. Counter-extension being made by two folded sheets placed obliquely across the shoulders and properly held, the head was grasped by one hand placed under the chin, the other over the occiput, and by steadily and firmly drawing the head directly backwards, and then upwards, an attempt was made at reduction, but failed for want of sufficient power. Dr. Ingraham was then requested to place his hands immediately over my own in the same position as before, and steady traction was again made in the same direction. Our united strength was required in drawing the head backwards and upwards to dislodge the superior oblique processes from their abnormal position. When this was felt to be yielding by Dr. Cullen (who kept one hand constantly at the seat of dislocation), Dr. Potter was directed to place his hands under our own, still in position, and assist in bringing the head forwards; at the same



Ayres's case of bilateral dislocation of the fifth cervical vertebra.

time the chest was depressed toward the table. The bones were distinctly felt to slip into their places; the line of the spine was instantly restored, the head and neck assuming their natural position and aspect. As soon as the patient became conscious, he expressed himself ignorant of what had taken place, but free from pain, and, in his own language, 'all right.' A bandage was arranged to support the head and keep it bent forwards. He had an anodyne for two nights following, after which no further treatment was necessary, and at the end of one week he had

complete control over the movements of the head and neck. Beyond the debility and emaciation immediately dependent upon protracted fasting and loss of rest, he has experienced no uneasiness since the operation. His appetite is now good, and all the functions perform their duty normally. In a subsequent inquiry, to determine, if possible, the cause of the accident, he states that he distinctly recollects going into a store in Atlantic Street, near the ferry, and there having angry words with an acquaintance; that he left the store, and was proceeding up the street (which is here a rather steep ascent), when he was violently struck from behind, over the lower portion of the neck. He likewise remembers falling forwards, and striking against some object, but does not know what it was, nor what took place until the following morning.¹

So far as I know, the only other example of supposed successful reduction of a complete bilateral dislocation of these vertebræ has been reported by Vrignonneau;² but of which Malgaigne expresses some doubt as to whether it was an example of partial or complete dislocation. After alluding to Gosselin's success upon the cadaver, Malgaigne says:³ "Some surgeons have even thought that they had obtained it upon the living subject. M. Vrignonneau was called to see a man 39 years of age, who had just fallen upon the head from a height of six metres. The face was bent upon the chest; the whole body was rigid, and was raised as if all of a piece; the patient, however, could still move his limbs. The surgeon diagnosed—but he does not say how—a dislocation forwards of the fifth cervical vertebra; and at first he did not dare to interfere. The next day, however, all the limbs were paralyzed; the following day death was imminent, as shown by the stertorous respiration and by the almost imperceptible pulse; he then concluded to try the reduction, which was accomplished with a distinct *craquement*. From that time all the symptoms subsided as if by enchantment, and two months later the man could work, there remaining only some stiffness in the neck, especially during the lateral movements, which remained quite limited. I praise the fortunate determination of the surgeon; but I regret that the diagnosis was not more fully established; and even while admitting the forward dislocation, the absence of paralysis(?) leaves one in doubt as to whether it was not an incomplete dislocation, such as those we are about to consider."

§ 4. Dislocations of the Atlas.

Surgeons have met with several forms of displacement between the atlas and axis. First, a forced inclination forwards of the atlas upon the axis; in consequence of which the body or anterior arch of the atlas is made to recede from the odontoid process, and the transverse ligament glides upwards without breaking; so that the extremity of the odontoid process comes to occupy a position underneath or behind the ligament, and thus presses upon the cord. It is apparent, also, that this form of displacement cannot occur without a rupture of the vertical ligaments

¹ Ayres, New York Journ. Med., Jan. 1857, p. 9.

² Vrignonneau, Journ. des Conn., Méd. Chir., t. 1, p. 21.

