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INJURIES

OF THE SPINE

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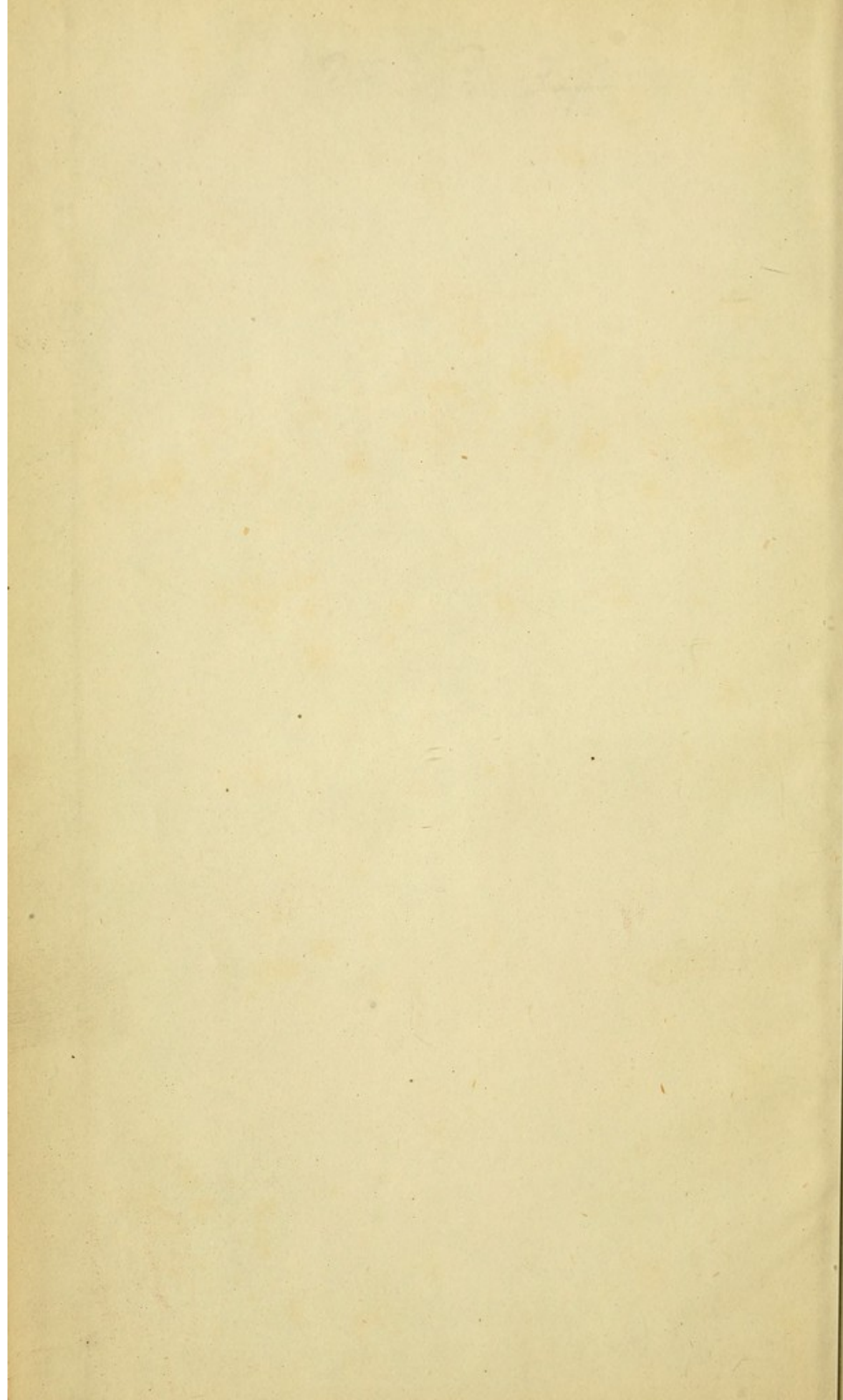
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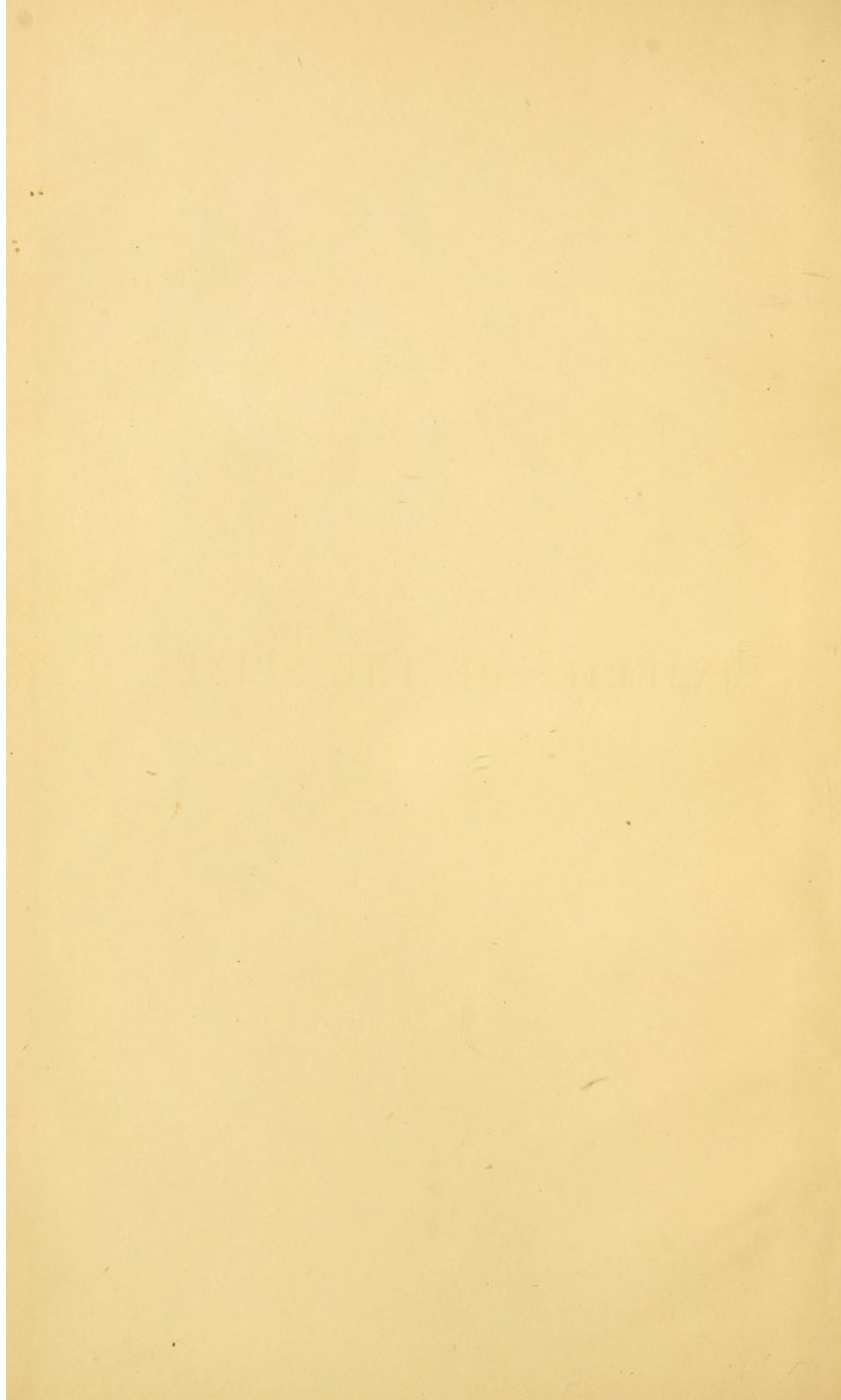
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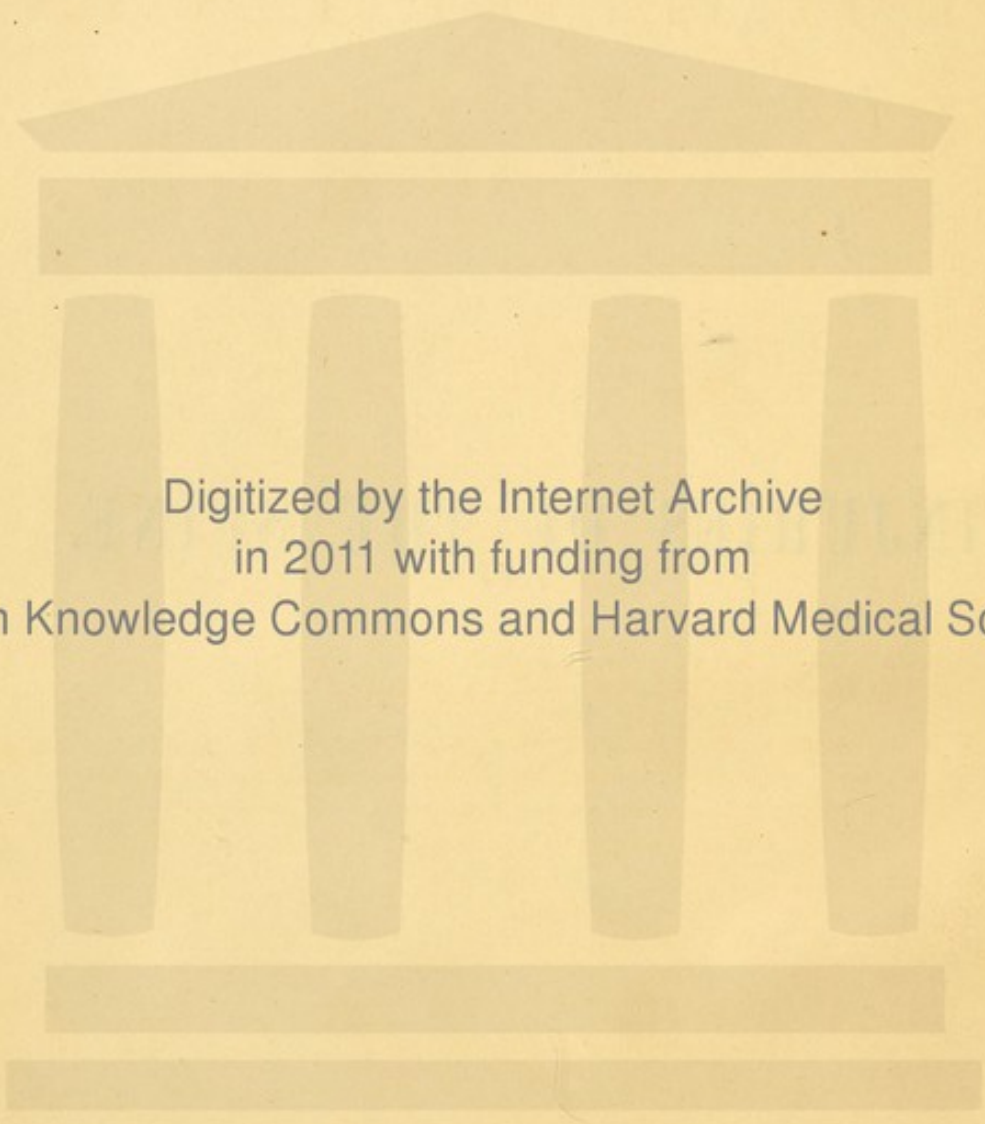




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INJURIES OF THE SPINE.



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WITH AN

ANALYSIS OF NEARLY FOUR HUNDRED CASES.

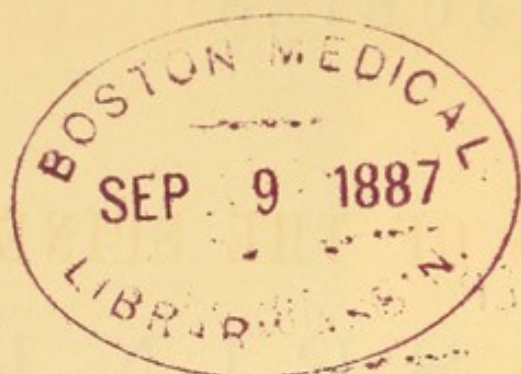
BY

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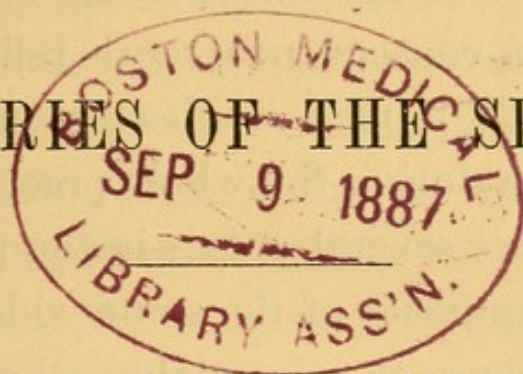
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INJURIES OF THE SPINE.



INJURIES of the head have been looked upon with great interest by writers on surgery from the earliest days of our art, and the works of surgical authors, from the time of Hippocrates to the present day, abound in observations and instructions with regard to the management of that class of affections.

Injuries of the spine, however, whether, as suggested by Sir Benjamin Brodie, because the spine has been considered as a mere appendage to the head, or possibly on account of the confessedly hopeless nature of many of these injuries, have received but comparatively little attention; and we find the same remarks and the same cases quoted (and not unfrequently, it must be acknowledged, misquoted) from book to book, without any apparent effort on the author's part to ascertain the correctness of his predecessor's observations.

In the early part of the present century, a controversy which arose between Sir Charles Bell and Sir Astley Cooper, as to the propriety of treating frac-

tures of the spine by trephining or resection, excited great attention in the minds of the surgical profession, and, as a consequence, more reliable information upon spinal injuries has been accumulated since that time than during the whole preceding period.

But there are several points in the pathology and treatment of injuries of the spine which are yet undecided; among them, notably, the propriety of spinal resection, the very matter so energetically, if not always courteously, debated by the two great authorities referred to; and it is as a contribution toward the settlement of these vexed questions that this essay is respectfully submitted.

I am not aware that any attempt has been hitherto made to obtain statistics upon these points from collected clinical records; and the rarity of this class of cases, or at least of such as admit of careful clinical study, is so great, that it is impossible for any observer to find in his individual experience a sufficiently large number to warrant a positive expression of opinion.

Of 1901 fractures treated during six years at the Middlesex Hospital, only 8 were fractures of the vertebræ,* while it is stated by Malgaigne that but 14 such cases were met with at the Hôtel Dieu in eleven years.

* Lonsdale: Treatise on Fractures.

The experience of the Pennsylvania Hospital shows likewise the rarity of these injuries. Thus in ten years, from 1830 to 1839 inclusive, there were treated but 8 cases of fractured spine, and 1 of spinal dislocation;* while the record of fractures kept at the same hospital during the past fourteen years shows that the vertebræ were affected in but 24 out of nearly 4000 cases treated during that period.

Before entering upon a discussion of the symptoms and treatment of spinal injuries, it may be well to consider briefly a class of cases which, though probably of more frequent occurrence than any other, but seldom come under the notice of the surgeon. These are cases of spinal concussion or contusion. The majority of these cases, like those of concussion or contusion of the brain, are of but slight importance; and though fatal cases have been from time to time recorded, they are even in slighter proportion than in cases of contused brain. The reason for this is not merely, as might be supposed, on account of the greater importance of the brain to the maintenance of life, but is in a great measure due, as recently pointed out by Dr. Lidell, to the mechanical arrangement by which the spinal cord floats loosely in an elastic medium (the cerebro-

* Norris: Am. Jour. of Med. Sci., 1841.

spinal fluid) within its bony case, while the brain fits so closely to the skull as to be much more exposed to injury.*

CASE.—A male child of two years was admitted to the Pennsylvania Hospital on November 13th, 1861, having a short time previously received a severe blow upon the back. There were no external marks of injury, but the lower limbs were paralyzed, doubling up upon themselves when an effort was made to place the child in an erect position. He was discharged, cured, after two months, his treatment having consisted in little else than rest in a recumbent posture.

The cause of paralysis in some of these cases is rather obscure. In fatal cases the post-mortem appearances have generally consisted in effusion of blood, with more or less softening of the cord structure; but in some cases which have recovered, the paralysis has been so ephemeral as to give rise to the impression that its cause has been congestion rather than actual extravasation.

As a case of the first class may be instanced that reported by Dr. Kirkbride,† in which paralysis did not come on for two days, and was not complete for

* Lidell: *Am. Jour. Med. Sci.*, N. S., vol. xlviii.

† *Am. Jour. Med. Sci.*, O. S., vol. xv.

two days longer, death ensuing on the fifth, and the autopsy showing extravasation of blood and softening of the spinal cord without either fracture or dislocation. On the other hand, a case which recovered is reported by Dr. J. S. Hughes,* in which paralysis of the lower extremities came on immediately, but disappeared in four hours, being followed by paralysis of the upper extremities, which ultimately disappeared as well.

Boyer has reported fatal cases of contusion of the spinal cord, in which, after death, no morbid appearances could be detected in either cord or membranes; but I suspect, if he had had the more accurate means of observation afforded at the present day, the structure of the cord substance would not have been found unaltered.

Contusions of the spinal cord, like those of the brain, do not always manifest their bad effects until after a considerable interval of time. Thus a case is reported by M. Jules Luys† of a servant-girl aged 28, who fell from a chair while engaged in some household duty, but thought herself so slightly injured that she continued at her work till evening. She died after twelve days, an autopsy showing apoplexy of the membranes and congestion of the sub-

* Am. Jour. Med. Sci., N. S., vol. xxxiv.

† Recueil des Travaux de la Société Médicale d'Observation, t. i.

stance of the cord in the lumbar region, with apoplexy of the left ovary.

Dr. W. A. Hammond treated a girl for chronic myelitis eleven months after the receipt of an injury in the sacro-lumbar region;* while Dr. Hughes, in the paper already referred to, mentions having seen a case of spinal contusion followed by cerebro-spinal meningitis. Similar cases have been also recorded by Sir Charles Bell.†

The treatment of these cases in the early stage may be almost summed up in the one word—*rest*. Their different complications and sequelæ demand of course special attention in themselves. Dr. Hammond's case recovered under the administration of ergot as the principal remedy.

The majority of cases of spinal injury which come under the observation of the surgeon are those of fracture, or of dislocation, or of fracture with dislocation conjoined. A few cases are also on record where the spinal cord has been wounded without any injury to the vertebræ, and a few in which the intervertebral cartilages and ligaments have been ruptured, without fracture and without displacement of the vertebræ themselves. Many authors have doubted the possibility of vertebral dislocation without fracture, and Sir Astley Cooper stated that

* Am. Med. Times, 1861.

† Surg. Obs.

such a case had never come under his notice.* On the other hand, many cases have been reported as dislocations, in which slight fractures were proved by post-mortem inspection to have existed. There can be no doubt, however, that pure dislocation has occurred frequently in the cervical region, and occasionally even in the dorsal and lumbar portions of the vertebral column. Of 394 cases of spinal injury, the clinical histories of which I have examined, no less than 124, or 31.47 per cent., are reported as pure dislocations; while 195, or 49.49 per cent., are reported as pure fractures, and 53, or 13.45 per cent., as fractures with dislocation conjoined. I strongly suspect that in some of the cases reported as dislocations, there must have been slight bone lesions as well, and that the name diastasis would be therefore more appropriate than dislocation. As, however, a positive diagnosis can only be made in many instances by post-mortem inspection, and as the symptoms of all these injuries are much the same, and the proper treatment, as I shall endeavor to show, not materially different, it will be more clinically correct, as well as more convenient, to discuss them together, than to separate them according to their exact anatomical peculiarities.

The following table will exhibit the relative fre-

* Treatise on Dislocations and Fractures of Joints, p. 539.

quency with which the several regions of the spine have been affected in recorded cases of injury:

Cervical region alone affected in	208,	or 52·79 per cent.
Cervical and dorsal regions affected in..	4, “	1·02 “
Dorsal region alone affected in.....	106, “	26·90 “
Dorsal and lumbar regions affected in ..	20, “	5·08 “
Lumbar region alone affected in.....	37, “	9·39 “
Region not clearly indicated affected in	19, “	4·82 “

The large proportion of recorded injuries in the cervical region is, I believe, to be accounted for on the ground that these cases being but too often rapidly fatal, excite naturally a great deal of interest in the mind of the observer, and are therefore more frequently thought worthy of publication than those of injury in the dorsal or lumbar spine, which linger on from month to month, passing successively under the care of different surgeons, and looked upon by each as equally tedious and unsatisfactory.

It has long been recognized that the risk from injuries in the lower part of the spinal column is less than when the lesion is nearer the brain; thus Fallopius states distinctly that wounds of the lower part of the spinal cord are not necessarily fatal;* Morgagni, however, was of the opinion that injuries of the cauda equina were more rapidly fatal than where the cord itself was involved.†

* Opera Medica, t. ii. p. 164.

† De Sed. et Caus. Morb., t. iii. pp. 148-9.

As a rule, the higher is the part injured, the gloomier is the prognosis, and the more rapidly is death apt to supervene; the exceptions being generally such in appearance only, and explicable by the injury of the cord having extended higher than the point of external lesion.

Injury of the cord above the third cervical vertebra is commonly followed by immediate death; and Mahon, in experimenting upon dogs, found that the slightest touch of a stylet between the first and second cervical vertebræ proved instantly fatal.*

As the nature and causes of injuries of the spine differ in the different regions affected, they can be better studied by taking up first the injuries of the cervical region, and reserving those of the dorsal and lumbar portions for a subsequent page.

Of 394 cases, the histories of which I have examined, the cervical spine was affected in 212, or 53·81 per cent.; rather more therefore than half of the whole number.

Of these 212 cases, 104, or 49·06 per cent., are reported as dislocations; 66, or 31·13 per cent., as fractures without dislocation; and 34, or 16·04 per cent., as fractures accompanied with dislocation.

In 5 cases (2·36 per cent.) the spinal cord was wounded without injury to the vertebral canal,

* Médecine Légale, t. iii. p. 58.

while in 2, or 0·94 per cent., there was rupture of the intervertebral cartilages and ligaments without displacement; and in 1 (0·47 per cent.), which apparently proved fatal from other causes, the odontoid process constituted a separate bone, and articulated with the rest of the axis by means of a false-joint.

As will be perceived by comparing the proportion of dislocations in the cervical region (49·06 per cent.) with the proportion of those injuries in the spine taken as a whole (31·47 per cent.), the former greatly exceeds the latter; and this is what might be expected not only from the different anatomical structure of the vertebræ in the several parts of the spine, but also from the fact pointed out by Mr. Shaw, that in the dorsal region the ribs serve the purpose of splints in preventing displacement.*

It should, however, be mentioned that other observers have placed the proportion of spinal dislocations even higher than I have been led to do from my own investigations; thus Mr. Bryant states that in 17 autopsies made at Guy's Hospital in cases of spinal injury, during six years, no less than 6, or 35·29 per cent., were proved to have been pure dislocations.†

* Holmes: System of Surgery, vol. ii.

† Guy's Hospital Reports, 3d S., vol. v.

With regard to the sexes of those who met with injuries of the cervical spine, more than three-fourths of the whole are found to have been males. The figures stand thus: males, 162, or 76·42 per cent.; females, 21, or 9·90 per cent.; and the sex not stated in 29, or 13·68 per cent.

