

Original Articles.

FURTHER OBSERVATIONS ON CERVICAL DISLOCATION AND ITS REDUCTION.

BY G. L. WALTON, M.D., BOSTON.

CERVICAL dislocation is not a mere medical curiosity, but a pathological condition likely to appear in the practice of any physician or surgeon. Its pitiable results are generally, perhaps always, capable of speedy, safe and complete amelioration. It occurs with sufficient frequency to justify every practitioner in familiarizing himself with the diagnostic features and the method of reduction. The limit of time after which operation is contraindicated has yet to be determined; it certainly exceeds six months.

The frequency of this accident is shown by the fact that, in addition to the eight cases whose details I have previously published,¹ at least as many other cases have come under my observation not presenting peculiarities worthy of separate description. All but three of these cases appeared at the Massachusetts General Hospital.

My attention was first directed to the importance of finding an efficient method of reduction by the case in Dr. Warren's service, in which the most vigorous traction with manipulation failed, but spontaneous reduction was effected later by involuntary movement on the part of the patient following the application of cold water to the spine. This case illustrates the futility of traction and at the same time shows the ease with which reduction can be effected if the proper movements are made. Such movements are not likely to be made voluntarily by the patient on account of the instinctive fear of injury, though in the case of Blasius, a child on the way home from an unsuccessful operation is said to have reduced its own dislocation by pressure upon the neck, the head and shoulders being fixed.

Among the methods practiced prior to 1893 none seemed quite to meet the requirements. Traction with or without abduction and rotation was the keynote. The method proposed by Hueter² and favored by Stimson³ seemed most reasonable; this method consisted of abduction and rotation without traction. Abduction, however, may fail to free the displaced articular process, which is held by the ligaments firmly locked against the anterior surface of the articular process of the vertebra below.

The observation of Dr. Warren's remarkable case induced me to make a careful study of the vertebrae. This study resulted in the conclusion that dorso-lateral flexion, combined if necessary with slight rotation (to enable the upper articular process to pass the brim of the lower articular process), would fulfil the requirements, the vertebra being afterward rotated into place as by the old methods. This plan was first suggested to Dr. Richardson, who demonstrated its

efficiency upon the cadaver, then to Dr. Beach, in whose service the next case appeared at the Massachusetts General Hospital. The details of Dr. Beach's case, with photographs before and after operation, successfully performed by this method, were reported in this JOURNAL.

This method has since received further authoritative surgical endorsement.⁴

Dr. Mixter has recently reduced by this method a case of six months' standing resulting from a railway accident. The final outcome of this case it is too soon to report, as the head is still in plaster, but in the normal position.

I have seen two other cases which have slipped back during the etherization preparatory to operation. One of these was a unilateral case in Dr. Warren's service. The other case was that of a young man whose head was bent into the typical position of left unilateral dislocation during a football scrimmage. I saw him in consultation with Dr. Sherman of West Newton, who was immediately summoned. It was decided to etherize the following morning, and Dr. Perkins, the regular attendant, into whose hands the case passed, and who coincided in this opinion, reports that during etherization a sudden movement on the part of the patient restored the head to its normal position.

The following case is of interest on account of its etiology, as well as illustrating the ease with which spontaneous reduction may take place while the patient is relaxed in sleep:

CASE. C. V., twenty-eight, an architect, a tall man of slender build and long neck, active in movement, but not especially athletic, consulted Dr. Paul (at whose request I also saw him) Dec. 3, 1901, for a displacement of the neck which he had produced three hours before by a violent movement made during the act of brushing the hair with military brushes. The patient presented the characteristic attitude of right unilateral dislocation; the head was tilted as well as rotated to the left, showing that the articular process had not fallen into the intervertebral notch. Operation was advised and accepted, and the patient entered the Massachusetts General Hospital in Dr. Warren's service. On awaking the following morning the patient found his head restored to its proper position, the spontaneous reduction having occurred during sleep. No further treatment was needed.

Dr. Beach has kindly furnished me the following reports of two other cases coming under his observation:

CASE. Patient, a child between six and seven years old, living in Edgartown; was brought to me one week after a fall from a hammock. It was not known how she struck the earth, but her neck was stiffened by the tenderness and rigidity of the muscles on each side, and permitted very little motion of the head. When examined there was a distinct and considerable projection

¹ Boston Med. & Surg. Journ., March 21, 1880; *Idem*, May 8, 1890; *Idem*, Dec. 7, 1893. Journ. Nervous and Mental Diseases, 1889.

² International Clinics, 1892, 2d series, p. 207.

³ Langenbeck's Archiv. Bd. IX, s. 946.

⁴ Fractures and Dislocations. New York, 1888.