³ Malgaigne, op. cit., t. 2, p. 363.

which bind the transverse ligaments to the axis; nor without a separation of the atlas from the axis posteriorly and a rupture of the posterior atlo-axoidæan ligament. Second, a similar inclination of the atlas, accompanied with a rupture of the transverse and superior vertical ligaments, in consequence of which also the odontoid process is allowed to fall upon the cord. Third, the atlas in the same position, with the odontoid process broken at its base. Fourth, the atlas displaced directly forwards or backwards. Fifth, a displacement of only one articular process in a direction forwards; and sixth, a displacement of one articular process forwards, and of the other backwards.

I have already, when speaking of fractures of the atlas, or of the atlas and axis together, called attention to several examples of that form of the dislocation which is accompanied with a fracture of the odontoid process. The other forms of dislocation are characterized by so few symptoms peculiar to themselves, or which can be regarded as diagnostic and not already sufficiently studied in connection with other dislocations of the neck, that I shall not deem it necessary to do more than remind my readers, that if permitted to remain unreduced a speedy and fatal issue is inevitable, and to point them to some examples of recovery, after reduction has been fortunately accomplished. These may suffice to show that Dupuytren was in error when he declared that such accidents were wholly beyond the resources of our art.

An old man received upon his head a bundle of hay cast from the top of a wagon. He fell with his head bent forwards so that his chin touched the top of the sternum, and in this position it remained immovably fixed; all the other portions of his body preserving their natural functions. A surgeon, who was indeed the father of Malgaigne, being called, assured the patient, that unless he could give him relief he certainly would die; but that inasmuch as the attempt might itself prove fatal, he ought at once to put in order his affairs. Accordingly the man partook of the sacrament; then the surgeon seated him upon the ground, and placing himself at his back with his knees resting upon his shoulders for the purpose of making counter-extension, and with a towel brought over his own shoulders and under the chin of the patient for extension, he proceeded to act upon the neck in the direction of the axis of the spine. The efforts were long and painful; but at last, while the head was lifted as far as possible, it was suddenly drawn backwards, and immediately it resumed its natural direction. Absolute quietude was enjoined, and the patient recovered in a short time and without any accident.

This patient was seen two years after by the younger Malgaigne, at which time no trace of the accident remained, except an impossibility of turning the head to the right or to the left.

Another example is related by Ehrlich, but in this case the dislocation was backwards. A young man, æt. 16, while carrying a sack of flour up a ladder, fell backwards, and the sack falling over upon his face and head came to the ground before him. He was found lying with his head thrown back and to the right, the head resting upon the scapula of this side, but having so completely lost its "solidity" that by its own weight it would fall from one side to the other. On the front and left side of the neck there existed a prominence supposed to be formed by the atlas;

the patient was unconscious; the pulse was scarcely perceptible, and the whole body was suffering under paralysis. Ehrlich directed the shoulders to be held by one assistant, and the head to be drawn upon by another, while he pressed with his own hands forcibly upon the displaced atlas from behind. After several fruitless attempts, the reduction took place, accompanied with a sound distinctly audible to all of the assistants; the head resumed its position firmly, and the arms began to move. The head was afterwards maintained in place by a bandage. The cure proceeded rapidly, and after a time no trace of the injury remained but a disagreeable tension in the nape of the neck whenever he moved his head briskly to the one side or the other.¹

Peabody,² in the case of a man who had subluxation of the atlas, occasioned by a fall from a height upon his head, and in whom death seemed imminent, succeeded after several trials. The patient was unconscious, his eyes were closed, and his pupils dilated. Immediately upon the reduction having been effected, which was accompanied with a violent *craquement*, the patient opened his eyes, spoke to those who were about him, and complained of pain in the back of his neck. On the following day he could be considered as in his normal condition.