No age appears to be exempt from these injuries, though the majority are found in the most active period of adult life. Galen taught, following Hippocrates, that dislocation of the vertebræ was an affection of childhood, subsequent to teething and previous to the age of puberty.* In this statement, however, he, in common with all the authors of antiquity down even to the day of Ambrose Paré, confounded vertebral dislocations with spinal curvatures from causes other than traumatic. Of the cases which I have collected, 22, or 10·38 per cent., were less than 20 years of age; 75, or 35·38 per cent., were between 20 and 50; while 17, or 8·02 per cent., were more than 50 years old. In the remainder the age is not mentioned. The youngest was a child of 8 days, which was killed by its mother, and the oldest a man of 74 years, who met with his injury by falling down stairs.

The *causes* in 212 cases of injury to the cervical spine may be compendiously seen in the following table:

* Opera, ed. Kühn, t. v. p. 695.

Falls.....	93, or 43·86 per cent.
Blows.....	32, “ 15·10 “
Falls and blows (simultaneous)	9, “ 4·24 “
Gunshot wounds	16, “ 7·55 “
Muscular action.....	10, “ 4·72 “
Hanging	5, “ 2·36 “
Other causes.....	10, “ 4·72 “
Not ascertained.....	37, “ 17·46 “

The injuries were ascertained to have been from direct violence in 62 cases (29·25 per cent.), and from indirect violence in 44 cases (20·75 per cent.).

In 5 cases (2·36 per cent.), the injuries were self-inflicted; once by a pistol-shot, and four times by hanging.

Gouey supposed that fractures of the bodies of vertebræ could only take place when caused by gunshot wounds; Heister, however, contradicted this from his own experience, stating that he had seen such fractures followed by death, and caused by falls.*

Much discussion was at one time excited among French surgeons by the fact that in the autopsies of prisoners executed by hanging at Lyons, there was universally found a dislocation between the first and second vertebræ, whereas this lesion was not observed among those executed at Paris and elsewhere. Louis explained the discrepancy by ascertaining that the difference depended on the peculiar

* Inst. Chirurg., t. i. p. 199.

modus operandi of the hangman at Lyons, who was in the habit of taking a seat upon the shoulders of his victims and twisting their heads until he heard a crack in the neck.*

Several cases are recorded where children dislocated the odontoid process in turning somersaults, and it is stated by Marjolin that in very young persons the odontoid process is so short that it may pass behind its restraining ligament without rupture of the latter.†

To discuss the various accidents which caused the injuries in the cases collected would occupy too much space for the design of this essay, and the reader is therefore referred to the tables appended, where will be found briefly set forth the principal facts in reference to each case.

Before considering the symptomatology of spinal injuries, it will be well to glance briefly at the nature and causes of those occurring in other than the cervical region.

In 130, or 32·99 per cent. of the cases collected, the dorsal spine was affected; in 106, or 26·90 per cent., the injuries being confined to this region. Of these 130 cases, only 17, or 13·08 per cent., are reported as dislocations; a remarkable diminution

* Boyer: Surgical Diseases, etc., transl. by Stevens, vol. ii. p. 230.

† Dict. de Médecine, t. xiii. p. 383.

from the proportion of these injuries in the cervical region. Nearly two-thirds of the whole—85, or 65·39 per cent.—were fractures without dislocation, and 21, or 16·15 per cent., fractures with dislocation conjoined. Of the remainder, 5 (3·85 per cent.) were wounds of the spinal cord without injury to the vertebral canal, and 2, though reported as fractures, I suspect to have been really of a different class of injuries. In the *Edinburgh Medical and Philosophical Commentaries*, vol. vi. p. 71, is a paper by Mr. Charles Hall, describing a form of paralysis dependent on what he terms a gradual starting out of one or more vertebræ; and he states that in these cases a spontaneous cure may be anticipated, the contiguous vertebræ gradually curving outward likewise, and thus relieving the cord from compression. Under this head I think should probably be placed the two cases referred to, as well as those reported by Dr. John H. Packard of this city.*

More than four-fifths of those who received injuries of the dorsal spine were males, their number being 107, or 82·31 per cent. Only 8, or 6·15 per cent., are stated to have been females, the sex of the remainder not having been ascertained.

Ten, or 7·69 per cent., were less than 20 years of age; 67, or 51·54 per cent., between 20 and 50;

* *Am. Jour. Med. Sci.*, vol. xxxvii., N. S., p. 62.

while only 3, or 2·31 per cent., are known to have been more than 50 years old. The age was not ascertained or not stated in the remaining 50 cases.

The *causes* in 130 cases of injury of the dorsal spine may be seen in the following table :

Falls	53, or 40·77 per cent.
Blows.....	32, " 24·61 " "
Falls and blows (simultaneous).....	2, " 1·54 " "
Gunshot wounds	10, " 7·69 " "
Other causes.....	8, " 6·15 " "
Not ascertained	25, " 19·23 " "

The injuries were produced by direct violence in 41 cases, or 31·54 per cent. of the whole, and by indirect violence in 10 cases, or 7·69 per cent.

The *lumbar* region of the spine I have found to be affected in 57 cases, or 14·46 per cent. of the whole number. Of these, only 3, or 5·26 per cent., are reported as dislocations, a still smaller proportion than was found in the dorsal region; a fact which proves, I think, that the comparative mobility of the several parts of the spine has little if anything to do with their relative susceptibility to dislocation, the lumbar vertebræ being quite as mobile as the dorsal. By far the largest number of these injuries of the lumbar spine were fractures; the figures are 46, or 80·70 per cent. of the whole: 4, or 7·02 per cent., are reported as fractures with dislocation, and 1 (1·75 per cent.) as a wound of the

spinal cord; while in 3 (5·26 per cent.) the exact nature of the injury was not ascertained.

Fifty-two of the 57 (91·23 per cent.) were males; 3, or 5·26 per cent., being females, and the sex of the two others not known.

Eight, or 14·04 per cent., were under 20 years of age; 23, or 40·35 per cent., between 20 and 50; and 6, or 10·52 per cent., over 50 years old. The ages of the remaining 20 were either not known or not stated.

The following table will give the *causes* in these 57 cases of injury to the lumbar spine:

Falls	20, or 35·09 per cent.
Blows.....	15, " 26·32 "
Falls and blows (simultaneous).....	1, " 1·75 "
Gunshot wounds.....	13, " 22·81 "
Other causes.....	3, " 5·26 "
Not ascertained.....	5, " 8·77 "

The injuries were found to have been produced by direct violence in 25, or 43·86 per cent. of the cases, and by indirect violence in 5, or 8·77 per cent.

Suicide by a gunshot wound was the cause of injury in 1 case (1·75 per cent.).

There yet remain to be considered the nature and causes of 19 cases of spinal injury, in which the locality is not definitely stated.

Of these, 2, or 10·53 per cent., are reported as pure dislocations, and 14, or 73·68 per cent., as uncomplicated fractures; 1 as a wound of the spinal cord (5·26 per cent.), and 2 the nature of which was not positively ascertained, though supposed by their

observer, Mr. Liston, to have been cases of laceration of the intervertebral ligaments, without either fracture or dislocation.

Thirteen of the 19, or 68·42 per cent., were males, and 2, or 10·53 per cent., females, the sex of the remaining 4 not being stated.

Four (21·05 per cent.) were between 20 and 50 years old, the ages of the rest being either not known or not recorded.

The *causes* were as follows: falls, in 6, or 31·58 per cent.; blows, in 2, or 10·53 per cent.; other causes in 5, or 26·32 per cent.; and not stated in 6, or 31·58 per cent.

Direct violence is known to have caused the injury in 1 case (5·26 per cent.), and indirect violence in 2, or 10·53 per cent.

It will be seen from the above considerations that falls have been the most frequent causes of injuries of the spine. In two cases death resulted from falling backward from a fence, a distance of only a few feet, while in several instances fatal injuries have been produced by falls in the attempt to turn somersaults; the latest case of this kind was reported by my friend, Surgeon Gray, of the regular army, in the number of the *American Journal of the Medical Sciences* for July, 1866. It will also be observed that more than one-seventh of the whole

number of cases have been attributed to indirect violence—the counterstroke of the older writers; and Justamond observes that in some cases, even when the immediate effects appear but slight, falls by counterstroke produce lumbar abscesses with secondary disease of the vertebræ and ligaments.*

The comparatively small number of cases reported as produced by gunshot wounds, is no doubt owing to most of these cases proving fatal either on the field of battle or shortly afterward, and not therefore finding their way into contemporaneous medical literature.

The next point to be studied with regard to spinal injuries is their symptomatology; and here I shall adopt in the main the classification used by Sir Benjamin Brodie, in his admirable “Observations,” in the twentieth volume of the *Medico-Chirurgical Transactions*.

By far the most frequent symptom in injuries of the spine, whatever be the region affected, is *paralysis of the voluntary muscles* below the seat of injury. I find this phenomenon noted in 120 out of 212 cases occurring in the cervical portion, being 56·60 per cent., while its absence is noted in but 11 cases, or 5·19 per cent. It occurred in 73 out of 130 cases where the dorsal region was involved, or 56·15 per

* Surgical Tracts, Houlston's ed., pp. 280 *et seq.*

cent., and was absent in 12 cases, or 9.23 per cent. Its presence is noted in 26 out of 57 (45.62 per cent.) cases of injury of the lumbar spine, and in 9 out of 19 (47.37 per cent.) cases in which the locality is not indicated; while its absence is mentioned in but 8 (14.04 per cent.) of the former class, and in 1 (5.26 per cent.) of the latter.

No doubt motor paralysis existed in many cases where its presence was not specially noted; either from death ensuing before a careful examination could be instituted, or from other lesions so complicating the injury as to make a thorough examination impossible. Thus in a case which occurred at the Episcopal Hospital during my last term of service, a fracture of the lumbar vertebræ was accompanied with fractures of both legs and one thigh, so that, though both lower extremities lay perfectly helpless upon the bed, I was not able to say certainly, during the short interval that elapsed before the patient's death, whether or not he was actually paralyzed.

In injuries below the second lumbar vertebra, if paralysis exist at all, it is generally partial and temporary; as the spinal cord itself does not usually continue below this point, and the cauda equina is comparatively free from risk of injury. Below the eleventh dorsal vertebra, the paralysis is generally not so complete as when the injury is above; for the

cord is protected in this part by the roots of the cauda equina.

As a rule, paralysis does not extend to parts which are supplied with nerves arising higher than the seat of injury; and sometimes the exact point of lesion can be accurately determined in this way. Thus Mr. Erichsen has seen two cases of fracture of the sixth cervical vertebra, in which there was paralysis of the ulnar side of the forearm, and not of the radial; thus fixing the point of injury as below the origin of the external cutaneous and radial nerves, and yet higher than the origin of the ulnars.* There are, however, some exceptions to this rule. Thus in a case of Mr. Stafford's, paralysis of both upper and lower extremities accompanied a fracture of the lumbar vertebræ, and a similar case occurred in the practice of Sir Benjamin Brodie. These are, however, as stated by the latter, probably exceptions in appearance only, a contusion or other injury to the cord in its upper part coexisting with the more patent injury below.† Again, in some rare cases there may be paralysis of the upper extremities, while the lower have never lost or have regained their power of motion, as in Dr. J. S. Hughes's case already referred to, and in one reported by Mr. Arnott in the *Lancet* for 1851.

* Science and Art of Surgery, p. 298.

† Medico-Chirurg. Trans., vol. xx.

Brodie also refers to cases quoted by Velpeau, in which the spinal cord was said to have been completely divided without any paralysis ensuing. In these cases, either the injury must have been very low down, below the origins of most of the spinal nerves, as suggested by Prof. Brown-Séquard,* or, as seems to me more probable, and as plainly indicated by Brodie himself, the division was not so complete as was imagined, enough fibres remaining uncut to preserve the communication between the brain and the parts below.

Not only can the seat of the cord lesion be ascertained from observation of the parts paralyzed, but the extent of the lesion has also been accurately determined before death, by observing what muscles can be made to contract by electricity. Thus M. Landry, in a case of dislocation of the fifth dorsal vertebra, found that the muscles of the thigh ceased to respond to electricity, while those of the leg, though equally paralyzed, continued to contract when submitted to the electric stimulus. The autopsy showed that the part of the spinal cord whence arose the femoral nerves was disorganized, while the part below which gave off the crural nerves was quite healthy.

Thus the fact that each segment of the cord con-

* Lectures on the Central Nervous System, p. 224.

stitutes a separate nerve centre, furnishes a means of most accurately diagnosing the extent of injury which the cord has received.*

Paralysis of voluntary motion is generally symmetrical—that is to say, it extends equally on both sides of the body. Mr. Liston, however, attended a case of fractured spine in which there was loss of motion on one side, and of sensation on the other.† This is of course to be explained by the injury affecting one side only of the spinal cord, as in Dr. J. Hughlings Jackson's case of stab-wound of the cervical region, where there was loss of motion and ptosis on the side of the lesion, with loss of sensation on the opposite side.‡

The next symptom which claims our attention in injuries of the spine is the existence of *muscular spasms*, in some cases even amounting to *convulsions*. This symptom I find noted in connection with injuries of the cervical region in 7 out of 212 cases, or 3·30 per cent., and of 130 cases affecting the dorsal spine, in 3, or 2·31 per cent.

Sir Benjamin Brodie supposed that this symptom indicated compression of the spinal cord, and states

* Landry: Recueil des Travaux de la Société Médicale d'Observation, t. i. p. xvii.

† Elements of Surgery, p. 466.

‡ London Hospital Reports, vol. i. p. 374.

that he had "not met with any case in which it was proved by dissection that this symptom existed in combination with disorganization of the cord, and independently of pressure on it." I am disposed to agree with this statement, as applied to spasms occurring in the early stage of spinal injuries, from an examination of the cases which I have collected; though the value of this symptom for diagnostic purposes is diminished by the fact that the cord has frequently been found compressed after death, though no muscular spasms were present during life.

Epileptic convulsions were found to follow a blow on the back of the neck in a case recorded by Bohn.*

Loss of sensation generally accompanies and is co-extensive with motor paralysis in injuries of the spine. So complete has been the anæsthesia in some cases, that the patients have been totally unconscious of severe injuries received in the paralyzed parts.

Thus Dr. F. H. Hamilton, Jr., met with a case of fracture in the cervical region with compression of the cord, in which a compound fracture of the thigh escaped the attention of both patient and attendants, and was only accidentally discovered after

* Mahon: Médecine Légale, t. iii. p. 59.

some time by the bedclothes becoming wet with the escaping blood;* while a still more remarkable case is narrated by Dr. W. D. Purple, of a man who, several years after receiving an injury in the dorsal region, insisted upon having both thighs amputated near the hip-joint, because he regarded them as useless appendages, the amputations being performed without the administration of any anæsthetic, and yet the patient absolutely feeling nothing, and not manifesting the slightest emotion during the course of the operation.†

But while sensation is generally abolished in cases of paralysis from spinal injury, instances are not wanting where it has been present in an unnatural degree. I find hyperæsthesia noted in 3 cases of cervical injury (1·41 per cent.), and in 1 of dorsal (·77 per cent.). Thus in a case reported by Mr. South, of fracture of several cervical vertebræ, there was paralysis with hyperæsthesia on the right side, while anæsthesia was observed upon the left.‡ In many cases where at first sensation and motion are equally lost, the former may be completely regained, while the latter remains still very imperfect; on the other hand, the loss of sensation sometimes precedes that of motion. Mr. Bryant met with a case of in-

* Am. Med. Times, N. S., vol. viii.

† N. Y. Jour. Med., 1853.

‡ Notes to Chelius's Surgery, vol. i.

jury in the dorsal region, where at first sensation was absent, though the power of motion remained. In a short time motor paralysis came on, while sensation returned—both motion and feeling, however, finally disappearing before death.*

Pain at the seat of injury is, as might be expected, a prominent symptom in injuries of the spine. I find it noted in nearly one-sixth of the entire number of cases, viz., in the cervical region, 40, or 18·86 per cent.; in the dorsal, 18, or 13·85 per cent.; and in the lumbar, 5, or 8·77 per cent.

Four cases of injury of the cervical region (1·88 per cent.) were accompanied with great pain referred to other parts of the body, while in 2 cases (·94 per cent.) it is expressly stated that the patients felt absolutely no pain whatever.

Unusual sensations, such as burning, constriction, etc., are sometimes experienced and referred to various parts of the body, though their nervous connection with the sensorium may be entirely destroyed at the time.

Dyspnœa is a marked and distressing symptom of spinal injuries in the cervical region. I find it noted in 21 cases (9·90 per cent.); it was also observed in 4 cases (3·08 per cent.) of injuries in the

* Guy's Hospital Reports, 3d S., vol. v.

dorsal region. It is customary to say that in lesions of the cervical cord respiration is performed by the diaphragm alone; but, as pointed out by Mr. Shaw, in his excellent paper in the second volume of Holmes's System of Surgery, in many of these cases the diaphragm is greatly assisted by the serratus-magnus muscle (supplied by the external thoracic nerve), which, the shoulders being fixed, tends to lift and expand the chest. In fact, it is questionable whether the diaphragm alone be sufficient for respiration for more than a very short time. Where the spinal cord is destroyed above the origin of the phrenic nerve, death is of course instantaneous.

The occurrence of dyspnœa in injuries of the dorsal spine is dependent upon two causes: first, as indicated by Brodie, because the action of the abdominal muscles is necessary for complete *expiration*; and secondly, as shown by Mr. Shaw, because paralysis of these muscles permits the distention of the bowels by gas, thus thrusting the diaphragm upward, and mechanically interfering with its motion. The occurrence of dyspnœa toward the end of cases of dorsal injury is generally due to progressive softening of the cord extending upward to the cervical region.

Dysphagia has accompanied injuries of the cervical spine in 5 cases (2·36 per cent.), and *vomiting* in 3 (1·41 per cent.). *Jaundice* was observed in 1 case

of dorsal injury, without any hepatic lesion being discovered after death.

Most authors on spinal injuries have stated that *involuntary fecal discharges* accompany lesions of the cord in any portion of its length. Brodie, on the other hand, says: "In the first instance, whatever be the seat of the injury in the spinal cord, the bowels are torpid, so that they cannot be made to act except under the influence of the most powerful purgatives;" and he then goes on to say that the exceptions are apparent merely, the contents of the rectum at the period of injury being discharged involuntarily, while *costiveness* is at the same time established as the result of the paralyzed state of the bowel. Neither of these statements seems to me to be applicable to every case, and I believe the true explanation has been furnished by Mr. Hilton,* in the fact that, as the sphincter muscle of the rectum is not entirely under the control of the will, and as its nervous supply comes from the lowest portion of the cord, when this portion is involved in the injury, the sphincter is paralyzed, and the contents of the bowel involuntarily evacuated; while, when the injury is higher up, this portion of the cord continues for a time at least to act as a separate nerve centre, and costiveness is the necessary result.

* Guy's Hospital Reports, 3d S., vol. xi.

Retention of urine is present in almost every case of spinal injury, being followed after a time (if the patient survive) by *incontinence*—the urine constantly dribbling away, producing excoriation, and increasing the tendency to bed-sores. Morgagni and others have, however, reported cases where incontinence of urine was present from the outset. A rarer but more serious symptom than *retention*, is *suppression* of urine, of which several remarkable cases are on record. Thus Brodie met with a case in which 8 ounces only of urine were secreted in 50 hours. Dr. Joseph Comstock, after a fracture of the fifth cervical vertebra, found absolutely no urine secreted during 33 hours;* while Dorsey knew a patient who passed no urine for *two weeks*, nearly three quarts being evacuated by the catheter at the end of that time.†

Hæmaturia I find noted in one case, and *sugar in the urine* also in a single instance: the latter was in a case of fracture of the sixth cervical vertebra, treated at the London Hospital;‡ it is of interest in connection with recent experiments as to the artificial production of diabetes.

I have no remarks to offer with regard to the changes which occur in the urine in the course of

* Boston Med. Jour., 1848.

† Elements of Surgery, vol. i. p. 126.

‡ Lond. Hosp. Reports, vol. i.

spinal injuries; those interested in the matter are respectfully referred to Sir Benjamin Brodie's excellent paper already so often quoted.

The next symptom that demands our attention is one equally remarkable and difficult of explanation; I refer to *priapism*. I find this noted 16 times in the injuries of the cervical region (7.55 per cent.), and 9 times in those of the dorsal (6.92 per cent.). It is, I believe, totally unconnected with the existence of voluptuous sensations, and my investigations confirm Brodie's remark that it is never met with but in connection with paralysis. Sir Benjamin erred, however, in supposing that it was not found in cases of injury below the sixth dorsal vertebra; for it is noted in four such instances, reported respectively by Messrs. Bryant,* Parker,† Tripler,‡ and Hutchison.§ The best discussion of this curious symptom with which I am acquainted, may be found in Mr. Hilton's admirable Clinical Lecture, in the eleventh volume, present series, of Guy's Hospital Reports, to which the attention of the reader is respectfully invited.

Another symptom, which has generally escaped the attention of writers on spinal injuries, is *flushed*

* Proc. Path. Soc. Lond., vol. viii.

† N. Y. Jour. Med., 1852.

‡ Ibid., 1851.

§ Am. Med. Times, 1861.

face. This, I believe, is observed only in cases where the cervical portion of the cord is affected, and is accounted for by M. Topinard as due to a partial paralysis of the sympathetic nerve, that nerve getting its cervico-cephalic branch from the "cilio-spinal region" of the spinal cord, as demonstrated by Messrs. Budge and Waller.* Flushing of the face is usually accompanied by lachrymation and contracted pupils; I find it noted in 5 cases (2·36 per cent.), all of the cervical region.

Alteration of the vital temperature is a symptom which has not yet been sufficiently investigated. I find the temperature noted as abnormally high in 6 cases of injury in the cervical region (2·83 per cent.), and in 3 of the dorsal (2·31 per cent.). In a case of injury of the cervical spine observed by Brodie, the thermometer, when placed between the thighs, rose to 111° Fahr., and the temperature had not fallen when ascertained immediately after the patient's death. Persistent elevation of the temperature in spinal injuries is a most serious symptom, and furnishes grounds for a gloomy prognosis. It gives reason to fear that progressive disorganization of the cord is going on which will almost surely terminate fatally.

* Recueil des Travaux de la Société Médicale d'Observation, t. ii. p. 508.

Diminution of the temperature in the parts paralyzed is, as might be anticipated, not an unfrequent symptom in the course of such spinal injuries as survive the risks of the earlier periods.

Tetanus might, *à priori*, be thought a symptom which would frequently occur in the course of spinal injuries, but I find it noted in only one case; and in that it was proved by post-mortem examination to have had an eccentric origin. It was a case of gunshot fracture of the third lumbar vertebra, and the autopsy showed a contusion of the anterior crural nerve.* This seems to me a strong reason for doubting whether tetanus is ever of centric origin.

In view of the serious nature of most spinal injuries, we would expect to find *shock* a frequent symptom, yet I find it noted in but 7 cases: 6 of the cervical region (2.83 per cent.), and 1 of the lumbar (1.75 per cent.).

Concussion, or *contusion of the brain*, in varying degrees, was observed 19 times (8.96 per cent.) in injuries of the cervical region, 8 times (6.15 per cent.) in those of the dorsal region, 4 times (7.02 per cent.) in those of the lumbar region, and once (5.26 per cent.) in those the locality of which was not ascertained. The greater frequency of this

* Lidell: Am. Jour. Med. Sci., N. S., vol. xlviii.

symptom in connection with lumbar injuries than with dorsal, may probably be accounted for by the greater liability of the brain to suffer from counter-stroke in falls or blows upon the buttocks and loins, than when the force is expended upon the middle of the back.