⁴ Keen in Dennis' System of Surgery, 1895. International Text Book of Surgery, Warren, Gould, 1900. Scudder: The Treatment of Fractures, fourth edition.

of the bodies of two vertebrae into the pharynx as seen from the mouth. There was also a distinct concavity on the dorsum of the neck at a point corresponding with the second and third cervical spinous processes. No attempt was made at reduction on account of the change in the rigidity of the muscles following the accident. I sent word to her attending physician, Dr. Thomas J. Walker of Edgartown, that I hoped he would preserve the anatomical appearances by a plaster cast. Before that could be obtained spontaneous reduction took place, as will be seen by the following quotation from Dr. Walker's letter of July 1:

DEAR DOCTOR: I am very sorry to report to you that the time when I could have made a valuable cast of the injury of our little patient had gone by before I got time to attend to it. She did not get any sleep from 4 A.M. Saturday until that night, when she slept very soundly, during which sleep no doubt the system became thoroughly relaxed. On my visit in the morning (Sunday) I found the cervical vertebrae in perfect position and free motion of the head in every direction.

(Signed)

T. J. WALKER, M.D.

CASE. C. McL. entered the Massachusetts General Hospital May 8, 1890. Seventeen days ago, while running around a corner, turned her head sharply, upon which it was caught, and it has remained in that position since. Has had considerable pain in neck and head. Patient, an apparently healthy child, walks about with ease. Head in position of decided wry-neck, turned sharply to the right, sterno-mastoids flaccid, slight amount of antero-posterior motion to head, lateral motion very slight, head cannot be brought to median line, spine of third vertebrae felt out of position one-half inch from median line to the left. Right side higher than left. Right side of back of neck concave, left side convex.

May 18. Poultice to neck after consultation with the staff. She was given ether, breathed quietly for a few seconds, then struggled suddenly and the dislocation was reduced. Motion of the head possible in all directions.

May 19. Head fairly moveable, but with some pain.

May 20. Head in good position, supported by tin internal angular splint.

May 21. Splint not satisfactory. Head resumes the former position.

May 22. Patient in bed, poultice applied.

May 23. Moves head quite freely and without pain.

June 1. Poultice omitted.

June 2. Neck much stiffer, poultice applied.

June 6. Mobility returning. The motion varies much on different days. It has been noticed that when patient is asleep the head is freely movable.

June 10. Patient measured for wry-neck apparatus.

June 12. To return in two weeks for apparatus.

Nov. 10. Returns wearing apparatus. Can move head freely, no deformity. Dispense with apparatus.

Nov. 20. Perfect result. Moves head freely in all directions. No pain or tenderness, no deformity or displacement.

In the seven cases, then, coming to my knowledge since proposing this method of reduction, two have been replaced in sleep, three during etherization and two by the operation itself.

The success of the method in the cases which came to operation, together with the general lack of familiarity with the subject, will perhaps justify a recapitulation of the salient features of this dislocation and its relief.

Mechanism of the dislocation. — In the lumbar and dorsal regions the articular processes are so upright that dislocation can hardly occur without fracture. But the articular processes in the cervical region are so nearly horizontal that a process of one vertebra can readily slip forward over that of the vertebra below and fall into the intervertebral notch. More rarely both of the articular processes of a vertebra may be displaced, probably successively rather than simultaneously.

With regard to the position assumed by the head in these cases, let us suppose an articular process on the left has slipped over; the head will be rotated with the face to the right. If the articular process has slipped down into the notch the head will be tilted to the left, the face being still rotated to the right. If the articular process has become caught on the crest of the process below, the head will be tilted to the right as well as rotated to the right. *The side on which dislocation has occurred can always be determined, therefore, by the direction of rotation; the question whether the articular process has slipped into the notch* (a matter of secondary importance, inasmuch as the movement of reduction is the same in both cases) *may be determined by the tilting of the head.* In case bilateral dislocation has occurred, the head will be carried forward and tilted directly backward.

Diagnosis. — The only conditions with which dislocation is likely to be confused are torticollis and vertebral disease (tubercular caries). In case of torticollis, assuming the head to be rotated to the right and the head tilted to the left, this movement will have been produced by the sterno-mastoid muscle on the left, which will therefore be contracted. If this position is assumed in unilateral dislocation, on the other hand, the left sterno-mastoid will be lax, but the right will be put more or less upon the stretch. In cervical caries the history is the important diagnostic factor.

In the majority of cases of unilateral dislocation no paralysis occurs, sufficient of the lumen being left for the safe passage of the spinal cord, the nerve roots also escaping pressure. In the unilateral cases coming under the writer's observation, paralysis (obviously from root pressure) occurred in two only. In the case of bilateral dislocation spastic paralysis of the lower extremities indicated pressure upon the spinal cord itself.