Uhde, Wagemann, and Boettger, of Braunschweig, report a case of bilateral dislocation of the atlas, in which the right inferior articular process of the atlas was displaced forwards, in front of the corresponding superior articular surface of the axis, and the left inferior articular surface of the atlas backwards, behind the corresponding superior articular surface of the axis, as shown by the position of the left transverse process of the atlas. "The patient, a roofer, fell from a height of thirty feet. The head was rotated upon all three of its axes, the right half of the face being turned forwards, the facial line forming an angle with the median line of the body, and the chin thrown forwards, and the forehead backwards. On the left side there was paralysis of the plexus pharyngeus and the hypoglossal nerve; on the right, simply paralysis of the glosso-pharyngeus. Careful anatomical and experimental research proved that the injuries of the nerves depended upon the dislocation. The nervus accessorius W. also suffered at a point corresponding to that on the hypoglossus, and to this the paralysis of the left velum palati, observed in the patient, was attributed; the plexus pharyngeus, of which the anterior branch of the accessorius forms a part, suffering by traction on the trunk of the nerve. The experiments also proved that, in this dislocation the cord is not subjected to pressure, and that the vertebral artery is not injured. The dislocation was partially reduced two days after the accident by extension, extreme flexion of the head on the left shoulder, and rapid rotation backwards and to the right, together with direct pressure upon the left transverse process of the atlas. The condition of the patient improved materially after extension had been made for some time with Glisson's apparatus. After the lapse of several weeks the patient was able to move his head in every direction. Barely a trace of the paralysis remained."³

¹ Malgaigne, Ehrlich. Malgaigne, op. cit., tom. ii. p. 334.

² Peabody, Boston Med and Surg. Journ., 1876, vol. 2, p. 79.

³ St. Louis Courier of Med., Jan. 1879, from Arch. für Klin. Chirurg., Sept. 1878.

Bernhuber¹ treated a young man who had fallen, striking the back of his neck upon a piece of furniture. He lost consciousness, but when a point opposite the atlas was pressed upon he became convulsed. On the second day the convulsions were continuous, and death seemed imminent. The surgeon seized the head with both of his hands, and made traction upwards, when the patient opened his eyes and became conscious. By means of bandages and a gallows the head was maintained in that position. All symptoms at once disappeared, but it was observed that whenever the extension ceased and the head was permitted to fall upon the trunk, the somnolency was prone to return, and for this reason the extension was continued. The patient recovered, with only a slight rigidity of the neck.

§ 5. Dislocations of the Head upon the Atlas, or Occipito-Atlasian Dislocations.

Lassus, Palletta, and Bouisson² have each reported one example of this dislocation. In neither case was the dislocation complete, but death occurred speedily in every instance. Dariste exhibited to the Anatomical Society of Paris, in 1838, a specimen of incomplete dislocation of the occipito-atlasian articulation, with stretching of the transverse ligament; the patient from whom the specimen was taken having lived more than a year after the accident, when he died from a tubercle in the brain.³

Milner, of London,⁴ has reported a case of complete dislocation of the head upon the atlas. A man, æt. 38, fell from a height of seventy feet, and was killed instantly. On examination it was found that all the ligaments uniting the occiput with the atlas were ruptured, and dislocation was complete. The posterior arch of the atlas was fractured; the spinal marrow, the two arteries, and the two vertebral veins were ruptured.

It is unnecessary to say that only in examples of partial dislocation of the head could a hope be entertained that surgical resources would be of any avail; and even in these cases death has, in all the reported examples, taken place too speedily to permit surgical interference.

CHAPTER V.

DISLOCATIONS OF THE RIBS.

THE ribs may be separated from the bodies of the vertebræ, from the cartilages of the ribs, and from each other. The cartilages of the ribs may also be separated from the sternum.

¹ Bernhuber, Denucé, Art. Région Atlasienne, Nouv. Dic. de Med. et de Chir. Prat., t. 3, p. 809. (Poinsot, op. cit., p. 772.)

² Lassus, Palletta, Bouisson. Malgaigne, op. cit., p. 320.

³ Dariste, Amer. Journ. Med. Sci., Nov. 1838, p. 237, from Archives Gén., May, 1838.

⁴ Milner, St. Barthol. Hosp. Rep., vol. x.