Delirium occurred 13 times; viz., 6 times in cervical injuries (2·83 per cent.), 5 times in dorsal (3·85 per cent.), and 2 times in lumbar (3·51 per cent.).

Coma and *insomnia* are each noted twice, the cervical spine being involved in every instance.

Gangrene and *sloughing*, or the formation of bed-sores, become more frequent as the injury is situated in the lower part of the spinal column. These evidences of impaired vitality were noted in the cervical region but 3 times (1·41 per cent.), and in the dorsal region 12 times, or 9·23 per cent., while in the lumbar region the proportion rose as high as 13·29 per cent. (7 cases). Bed-sores are generally phenomena of the latter stages of spinal lesions, though in some cases they have appeared within a very short time of the reception of the injury.

These are all the remarks I have to offer with regard to the *rational* symptoms of injuries of the spine. The condition of the pulse, appearance of the tongue, etc. do not present any remarkable differences from what is observed after other serious surgical accidents, and I do not think any *peculiar*

information is to be derived from their examination. It has recently been asserted that the blood drawn from the veins in spinal injuries is arterial in hue; but the fact has not been confirmed by other observers.*

With regard to the *physical* symptoms of injuries of the spine, they may conveniently be classed under the heads of *deformity*, *mobility* (or their opposites), and *crepitus*.

The comparative frequency of these symptoms may be seen from the following tables:

	DEFORMITY NOTED IN		ITS ABSENCE NOTED IN	
	Cases.	Per cent.	Cases.	Per cent.
Cervical region	33, or	15.57.....	4, or	1.88
Dorsal "	41, "	31.54.....	2, "	1.54
Lumbar "	18, "	31.58.....		
Not ascertained.....	4, "	21.05.....		

	MOBILITY NOTED IN		IMMOBILITY NOTED IN	
	Cases.	Per cent.	Cases.	Per cent.
Cervical region	13, or	6.13.....	12, or	5.66
Lumbar "	1, "	1.75.....		

	CREPITUS NOTED IN	
	Cases.	Per cent.
Cervical region	5, or	2.36
Dorsal "	3, "	2.31
Lumbar "	1, "	1.75

It may be seen from the consideration of the various symptoms of spinal injuries, that their dif-

* Potter: Am. Jour. Med. Sci., N. S., vol. xlv.

ferential *diagnosis* is always difficult and often impossible.

Hippocrates recognized the fact that many cases which were considered forward displacements of the vertebræ were really but fractures of their spinous processes; but no writer, so far as I know, until Ambrose Paré, attempted accurately to distinguish the various accidents to which the spine was subject. This illustrious surgeon drew the distinction between luxations and subluxations of the cervical vertebræ, and made an advance from the error perpetuated from the time of Galen, by recognizing that some curvatures of the spine were produced by "inward causes;" his predecessors having generally if not universally confused all cases of spinal curvature under the head of backward displacements from accidents.

Boyer,* Charles Bell,† and Aston Key‡ have severally pointed out conditions of the cord resulting from accident which may exactly simulate fractures or dislocations of the vertebræ as far as the rational symptoms are concerned; and very slight observation is sufficient to show how unsatisfactory are the physical phenomena as diagnostic marks.

Even crepitus, which we generally consider proof

* Surgical Diseases, etc., vol. ii.

† Surgical Observations.

‡ Guy's Hospital Reports, 1st S., vol. iii.

positive of the existence of a fracture, was, in one of the nine cases in which it is noted, supposed to have accompanied a pure dislocation, though as the patient recovered, the diagnosis could not of course be verified by an autopsy.

Riolan, in the case of a soldier who had been hung but escaped death, supposed that there had been no dislocation, only tearing or stretching of the ligaments, because, though the head remained inclined to one side, the power of rotation was preserved;* but the fact is that the power of rotation has sometimes been lost though the dislocation has been certainly reduced, while in other cases dislocation has been accompanied by unnatural mobility, remaining even in the corpse after death.†

Fortunately it is not often necessary for any practical purpose to decide positively whether a given injury of the spine be a fracture or a dislocation, or a combination of both forms of injury. Pure dislocations, as has been seen, are very rare except in the cervical region; and it is therefore pretty safe in an injury of any other locality to conclude that the case is a fracture, or if accompanied with marked deformity, a fracture with dislocation conjoined.

* Marjolin: Dict. de Médecine, t. xiii. p. 382.

† Malgaigne: Traité des Fractures et des Luxations, t. ii. *ad loc.*

Systematic writers have divided cervical dislocations into several distinct classes, and those interested in the matter are referred to Malgaigne's admirable treatise, where the whole subject is thoroughly and clearly discussed.

It is more important in any given case to be able to say what is the probable amount of injury to the spinal cord, and the means of doing this, though already mostly discussed, may be here briefly recapitulated.

If the paralysis below the seat of injury be immediate, complete, and permanent, there is every reason to fear that the cord has been absolutely divided. If the paralysis be immediate but not permanent, it is probably a case of "concussion of the cord," so called, without serious structural lesion. Should paralysis come on after a few hours, and gradually increase to a certain point, then to diminish again, it is probably due to effusion of blood, within or without the cord, which, under favorable circumstances, may be reabsorbed, or coagulated, or may possibly remain in a fluid state without giving further annoyance, as in the case reported by Mr. Heaviside.* If, however, the paralysis gradually creep up, every day invading a fresh space, there is scarcely room to doubt that progressive disorganization of the cord is taking place, which, if not spon-

* Cooper: Disloc. and Fract. of Joints, p. 545.

taneously arrested, will infallibly sooner or later prove fatal.

The extent of cord lesion in a downward direction may be ascertained by the electric test proposed by M. Landry, and described on a previous page.

Spasms of the voluntary muscles or convulsions will generally indicate that the cord is compressed; though, on the other hand, serious compression of the cord may exist without manifesting itself by the production of spasms.

A knowledge of the condition of the cord is the most important item in forming an opinion as to the result of a case, and upon this knowledge must therefore be principally based the *prognosis*.

The condition of the cord *after death* in those cases in which it has been noted, may be seen from the following table :

CONDITION OF SPINAL CORD.	CERVICAL REGION. (212 cases.)	DORSAL REGION. (130 cases.)	LUMBAR REGION. (57 cases.)
	Cases. Per cent.	Cases. Per cent.	Cases. Per cent.
Cord compressed in	35 or 16.51	6 or 4.61	2 or 3.51
Do. or membranes inflamed in..	5 " 2.36	6 " 4.61	1 " 1.75
Do. disorganized in.....	32 " 15.10	21 " 16.15	5 " 8.77
Do. fibres divided in.....	15 " 7.08	12 " 9.23	6 " 10.52
Do. do. stretched in.....	1 " .47	... ..	... ..
Do. penetrated by spicule in.....	1 " .47	2 " 1.54	1 " 1.75
Ball lodged in cord in.....	... ..	1 " .77	... ..

The *Prognosis* in cases of spinal injury, whether as regards the result to life, or, in case life is spared, the restoration of the patient to health and usefulness, must always be guarded, and in many cases is of necessity unfavorable. These accidents are not, however, by any means so fatal as is generally supposed, nor are well-authenticated instances wanting of patients restored, in spite of the most severe injuries, to lives of active usefulness and enjoyment.

A high authority in experimental physiology, who has lately taken up the defence of Cline's operation of spinal resection, has placed the proportion of cases which survive severe spinal injuries under the ordinary treatment at "perhaps less than 1 per 100."* I have been unable to find any reference to the cases on which the writer's statistics are based; certainly in the cases, the histories of which I have examined, the mortality has not been nearly so large.

In the following table I have classed those as *recovered*, who were sufficiently restored to pursue their former occupations, or at any rate to maintain themselves by comparatively active exertions; those as *relieved*, who, though benefited by treatment, could not be fairly considered as recovered; and

* Brown-Séguard: Lectures on the Central Nervous System, p. 259.

those as *not improved*, who, though life was prolonged, yet remained as helpless as they were at the beginning of their treatment.

*TABULAR VIEW OF THE RESULTS IN 394 CASES OF SPINAL INJURY.**

RESULT.	CERVICAL REGION. (212 cases.)		DORSAL REGION. (130 cases.)		LUMBAR REGION. (57 cases.)		REGION NOT STATED. (19 cases.)	
	Cases.	Per ct.	Cases.	Per ct.	Cases.	Per ct.	Cases.	Per ct.
Recovered	38	or 17·92	28	or 21·54	15	or 26·32	8	or 42·10
Relieved.....	6	" 2·83	13	" 10	6	" 10·52	3	" 15·79
Not improved.....	2	" ·94	6	" 4·61	1	" 1·75	3	" 15·79
Died	164	" 77·36	82	" 63·08	34	" 59·66	5	" 26·32
Not stated.....	2	" ·94	1	" ·77	1	" 1·75	...	...

Hippocrates maintained that a fracture of the spine was attended with less risk than a contusion, and Galen followed him in the same view.† The same idea may be traced in writings of a much later day. Thus Hévin says that the greater is the injury to the vertebræ, the less is the danger, for the cord is thus less liable to be hurt.‡ But, as remarked in an earlier page, the analogy between the spinal cord and the brain does not hold good as regards contusions, on account of the anatomical difference of

* In this table, as in others, it must be observed that cases in which *two regions* of the spine were involved are noted under *each region*.

† Opera Medica, ed. Kühn, t. xviii. a. p. 565.

‡ Cours de Pathologie, t. ii. p. 390.

their arrangements as regards their bony investitures. If, therefore, the spinal column had escaped injury, the surgeon would not be disposed to dread any very serious lesion of the spinal cord. On the other hand, the danger in all injuries of the spine is proportionate to the amount of harm received by the cord. Thus in the British army during the Crimean war, of 10 cases of gunshot fracture of the vertebræ, without direct injury to the cord, 4 recovered, being all fractures of the processes without invasion of the spinal canal. The remaining 6, as well as 22 with direct lesion of the cord, died.*

The danger in spinal injuries varies with the locality affected. As a rule, the nearer to the brain is the seat of injury, the greater is the danger to life. The ancients looked upon those cases in which there was forward displacement as much more dangerous than those in which the displacement was in the opposite direction. Galen gave as a reason, that the spinal nerves came off at the anterior part of the spine, and that the top of the bladder was likely to be pressed upon in anterior displacements. But the real explanation of their opinion is to be found, I think, in the fact that they almost all confused curvatures of the spine with posterior displacements.

* Lidell: Am. Jour. Med. Sci., N. S., vol. xlviii. p. 317.

In an injury of the cervical region the prognosis must certainly be gloomy. The large majority of these cases (except those of unilateral dislocation) will almost surely prove fatal in a very few days or even hours. Injuries of the dorsal spine, if of the upper part, are full of danger; those of the lower part may not cause death, but are often followed by persistent paralysis. Injuries below the second lumbar vertebra offer a more favorable prognosis than those in any other portion of the spine.

In the upper part of the vertebral column, the danger is from interference with respiration; in the lower part, chiefly from exhaustion, the formation of bed-sores, and inflammation of the urinary organs.

There are certain symptoms which are justly considered important as furnishing grounds for prognosis.

Dyspnœa is a most unfavorable symptom: coming on a few days after the accident, it generally indicates progressive upward disorganization of the cord, and even when arising from other causes, tends of itself to a fatal issue by the accumulation of mucus in the air-passages, the consequent deficient aeration of the blood, and finally the induction of coma.

Flushed face (unless from coincident pneumonia or such other cause) is a symptom of the gravest import: it indicates serious lesion of the cord in the cervical region.

Increased animal temperature and *priapism* are also serious symptoms, especially the former.

Evidences of cerebral disturbance are of course to be dreaded, as indicating primary injury to the brain or the spread of meningitis, according to the period of their manifestation.

Supposing the first dangers to have passed by, a diminution of paralysis is of course a most favorable symptom. The return of motor power is not unfrequently accompanied by involuntary contractions and twitchings of the muscles; these are not to be considered unfavorable, although in an earlier stage they are supposed by Brodie, and as I think correctly, to indicate a certain amount of compression of the spinal cord.

There is one cause of death in injuries of the upper part of the spine, pointed out by Mr. Bransby B. Cooper, which so far as I know has not been noticed by any other writer. This is the interference with the function of the skin, placing the patient to a certain extent in the condition of a person with an extensive burn.*

Aston Key has well remarked upon the dangers of the *cumulative* effect of pressure upon the spinal cord as well as upon the brain.† It is owing to this

* Med. Gazette, June 13, 1845.

† Guy's Hospital Reports, 1st S., vol. iii. p. 17.

that in many cases of chronic disease of the vertebræ death occurs unexpectedly and without apparent cause. Caries, or necrosis of the spine, whether from traumatic or constitutional causes, are full of risk to the patient, though cases are on record of complete recovery after the exfoliation of considerable portions of bone. Such are the cases recorded by Wade,* Mercogliano,† and Spencer Wells.‡

The following table exhibits the comparative duration of fatal cases of spinal injury in the different regions affected :

DURATION OF FATAL CASES.	CERVICAL REGION. 212 cases; 164 fatal.	DORSAL REGION. 130 cases; 82 fatal.	LUMBAR REGION. 57 cases; 34 fatal.	REGION UNKNOWN. 19 cases; 5 fatal.
	Cases. Per ct. of whole.	Cases. Per ct. of whole.	Cases. Per ct. of whole.	Cases. Per ct. of whole.
Died instantly or before treatment	19 or 8·96	2 or 1·54	2 or 3·51	... ..
Died within twenty-four hours.....	20 " 9·43	3 " 2·31	4 " 7·02	1 or 5·26
Lived between a day and a week.....	70 " 33·02	11 " 8·46	4 " 7·02	... ..
Lived between a week and two weeks.....	18 " 8·49	17 " 13·08	6 " 10·52	1 " 5·26
Lived between two weeks and a month.....	6 " 2·83	17 " 13·08	6 " 10·52	1 " 5·26
Lived between a month and a year..	11 " 5·19	20 " 15·38	8 " 14·04	... ..
Lived more than a year.....	2 " 0·94	... ..	2 " 3·51	... ..
Duration not stated.	18 " 8·49	12 " 9·23	2 " 3·51	2 " 10·53

* Medico-Chirurgical Transactions, vol. xxxii.

† Am. Jour. Med. Sci., O. S., vol. xi. p. 520.

‡ Ibid., N. S., vol. li. p. 547.

Not all of the cases that died after injuries of the spine, proved fatal on account of the spinal lesion; for in a considerable number there were received at the same time other injuries, sufficient in themselves to account for death. There were of such cases, in the cervical region, 12, or 5·66 per cent.; in the dorsal region, 15, or 11·54 per cent.; in the lumbar region, 9, or 15·79 per cent.; and among those the region of which was not stated, 1, or 5·26 per cent.

Bony union is rarely complete after fractures of the vertebræ, according to Rokitansky, though instances have been recorded by Cloquet, Aston Key, and others. Anchylosis after disease of the vertebræ is more frequent, and is in such cases the most desirable termination; some very curious specimens illustrating this condition are described by Laurence, Bertin,* and Duverney.†

Rokitansky mentions a specimen, in the Vienna Museum, of fracture of the odontoid process, where life was prolonged for a considerable time without any union;‡ and in Phillips's often quoted case, the atlas and odontoid process being broken and thrust forward, the head had settled down and formed a

* *Traité d'Ostéologie*, t. iii. p. 80.

† *Maladies des Os*, t. ii. p. 131.

‡ *Pathological Anatomy*, Syd. Society ed., vol. iii. p. 246.

new joint with the axis; the cord being uninjured, and the patient dying of other causes.*

Before proceeding to consider the best method of treating injuries of the spine, it may not be uninteresting to take a brief review of the opinions of some of the most eminent teachers of our art, in days preceding our own.

We learn from Hippocrates that the customary mode of treating displacements of the spine, in his day, was by fastening the patient to a ladder, and shaking him in mid-air. This process was dignified by the name of "succussion." It did not meet the entire approval of the father of medicine; "succussion on a ladder," he says, "has never straightened anybody, as far as I know, but it is principally practiced by those physicians who seek to astonish the mob—for to such persons these things appear wonderful, for example, if they see a man suspended or thrown down, or the like; and they always extol such practices, and never give themselves any concern whatever may result from the experiment, whether bad or good. But the physicians who follow such practices, as far as I have known them, are all stupid."†

He then goes on to describe how succussion

* Med.-Chirurg. Transact., vol. xx. p. 78.

† Hippocrates: Adams's transl., vol. ii. p. 605.

should be performed if attempted at all, laying stress upon the importance of the patient being strapped to the ladder head downward (in case of injury in the lower part of the spine), so that the weight of the body should be principally below the point affected.

Displacements forward, he says, are hopeless; those cases which have been supposed to have recovered, having been really only fractures of the spinous processes. For displacements in a backward direction he recommends the following treatment, the patient being stretched upon a bed or table in a prone position. "The physician, or some person who is strong and not uninstructed, should apply the palm of one hand to the hump, and then having laid the other hand upon the former, he should make pressure, attending whether this force should be applied directly downward or toward the head or toward the hips. This method of applying force is particularly safe; and it is also safe for a person to sit upon the hump while extension is made and raising himself up to let himself fall down again upon the patient. And there is nothing to prevent a person from placing a foot on the hump and supporting his weight on it, and making gentle pressure."* A more powerful means

* Loc. cit., p. 612.

than any other is to use a board fastened to one side of the bed, passing over the seat of deformity and employed as a lever of the second order.

The same treatment, with but slight variations, is recommended by Paulus Ægineta, Albucasis, Haly Abbas, Avicenna, Oribasius, and Celsus.

In cases of fracture, according to Ægineta, the surgeon must, if possible, attempt to extract the compressing bone by incision (having first warned the patient of his danger), or, if not, should soothe the patient by antiphlogistic treatment.* The same recommendation is also given by Albucasis, Haly Abbas, and Avicenna.

Ambrose Paré recommends extension and rotation in dislocations of the cervical vertebræ, and extension with pressure in those of other regions. In cases of fracture, if the processes only are broken, they should be replaced; but if entirely separated from the periosteum, they should be extracted. If paralysis be present, an incision should be made, and the fragments extracted.†

Fabricius Hildanus recommends that reduction should be attempted in case of inward displacement, by extension and pressure, by means of a towel stretched under the belly, thus lifting the pa-

* Paulus Ægineta: Adams's transl., p. 455.

† Opera Chirurgica, ed. 1594, pp. 410-435.

tient while in a prone position. If this does not succeed, an incision should be made from behind, and the displaced portions of bone elevated by means of hooks.*

Sculdetus repeats the advice given by Hippocrates, and gives an accurate description (with a plate) of the method of reducing backward displacements.†

Heister discourses as follows concerning wounds of the spinal cord: "If the marrow which is in the spine receive a wound, there is seen no safer mode of cure than to insert into the wound itself, lint smeared with Peruvian balsam, or essence of myrrh and amber, or spirit of mastich, or some similar medicament mixed with honey of roses, and then to bind it up with vulnerary plasters. The rest should be left to God and the goodness of nature. For slight wounds heal quickly, but those which are more severe cannot be cured in any way."‡

In fractures of the processes, he tells us, the fragments should be replaced by the fingers, and held in place by pasteboard splints and bandages. In cases where the cord is ruptured, death is almost sure to follow; but as it seems cruel to neglect the patient on account of certain death, it is preferable to at-

* Obs. Chirurg., cent. v. obs. 69.

† Armamentarium Chirurg., tab. xxv. p. 63.

‡ Inst. Chirurg., t. i. p. 128.

tempt something, though vainly. The surgeon should therefore denude the injured part with his scalpel, and remove the fragments that press upon the cord. Then he should wash the wound, dress it with balsamic drugs, and keep it warm with a bandage. This should be continued until the wound is healed or the patient dead.* In dislocations of the vertebræ of whatever region, reduction should be attempted.†

Boyer, who has been blindly followed by most writers on spinal injuries since his day, rejected all efforts at reduction in cases of vertebral luxation, and quoted Petit-Radel's celebrated case as an illustration of the dangers of such attempts. But, as pointed out by Malgaigne, the case in question was not by any means such as represented by Boyer, and the fact that in that case attempts at reduction proved fatal, demonstrated nothing but that the attempts were unskillfully made by an incompetent person.‡

The difficulty of sometimes getting at the truth in a matter of simple fact may be seen from the various opinions attributed to Desault upon this subject. Thus Boyer states that Desault refused to

* Inst. Chirurg., t. i. p. 200.

† Ibid., pp. 236-241.

‡ Malgaigne: *Traité des Fractures et des Luxations*, t. ii. pp. 326-332.

attempt the reduction of a cervical dislocation; South* says that he made the attempt, and failed; while Malgaigne quotes from Leveillé, who said that he had heard from Desault himself, that the attempt had been made, and had succeeded. I have always found Malgaigne so accurate, that I have had no hesitation in following him in adopting the latter statement as correct.

Benjamin Bell recommended the reduction of dislocations by bending the body of the patient over a cask.† Our own Physick treated a case of fractured spine by extension and counter-extension, with partial relief of the paralysis.‡ Malgaigne and Sir Benjamin C. Brodie have ably advocated the employment of extension in the treatment of displacements of the vertebræ, with or without fracture; and quite recently Mr. Hilton, of Guy's Hospital, has furnished his testimony to the value of the same mode of treatment; while, on the other hand, any attempts to remedy displacement in this way have been held improper by Dupuytren, Bransby B. Cooper, Le Gros Clark, and others.

Before analyzing the cases which I have collected with a view of illustrating the correct treatment of spinal injuries, it will be proper to consider briefly

* Notes to Chelius.

† System of Surgery, vol. vii. p. 112.

‡ Dorsey: Elements of Surgery, vol. i. p. 126.

the history of the operation of resection as applied to such cases.

Excision of portions of the vertebræ, whether by the trephine or the saw, has been recommended by many writers, from the time of Paulus Ægineta down to our own day, but I find no record of the operation having been attempted until about fifty years ago. Paré, Hildanus, Matz, Heister, and Vigaroux all referred to the operation, but it does not appear that any of them performed it. Mr. Cline was the first who put in practice the doctrines that had so long been taught, and in the fifty-two years that have elapsed since his operation, it has, so far as I know, been repeated but twenty-five times. Sir Astley Cooper did indeed undertake the operation, but, after making his incision, found that his diagnosis had been wrong, and that the fracture involved the spinous process only; the operation was therefore not concluded, and the result of the case is not known.*

Louis's operation, in 1762, sometimes referred to as the first resection of the spine, was not a resection at all. Louis merely removed some loose fragments of bone in a case of gunshot fracture; the patient improved, but twelve years later still walked with a cane.†

* South: Notes to Chelius, vol. i.

† Archives Générales de Médecine, 1836.

Heine, Roux, Holscher, and Dupuytren each removed portions of vertebræ *for disease*; their operations, therefore, do not come under consideration in this paper. Dr. Blackman has also excised a portion of the sacrum; without benefit, however, to his patient.*

The operation has been forcibly condemned by Bell, Brodie, Shaw, Malgaigne, Jobert, and many others, and as strenuously advocated by the Coopers (Astley and Bransby), South, Velpeau, and Prof. Brown-Séquard.