Operation. — The method of reduction will be made clear by the following diagram (Fig. 1):

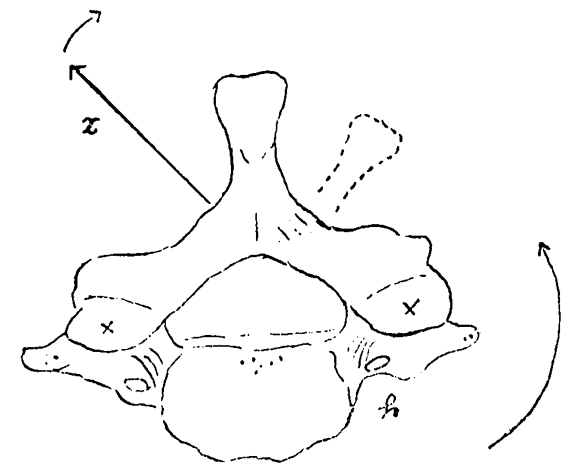


FIG. 1. Diagram of upper surface of lower vertebra, arrows indicating movements for reduction.

This diagram shows the upper surface of the lower of the two vertebrae concerned, that is, the one in normal position. The articular processes of this vertebra are marked XX. The left articular process of the vertebra above having slipped into the intervertebral notch (Y), the situation of the spinous process of the dislocated vertebra will be indicated by the dotted lines. The direction in which the head must be tilted for reduction is indicated by the line Z (in other words, if the patient is facing north the head must be tilted southeast). Slight rotation in the direction of the short curved arrow on the right of the diagram may be necessary to free the process. After the articular process is freed, rotation into place in the direction of the long curved arrow on the left of the diagram will complete reduction. In case the right articular process is displaced by the dislocation, these movements must be reversed.

The patient should be in the sitting position for the operation, and the head should be rocked without traction, for traction only lessens the effectiveness of the fulcrum necessary to reduction.

LESIONS THAT AUGMENT THE DEVELOPMENT OF TETANUS AND OTHER INFECTIONS IN GUNSHOT WOUNDS.

BY LOUIS A. LAGARDE, M.D., WASHINGTON, D.C.

THE object of this paper is not so much to discuss the lesions that predispose to infection in gunshot wounds as it is to point out the histological anatomy of such wounds as revealed by microscopic sections.

Gunshot wounds are often referred to as punctured, penetrating or perforating wounds, such as are apt to be inflicted by any blunt instrument wielded with sufficient force. This idea is correct only within limits. A punctured wound from a blunt instrument exhibits lacerations and contusions in and immediately around the area of injury, while a punctured wound by a bullet propelled by a certain degree of velocity will

exhibit loss of tissue and lacerations, not only in the immediate vicinity of the channel made by the projectile, but lesions will appear in the parts beyond to an extent dependent upon:

- (1) The sectional area of the bullet.
- (2) Its velocity.
- (3) The resistance encountered on impact.

The greater the velocity or sectional area of the bullet, the greater will be the lesion in the surrounding tissues; and in those instances when the velocity is great, and the resistance on impact is unyielding, as in the case of a ball colliding with the shaft of a long bone like the tibia or femur, the destructive effects are enormous. These effects are so extensive that the wounds produced in this way are referred to as explosive wounds, or wounds showing explosive effects. It is not necessary to resort to the latter class of wounds to study the lesions that are thus created; in fact, microscopic sections of gunshot wounds in soft parts reveal all the characters of gunshot wounds sufficiently for the purpose of study.

Aside from the microscopic studies of the contused area, we know that the tissues are injured beyond the track of the bullet by certain appearances, which reveal themselves in the history of such cases. Thus slough often occurs in the skin beyond the margins of entrance and exit. Later, when healing is well along, a cord marking the track of the bullet running in the soft parts between the two external wounds is easily discernible to the sense of touch.

In recent studies upon the character of the various tissue lesions Strick has shown that hematوماتa especially predispose to the development of infections. He was able to show that hematوماتa in wounds increase the susceptibility to infection from tetanus a thousand times more than exists in a clean incised wound. More recently we have demonstrated that burn, as in toy-pistol wounds, adds to the susceptibility, and that animals infected in a cut made by a red-hot knife, with a certain spore mass of tetanus, died in every case, while animals similarly infected in incised wounds made with a cold knife lived in every instance.

Dr. Lardy, in the Greco-Turkish war, in commenting upon the conditions found in 95 infected gunshot wounds out of a total of 469 cases, gives the following:

Pieces of cloth in wound carried by the ball	13
Hematوماتa	3
Fragments of bone acting as secondary missiles	29
Lodged balls	22
Cause of suppuration undetermined	28
Total	95

In this estimate we must conclude that the percentage of cases showing hematوماتa is small in view of the twenty-nine cases which presented fragments of bone lodged as secondary missiles. Each one of these fragments was displaced by the force of impact, which of necessity possessed energy enough to rupture the tissue about it, and there was doubtless a corresponding degree of hematوماتa.