Sir Astley Cooper assured his class that it would be unmanly for any of them to refuse the operation, if they should be so unfortunate as to break their backs; while Jobert, in treating of gunshot wounds of the spine, cautions against making too great efforts to extract the ball, and pronounces the use of the trepan in such cases "barbarous and ridiculous."†

Malgaigne proposed the revival of Hildanus's suggestion, to restore displaced fragments by the use of tenacula, afterward holding them in position by means of splints.

It is stated by Prof. Brown-Séquard that "it is quite evident that the laying bare of the spinal cord

* Hutchison: Am. Med. Times, July 13, 1861.

† Maladies par Armes à Feu, pp. 121-3.

is not a dangerous operation ;” the experience of other authorities, however, somewhat varies from his upon this point. Thus Heine resected vertebræ in 24 cats and 12 dogs, all the cats dying in consequence, and only 2 dogs surviving the operation.*

Without entering into a discussion of the various arguments, either in favor of these modes of treatment (extension and resection) or against them, which may be found pretty fairly set forth in most of the text-books of the day, I propose to submit them to the test of recorded clinical experience, and to do this, I shall proceed to analyze the cases which I have collected, by giving (1) a tabular view of the treatment employed in the injuries of the various regions; (2) an analysis of the nature of the injuries as regards results; (3) an analysis of the results as regards the treatment employed; and (4) a comparison of the results of various modes of treatment for each region. I shall then conclude this essay by endeavoring to furnish a just estimate of the operations of extension and resection respectively.

In doing this, I do not wish to be supposed to overvalue the importance of medical statistics. I am well aware that they are peculiarly liable to misstatement and misinterpretation. But I have en-

* Wagner : Resection of Bones and Joints, New Syd. Society ed., p. 152.

deavored to make these statistics as accurate as possible, by rejecting cases that were not well authenticated, and by reading those that I have admitted to my series as far as possible with unprejudiced eyes. The conclusions at which I have arrived, I believe to be well founded; though, as regards one operation at least, I was before beginning these investigations strongly inclined to the other side. At any rate, my labors are presented honestly, and with a desire that they may be corrected if wrong. The questions involved are of the last importance, and anything that can throw light upon them is a useful addition to our common stock of knowledge.

** TABULAR VIEW OF THE TREATMENT USED IN 394 CASES OF SPINAL INJURY.*

TREATMENT EMPLOYED.	CERVICAL REGION. 212 cases.	DORSAL REGION. 130 cases.	LUMBAR REGION. 57 cases.	REGION UNKNOWN. 19 cases.
	Cases. Per ct.	Cases. Per ct.	Cases. Per ct.	Cases. Per ct.
Extension (with rotation, pressure, etc.).....	32 or 15·10	†11 or 8·46	3 or 5·26	... ..
Resection	7 " 3·30	13 " 10·00	3 " 5·26	5 or 26·32
General treatment only	154 " 72·64	104 " 80·00	49 " 85·97	14 " 73·68
None (cases of instant death, etc.)...	19 " 8·96	2 " 1·54	2 " 3·51	... ..

* Cases in which more than one region was involved, are noted under both.

† Temporary extension in 8 cases; continuous extension in 3. Extension had failed in 1 case that was afterward resected.

*ANALYSIS OF NATURE OF INJURIES AS REGARDS
RESULTS.*

	CERVICAL RE- GION.	DORSAL RE- GION.	LUMBAR RE- GION.	REGION UN- KNOWN.
	Cases. Per ct.	Cases. Per ct.	Cases. Per ct.	Cases. Per ct.
Dislocations.	(104.)	(17.)	(3.)	(2.)
Recovered	33 or 31.73	4 or 23.53	2 or 66.67	... ..
Relieved	2 " 1.92	2 " 11.76	... ..	1 or 50.00
Not improved .....	... ..	1 " 5.88	... ..	... ..
Died	68 " 65.39	10 " 58.82	1 " 33.33	1 " 50.00
Not stated	1 " 0.96	... ..	... ..	... ..
Fractures.	(66.)	(85.)	(46.)	(14.)
Recovered	4 or 6.06	17 or 20.00	9 or 19.57	6 or 42.86
Relieved	4 " 6.06	7 " 8.24	4 " 8.70	2 " 14.29
Not improved	1 " 1.52	4 " 4.71	1 " 2.17	3 " 21.43
Died	57 " 86.36	56 " 65.88	31 " 67.39	3 " 21.43
Not stated .....	... ..	1 " 1.17	1 " 2.17	... ..
Fractures with Dis- location.	(34.)	(21.)	(4.)	(0.)
Recovered	1 or 2.94	4 or 19.05	... ..	... ..
Relieved .....	... ..	1 " 4.76	2 or 50.00	... ..
Not improved .....	... ..	1 " 4.76	... ..	... ..
Died	33 " 97.06	15 " 71.43	2 " 50.00	... ..
Wounds of Spinal Cord.	(5.)	(5.)	(1.)	(1.)
Recovered .....	... ..	1 or 20.00	1 or 100.00	... ..
Relieved .....	... ..	3 " 60.00	... ..	... ..
Not improved	1 or 20.00	... ..	... ..	... ..
Died	3 " 60.00	1 " 20.00	... ..	1 or 100.00
Not stated	1 " 20.00	... ..	... ..	... ..
Other Cases.	(3.)	(2.)	(3.)	(2.)
Recovered .....	... ..	2 or 100.00	3 or 100.00	2 or 100.00
Died	3 or 100.00	... ..	... ..	... ..

ANALYSIS OF RESULTS AS REGARDS TREATMENT.

	CERVICAL RE- GION.	DORSAL RE- GION.	LUMBAR RE- GION.	REGION UN- KNOWN.
1. Recovered.	Cases. Per ct.	Cases. Per ct.	Cases. Per ct.	Cases. Per ct.
<i>Dislocations:</i>	(33.)	(4.)	(2.)	(0.)
Extension, etc. in...	25 or 75·76	3 or 75·00	1 or 50·00	... ..
General treatment	8 " 24·24	1 " 25·00	1 " 50·00	... ..
<i>Fractures:</i>	(4.)	(17.)	(9.)	(6.)
Resection in.....	... ..	... ..	... ..	*1 or 16·67
General treatment	4 or 100·00	17 or 100·00	9 or 100·00	5 " 83·33
<i>Fractures with dis- location:</i>	(1.)	(4.)	(0.)	(0.)
Extension in.....	... ..	2 or 50·00	... ..	... ..
General treatment	1 or 100·00	2 " 50·00	... ..	... ..
<i>All other cases:</i>	(0.)	(3.)	(4.)	(2.)
General treatment	... ..	3 or 100·00	4 or 100·00	2 or 100·00
2. Relieved.				
<i>Dislocations:</i>	(2.)	(2.)	(0.)	(1.)
Extension in.....	... ..	1 or 50·00	... ..	... ..
General treatment	2 or 100·00	1 " 50·00	... ..	†1 or 100·00
<i>Fractures:</i>	(4.)	(7.)	(4.)	(2.)
Resection in.....	... ..	1 or 14·29	... ..	... ..
General treatment	4 or 100·00	6 " 85·71	4 or 100·00	2 or 100·00
<i>Fractures with dis- location:</i>	(0.)	(1.)	(2.)	(0.)
Extension in.....	... ..	... ..	1 or 50·00	... ..
General treatment	... ..	1 or 100·00	1 " 50·00	... ..
<i>All other cases:</i>	(0.)	(3.)	(0.)	(0.)
General treatment	... ..	3 or 100·00	... ..	... ..
3. Not improved.				
<i>Dislocations:</i>	(0.)	(1.)	(0.)	(0.)
General treatment	... ..	1 or 100·00	... ..	... ..
<i>Fractures:</i>	(1.)	(4.)	(1.)	(3.)
Resection in.....	1 or 100·00	... ..	... ..	1 or 33·33
General treatment	... ..	4 or 100·00	1 or 100·00	2 " 66·67
<i>All other cases:</i>	(1.)	(1.)	(0.)	(0.)
General treatment	1 or 100·00	1 or 100·00	... ..	... ..

* This case of recovery after resection is somewhat doubtful.

† In this case efforts at reduction by pressure alone had failed.

ANALYSIS OF RESULTS AS REGARDS TREATMENT—

(Continued.)

	CERVICAL RE- GION.		DORSAL RE- GION.		LUMBAR RE- GION.		REGION UN- KNOWN.	
4. Died.	Cases.	Per ct.	Cases.	Per ct.	Cases.	Per ct.	Cases.	Per ct.
<i>Dislocations:</i>	(68.)		(10.)		(1.)		(1.)	
{ Died too soon for treatment.....	13 or	19·12	...	...	...	...	...	...
{ Coincident mortal lesions.....	2 "	2·94	...	...	...	...	1 or	100·00
{ Subjects for analysis	53 "	77·94	10 or	100·00	1 or	100·00	...	...
Extension in.....	*7 "	13·21	1 "	10·00	...	...	...	...
General treatment	46 "	86·79	9 "	90·00	1 "	100·00	...	...
<i>Fractures:</i>	(57.)		(56.)		(31.)		(3.)	
{ Died too soon for treatment.....	5 or	8·77	2 or	3·57	2 or	6·45	...	...
{ Coincident mortal lesions	†7 "	12·28	†12 "	21·43	6 "	19·35	...	...
{ Subjects for analysis	45 "	78·95	42 "	75·00	23 "	74·19	3 or	100·00
Resection in.....	5 "	11·11	9 "	21·43	2 "	8·69	2 "	66·67
General treatment	40 "	88·89	33 "	78·57	20 "	86·96	1 "	33·33
Extension in.....	...	...	...	...	‡1 "	4·35	...	...
<i>Fractures with dislocation:</i>	(33.)		(15.)		(2.)		(0.)	
{ Coincident mortal lesion in...	...	...	1 or	6·67	...	...	...	...
{ Subjects for analysis	33 or	100·00	14 "	93·33	2 or	100·00	...	...
Extension in.....	...	...	4 "	28·57	...	...	...	...
Resection in.....	...	...	‡2 "	14·29	...	...	...	...
General treatment	33 "	100·00	8 "	57·14	2 "	100·00	...	...
<i>All other cases:</i>	(6.)		(1.)		(0.)		(1.)	
General treatment	6 or	100·00	1 or	100·00	...	...	1 or	100·00

* Reduction effected in 3; efforts failed in 3; efforts caused death in 1.

† Resection performed in 1 case.

‡ This case complicated with fracture and dislocation of twelfth dorsal vertebra.

§ In one case that was resected, extension had previously failed to reduce the displacement.

ANALYSIS OF RESULTS AS REGARDS TREATMENT—
(Concluded.)

	CERVICAL RE- GION.	DORSAL RE- GION.	LUMBAR RE- GION.	REGION UN- KNOWN.
5. Result not stated.	Cases. Per ct.	Cases. Per ct.	Cases. Per ct.	Cases. Per ct.
<i>Fractures:</i>	(0.)	(1.)	(1.)	(0.)
Resection in.....	... ..	... ..	*1 or 100·00	... ..
General treatment	... ..	1 or 100·00	... ..	... ..
<i>All other cases:</i>	(2.)	(0.)	(0.)	(0.)
General treatment	2 or 100·00	... ..	... ..	... ..

*COMPARISON OF RESULTS OF VARIOUS MODES OF
TREATMENT.*

	CERVICAL RE- GION.	DORSAL RE- GION.	LUMBAR RE- GION.	REGION UN- KNOWN.
1. Dislocations.	Cases. Per ct.	Cases. Per ct.	Cases. Per ct.	Cases. Per ct.
<i>Extension:</i>	(89.)†	(17.)	(3.)	(1.)‡
Recovered.....	25 or 78·12	3 or 60·00	1 or 100·00	... ..
Relieved.....	... ..	1 “ 20·00	... ..	... ..
Died	7 “ 21·88	1 “ 20·00	... ..	... ..
<i>General treatment:</i>				
Recovered.....	8 “ 14·04	1 “ 8·33	1 “ 50·00	... ..
Relieved.....	2 “ 3·51	1 “ 8·33	... ..	1 or 100·00
Not improved .....	... ..	1 “ 8·33	... ..	... ..
Died	46 “ 80·70	9 “ 75·00	1 “ 50·00	... ..
Not stated	1 “ 1·75	... ..	... ..	... ..

* This case is known only from a brief reference in the British and Foreign Medical Review for 1838, in which the reviewer, who knew of the case from hearsay only, states that “the patient did well;” but, as nearly thirty years have failed to elicit any further account of the case, it is probable that the patient was not ultimately benefited, if indeed he survived.

† Fifteen cases omitted; not subjects for comparison, on account of rapid deaths or the existence of other mortal lesions.

‡ One case omitted; not subject for comparison, as above.

*COMPARISON OF RESULTS OF VARIOUS MODES OF
TREATMENT—(Concluded.)*

	CERVICAL RE- GION.		DORSAL RE- GION.		LUMBAR RE- GION.		REGION UN- KNOWN.	
2. Fractures.	Cases.	Per ct.	Cases.	Per ct.	Cases.	Per ct.	Cases.	Per ct.
<i>Extension :</i>	(54.)*		(71.)†		(38.)‡		(14.)	
Died .....	...	...	...	...	1 or 100·00 (Complicated.)		...	...
<i>Resection :</i>								
Recovered.....	...	...	...	...	...	...	1 or 20·00 (Doubtful.)	
Relieved.....	...	...	1 or 10·00	...	...	...	1 or 20·00	
Not improved.....	1 or 16·67	...	...	...	...	...	1 " 20·00	
Died	5 " 83·33	...	9 " 90·00	...	2 " 66·67	...	2 " 40·00	
Not stated.....	...	...	...	...	1 " 33·33	...	...	...
<i>General treatment :</i>								
Recovered.....	4 " 8·33	...	17 " 27·87	...	9 " 26·48	...	5 " 55·56	
Relieved	4 " 8·33	...	6 " 9·84	...	4 " 11·76	...	1 " 11·11	
Not improved.....	...	...	4 " 6·56	...	1 " 2·94	...	2 " 22·22	
Died	40 " 83·33	...	33 " 54·10	...	20 " 58·82	...	1 " 11·11	
Not stated .....	...	...	1 " 1·64	...	...	...	...	...
3. Fractures with Dislocation.								
<i>Extension :</i>	(34.)		(20.)§		(3.)||		(0.)	
Recovered.....	...	...	2 or 33·33	...	...	...	...	...
Relieved.....	...	...	...	...	1 or 100·00	...	...	...
Died .....	...	...	4 " 66·67	...	...	...	...	...
<i>Resection :</i>								
Died .....	...	...	2 " 100·00	...	...	...	...	...
<i>General treatment :</i>								
Recovered.....	1 or 2·94	...	2 " 16·67	...	...	...	...	...
Relieved.....	...	...	1 " 8·33	...	1 " 50·00	...	...	...
Not improved .....	...	...	1 " 8·33	...	...	...	...	...
Died	33 " 97·06	...	8 " 66·67	...	1 " 50·00	...	...	...

* Twelve cases omitted; not subjects for comparison, on account of rapid deaths or the existence of other mortal lesions.

† Fourteen cases omitted; not subjects for comparison, as above.

‡ Eight cases omitted; not subjects for comparison, as above.

§ One case omitted; not subject for comparison, as above.

|| One case omitted; not subject for comparison, as above.

An inspection of the preceding table will show that, in the treatment of dislocations in the cervical region, the mortality has been nearly four times greater when constitutional or general treatment has been relied on exclusively, than when attempts have been made to reduce the dislocation by extension, rotation, etc. Of course, in this as in the other comparisons instituted, it is necessary to reject such cases as were found dead, or died too soon for any treatment to be employed, as well as those who suffered coincidently from other lesions, sufficient in themselves to account for death. The same, or nearly the same, relative mortality is found to have attended these modes of treatment in the other regions of the spine.

With regard to the treatment of pure fractures of the vertebræ, it is evident that extension is totally inapplicable; accordingly we find it employed in but one case, and that a fracture of the first lumbar, complicated with *fracture and dislocation* of the last dorsal vertebra.

Comparing the results of resection with those obtained by the use of general treatment only, we find, in the cervical region, the mortality equal under either method; but the results in those cases that did not die were decidedly more favorable under the latter. In the dorsal region we find the mortality about 36 per cent. greater, and in the lumbar region

8 per cent. greater, by resection, than by general treatment only; while the difference in the same direction was even more in those cases of which the region was not ascertained.

More serious than either pure fractures or pure dislocations, are fractures with dislocations conjoined. In the cervical region these injuries were all treated on general principles, with the enormous mortality of over 97 per cent. In the dorsal region the relative mortality was as follows: by extension and by general treatment, each $66\frac{2}{3}$ per cent.; by resection, 100 per cent. The cases treated by extension that did not die, made more complete recoveries than those treated on general principles only. The cases of fracture with dislocation occurring in the lumbar region were too few to afford much information; as far as they go, however, they help to show the advantages of the treatment by extension.

Looking upon the subject from another point of view, we find that extension has been employed altogether in 44 cases, and general treatment only in 117 analogous cases—*i.e.* dislocations and dislocations with fracture; cases of instant death, or in which there were other mortal lesions, being omitted. The results are exhibited in the following table:

EXTENSION IN 44 CASES.		GENERAL TREATMENT IN 117 CASES.	
	Cases. Per ct.		Cases. Per ct.
Recovered	30 or 68·18	Recovered	13 or 11·11
Relieved.....	2 " 4·55	Relieved.....	6 " 5·13
Not improved.....	...	Not improved.....	2 " 1·71
Died.....	12 " 27·27	Died.....	95 " 81·20
Not stated .....	...	Not stated	1 " ·85

It will thus be seen that the proportion of deaths has been almost three times as large when general treatment has been exclusively used as when extension has been employed. The results of those cases which have survived have also been, as a rule, more satisfactory after extension than without it.

It seems to me that the inference is fairly warranted, from the above considerations, that extension (combined, of course, with rotation or pressure as required) should be employed in every case of dislocation of the spine, or of fracture with dislocation. If the diagnosis is not clear, it would be better to adopt this method of treatment than to reject it, and I should be disposed to try it in every case where there was either shortening or marked angular displacement.

Looking in the same way at the operation of resection, we find that it has been practiced in 24 cases, rejecting 2 in which other mortal lesions were present. General treatment alone has been em-

ployed in 184 analogous cases—*i.e.* fractures and fractures with dislocation. The results have been as follows:

RESECTION IN 24 CASES.		GENERAL TREATMENT IN 184 CASES.	
	Cases. Per ct.		Cases. Per ct.
Recovered (doubtful).....	1 or 4·17	Recovered	33 or 17·94
Relieved.....	2 “ 8·33	Relieved.....	15 “ 8·15
Not improved.....	2 “ 8·33	Not improved.....	7 “ 3·80
Died.....	18 “ 75·00	Died.....	128 “ 69·57
Not stated	1 “ 4·17	Not stated	1 “ ·54

From this it will be seen that the proportion of deaths after resection is nearly 6 per cent. greater than when general treatment alone has been employed; and the importance of this fact is not diminished by most of the operators having stated that the operation had nothing to do with the fatal result, for we are all aware that the same has been said with regard to almost every capital operation in surgery.

Moreover, in those cases that survived, the proportion of recoveries was much larger when general treatment only was employed; there being in fact *not one well-authenticated instance of recovery after spinal resection.*

Is the inference then unwarranted that resection is an operation not to be recommended, either with

a view of saving life or as a means of improving the patient's condition?

With regard to the treatment to be adopted in cases which do not admit of extension, I shall say but little, as the matter is well discussed in most of the text-books of the day. To two or three points, however, special attention may be directed. And first, in injuries of the upper part of the spine, great caution should be exercised as to turning the patient on his face for examination; for cases are recorded where such a procedure caused an instant arrest of the respiratory function. Secondly, in injuries of any portion, great care must be used in the introduction of the catheter, not to injure the urethra or bladder. The instrument should be flexible, and should be introduced without the stylet. Mr. Hilton met with two cases of fatal peritonitis following injuries of the bladder caused by neglect of this precaution.* Lastly, every care should be taken to guard against the formation or increase of bed-sores. Prof. Brown-Séquard and others speak highly of the alternate application of ice and hot poultices. I have seen good results from the use of a continuous feeble galvanic current, applied to the ulcerated part. Constant pressure should be avoided by frequently changing the patient's position, and using

* Guy's Hospital Reports, 3d S., vol. xi. p. 367.

soft cushions and pads. A water-bed, when it can be obtained, will prove a valuable adjuvant; air-pillows I have generally found to do more harm than good, being far inferior to pillows stuffed with down or soft feathers. The parts exposed to pressure should be frequently bathed with slightly stimulating and astringent washes.

The following conclusions are, I think, justifiable from the considerations urged in the preceding pages:

1. Injuries of the spine are not nearly so fatal as is generally supposed, and they have been, not unfrequently, completely recovered from.

2. By watching carefully the symptoms and knowing the lesions which they indicate, the patient's progress toward health or death can be pretty accurately foreseen in most cases.

3. Whenever there is reason to believe that one or more vertebræ have been displaced, extension should be employed: temporary, if that be sufficient; if not, continuous.

4. In no case do resection or trephining offer a reasonable prospect of improving the patient's condition, but on the contrary there is reason to fear that they would increase the chances of a fatal termination.

5. Those cases of spinal injury which are not adapted for the employment of extension, should be

treated in accordance with ordinary rational and physiological principles.

6. No new mode of treatment is entitled to adoption in a class of injuries so serious as this, unless it can be shown by clinical experience that it is at any rate *not less successful* than the modes commended to us alike by reason and long experience.

PHILADELPHIA, *September 3d*, 1866.

NOTE.—Since writing these pages, I find in the July number of the *Recueil de Mémoires de Médecine, etc., Militaires*, an extremely interesting case of bilateral forward dislocation of the sixth cervical vertebra. Unsuccessful attempts at reduction were made on the 18th and 21st days respectively. The patient survived 70 days, dying at last from exhaustion. M. Richon, who reports the case, justly observes that attempts at reduction more promptly made might probably have saved the patient's life. The cord was found disorganized after death, and bony union of slight fractures had taken place.

APPENDIX

OF

CASES.

TABULAR VIEW OF 394 CASES

No.	AGE, OCCUPATION, ETC.	MODE OF INJURY.	DESCRIPTION OF INJURY; PROGRESS OF CASE, ETC.
1	Male.	Mass of hay fell on the back of his neck.	Patient stunned and paralyzed; convulsions of upper extremities.
2	Male, peasant, aged 40.	Fell head-foremost from a tree.	Paralyzed.
3	Male, porter.	Fell with weight on shoulders.	Did not seek medical assistance for a month; then presented deformity of neck, without paralysis. Convulsions came on suddenly, and quickly proved fatal.
4	Male, aged 16.	Crushed under cart.	Taken out dead.
5	Female, aged 25.	Suicide by hanging.	Found dead.
6	Male, child.	Blow on back of head.	No bad symptoms followed injury; after 3 days died suddenly during an effort at reduction.
7	Male, aged 15.	Blows on back of neck.	Paralysis came on 4 months after injury.
8	Male.	Suicide by hanging.	Instant death.
9	Mason, aged 60.	Fell head-foremost from a height.	Shock; unnatural mobility of head.
10	Male, aged 20.	Found dead in a ditch.	.....
11	Female, aged 68.	Fell from ladder, striking forehead.	Instant death.
12	Male, aged 22.	Suicide by pistol-shot in neck.	Could only move by supporting head with hands; death occurred suddenly.

OF INJURY TO THE SPINE.

TIME UNDER OBSERVATION.	RESULT.	REMARKS, AUTOPSY, ETC.	AUTHOR.	REFERENCE.
6 hours.	Died.	Dislocation of occiput from atlas; rupture of vertebral artery and vein.	Lassus.	Pathologie Chirurgicale, t. ii.
5 days.	Died.	Fracture of fourth cervical vertebra, and dislocation of occiput from atlas.	Paletta.	Exercitationes Pathologicae.
5 weeks from date of injury.	Died.	Fracture, with displacement of odontoid processes of axis.	Id.	Op. cit.
.....	Died.	Dislocation forward of atlas on occiput; medulla compressed but not crushed.	Bouisson.	Revue Médico-Chirurgicale de Paris, t. ii.
.....	Died.	Dislocation of atlas from axis.	Ansiaux.	Orfila, Méd. Légale, t. ii.
3 days.	Died.	Transverse ligament ruptured by efforts at reduction; odontoid process pressed on cord.	Petit-Radel.	Encyclopédie Méthodique.
4½ months.	Died.	Dislocation forward of atlas; cord compressed.	Costes.	Revue Médico-Chirurgicale, t. xii.
.....	Died.	Rupture of odontoid ligament; cord compressed by odontoid process.	Duméril.	Gazette Médicale, 1840.
20 hours.	Died.	Dislocation forward of atlas on axis; no fracture; cord compressed by odontoid.	Hirigoyen.	Journal de Chir., 1844.
.....	Died.	Transverse ligament ruptured; cord compressed by odontoid.	Caussé.	Mémoire Méd. Légale.
.....	Died.	Fractures of atlas and odontoid process; atlas displaced backward.	Melchiori.	Gaz. Medica Stati Sardi, 1850.
17 days.	Died.	Fracture of odontoid process.	Richet.	Thèse de Concours, 1851.

No.	AGE, OCCUPATION, ETC.	MODE OF INJURY.	DESCRIPTION OF INJURY; PROGRESS OF CASE, ETC.
13	Laborer, aged 32.	Fell head-foremost from hay-rick.	In 2 days went to work again; after a month walked 2 miles to consult a surgeon; neck stiff, but no paralysis; a year later died of dropsy.
14	Laborer.	By muscular action; in pushing a wheelbarrow, an obstacle was suddenly overcome and the man fell.	Instant death.
15	Boy, aged 3 y'rs.	Injury from a severe fall.	Whenever he moved his head, was obliged to support it with both hands.
16	Male.	Gunshot wound of neck.	.....
17	Milkman, aged 40.	Thrown from wagon 15 feet, striking head and face.	Pain in neck; protuberance on left side; could not turn head, and supported it with his hands; resumed occupation; died suddenly after 5 months.
18	Male, aged 60.	Bundle of hay fell on his head.	Head bent forward, chin touching sternum; no paralysis; a dislocation of the atlas was diagnosed.
19	Male, aged 16.	Fell backward from ladder, with sack of flour over his head.	Unconscious; almost pulseless; paralyzed; unnatural mobility of head; prominence in front and to left. Displacement of atlas diagnosed.
20	Male, servant, aged 30.	Wheels of wagon passed over neck and chest.	.....
21	Sailor, aged 16.	Fell 20 feet, striking back of neck against wood.	Shock; priapism; paralysis; involuntary discharge of feces; pain in neck.
22	Male, aged 38.	Fell from ladder, striking head and neck.	Walked to hospital; complained of pain in head; seemed deaf and stupid; next day delirious; required strait-waistcoat; became sensible again, and died suddenly on fourth day.
23	Male, aged 74.	Fell down stairs.	Paralysis of upper extremities, not of lower.
24	Soldier.	Gunshot wound.	Ball dropped into mouth.

TIME UNDER OBSERVATION.	RESULT.	REMARKS, AUTOPSY, ETC.	AUTHOR.	REFERENCE.
1 year.	Recovered. (Died of other causes.)	Autopsy showed fractures of atlas and odontoid process, which were thrust forward against pharynx; head had settled down on axis, and formed new joint; cord unhurt.	Phillips.	Medico-Chirurgical Transactions, vol. xx. p. 78.
.....	Died.	The odontoid process had ruptured its restraining ligaments, and by a sudden luxation had crushed the cord, causing instant death.	Charles Bell.	Surgical Observations, p. 149.
1 year.	Died.	Fracture of atlas; when head moved, cord compressed by odontoid.	Cline, Senior.	A. Cooper, Disl. and Fract. of Joints.
4 days.	Died.	Laminae and transverse process of axis driven in on cord.	Astley Cooper.	Hamilton, Fract. and Disloc.
5 months.	Relieved.	Autopsy showed fracture of odontoid process; lower end turned back to spinal cord.	Willard Parker.	Gross, System of Surgery, vol. i.
2 years.	Recovered.	Reduction effected by extension; after two years head could not be turned.	Malgaigne, Senior.	Malgaigne, Tr. des Fract. et des Luxns., t. ii.
.....	Recovered.	Reduction effected by extension and pressure; success of efforts marked by audible sound.	Ehrlich.	Journal Complémentaire, t. xxxvi.
.....	Died.	Fracture of odontoid process; cord reduced to pulp; trachea and oesophagus torn away; scapula fractured; carotid artery ruptured.	Casper.	Medical Jurisprudence, vol. i.
26 hours.	Died.	Fracture of atlas in three places, and fracture with displacement of fifth cervical vertebra; cord compressed, swollen, and soft.	Curling.	London Hospital Reports, vol. i.
3 days.	Died.	Congestion of brain with serous effusion. Odontoid process constituted separate bone, and articulated with axis by false joint; no injury to cord.	Id.	Ibid.
1 hour.	Died.	Fracture spinous process of axis; fragment wedged between axis and third cervical vertebra; effusion of blood in vertebral canal.	Arnott.	Lancet, 1851.
30 days.	Died.	Fractures of atlas and axis.	Williamson.	Dublin Quarterly Journal, vol. xxvii.

No.	AGE, OCCUPATION, ETC.	MODE OF INJURY.	DESCRIPTION OF INJURY; PROGRESS OF CASE, ETC.
25	Male, aged 60.	Found dead in bed.	For several years had suffered from sore throat with abscesses, but otherwise in good health.
26	Female, aged 30.	No apparent cause.	Sudden death.
27	Male, aged 64.	Fell from horseback, striking head.	"Dislocation of odontoid process." Seven years later, died suddenly in convulsions.
28	Male, aged 20.	Suicide by hanging to bed-post.	Found dead next day. "A diabolical luxation."
29	Butcher, aged 50.	Quarter of beef fell from cart on his neck.	Ecchymosis and crepitus at back of neck; paralysis; dyspnoea; death as from suffocation.
30	Female, aged 56.	Fell backward down stairs, striking back of neck.	Pain, thirst, constipation; paralysis, incomplete of upper extremities; head thrown forward and to right; cervical spine depressed.
31	Mason, aged 49.	Fell backward down stairs, striking head on step; a bag of plaster came upon his breast.	Head thrown forward and to right; stiff; spinous processes of fourth and fifth cervical vertebrae could not be felt, while their transverse processes were abnormally prominent. At first no paralysis, but came on afterward.
32	Quartermaster of brig, aged 42.	In swimming, plunged against a sail spread to keep off sharks.	Paralyzed, etc.
33	Sawyer, aged 41.	Plank struck him on the neck.	Head thrown forward; contusion of neck; paralysis.
34	Female, aged 29.	Fell 10 or 12 feet, striking chest on door.	Scalp wound; paralysis; urine ropy. Bed-sore preceded death.
35	Carman, aged 21.	Fell, striking back of neck.	Paralysis; recovered in 2½ months. In taking a long walk, fell again with sudden paralysis. [Cf. case No. 90 of this table.]

TIME UNDER OBSERVATION.	RESULT.	REMARKS, AUTOPSY, ETC.	AUTHOR.	REFERENCE.
.....	Died.	Dislocation of odontoid process, which projected through foramen magnum; no evidence of disease of either ligaments or bones.	W. Thompson.	Am. Journ. Med. Sci., 1st S., vol. xvi.
.....	Died.	Dislocation of odontoid process backward.	Cruikshank.	Ibid.
7 years.	Recovered.	Died suddenly, aged 71.	T. R. Beck, from An. Register.	Ibid., N. S., vol. xi.
.....	Died.	Spinal column almost in contact with sternum.	Fabricius Hildanus.	Obs. Chir., cent. v.
2 or 3 days.	Died.	Fractures of spinous, transverse, and articulating processes of fifth, sixth, and seventh cervical vertebræ; interarticular cartilage between fifth and sixth, torn, and cord disorganized.	Dupuytren.	Diseases and Injuries of Bones.
34 hours.	Died.	Fracture and dislocation forward of sixth cervical vertebra; cord compressed and flattened.	Id.	Op. cit.
10 hours.	Died.	Displacement forward of fifth cervical vertebra, with fracture of processes; cord divided.	Id.	Op. cit.
7 days.	Died.	Displacement forward of sixth cervical vertebra; cartilage ruptured; and spinal cord compressed, softened, and injected with blood.	Id.	Op. cit.
24 hours.	Died.	Dislocation forward of fifth cervical vertebra, with fracture of sixth; spinal canal nearly obliterated; cord compressed and softened.	Id.	Op. cit.
45 days.	Died.	Brain softened; fracture of sixth cervical vertebra (with displacement backward) in process of repair; cord flattened; yellow at point of injury, and pink above and below.	Id.	Op. cit.
34 days from second injury (40 days as quoted by Malgaigne).	Recovered. — Died of second injury.	Fractures of fourth and fifth cervical vertebræ (body of fourth); callus fractured by second fall. This case appears to be the same as that quoted by Malgaigne and others from Ollivier d'Angers.	Id. — Ollivier d'Angers.	Op. cit. — Tr. des Maladies de la Moëlle Epin., t. i.

No.	AGE, OCCUPATION, ETC.	MODE OF INJURY.	DESCRIPTION OF INJURY; PROGRESS OF CASE, ETC.
36	Soldier.	Gunshot wound of neck.	Almost complete paralysis.
37	Carpenter, aged 31.	Gunshot wound.	Ball entered nose; patient did well for 10 days. Death from secondary hemorrhage.
38	Mason, aged 21.	Fell 40 feet on head.	Scalp wound; pain in neck; paralysis; priapism; great heat of skin.
39	Porter, aged 27.	Fell forward, with load on neck.	Presented usual symptoms of compression of spinal cord; no deformity; respiration stertorous before death.
40	Female, young.	Fell 12 feet, striking breast.	Wound of neck; partial and afterward complete paralysis; bed-sores.
41	Male, aged 21.	Fell 40 feet.	Fracture of a cervical vertebra; complete paralysis.
42	Male, aged 26.	Fell 10 or 12 feet, striking neck.	Completely paralyzed, except as to power of rotating head.
43	Porter.	Bag of flour weighing 3 cwt. fell on nape of neck.	Projection of seventh cervical vertebra; paralysis, pain, dyspnoea, etc.
44	Female.	.....	Head fixed; no paralysis; died suddenly while turning her head in bed.
45	Shipwright, aged 30.	Fell 20 feet, striking occiput.	Paralysis; priapism; flushed face; retention of urine, etc.
46	Porter, aged 45.	Barrow of grain fell 14 feet on head and neck.	Three scalp wounds, one involving the bone; great mobility and pain about the 6th and 7th cervical vertebrae; paralysis, etc.
47	Male.	.....	Symptoms of compression from supposed fracture.
48	Female, aged 47.	"Turn - up bedstead" slipped and fell on her neck.	After 11 days no paralysis except of intercostals; pain and depression over fifth and sixth cervical vertebrae, pressure on which point, or coughing or sneezing, produced complete paralysis.

TIME UNDER OBSERVATION.	RESULT.	REMARKS, AUTOPSY, ETC.	AUTHOR.	REFERENCE.
24 hours.	Died.	Fractures of fourth and fifth cervical vertebræ; cord unhurt; much blood effused in spinal canal and at base of brain.	Dupuytren.	Op. cit.
10 days.	Died.	Fracture transverse process second cervical vertebra; hemorrhage from vertebral artery.	Id.	Op. cit.
48 hours.	Died.	Fractures of sixth and seventh cervical vertebræ; cord disorganized.	Blandin.	Dupuytren, op. cit.
2 days.	Died.	Fracture and displacement forward of fifth cervical vertebra; cord softened.	Dupuytren.	Op. cit.
45 days.	Died.	Fracture of sixth cervical vertebra; cord flattened and strangulated.	Id.	Op. cit.
14 years.	Relieved.	Life prolonged for fourteen years.	Hilton.	Holmes, System of Surgery, vol. ii.
15 months.	Died.	Fracture of fifth cervical vertebra; lateral displacement of several spinous processes; cord almost severed.	Page.	Ibid.
7 days.	Died.	Fracture of posterior lamina of seventh cervical vertebra; cord compressed by fragment.	Boyer.	Surgical Works, vol. ii.
Few days.	Died.	Fracture of spinous process of fifth cervical vertebra; impacted between arches of fourth and fifth, compressing cord.	Erichsen.	Science and Art of Surgery.
8 days.	Died.	Fracture of sixth cervical vertebra, with displacement backward; cord disorganized.	Bransby B. Cooper.	Surgical Essays.
2 days.	Died.	Capsular ligament and intervertebral cartilage of fifth and sixth cervical vertebræ lacerated; no fracture; cord unhurt, but dura mater slightly inflamed.	Id.	Op. cit.
Few hours.	Died.	Spinal cord disorganized at point of injury; diastasis of fifth from sixth cervical vertebra.	From Med. Gaz.	Cooper (B. B.), op. cit.
16 weeks.	Died.	After three weeks, some slight motion produced paralysis of hand and arm. No autopsy. Meningitis probably followed a slight displacement.	Greenwood.	Ibid.

No.	AGE, OCCUPATION, ETC.	MODE OF INJURY.	DESCRIPTION OF INJURY; PROGRESS OF CASE, ETC.
49	Sailor, aged 40.	Jumped against a sail in swimming.	Instant paralysis; subsequently vomiting.
50	Male, aged 68.	Fell down stairs.	Stunned at first; pain in neck; paralysis, except of <i>left</i> leg; hyperæsthesia of <i>right</i> side, anæsthesia of <i>left</i> .
51	Boy.	Fell on a post.	Symptoms of injury to belly, but not of injury to spine.
52	Male.	Jumped 7 or 8 feet into water 3 feet deep; threw head backward.	Great shock; pain, paralysis, priapism, suppression of urine; mobility of head; paralysis went off; delirium.
53	Porter, aged 22.	Carrying a barrel on his neck, slipped and fell on buttocks.	Paralysis, priapism, etc.
54	Male, needle-maker, aged 24.	Turned his head quickly.	Felt a crack in his neck; head was fixed; pain; partial paralysis; a hollow observed in neck, between third and fifth cervical vertebrae; spinous process to right.
55	.....	.....	Forward unilateral dislocation of a cervical vertebra. Paralysis came on gradually.
56	Mason.	Fell from ladder; struck back of neck against a stone.	Paralysis, priapism, etc.
57	Male.	Weight fell 8 or 10 feet on neck.	No paralysis; delirium on third day. Movement gave great pain.
58	Coachman, aged 31.	Bundle slipped on shoulder.	Unilateral (left) forward dislocation of a cervical vertebra; could not hold reins in left hand from pain.
59	Female, aged 13.	Bundle slipped on shoulder.	Unilateral dislocation forward of a cervical vertebra; no weakness of limbs.
60	Carter.	Wheel passed over neck and shoulder.	Mobility of head; pain; paralysis.
61	.....	.....	Mobility of head; complete paralysis; less next day.
62	Male.	Fell backward from wheel, neck striking ground.	Paralysis; mobility about seventh cervical vertebra; paralysis began to diminish after 2 months.

TIME UNDER OBSERVATION.	RESULT.	REMARKS, AUTOPSY, ETC.	AUTHOR.	REFERENCE.
48 hours.	Died.	Fractures of body of fourth, and arches of fourth and fifth cervical vertebræ.	South.	Notes to Chelius, vol. i.
5 days.	Died.	Fractures of first, second, and fifth cervical vertebræ; cord not compressed, but disorganized opposite fifth vertebra.	Id.	Op. cit.
4 days.	Died.	Diastasis of second cervical vertebra from cartilage above; blood effused on cord; liver ruptured.	Id.	Op. cit.
10½ hours.	Died.	Fracture fifth cervical vertebra; spinal canal filled with blood. Fracture caused by muscular action.	Reveillon.	Archives Gén. de Méd., 1827.
4 days.	Died.	Dislocation forward of fourth cervical vertebra.	Lawrence.	Med.-Chir. Trans., vol. xiii.
8 days.	Recovered.	Dislocation reduced by extension.	Schuh.	South, op. cit.
12 days.	Died.	Dislocation was reduced, but reproduced, as shown by autopsy.	Id.	Malgaigne, op. cit., t. ii.
2 days.	Died.	Fracture of arch of fifth cervical vertebra; cord compressed.	Malgaigne.	Treatise on Fractures. Packard's ed.
5 days.	Died.	Incomplete luxation and fracture of a cervical vertebra. Reduction had been effected but displacement reproduced, as shown by autopsy.	Id.	Traité des Fractures et des Luxations, t. ii.
.....	Recovered.	Reduction effected with an audible sound; wore pasteboard collar for 2 days.	Id.	Op. cit.
4 days.	Recovered.	Reduction effected with an audible sound.	Id.	Op. cit.
31 hours.	Died.	Subluxation of sixth cervical vertebra, with slight fracture; cord stretched and blood effused.	Id.	Op. cit.
1 day.	Died.	Complete bilateral luxation of fifth cervical vertebra.	Id.	Op. cit.
3 years.	Recovered.	Nearly well after 3 years. General treatment employed.	Ollivier d'Angers.	Op. cit., t. i.

No.	AGE, OCCUPATION, ETC.	MODE OF INJURY.	DESCRIPTION OF INJURY; PROGRESS OF CASE, ETC.
63	Male.	.....	Bilateral luxation of sixth cervical vertebra; no deformity; paralysis, but incomplete in arms.
64	Male, circus- rider.	Fall in the pit.	Instant paralysis; neck stiff and painful; no deformity.
65	Male, aged 50	Thrown on floor of room, striking shoulder.	Complete paralysis; slight pain in neck.
66	Male.	Gunshot wound.	Head turned to right; paralysis of left side; no pain.
67	Male, aged 40.	Balustrade struck on head and neck.	Paralysis, pain, etc.
68	Male, aged 40.	Thrown from wagon, striking back of neck.	Stunned for several hours; then paralysis came on; after 9 months, spinous process of seventh cervical vertebra still displaced to left side.
69	Sailor.	Fell backward, striking neck on iron bar.	Paralysis, vomiting, flushed face, etc.
70	Male.	Thrown backward from wagon, striking head.	Paralysis; crepitus in upper part of cervical spine; breathing almost stopped when turned on face
71	Male, aged 30.	Injury received in wrest- ling.	Paralysis; pain; crepitus over fifth cervical vertebra.
72	Male, aged 10.	Fell 20 feet, striking head.	Stunned; head bent under body; left oblique process of fourth cervical vertebra dislocated forward on fifth.
73	Male, aged 50.	Fell backward from fence; struck head	Dislocation of second from third cervical vertebra; head thrown back; paralysis; no pain.
74	Female.	.....	Prominence in pharynx, between positions of fourth and fifth cervical vertebrae; patient unconscious; heart had nearly stopped.
75	Male.	Thrown against wall.	Right unilateral forward dislocation of fourth cervical vertebra; dysphagia.
76	Female, aged 9.	.....	Right unilateral dislocation of fifth or sixth cervical vertebra; pain; immobility; convulsions when turned to left side.
77	Male.	Fell on head.	Neck bent to right side; paralysis of upper extremities; convulsions and hiccough.
78	Laborer, aged 30.	Struck on neck while drunk, and fell.	Head thrown backward and stiff; pain in neck; dyspnoea and dysphagia; <i>no paralysis</i> . A dislocation between fifth and sixth cervical vertebrae diagnosticated.

TIME UNDER OBSERVATION.	RESULT.	REMARKS, AUTOPSY, ETC.	AUTHOR.	REFERENCE.
.....	Died.	Complete luxation (quoted by Malgaigne).	Ollivier d'Angers.	Op. cit. -
40 hours.	Died.	Dislocation of sixth and seventh cervical vertebræ; no fracture.	Gross.	Op. cit., vol. ii.
24 hours.	Died.	Fracture of third cervical vertebra; cord not hurt.	.....	Edinburgh Med. and Philo. Com., vol. i.
36 hours.	Died.	Ball had punctured thyroid cartilage and transverse process of fourth cervical vertebra; serous effusion on arachnoid.	Hamilton.	Treatise on Frac- tures and Dislo- cations.
36 hours.	Died.	Fracture of arch of sixth cervical vertebra; cord compressed.	Id.	Op. cit.
9 months.	Relieved.	Head bent forward and stiff; could walk a few steps, but with fatigue; pain in legs, etc.	Id.	Op. cit.
40 hours.	Died.	Fractures of third and fourth cervical vertebræ; cord almost divided.	Id.	Op. cit.
48 hours.	Died.	No autopsy.	Id.	Op. cit.
48 hours.	Died.	Fracture of fifth cervical vertebra; cord compressed; effusion of blood.	Hiram A. Prout.	Am. Journ. Med. Sci., 1837.
.....	Recovered.	Prof. Horner refused to attempt reduction.	Horner.	Hamilton, op. cit.
48 hours.	Died.	Attempts at reduction failed.	Spencer.	Boston Medical Journ., vol. x.
.....	Recovered.	Reduction by extension and pressure of fingers in pharynx.	Hickerman.	Hamilton, op. cit.
.....	Recovered.	Reduction by extension and rotation on seventh day.	Schranth.	Gazette Médicale, 1847.
.....	Recovered.	Reduction by extension and rotation after 40 hours.	Maxson.	Buffalo Med. Jour., 1857.
.....	Recovered.	Reduction by extension.	Rust.	South, op. cit.
17 days.	Recovered.	Reduction by extension on tenth day. Dislocation described as complete.	Ayres.	N. Y. Jour. Med., 1857.

No.	AGE, OCCUPATION, ETC.	MODE OF INJURY.	DESCRIPTION OF INJURY; PROGRESS OF CASE, ETC.
79	Male.	.....	Head bent forward and to left side; pain in neck. Partial backward dislocation of third cervical vertebra diagnosed.
80	Porter, aged 36.	Fell from coach, striking head.	Scalp wound; great pain and depression at junction of fifth and sixth cervical vertebræ; neck and face congested; paralysis; no priapism.
81	Male.	Struck against gateway while riding on an omnibus.	.....
82	Child.	.....	Partial dislocation of a cervical vertebra.
83	Carpenter, aged 35.	Fell backward 4 feet, striking neck.	Paralysis, pain on motion, etc.
84	Male, aged 30.	Thrown from gig against curb-stone while drunk.	Swelling at back of neck, pain, paralysis, priapism, etc.; extension and counter-extension gave temporary relief.
85	Male, aged 36.	A maniac; struggling against restraint, threw head violently forward.	Paralysis; head bent forward.
86	Male, aged 37.	Fall.	.....
87	Male.	Fell backward over paling.	Paralysis, etc.
88	Male, aged 23.	Fell into hold of vessel, striking neck.	Paralysis, etc. Temperature two hours after accident was 102° Fahr.
89	Male, aged 19.	Fell into hold of vessel, striking head and neck.	Pain, paralysis, priapism; neck shortened and head thrown forward. "Symptoms of concussion."
90	Plasterer, aged 15.	Cause of first injury not stated.	Paralysis of upper extremities. Six months after first accident, was pushed down while walking; complete paralysis ensued.
91	Soldier, aged 18.	Gunshot wound.	Ball entered left cheek; lodged in spinal column; paralysis, pain in neck, etc.
92	Soldier, aged 19.	Gunshot wound.	Ball entered upper jaw, and lodged in third cervical vertebra; paralysis at first, but disappeared in a few hours. Ball was removed after 6 weeks, and 5 weeks later some portions of the vertebra exfoliated.

TIME UNDER OBSERVATION.	RESULT.	REMARKS, AUTOPSY, ETC.	AUTHOR.	REFERENCE.
4 months.	Recovered.	Dislocation not reduced.	Sanson.	Hamilton, op. cit.
57 hours.	Died.	No fracture. Dislocation forward and to right of fifth cervical vertebra; cord compressed; cartilage torn.	Butcher.	Operative and Conservative Surgery.
.....	Died.	Complete dislocation of middle cervical vertebra (fourth) without fracture.	S. Cooper.	Butcher, op. cit.
.....	Recovered.	Reduction effected.	J. R. Wood.	Gross, op. cit., vol. ii.
24 hours.	Died.	Complete backward dislocation of fifth cervical vertebra; no fracture; cord softened.	Liston.	Lancet, 1837.
24 hours.	Died.	Complete forward dislocation of fifth cervical vertebra without fracture.	Norris.	Am. Journ. Med. Sci., 1841.
36 hours.	Died.	Cartilage between fifth and sixth cervical vertebræ torn; no fracture, and only slight displacement. Great ecchymosis on spinal cord.	Lasalle.	Gazette Médicale, 1841.
55½ hours.	Died.	Dislocation backward of fifth cervical vertebra; cord compressed.	From Edinb. Journal.	Butcher, op. cit.
Few days.	Died.	Dislocation between fourth and fifth cervical vertebræ; cord torn.	Miller.	Ibid.
11 days.	Died.	Fractures of fifth, sixth, and seventh cervical vertebræ; cord compressed.	T. G. Morton.	Proceedings Path. Soc. Phila., vol. i.
10 days.	Died.	Fractures of fourth, fifth, and sixth cervical vertebræ; partial dislocation of fifth; cord compressed, and clots in vertebral canal.	Id.	Ibid.
13 days from second injury.	Relieved. — Died of second injury.	Fracture of body of fourth cervical vertebra, with backward projection; cord compressed. (Cf. case No. 35 of this table—"Dupuytren.")	Callender and Willett.	St. Barthol. Hospital Reports, vol. i.
10 months.	Relieved.	Motor power not entirely restored.	Mitchell, Morehouse, and Keen.	Gunshot Wounds and Injuries of Nerves.
11 months.	Recovered.	Soldier re-enlisted in first battalion Veteran Reserve Corps.	Id.	Op. cit.

No.	AGE, OCCUPATION, ETC.	MODE OF INJURY.	DESCRIPTION OF INJURY; PROGRESS OF CASE, ETC.
93	Female.	Hung; execution of sentence.	.....
94	Male.	.....	Left lateral luxation of fifth on sixth cervical vertebra.
95	Male, aged 12.	Direct violence.	Left lateral luxation of third on fourth cervical vertebra.
96	Female, aged 7.	.....	Head stiff and to right side; pain on motion; only slight paralysis; fractured clavicle; dislocation of left articular process of fourth on fifth cervical vertebra.
97	Male, actor, aged 50.	Thrown while wrestling.	Paralysis of lower extremities; afterward of upper extremities also; pain in neck.
98	Soldier.	Gunshot wound.	Wound in lower part of cervical spine; paralysis.
99	Soldier.	Gunshot wound.	Wound in lower part of cervical spine; paralysis.
100	Peddler, aged 30.	Driving through doorway, struck head against a beam.	Fracture with displacement between fifth and seventh cervical vertebrae; paralysis, priapism, etc.
101	Farmer, middle-aged.	Fell backward from hay-wagon, striking neck.	Fracture with displacement at "root of neck;" paralysis, etc.
102	Laborer, aged 30.	Fell 60 feet into a lime-kiln.	Stunned; lay insensible till death.
103	Militia-man.	Gunshot wound.	Wound of neck and jaw; instant death.
104	Child, 8 days old.	Violence from mother.	Instant death.
105	Coal porter, aged 33.	Fell down stairs, with sack of coals on top of him.	Paralysis, priapism, diaphragmatic breathing; after a few hours, hyperæsthesia.
106	Male, aged 40.	Fell backward, with plank on him.	Complete paralysis of left leg; partial of right leg and both arms; power returned in 2 hours, but again disappeared entirely in 16 hours; priapism, calor mordicans, diaphragmatic breathing, etc.
107	Sawyer, aged 38.	Swung into air by acquaintance, and fell on neck.	Paralysis, dyspnoea, etc.

TIME UNDER OBSERVATION.	RESULT.	REMARKS, AUTOPSY, ETC.	AUTHOR.	REFERENCE.
.....	Died.	Fracture second cervical vertebra, and rupture of cartilage between second and third.	Mahon.	Méd. Légale, t. iii.
.....	Died.	.....	Richet.	Garnier et Wahu, Annuaire, 1865.
.....	Recovered.	Reduction effected by extension and rotation.	Id.	Ibid.
.....	Recovered.	Reduction effected while patient under influence of chloroform; motions of head were instantly restored.	W. M. Ryer.	Am. Journ. Med. Sci., N. S., vol. xxxvii.
3 days.	Died.	Fractures of fifth, sixth, and seventh cervical vertebræ; theca torn; much blood effused on spinal cord.	J. J. Crane.	Lidell in Am Jour. Med. Sci., N. S., vol. xlviii.
3 days.	Died.	Death from asphyxia.	Lidell.	Ibid.
4 days.	Died.	Death from asphyxia.	Id.	Ibid.
70 hours.	Died.	No autopsy.	Id.	Ibid.
4 days.	Died.	No autopsy.	Id.	Ibid.
3 hours.	Died.	Fracture of third cervical vertebra; cord ruptured; fracture of sternum and 3 ribs; congestion of brain, and rupture of liver.	Casper.	Op. cit.
.....	Died.	Fractures of fifth, sixth, and seventh cervical vertebræ; cord torn.	Id.	Op. cit.
.....	Died.	Dislocation of axis.	Maschka.	New Syd. Soc. Year Book, 1859.
34 hours.	Died.	Fracture and displacement of fourth from fifth cervical vertebra; cord contused but not compressed.	Bryant.	Guy's Hospital Reports, 3d S., vol. v.
45 hours.	Died.	Fracture and displacement of fourth cervical vertebra; cord compressed by effused blood, but not by displaced bone.	Id.	Ibid.
80 hours.	Died.	Fracture and dislocation of fifth and sixth cervical vertebræ; cord compressed and softened.	Birkett.	Bryant, loc. cit.

No.	AGE, OCCUPATION, ETC.	MODE OF INJURY.	DESCRIPTION OF INJURY; PROGRESS OF CASE, ETC.
108	Male, aged 17.	While wrestling, thrown with head under adversary's arm.	Paralysis, etc.
109	Male, aged 36.	While drunk, fell down stairs, striking neck; head thrown forward.	Paralysis, etc.
110	Female, aged 41.	Knocked down by sack of charcoal falling on head.	Paralysis; pain; neck shortened; retention of urine; dyspnoea, etc.
111	Laborer, aged 24.	Fell from scaffold.	Paralysis, etc.
112	Dock-labor'r, aged 34.	Sack of rape-seed, weighing 2 cwt., fell 12 feet on neck.	Paralysis; pain; hyperæsthesia; priapism.
113	Laborer, aged 57.	Fell down stairs, striking head, which doubled on chest.	Paralysis; pain; sugar in urine. Died suddenly on being raised in bed.
114	Dock-labor'r, aged 45.	Fell down stairs.	Fracture lower part cervical spine; paralysis.
115	Soldier.	Fell 20 feet, striking neck.	Crepitu over second and sixth cervical vertebrae; paralysis; slight pain; compound fracture of thigh, unperceived by patient.
116	Male.	.....	Paralysis; diaphragmatic breathing; temp. 111° Fahr.
117	Male.	.....	Fracture of seventh cervical vertebra; dyspnoea came on suddenly on twelfth day.
118	.....	.....	Fracture and dislocation of seventh cervical vertebra; dyspnoea much increased before death.
119	.....	.....	Paralysis affected radial more than ulnar side of forearm.
120	Laborer.	While drunk, fell 15 feet, striking head.	Dislocation, with fracture, of sixth cervical vertebra on seventh; paralysis, flushed face, dyspnoea, etc.
121	Laborer.	15 cwt. of coal struck chest, knocking against ship, which came in contact with back of neck.	Projection in neck; paralysis, priapism, etc.
122	Seamstress.	Caught between revolving shaft and wall.	Paralysis, etc.

TIME UNDER OBSERVATION.	RESULT.	REMARKS, AUTOPSY, ETC.	AUTHOR.	REFERENCE.
13 hours.	Died.	Dislocation forward of fourth cervical vertebra without fracture; cord disorganized.	Birkett.	Ibid.
36 hours.	Died.	Dislocation of fifth cervical vertebra without fracture; cord crushed.	Hilton.	Bryant, loc. cit.
28 hours.	Died.	Fractures of first, second, and third cervical vertebrae; cord not compressed, but disorganized.	Curling.	Lond. Hosp. Reports, vol. i.
2½ days.	Died.	Dislocation forward of third cervical vertebra; no fracture; cord softened and infiltrated.	Id.	Ibid.
29½ hours.	Died.	Dislocation of fifth from sixth cervical vertebra, and partial dislocation of fourth from fifth; spinal cord bruised; clot.	J. R. B. Dove.	Ibid.
3 days.	Died.	Fracture of sixth cervical vertebra; cord bruised; lungs congested.	Id.	Ibid.
.....	Recovered.	Details to be published hereafter.	A. Walker.	Ibid., vol. ii.
40 hours.	Died.	Fractures of spinous processes of second and third cervical vertebrae, and longitudinal fracture of sixth cervical vertebra (body); cord compressed.	F. H. Hamilton, Jr.	Am. Med. Times, N. S., vol. viii.
22 hours.	Died.	Displacement of fifth from sixth cervical vertebra; effusion of blood, and laceration of cord.	Brodie.	Med.-Chir. Trans., vol. xx.
13 days.	Died.	Cord softened, but not compressed.	Id.	Ibid.
17 days.	Died.	.....	Green.	Brodie, loc. cit.
3 days.	Died.	Fracture and dislocation of seventh cervical vertebra.	Parmentier.	Rec. des Trav. de la Soc. Méd. d'Obs., t. i.
Several days.	Died.	Cord bruised and softened between third and sixth cervical vertebrae.	Topinard.	Ibid., t. ii.
2 days.	Died.	Fracture of sixth cervical vertebra; spinal cord enlarged and softened, containing clot.	Luke.	Lancet, 1850.
6 days.	Died.	Dislocation forward of seventh cervical vertebra; no fracture.	Drew.	Ibid.

No.	AGE, OCCUPATION, ETC.	MODE OF INJURY.	DESCRIPTION OF INJURY; PROGRESS OF CASE, ETC.
123	Male, aged 45.	Horse fell upon him.	Paralysis came on in following night. No cerebral symptoms.
124	Plasterer, aged 40.	Fell from scaffolding, striking head.	Stunned; paralysis of right side; scalp wound and fractured clavicle.
125	Female, aged 25.	Fell 30 feet, striking head.	Dislocation of 3 or 4 upper cervical vertebræ; insensible for 3 days; no paralysis; scalp wound; fractured clavicle.
126	Female.	Shot by her husband.	Gunshot fracture of sixth cervical vertebra; ball lodged in body; coma for 7 hours before death.
127	Coal-heaver.	Fell from wagon while drunk.	No apparent injury; could not rise in bed. In turning head to be shaved, died suddenly.
128	Sailor, aged 46.	Fell forward on right side of head.	Right posterior dislocation of fifth and sixth cervical vertebræ. Pain; partial paralysis; crepitus.
129	Male, aged 30.	Thrown in wrestling, striking head.	Paralysis; pain; fever; dyspnœa before death.
130	Male, aged 25.	Fell 15 feet from tree, striking head and neck.	Stunned; paralysis; vomiting.
131	Female, aged 18.	Fell 11 or 12 feet; stunned.	Walked home 3 or 4 miles; resumed work for 11 days; then pain, fever, etc.; paralysis on sixteenth day; delirium, "jumping of legs," etc.
132	Laborer, aged 25.	Thrown from cart, with neck across a hamper.	Paralysis, etc.
133	Male, aged 33.	Fell 14 feet, head-foremost.	Depression over cervical spine; paralysis; priapism.
134	Female, aged 38.	While drunk, fell 30 feet from window.	"Concussion;" scalp wound; paralysis; delirium.
135	Male.	Thrown on curb-stone in a fight.	Paralysis; slight improvement before death.

TIME UNDER OBSERVATION.	RESULT.	REMARKS, AUTOPSY, ETC.	AUTHOR.	REFERENCE.
7 days.	Died.	Fractures of fifth, sixth, and seventh cervical vertebræ; blood effused, and had fallen to bottom of spinal canal; cord uninjured; a tumor in the cerebellum.	Holt.	Ibid.
40 hours.	Died.	Fractures of fourth and fifth cervical vertebræ; hemorrhage into cord, which was soft and bruised.	Solly.	Ibid., 1851.
14 days.	Recovered.	Deformity remained.	Greenhow.	Ibid.
27 days.	Died.	Necrosis of body of sixth cervical vertebra; pus had entered spinal canal.	Maison-neuve.	Ibid., 1852.
1 hour.	Died.	Fracture of a cervical vertebra; cord penetrated by spicula.	Abernethy.	J. Comstock, Bost. Med. Jour., 1848.
6 weeks.	Recovered.	Dislocation reduced by extension and rotation; paralysis instantly disappeared.	From London Lancet.	Eve, Surgical Cases.
36½ days.	Died.	Fracture of arch of fifth cervical vertebra; cord compressed and disorganized.	T. B. Ladd.	Boston Medical Journal, 1852.
10 days.	Died.	Diastasis of first from second, and of fifth from sixth cervical vertebræ; cord disorganized opposite fifth and sixth.	J. A. Mayes.	Southern Med. and Surg. Jour., 1847.
18 days.	Died.	Fracture of seventh cervical vertebra; spinal canal filled with pus.	Simon.	Proceedings Lond. Path. Society, vol. vi.
50 hours.	Died.	Dislocation forward of sixth cervical vertebra; no fracture; blood extravasated around cord.	W. T. King.	Lancet, 1849.
40 hours.	Died.	Dislocation forward of fifth on sixth cervical vertebra; no fracture.	Tatum.	Gray, Proc. Lond. Path. Soc., vol. viii.
8 days.	Died.	Fracture of skull and of sixth cervical vertebra; red softening of central gray matter of cord; antero-lateral columns healthy.	Holt.	Anstie, Ibid., vol. x.
.....	Died.	Dislocation of fifth and sixth cervical vertebræ; cord softened.	J. P. Harrison.	Am. Jour. Med. Sci., N. S., vol. xiii.

No.	AGE, OCCUPATION, ETC.	MODE OF INJURY.	DESCRIPTION OF INJURY; PROGRESS OF CASE, ETC.
136	Male, aged 39.	Fell from tree, striking head.	Unconscious for half an hour; bilateral complete forward dislocation of fifth cervical vertebra; pain; dyspnoea; death imminent. (Malgaigne doubts <i>completeness</i> of dislocation.)
137	Laborer, aged 30.	Injured in a fight.	Died in less than 36 hours.
138	Male, aged 32.	Fell down stairs while drunk.	Collapsed, paralyzed, etc.
139	Lawyer.	Turned head suddenly.	Dislocated inferior oblique process of a cervical vertebra.
140	Male, aged 8 or 9.	Turning somersault.	Dislocation of an oblique process of a cervical vertebra.
141	Male, young.	Turned head suddenly.	Dislocated inferior oblique process of a cervical vertebra.
142	Soldier.	Gunshot wound.	Posterior portions of sixth and seventh cervical vertebrae torn away by bullet.
143	Soldier.	Gunshot wound.	Bullet lodged in cervical vertebrae.
144	.....	.....	Incomplete dislocation backward of fifth cervical vertebra.
145	.....	.....	Complete dislocation of fifth cervical vertebra.
146	.....	.....	Subluxation of a cervical vertebra.
147	Male, aged 6 or 7.	Held up by chin and occiput; struggled.	Instant death.
148	.....	.....	Instant death.
149	.....	.....	Instant death.
150	.....	Carriage passed over neck.	Left lateral dislocation of a cervical vertebra; at first numbness of right side; resumed work; paralysis came on subsequently.
151	Mason.	Fell down stairs with weight on his head.	Instant paralysis; dysphagia.
152	Groom.	Fell 10 feet, striking a step.	Instant paralysis.

TIME UNDER OBSERVATION.	RESULT.	REMARKS, AUTOPSY, ETC.	AUTHOR.	REFERENCE.
.....	Recovered.	Reduction effected, 40 hours after accident, by extension; success indicated by audible "snap;" neck remained somewhat stiff, and with impaired motion.	Vrignon-neau.	Ibid., vol. xvii.
.....	Died.	Dislocation between fourth and fifth cervical vertebræ; no fracture; cord softened.	H. G. Clark.	Ibid., vol. xxvi.
36 hours.	Died.	Spinal cord crushed and nearly torn across. Fractures of first second, and third, and displacement of third from fourth cervical vertebræ.	Birkett.	British Med. Jour., 1859.
.....	Not stated.	.....	Desault.	Boyer, Surg. Works, vol. ii.
.....	Recovered.	Reduction successfully effected. (Leveillé.)	Id.	Malgaigne, op. cit., t. ii.
.....	Recovered.	Chin always rested on left shoulder.	Chopart.	Boyer, op. cit.
5 days.	Died.	.....	Stromeyer.	Fractures occurring in Gunshot Injuries. London, 1856.
.....	Died.	Death from inflammation.	Id.	Op. cit.
5 days.	Died.	Pure dislocation; no fracture.	Lente.	Hamilton, op. cit.
2 hours.	Died.	No fracture.	Id.	Ibid.
.....	Recovered.	Reduction successfully effected.	J. Flögel.	N. Syd. Soc. Yr. Bk., 1864.
.....	Died.	Neck dislocated by muscular action.	J. L. Petit.	Dorsey, El. of Surg., vol. i.
.....	Died.	Fractures second and third cervical vertebræ.	Stafford.	Brodie, loc. cit.
.....	Died.	Fractures second and third cervical vertebræ.	Id.	Ibid.
101 days.	Died.	Head drawn backward before death, probably from meningitis.	Preis.	Bibliotheca Germ. Med. Chir., t. ii.
6 hours.	Died.	Incomplete unilateral luxation of a cervical vertebra.	Diday.	Bulletin de la Soc. Anat., 1836.
36 hours.	Died.	Unilateral dislocation of a cervical vertebra.	Bodard.	Ibid., 1843.

No.	AGE, OCCUPATION, ETC.	MODE OF INJURY.	DESCRIPTION OF INJURY; PROGRESS OF CASE, ETC.
153	.....	Fell backward from height.	Paralysis after several hours; head moved easily.
154	.....	Fell from horse.	Unilateral dislocation of a cervical vertebra.
155	.....	Fell from horse.	Unilateral dislocation of a cervical vertebra.
156	.....	Fell down stairs 10 or 12 feet, striking neck.	Unilateral dislocation of a cervical vertebra; right hand disabled, but otherwise no paralysis.
157	.....	.....	Unilateral dislocation of a cervical vertebra; head turned to side on which luxation existed.
158	.....	Fell with weight on head.	Unilateral dislocation of a cervical vertebra; head turned to side on which luxation existed.
159	.....	Turned head quickly.	Unilateral dislocation of a cervical vertebra; sudden paralysis of arm, corresponding to side of luxation.
160	.....	Turned head quickly.	Unilateral dislocation of a cervical vertebra.
161	Female, aged 7.	Fell in running; threw head backward.	Unilateral dislocation of fourth cervical vertebra; deformity not perceived till next day; projection in pharynx. Malgaigne reduced dislocation on fifth day.
162	Male.	Suicide by hanging; knot in front.	Found dead; subluxation of sixth cervical vertebra backward.
163	Sailor.	Fell backward, striking head and neck.	Complete luxation (backward) of fifth cervical vertebra; no absolute paralysis.
164	Soldier.	Fell from horse.	Backward dislocation of a cervical vertebra; stunned; mobility of head; could walk in 3 days.
165	Male, aged 3½.	Another child jumped on back.	Fell; no paralysis; backward dislocation of third or fourth cervical vertebra.
166	.....	.....	Complete bilateral dislocation of seventh cervical vertebra; paralysis—partial only of upper extremities.
167	.....	.....	Complete bilateral dislocation of a cervical vertebra; complete paralysis.
168	.....	.....	Complete bilateral dislocation of sixth cervical vertebra; no deformity; complete paralysis, except of head and neck.

TIME UNDER OBSERVATION.	RESULT.	REMARKS, AUTOPSY, ETC.	AUTHOR.	REFERENCE.
40 days.	Died.	Complete unilateral dislocation, with slight fracture of a cervical vertebra.	Martellière.	Richet, Thèse, 1851.
.....	Recovered.	Reduction; paralysis instantly relieved.	Barny.	Jour. Gén. de Méd., t. ci.
.....	Recovered.	Reduction; paralysis instantly relieved.	Id.	Rev. Médicale, 1827, t. iii.
20 years.	Recovered.	Reduction not attempted. Right hand became slightly atrophied.	Favrot.	Richet, op. cit.
.....	Died.	Slight fracture.	Michon.	Gaz. des Hôp., 1847.
.....	Recovered.	.....	Id.	Ibid.
.....	Recovered.	Reduction successful; slight stiffness remained.	Newman.	Medical Repository, vol. iii.
.....	Recovered.	Reduction successfully effected.	Seifert.	Rust, Mag., t. xxxiv.
10 days.	Recovered.	Reduction successful; wore pasteboard collar for 10 days.	Dequevauviller.	Revue Méd.-Chir., t. vi.
.....	Died.	Rupture of cerebral peduncles.	Guerrin.	Gazette Médicale, 1833.
55 hours.	Died.	Cord compressed; all the vertebrae above fifth co-ossified; old forward dislocation (pathological) of atlas.	Stanley.	Medico-Chirurgical Review, vol. xxxiv.
8 days.	Recovered.	Reduction by extension and manipulation.	Sellier.	Journal de Desault, t. iii.
.....	Recovered.	Reduction by extension. (In this and preceding, Malgaigne doubts if the luxations were really backward.)	Walther.	Jour. der Chirurgie, 1822, t. iii.
.....	Died.	Efforts at reduction failed.	Gaitskill.	London Repository, vol. xv.
.....	Died.	Mobility of head persisted in corpse.	Gosselin.	Houel, Thèse, 1848.
8 days.	Died.	No fracture.	Roux.	Malgaigne, op. cit.

No.	AGE, OCCUPATION, ETC.	MODE OF INJURY.	DESCRIPTION OF INJURY; PROGRESS OF CASE, ETC.
169	.....	.....	Complete bilateral dislocation of fifth cervical vertebra; paralysis below axillæ, and partial of arms.
170	.....	.....	Complete bilateral dislocation of a cervical vertebra.
171	Male.	Fall.	Incomplete bilateral dislocation of fourth from fifth cervical vertebra.
172	Male.	Fall.	Incomplete bilateral luxation of a cervical vertebra.
173	Male.	Fall.	Incomplete bilateral luxation of a cervical vertebra.
174	Male.	Fall.	Incomplete bilateral luxation of a cervical vertebra.
175	Male.	Fall.	Incomplete forward bilateral luxation of a cervical vertebra.
176	Male.	Fall.	Incomplete forward bilateral luxation of a cervical vertebra.
177	Male, aged 40.	Fell head-foremost from cart.	Paralysis, pain, etc.
178	Male.	Fell from chariot on wheel.	No paralysis at first; pain on moving; on third day, in turning head felt a crack, and became paralyzed.
179	Male, aged 32.	Fell from hay-wagon, striking occiput; stunned.	Walked half a mile to surgeon; in three days resumed work; stiff neck and tumor over axis; after several months, dysphagia and tumor in pharynx; after year and half, died of pleurisy.
180	.....	.....	Incomplete luxation of occiput on atlas.
181	Female, aged 59.	Fell head-foremost from hay-wagon.	Unilateral dislocation of fifth on sixth cervical vertebra; head fixed; dyspnœa; paralysis of right arm only.
182	Soldier.	Turning somersault.	Complete bilateral backward dislocation of fifth cervical vertebra; complete paralysis, etc.
183	Laborer, aged 36.	Bag of salt fell on his neck.	Paralysis; priapism; flushed face; calor mordicans; dyspnœa before death; retention of urine and feces. No deformity.

TIME UNDER OBSERVATION.	RESULT.	REMARKS, AUTOPSY, ETC.	AUTHOR.	REFERENCE.
.....	Died.	.....	Pinault.	Bulletin de la Société Anat., 1827.
.....	Died.	Instant death; cord ruptured.	Melchiori.	Malgaigne, op. cit.
.....	Died.	.....	T. E. Schmid.	Luxatio Nuchæ, 1747.
.....	Died.	Great mobility of head.	Thillaye.	Bulletin de la Faculté de Méd., 1816.
.....	Died.	.....	Walther.	Jour. der Chirurgie, 1822.
12 days.	Died.	.....	Coliny.	Archives Générales de Méd., 1836.
.....	Died.	Fracture of lower vertebra.	Moutet.	Gaz. Méd. de Montpellier, 1853.
.....	Died.	Ligaments all torn.	Carassus.	Gazette Médicale, 1847.
22 hours.	Died.	Dislocation of fourth from fifth cervical vertebra; cord compressed.	Trélat.	Richet, op. cit.
7 days.	Died.	Complete forward dislocation of fifth cervical vertebra. (Malgaigne thinks at first incomplete luxation, spontaneously reduced.)	Caussé.	Mémoire Médico-légal, etc.
1½ years.	Recovered.	Died of other causes—pleurisy; autopsy showed fractures of atlas and odontoid process of axis.	From Archives Générales.	Am. Jour. Med. Sci., O. S., vol. xxiii.
More than 1 year.	Relieved.	Died of other causes—tubercle of brain.	Dariste.	Am. Jour. Med. Sci., O. S., vol. xxiii.
22 days.	Recovered.	After 36 hours, reduction by extension, which was then made continuous; paralysis disappeared next day.	Parisot.	Garnier et Wahu, Annuaire, 1866.
44 hours.	Died.	Slight fracture of transverse process.	C. C. Gray.	Am. Jour. Med. Sci., N. S., vol. lii.
2 days.	Died.	Six upper cervical vertebræ displaced forward on seventh; slight fracture of body of sixth.	Ashhurst.	Proceedings Path. Soc. Phila., vol. ii.

No.	AGE, OCCUPATION, ETC.	MODE OF INJURY.	DESCRIPTION OF INJURY; PROGRESS OF CASE, ETC.
184	Laborer, aged 45.	Fell into hold of ship.	Fracture of fourth cervical vertebra.
185	Drayman, aged 41.	Wheel passed over neck.	Fractures of body of third and spinous process of fourth cervical vertebræ; scalp wound.
186	Drayman, aged 30.	Heavy weight fell on shoulders.	Fracture of fifth or sixth cervical vertebra; scalp wound.
187	Laborer.	Fell backward from cart.	Fracture with displacement of sixth cervical vertebra.
188	Coal-wagoner.	Thrown from cart while drunk; struck neck and shoulders.	Could not stand, and dragged legs when supported; <i>no paralysis</i> while lying in bed; swelling between <i>shoulders</i> ; pain in <i>loins</i> ; on eighth day, convulsions—mania; eleventh day, paralysis, which afterward began to pass away.
189	Male.	Fell from barge into Thames at low-water.	Head stuck in mud; died instantly.
190	Stoker, aged 53.	Injured by machinery.	Lacerated wounds; pain in neck; paralysis; dyspnoea; retention of urine and feces.
191	Porter, aged 37.	Fell into hold of steam-boat.	Pain; paralysis; dyspnoea and dysphagia; retention of urine and feces; insomnia.
192	Female, aged 62.	Thrown from carriage.	Paralysis; retention of urine; coma next day.
193	.....	.....	Complete lateral dislocation of fifth cervical vertebra, without fracture.
194	Female, aged 28.	Fell 10 feet, striking head.	Felt "grating in neck;" depression over cervical spine, and prominence in pharynx; paralysis; pain; dyspnoea; retention of urine; insomnia; bowels opened involuntarily; bed-sores; convulsion.
195	Male, aged 35.	Thrown from cart into ditch.	Stunned; paralysis; dyspnoea.
196	Laborer, aged 22.	Fell from scaffold 20 feet, striking back.	Walked to neighboring house; paralysis began in 2 hours; priapism; retention of urine and feces; skin hot.
197	Plumber, aged 34.	Fell 55 or 60 feet.	Depression and pain over seventh cervical and first 3 dorsal vertebræ; paralysis; scanty urine.

TIME UNDER OBSERVATION.	RESULT.	REMARKS, AUTOPSY, ETC.	AUTHOR.	REFERENCE.
2 days.	Died.	Diagnosis not certain till confirmed by autopsy.	Ined.	Penn'a Hospital Record.
9 days.	Died.	Treated by rest on water-bed.	Id.	Ibid.
2 days.	Died.	.....	Id.	Ibid.
2 days.	Died.	Cord compressed.	Id.	Ibid.
20 days.	Died.	Diastasis of seventh cervical from first dorsal vertebra; interarticular cartilage had disappeared; pus had dropped to bottom of spinal sheath.	Charles Bell.	Surgical Observations.
.....	Died.	Subluxation of seventh cervical upon first dorsal vertebra; effusion of blood.	Id.	Observations on Injuries of Spine and Thigh-bone.
4 days.	Died.	Dislocation of fifth from sixth cervical vertebra; cord nearly divided.	Ch. D. Doig.	Edinb. Med. Jour., N. S., vol. ix.
4 days.	Died.	Fracture and dislocation of fifth cervical vertebra; clot and effusion on cord; cord unaltered.	Id.	Ibid.
20 hours.	Died.	Fractures of fifth and sixth cervical vertebræ; canal filled with clotted blood; cord unhurt.	J. Jardine Murray.	Ibid., vol. vii.
.....	Died.	Attempts had been made at reduction.	Duploury.	Brit. and For. Med.-Chir. Rev., vol. xxxiv.
12 days.	Died.	Dislocation of fifth from sixth cervical vertebra, and fracture of sixth dorsal; cord divided at lower point, and softened above.	Adams.	Dublin Med. Journal, vol. vi.
4 days.	Died.	Dislocation of fifth from sixth cervical vertebra; slight fracture; cord softened; extravasated blood.	Hutton.	Ibid., vol. xvii.
4 days.	Died.	Fractures of fifth, sixth, and seventh cervical, and of first dorsal vertebræ; no displacement; clots on cord, which softened.	Murney.	Ibid., vol. xxiv.
4 days.	Died.	No autopsy.	Id.	Ibid., vol. xxv.

No.	AGE, OCCUPATION, ETC.	MODE OF INJURY.	DESCRIPTION OF INJURY; PROGRESS OF CASE, ETC.
198	Male.	Gunshot wound.	Shot in back of neck while lying asleep on his side; his mistress, who was awake, stated that he did not stir a limb nor appear startled, though the report was loud.
199	Mason, aged 28.	Fall.	Fracture of spine about tenth dorsal vertebra; paralysis came on in 2 days.
200	Washer-woman, aged 28.	Fell from second story on feet, and then on back.	3 lower dorsal vertebræ projected backward; paralysis of right limb.
201	Female.	Jumped from window, striking feet and back.	Died upon admission to hospital.
202	Male, aged 46.	Fell from second story while drunk, striking cross-beam.	Paralysis; pain in loins; jaundice, etc.
203	Male, aged 37.	Drunk; could give no account of accident.	Paralysis; pain; tumor in back; bed-sores, etc.
204	Machinist.	Fell 15 feet, striking back.	Depression in back, which afterward disappeared; paralysis; sloughing; left side cedematous.
205	.....	.....	During life supposed to be concussion of cord only; partial paralysis; sloughing.
206	Drayman, aged 35.	Bag of hops, weighing $1\frac{1}{2}$ cwt., fell 40 feet on head and shoulders.	Fracture of fourth dorsal vertebra; paralysis; priapism. Temperature 103° to 106° Fahr.
207	Male, young.	Fell from tree.	Fracture of a dorsal vertebra; bed-sores healed; then sloughing cystitis.
208	Male, aged 19.	Fell 30 feet from pear-tree.	Fracture between eighth and tenth dorsal vertebræ; paralysis; bed-sores; incontinence of urine.
209	Shoemaker, aged 23.	Fell from second-story window.	Pain and projection about fifth or sixth dorsal vertebra; paralysis; in 4 months could walk.
210	Plasterer, aged 25.	Fell 40 feet; back struck against stone step.	Depression between spinous processes; pain; <i>no paralysis</i> ; on third day delirious, threw himself out of bed, etc.; on fifth day, had to be tied in bed.
211	Female, aged 18.	Thrown from second-story window on back.	Great tumefaction over lower dorsal vertebræ; spinous processes crushed; no paralysis; wound over sacrum; treatment by rest, etc.

TIME UNDER OBSERVATION.	RESULT.	REMARKS, AUTOPSY, ETC.	AUTHOR.	REFERENCE.
.....	Died.	Instant death; ball passed between arches of atlas and axis; divided cord, and lodged in odontoid process.	Shaw.	Holmes, System of Surgery, vol. ii.
2 months.	Recovered.	Treated by cupping, and rest in bed, etc.	Dupuytren.	Op. cit.
4 months.	Recovered.	Treated by rest, bleeding, etc.	Id.	Op. cit.
Few hours.	Died.	Fracture of twelfth dorsal vertebra; rupture of liver.	Id.	Op. cit.
9 days.	Died.	Fracture of eleventh dorsal vertebra, with backward projection; cord disorganized.	Id.	Op. cit.
32 days.	Died.	Fracture of eleventh dorsal vertebra; cord disorganized.	Id.	Op. cit.
.....	Died.	Fractures of eleventh and twelfth dorsal vertebræ, in process of cure; cord swollen and softened.	Id.	Op. cit.
.....	Died.	Fracture of tenth dorsal vertebra; clot and meningitis opposite ninth, tenth, and eleventh dorsal vertebræ.	Id.	Op. cit.
9 days.	.....	"Now moribund."	Shaw.	Holmes, Syst. of Surgery, vol. ii.
8 months.	Died.	Calculi in bladder and kidneys.	Id.	Ibid.
13 years.	Relieved.	Paralysis of limbs continued, but was able to drive himself.	Id.	Ibid.
21 years.	Relieved.	Paralysis gradually returned; died after 21 years; old fracture, with anchylosis of fifth dorsal vertebra; cord apparently destroyed for 2 inches.	Id.	Ibid.
5 days.	Died.	Fracture of body and spinous process of eleventh dorsal vertebra; cord not compressed, but greenish pus between it and sheath; effusion on brain.	Charles Bell.	Surgical Observations.
10½ months.	Recovered.	Lay for 8 months with body bent and legs drawn up; had regained erect posture when discharged.	Jobernes.	Bell, op. cit.

No.	AGE, OCCUPATION, ETC.	MODE OF INJURY.	DESCRIPTION OF INJURY; PROGRESS OF CASE, ETC.
212	Male, aged 30.	Fell 2 stories; struck back on pavement.	Pain in back; paralysis; after a week, slight depression in spinous processes.
213	Clerk, male, aged 22.	Fell from second story while drunk, striking heels and buttocks.	Fractures of both calcanea, and of spinous process of twelfth dorsal vertebra, which displaced to right side; great pain on motion.
214	Male, aged 35 or 40.	Gunshot wound of left axilla; small ball, and bird-shot.	Not seen for 6 days; many wounds, apparently but superficial. No spinal symptoms.
215	Male, aged 47.	Struck on back by timber weighing $\frac{1}{2}$ a ton.	Fracture of 4 ribs, of leg, and of a dorsal vertebra; stunned; paralysis, which diminished after 3 or 4 months, but returned.
216	Laborer, aged 40.	Fell 12 or 15 feet, striking back.	Projection of tenth and eleventh dorsal vertebrae; tenderness on pressure; paralysis; walked after 6 months.
217	Male, aged 22.	Struck by limb of tree.	Dislocation of fifth and sixth dorsal vertebrae; paralysis; after 6 years had both thighs amputated high up, as being useless appendages.
218	Male, aged 25.	Struck on back by fly-wheel.	.....
219	Soldier, aged 20.	Gunshot wound.	Fractured rib and spine; paralysis.
220	Returned soldier, aged 22.	Gunshot wound of neck.	Ball passed through thyroid gland, oesophagus, etc. Paralysis; pain; delirium.
221	Male, aged 30.	Gunshot wound.	Paralysis.
222	Dealer in glassware, aged 24.	Crushed between wagon and tree.	Found dead shortly afterward.
223	Male, aged 66.	Bag of corn fell on him.	Compound fracture of right thigh; amputated.
224	Mason, aged 32.	Fell 4 stories from scaffolding.	.....
225	Deer-stealer, aged 38.	Gunshot wound.	Ball entered left hand, and passed up arm between ribs, tearing lung.

TIME UNDER OBSERVATION.	RESULT.	REMARKS, AUTOPSY, ETC.	AUTHOR.	REFERENCE.
14 days.	Died.	Fractures of sixth and seventh dorsal vertebræ; cord pierced by fragment from body of vertebra; fractured rib.	Bell.	Op. cit.
.....	Recovered.	Treated by rest alone. When got up, spinous process had resumed proper place.	Malgaigne.	Treatise on Fractures. Packard's edit.
20 days.	Died.	Ball lodged in body of a dorsal vertebra; no splinters; pus between diaphragm and pleura.	Cocut.	Mémoires de Méd. Milit., t. xii.
49 weeks.	Died.	Bed-sore had healed.	Hamilton.	Op. cit.
4 years.	Recovered.	Resumed occupation; could walk half a mile. Projection remained.	Lente.	Am. Jour. Med. Sci., N. S., vol. xxxiv.
7 years.	Relieved.	Died from other causes. No autopsy. During amputation felt nothing whatever, though not under influence of anæsthetic.	W. D. Purple.	N. Y. Jour. of Medicine, 1853.
5 months.	Died.	Impacted fracture of third dorsal vertebra, with luxation of sternum.	Brinton.	Proceedings Path. Soc. Phila., vol. i.
.....	Died.	Fractures of eighth and ninth dorsal vertebræ; ball in canal.	W. Thompson.	Lidell, loc. cit.
26 hours.	Died.	Ball had punctured bodies of first and second dorsal vertebræ, and lodged in substance of spinal cord.	W. Pepper.	Proceedings Path. Soc. Phila., vol. ii.
8 days.	Died.	Cord almost divided; ball in body of seventh dorsal vertebra.	Gross.	Op. cit., vol. ii.
.....	Died.	Fracture of spinous process of first dorsal vertebra; heart torn from attachments and loose in thorax; lung and liver torn.	Casper.	Op. cit.
8 days.	Died.	Fracture of third dorsal vertebra; cord unhurt; fractures of two ribs, and contusion of heart.	Id.	Op. cit.
2 days.	Died.	Fractured skull and ninth dorsal vertebra; cord crushed.	Id.	Op. cit.
.....	Died.	Ball fractured third dorsal vertebra, lacerated cord, and lodged in structures of back.	Id.	Op. cit.

No.	AGE, OCCUPATION, ETC.	MODE OF INJURY.	DESCRIPTION OF INJURY; PROGRESS OF CASE, ETC.
226	Laborer, aged 33.	Timber fell on shoulders.	At first loss of sensation, but not of motion; afterward loss of motion, but return of sensation; finally, loss of both.
227	Male, aged 30.	Fell through trap-door on feet (16 or 18 feet); struck back on stone.	Projection in dorsal region; paralysis; priapism on second day.
228	Wagoner, aged 46.	Supposed to have been run over by wagon.	Died in a few minutes.
229	Male, aged 13.	Fell 35 or 40 feet, striking back; stunned.	Projection of sixth or seventh dorsal vertebra; delirium; paralysis; priapism; incontinence of urine and feces; abnormal heat; excoriation; cystitis on ninth day; bed-sores; did well for 3 weeks, then rigors, followed by death.
230	.....	.....	Fracture lower part of dorsal spine; paralysis, etc.
231	.....	.....	Fracture lower part of dorsal spine; paralysis.
232	Female, aged 22.	Jumped from window while drunk.	Partial dislocation of a dorsal vertebra; paralysis, pain, etc.
233	Female.	Gunshot wound.	Ball passed between eighth and ninth dorsal vertebrae; paralysis.
234	Soldier.	Sword wound.	Pain; no paralysis; lived several months (?).
235	Male.	Fell from vine.	Speechless; paralyzed; urine and feces escaped involuntarily; bled from nose and mouth.
236	Male, aged 45.	Fell from scaffold, and received blow on back.	Paralysis, followed by convulsions.
237	Male.	Fell from scaffold.	Fracture of sixth dorsal vertebra; paralysis; slough over sacrum exposing canal.
238	.....	.....	Fracture of third dorsal vertebra; paralysis.
239	Male.	.....	Fracture and dislocation of third dorsal vertebra; compression not constant; could be relieved by pressure.
240	.....	.....	Dislocation backward of fifth dorsal vertebra.
241	Male.	.....	Fracture of seventh dorsal vertebra; displacement reduced by extension accompanied by audible sound.

TIME UNDER OBSERVATION.	RESULT.	REMARKS, AUTOPSY, ETC.	AUTHOR.	REFERENCE.
10 days.	Died.	Dislocation forward of eleventh dorsal vertebra, with fracture of twelfth; cord disorganized.	Bryant.	Loc. cit.
21 days.	Died.	Fracture of eleventh dorsal vertebra, with slight backward projection; cord completely divided.	Hilton.	Guy's Hospital Reports, 3d S., vol. xi.
.....	Died.	Fractures of eighth, ninth, and tenth dorsal vertebræ; aorta ruptured.	Curling.	Lond. Hospital Reports, vol. i.
28 days.	Died.	Fracture and forward displacement of sixth dorsal vertebra; cord crushed, but not compressed; metastatic deposits in several viscera.	J. H. Gray.	Ibid.
.....	Recovered.	Details promised hereafter.	R. Llewellyn.	Ibid., vol. ii.
.....	Recovered.	Details promised hereafter.	D. Thorp.	Ibid.
1 year.	Recovered.	Could walk, but defective motion of left foot remained.	From Med. Times and Gaz.	Medical News, vol. xxii.
20 days.	Died.	.....	Platerus.	Morgagni, De Sed. et Caus. Morb., t. iii.
.....	.....	Blade transfixing twelfth dorsal vertebra and cord.	Cuvilliersius.	Ibid.
4 hours.	Died.	Fractures of skull, ribs, and 6 upper dorsal vertebræ.	Morgagni.	Ibid.
9 weeks.	Died.	Fracture of fourth dorsal vertebra; cord compressed and softened; abscess from seat of fracture extended into posterior mediastinum.	Brodie.	Loc. cit.
6 weeks.	Died.	Pus between vertebræ and cord; coagulated lymph; cord softened.	Id.	Loc. cit.
.....	Recovered.	.....	Green.	Brodie, loc. cit.
18 days.	Died.	Death through lungs.	Zambaco.	Rec. des Trav. de la Soc. Méd. d'Obs., t. i.
.....	Died.	No fracture.	Landry.	Ibid.
7 days.	Died.	Death from erysipelas; cord softened and disorganized; pus.	Luke.	Lancet, 1850.

No.	AGE, OCCUPATION, ETC.	MODE OF INJURY.	DESCRIPTION OF INJURY; PROGRESS OF CASE, ETC.
242	Coachman, aged 42.	Driving under arch, struck back of neck against a beam.	Displacement of ninth dorsal vertebra forward, and of tenth backward; paralysis. Treated by continuous extension.
243	Laborer, aged 25.	Scaffold pole fell on him.	Paralysis, etc.; no deformity.
244	Cooper.	Struck by falling tree.	Fracture and backward projection of eleventh dorsal vertebra; paralysis.
245	.....	.....	Fractures of third, fourth, and fifth dorsal vertebrae; third and fourth projected in front of sixth and seventh, and co-ossified in that position.
246	.....	Fell on back.	Projection of eleventh dorsal vertebra; 3 fingers could be laid between spinous processes of eleventh and twelfth. No paralysis.
247	.....	.....	Fractures of fourth, fifth, and sixth dorsal vertebrae, with angular projection and displacement.
248	Officer.	Gunshot wound received in duel.	Paralysis; sloughing, etc.
249	Soldier.	Gunshot wound.	Paralysis, etc.
250	Male.	Fell from height on back.	Paralysis; bed-sores in 12 days. No priapism.
251	Laborer, aged 34.	Fell from scaffold across a wall.	Paralysis; pain; priapism; deformity in lower part of spine reduced by extension and pressure.
252	Male, aged 48.	Fell from building across a plank.	Stunned; very restless; next day paralysis; projection in middle of back.
253	Male, aged 46.	Caught between top of car and door.	Depression in dorsal region; paralysis.
254	Shoemaker.	Fell into cellar.	Prominence of fifth and sixth dorsal vertebrae; paralysis.
255	Boatman, aged 33.	Fell into sawpit.	Next day paralysis, followed by delirium.
256	Male.	Struck by derrick on head and back.	Paralysis, bed-sores, etc.
257	Male.	Fell from second story.	Paralysis next day.

TIME UNDER OBSERVATION.	RESULT.	REMARKS, AUTOPSY, ETC.	AUTHOR.	REFERENCE.
1 year.	Recovered.	Resumed occupation; slight deformity remained.	Crowfoot.	Trans. Prov. Med. and Surg. Assoc., 1853.
11 days.	Died.	Dislocation of fifth from sixth dorsal vertebra; cord diffuent.	Robert.	Ranking's Abstract, 1854.
1 year.	Recovered.	Resumed occupation; slight deformity remained.	Dorrance.	Am. Journ. Med. Sci., O. S., vol. xvi.
2 months.	Died.	Cord completely divided.	Parkman.	Ibid., N. S., vol. xxv.
3 months.	Recovered.	Slight deformity and weakness remained.	Stafford.	Medical Gazette, vol. xvii.
3 months.	Died.	Spinal canal obliterated; bony growth around fracture.	Hewson.	Proc. Path. Soc. Phila., vol. i.
30 days.	Died.	Fracture of fifth dorsal vertebra; ball lodged in canal.	Williamson.	Dublin Qu. Med. Jour., vol. xxvii.
4 days.	Died.	Wounds of lung, diaphragm, and liver; ball passed between eleventh rib and vertebræ, lodging in canal.	Id.	Ibid.
8 weeks.	Died.	Fracture of twelfth dorsal vertebra; canal occupied by fragment; cord destroyed, though dura mater whole.	J. W. Ogle.	Proc. Path. Soc. Lond., vol. iv.
8 months.	Died.	Dislocation forward of eleventh dorsal vertebra; fracture of twelfth.	Cock.	Bryant, <i>ibid.</i> , vol. viii.
5 weeks.	Died.	Fractures of two dorsal vertebræ; cord softened; pus in canal.	C. A. Lee.	Am. Journ. Med. Sci., O. S., vol. xvii.
9 days.	Died.	Fracture of ninth dorsal vertebra; cord compressed and pulpy.	Norris.	<i>Ibid.</i> , vol. xxv.
15 months.	Not improved.	Paralysis persisted.	Ségalas.	<i>Ibid.</i> , N. S., vol. ix.
13 days.	Died.	Fracture of sixth dorsal vertebra; cord unhurt.	J. P. Harrison.	<i>Ibid.</i> , vol. xiii.
17 days.	Died.	Fractures of body of fourth, and spinous processes of fifth, sixth, and seventh dorsal vertebræ.	S. D. Townsend.	<i>Ibid.</i> , vol. xxii.
30 days.	Died.	Fracture of twelfth dorsal vertebra; cord softened.	Ollivier.	Op. cit.

No.	AGE, OCCUPATION, ETC.	MODE OF INJURY.	DESCRIPTION OF INJURY; PROGRESS OF CASE, ETC.
258	Male.	.....	Paralysis; not total as regards sensation.
259	Male, aged 31.	Fell into hold of ship, striking back.	Fascia torn off several dorsal spines; paralysis; extension under chloroform gave no relief; followed by great pain.
260	Male, aged 20.	Fell through trap-door.	Paralysis, pain, etc.
261	Male, aged 29.	Sack weighing $2\frac{1}{2}$ cwt. fell 8 or 9 feet on loins.	Fracture of eleventh dorsal vertebra, with displacement of spinous process; paralysis began to disappear after 5 weeks.
262	Sawyer, aged 37.	Fell from cart while drunk.	Stunned; pain; paralysis; priapism; scalp wound; next day crepitus over first and second dorsal vertebræ.
263	.....	.....	Fracture, with displacement of dorsal vertebra.
264	Mason.	Fell down stairs against step.	Backward dislocation of ninth dorsal vertebra, with slight fractures of tenth and eleventh.
265	Carter.	Wheel ran against him.	Dislocation backward of eighth dorsal vertebra; paralysis.
266	Mason.	Fell from height on back.	Complete forward bilateral dislocation of tenth dorsal vertebra.
267	Male.	Fell from height on back.	Complete forward bilateral dislocation of sixth dorsal vertebra.
268	Male.	Fell on buttocks.	Dislocation of tenth dorsal vertebra, with fractures of apophyses and of 7 ribs.
269	.....	.....	Patient paralyzed; lived some time.
270	Omnibus- driver, aged 25.	Jammed between omnibus-top and doorway.	Fracture of twelfth dorsal vertebra.
271	Laborer, aged 20.	Run over by railroad-car.	Fracture of tenth dorsal vertebra; severe contusion; complete paraplegia.
272	Harness- maker, aged 37.	Fell from roof.	Fracture of twelfth dorsal vertebra; spinous process projected backward.
273	Sailor, aged 40.	Fell on back.	Fracture of a dorsal vertebra, with backward projection.
274	Laborer, aged 36.	Struck by "shears" and lumber.	Compound fracture of leg, and fracture of a dorsal vertebra, with backward projection.

TIME UNDER OBSERVATION.	RESULT.	REMARKS, AUTOPSY, ETC.	AUTHOR.	REFERENCE.
.....	Died.	Displacement of twelfth dorsal vertebra; cord compressed, flattened, and softened.	Ollivier.	Ibid.
4½ months.	Died.	Displacement of eleventh from twelfth dorsal vertebra, with fracture of articular processes; cord disorganized; suppuration of kidneys.	Birkett.	Brit. Med. Journal, 1859.
9 days.	Died.	Twelfth dorsal vertebra fractured and torn away from eleventh; cord disorganized.	Id.	Ibid.
14 weeks.	Relieved.	Became dissatisfied and left hospital.	Id.	Ibid.
15 days.	Died.	Fractures of first and second dorsal vertebræ; small clot in canal; theca torn, and cord diffuent.	Paul Belcher.	Ibid., 1862.
.....	Recovered.	Treated by extension.	Higginson.	Ibid.
24 hours.	Died.	Cord apparently uninjured.	Melchiori.	Malgaigne, Tr. des Fract. et des Luxns., t. ii.
6 months.	Recovered.	Reduction by position in bed; slight deformity remained.	Id.	Ibid.
1 day.	Died.	No fracture; cord divided.	Id.	Ibid.
5 days.	Died.	No fracture; cord compressed.	Id.	Ibid.
3 months.	Died.	.....	Pons.	Ibid.
.....	Died.	Backward dislocation of eleventh dorsal vertebra; cord compressed.	.....	Lond. Hosp. Rep., vol. ii.
53 days.	Died.	.....	Ined.	Penna. Hospital Record.
64 days.	Died.	No autopsy.	Id.	Ibid.
94 days.	Relieved.	Slight deformity and paralysis of right limb remained.	Id.	Ibid.
77 days.	Recovered.	Slight deformity remained.	Id.	Ibid.
4 days.	Died.	Death hastened by mania à potu.	Id.	Ibid.

No.	AGE, OCCUPATION, ETC.	MODE OF INJURY.	DESCRIPTION OF INJURY; PROGRESS OF CASE, ETC.
275	Laborer, aged 24.	Injured at same time as preceding.	Fracture of a dorsal vertebra, with projection backward.
276	Operative, aged 16.	.....	Fracture of a dorsal vertebra, with projection forward.
277	Laborer, aged 28.	Fell from tree.	Compound fracture of skull; fractures of fifth and sixth dorsal vertebræ, with backward projection; paralysis.
278	Seaman, aged 25.	Fell from third story.	Contusion; scalp wound; pain in back; after some days, projection backward of twelfth dorsal vertebra observed; no paralysis.
279	Miner, aged 22.	Heavy stone fell on his back.	Fractures of eleventh and twelfth dorsal vertebræ, with lateral displacement; paralysis.
280	Bricklayer, aged 23.	Fell 2 stories on some timber.	Fractures of last dorsal and first lumbar vertebræ; marked projection backward.
281	Quarryman, aged 40-45.	Mass of earth fell on loins.	Tumor in front and back; crepitus; spine shortened; paralysis gradually crept upward.
282	Male, aged 19.	Struck on loins by falling timber.	Dislocation of last dorsal vertebra; reduced by extension; reduction attended by an audible sound; no relief.
283	Male, aged 25.	Struck on back by falling door.	Dislocation of last dorsal on first lumbar vertebra; paralysis; priapism. (Slight fracture.)
284	Musketeer.	Struck on back by falling wall.	Dislocation backward and to right side of twelfth dorsal vertebra.
285	Male, aged 11.	Crushed under ox-cart.	Dislocation of twelfth dorsal from first lumbar vertebra; paralysis.
286	Male, aged 55.	Blown off rigging by wind; struck shoulders.	Fractures of twelfth dorsal and first lumbar vertebræ; paralysis; chill; delirium; blisters formed on both thighs before death.
287	Female, aged 49.	Maniacal; jumped from window.	Contusions; <i>no paralysis whatever; walked with ease.</i>
288	Male.	Mass of chalk fell on him.	First lumbar projected backward over twelfth dorsal vertebra; dislocation reduced with audible sound by Mr. Hardwicke.

TIME UNDER OBSERVATION.	RESULT.	REMARKS, AUTOPSY, ETC.	AUTHOR.	REFERENCE.
1 day.	Died.	Rupture of spleen.	Ined.	Ibid.
37 weeks.	No im- prove- ment.	.....	Id.	Ibid.
21 days.	Died.	Death from exhaustion.	Id.	Ibid.
68 days.	Recovered.	Slight deformity remained.	Id. [Ash- hurst.]	Ibid.
126 days.	No im- prove- ment.	Deformity remained.	Id.	Ibid.
1 day.	No im- prove- ment.	Removed by friends. No pa- ralysis while in hospital.	Id.	Ibid.
7 days.	Died.	Bodies of twelfth dorsal and first lumbar vertebræ project- ed forward more than one inch; processes broken; cord torn; diaphragm lacerated.	Dupuytren.	Op. cit.
23 days.	Died.	Dislocation, with slight frac- ture, of twelfth dorsal verte- bra; fracture of first lumbar; secondary deposits in both knee-joints.	C. Hawkins.	Holmes, Proc. Path. Soc. Lond., vol. x.
Several months.	Recovered.	Reduction by extension and counter-extension under chlo- roform; audible sound; when discharged could walk with cane.	Graves.	Parker, N. Y. Jour. Medicine, 1852.
6 weeks.	Recovered.	Reduction by position (on belly); extension and pressure con- tinued for fifteen days.	Rudiger.	Desault, Jour. de Chir., t. iii.
8 years.	Not im- proved.	Pursued occupation of portrait painter while lying on side.	Swan.	Bost. Med. Jour., vol. xxii.
6 days.	Died.	Splinter from first lumbar ver- tebra had divided cord.	D. S. Conant.	Am. Med. Times, 1861.
16 days.	Died.	Brain watery; fractures of twelfth dorsal, and first, sec- ond, and third lumbar verte- bræ; no displacement; cord unhurt.	Bryant.	Loc. cit.
2 or 3 years.	Relieved.	Partial paralysis remained.	Brodie.	Loc. cit.

No.	AGE, OCCUPATION, ETC.	MODE OF INJURY.	DESCRIPTION OF INJURY; PROGRESS OF CASE, ETC.
289	Child.	Knocked down by coach.	Dislocation between twelfth dorsal and first lumbar vertebra; slight fracture.
290	Soldier.	Wall fell on his back.	Stunned; displacement backward of twelfth dorsal and first lumbar vertebrae; dyspnoea.
291	Officer.	Gunshot wound.	Ball entered junction of dorsal and lumbar regions, and lodged; paralysis; priapism; retention of urine and feces.
292	Laborer, aged 17.	Struck by fall of derrick.	Projection of 3 lower dorsal and first lumbar vertebrae; paralysis; dyspnoea.
293	Sawyer, aged 23.	Fell 24 feet.	Pain and ecchymosis in back; fractured calcaneum; after a week, projection of twelfth dorsal and first lumbar vertebrae.
294	Male, aged 32.	Fell, striking buttocks.	Projection at junction of dorsal and lumbar vertebrae; pain; paralysis; began to improve on second day.
295	Bricklayer, aged 32.	Fell 30 feet; stunned.	Projection of last dorsal and first lumbar vertebrae; no paralysis; resumed work after 6 months.
296	Male, aged 8.	Caught between wheel and body of wagon.	Displacement of 2 last dorsal and 3 first lumbar vertebrae; could not walk for 8 weeks; no absolute paralysis.
297	Male, aged 46.	Mass of earth fell on him.	Spine curved from ninth dorsal to third lumbar vertebra; in bed for 11 weeks; no absolute paralysis.
298	Sawyer, aged 31.	Log of wood, weighing 8 or 10 tons, came on back.	Projection from sixth dorsal to third lumbar vertebra; fracture of spinous process of eighth dorsal; no absolute paralysis; could walk after 14 days.
299	Female, aged 19.	Jumped from second story window, striking buttocks.	Projection of lower dorsal vertebrae; paralysis, which diminished after 2 weeks.
300	Male, aged 34,	.....	Projection of lumbar vertebrae 1 inch beyond dorsal; reduction by extension, under chloroform, with relief to symptoms.
301	Male, aged 19.	Great weight fell on shoulders.	Fell paralyzed.
302	Male.	Fell from height on back.	Dislocation forward of twelfth dorsal vertebra; slight fracture of first lumbar.
303	Male.	Fell from height on chest, and weight rolled on back.	Dislocation forward of twelfth dorsal, and fracture of first lumbar vertebra.

TIME UNDER OBSERVATION.	RESULT.	REMARKS, AUTOPSY, ETC.	AUTHOR.	REFERENCE.
13 months.	Relieved.	Died, thirteen months later, of croup.	C. Bell.	Op. cit.
6 weeks.	Recovered.	Displacement reduced by extension and pressure.	Schmucker.	Smith, N. Y. Jour. Med., 1852.
12 years.	Relieved.	Paralysis but slightly improved; could stimulate bladder and rectum to contract by tickling penis.	Tripler.	N. Y. Jour. Med., 1851.
25 days.	Died.	Autopsy showed congenital malposition of abdominal viscera in thorax.	H. J. Bowditch.	Buffalo Med. Jour., 1853.
2 months.	Recovered.	No spinal symptoms.	Stanley.	Ormerod, Clinical Collections.
40 days.	Recovered.	Walked with a cane.	Syme.	Ed. Med. Jour., vol. xxxvii.
2 years.	Recovered.	Back still weak.	Shaw.	Med. Gaz., vol. xvii.
3½ months.	Recovered.	Injury below origin of cauda equina.	Id.	Proc. Path. Soc. Lond., vol. iii.
.....	Recovered.	Resumed work; injury below origin of cauda equina.	Id.	Ibid.
2 years.	Recovered.	After two years could work in fields; injury below origin of cauda equina.	Id.	Ibid.
8½ months.	Relieved.	Died of phthisis; autopsy showed fractures of twelfth dorsal, and first and second lumbar vertebræ; cord compressed; callus formed.	H. J. Bigelow.	Am. Jour. Med. Sci., N. S., vol. xxi.
4 weeks.	Died.	No account of autopsy.	Higginson.	Brit. Med. Jour., 1862.
3 months.	Died.	Dislocation backward of twelfth dorsal, and fracture of first lumbar vertebra.	Robert.	Gaz. des Hôpitaux, 1848.
31 days.	Died.	.....	Pingrenon.	Revue Méd., 1830.
.....	Died.	.....	Lebert.	Bulletin de la Société Anat., 1836.

No.	AGE, OCCUPATION, ETC.	MODE OF INJURY.	DESCRIPTION OF INJURY; PROGRESS OF CASE, ETC.
304	Male.	.....	Dislocation with fracture of first lumbar vertebra; paralysis.
305	Quarryman, aged 28.	Mass of earth fell on him.	Fractured radius; pain in loins; paralysis.
306	Male.	Jumped from third story.	Deformity and great mobility of spine; paralysis, at first partial, afterward complete; bed-sores.
307	Soldier.	Fell from rampart.	Projection of fourth and fifth lumbar vertebrae, with "profound commotion."
308	Male, aged 25.	Boiler rolled on back.	Paralysis; retention of urine; lower temperature of paralyzed limbs; sensation improved after 5 weeks; erysipelas and sloughing.
309	Boy.	.....	Fracture and displacement of third and fourth lumbar vertebrae; paralysis; attempts at reduction partially successful.
310	Female.	Gunshot wound.	Ball lodged in lumbar vertebrae; paralysis; bed-sores.
311	Male, aged 20.	Fell from roof on buttocks and loins.	Fracture of third or fourth lumbar vertebra; paralysis; bed-sores; exfoliation from fifth lumbar.
312	Soldier, aged 19.	Gunshot wound.	Ball entered loins, and lodged in spine: no paralysis; <i>tetanus</i> .
313	Soldier, aged 19.	Gunshot wound.	Fractures of second and third lumbar vertebrae; ball lodged; partial paralysis.
314	Soldier, aged 40.	Gunshot wound.	Fractures of third and fourth lumbar vertebrae.
315	Soldier, aged 18.	Gunshot wound.	Fracture of spinous process of second lumbar vertebra; paralysis—began to diminish after 5 days.
316	Male, aged 36.	Fell 50 feet from mast.	Shock; contusion of head; pain in head; space between twelfth dorsal and first lumbar vertebrae; no paralysis.
317	.....	.....	Fracture of first lumbar vertebra.
318	Male, aged 28.	Mass of chalk fell on him.	Fractures of first and second lumbar vertebrae; death from bed-sores.
319	Soldier.	Gunshot wound.	Ball lodged in lumbar vertebrae.
320	Rigger, aged 54.	Fell from masthead to deck.	.....

TIME UNDER OBSERVATION.	RESULT.	REMARKS, AUTOPSY, ETC.	AUTHOR.	REFERENCE.
8 months.	Died.	Destruction of cord and cauda equina; fracture united.	Vincent.	Ibid., 1850.
11 days.	Died.	Fracture, with backward projection of first lumbar vertebra; cord softened.	Dupuytren.	Op. cit.
.....	Died.	Fracture of second lumbar vertebra; cyst of pus by tenth dorsal; cord liquefied.	Id.	Op. cit.
.....	Recovered.	Cured after long treatment.	Bégin.	(Œuvres Chir., t. ii.
2 months.	Died.	Fracture of second lumbar vertebra; cord penetrated by fragment and softened.	Hamilton.	Ed. Med. Journal, N. S., vol. vi.
3 or 4 months.	Relieved.	Motion improved after first month.	Brodie.	Loc. cit.
Several months.	Died.	.....	F. H. Hamilton.	Op. cit.
4 years.	Relieved.	Could not quite stand alone; went about country as peddler.	Lente.	Am. Jour. Med. Sci., N. S., vol. xxxiv.
11 days.	Died.	Ball lodged in body of third lumbar vertebra; contusion of anterior crural nerve; peritonitis.	W. B. Dick.	Lidell, loc. cit.
15 days.	Died.	Wound of right kidney; peritonitis, enteritis, and cystitis.	C. R. Nelden.	Ibid.
10 days.	Died.	Ball lodged in spinal canal.	W. Thompson.	Ibid.
2 months.	Recovered.	Able to walk with a cane.	Lidell.	Ibid.
24 hours.	Died.	Fracture of first lumbar vertebra; no pressure on cord; fracture of skull; rupture of bowels; peritonitis.	Key.	Guy's Hospital Reports, 2d S., vol. ii.
367 days.	Died.	Bony union; cord completely divided.	Id.	F. H. Hamilton, op. cit.
376 days.	Died.	Bony union; cord almost divided.	Harrold.	Cooper, Disloc. and Fract. of Joints.
.....	Died.	Death from inflammation.	Stromeyer.	Op. cit.
15 minutes.	Died.	Fractures of first, second, and third lumbar vertebrae; rupture of aorta.	Curling.	Loc. cit.

No.	AGE, OCCUPATION, ETC.	MODE OF INJURY.	DESCRIPTION OF INJURY; PROGRESS OF CASE, ETC.
321	Male, aged 46.	Struck on back by timber.	Paralysis, etc.
322	.....	Gunshot wound.	Fracture of 2 lumbar vertebræ; ball lodged.
323	Centurion.	Gunshot wound.	Wound of lumbar spine.
324	Male.	Gunshot wound.	Ball traversed lumbar spine.
325	Builder.	Fell from upper floor on loins.	Dislocation forward of 3 upper lumbar vertebræ; paralysis.
326	Male, aged 29.	Fell from tree.	Inward displacement of second lumbar vertebra; paralysis; fever; delirium; several barbers had failed to recognize nature of injury.
327	Soldier, aged 20.	Gunshot wound.	Ball entered on right side, near first and second lumbar vertebræ; paralysis; wound healed in 3 months.
328	Male, aged 34.	Crushed in driving through archway.	Projection of second lumbar vertebra; paralysis; in 13 weeks able to walk with cane.
329	Carriage-maker, aged 31.	Blow on back from ton weight.	Projection of second and third lumbar vertebræ; pain; paralysis.
330	Male, aged 55.	Knocked down and driven against by omnibus.	Stunned; died in 5 minutes.
331	Male, aged 22.	Suicide by gunshot wound.	Tossed restlessly.
332	Tiler.	Fell from house on stones.	Paralysis; diminished after a time.
333	Laborer, aged 53.	Fell 14 feet.	Contusion; fracture of lower lumbar vertebræ; paralysis.
334	Laborer, aged 55.	Fell against fence.	Contusion of brain; fractures of first and second lumbar vertebræ, with backward projection; retention, and afterward incontinence of urine; paralysis.
335	Laborer.	Fell from sixth story.	Comminuted fracture of lumbar vertebræ; fracture of coccyx; fractures of both legs.
336	Laborer, aged 69.	Fell from third story window.	Fracture of vertebræ at junction of dorsal and lumbar regions.
337	Soldier.	Gunshot wound.	Ball entered left side of lumbar spine, and carried away spinous process; ball removed many months afterward from opposite hip; paralysis at first.

TIME UNDER OBSERVATION.	RESULT.	REMARKS, AUTOPSY, ETC.	AUTHOR.	REFERENCE.
14 days.	Died.	Comminuted fracture of a lumbar vertebra.	Morgagni.	Op. cit.
12 or 14 weeks.	Died.	.....	Meeckrenius.	Morgagni, op. cit.
8 days.	Died.	Cord itself divided.	Bohnius.	Ibid.
36 hours.	Died.	.....	Marcellus Lucius.	Ibid.
4 days.	Died.	.....	Bellinus.	Ibid.
.....	Recovered.	After fifteen months, paralysis had nearly gone. •	Fabricius Hildanus.	Op. cit.
14 years.	Relieved.	Died after fourteen years; ball lodged in spinal canal; right half of cauda equina divided.	Hutin.	Lancet, 1849.
4½ months.	Recovered.	Resumed occupation.	T. Wakley.	Ibid.
5½ months.	Recovered.	Walked, but not very well.	Id.	Ibid.
5 minutes.	Died.	Fracture of fourth lumbar vertebra, and laceration of aorta.	Roper.	Forster, Proc. Path. Soc. Lond., vol. viii.
1¼ hours.	Died.	Ball perforated stomach, jejunum, and aorta, and lodged in body of fourth lumbar vertebra.	Shaw.	Proc. Path. Soc. Lond., vol. x.
Several years.	Relieved.	Died several years afterward; fracture and dislocation backward and to right of second lumbar vertebra; cauda equina compressed.	J. Cloquet.	Maisonnabe, Jour. des Difformités, t. i.
39 days.	Died.	Death from exhaustion.	Ined.	Penn'a Hospital Record.
333 days.	Relieved.	Power of motion in some degree restored; deformity remained.	Id. [Ashhurst.]	Ibid.
1 day.	Died.	Died of exhaustion and internal (post-peritoneal) hemorrhage.	Id.	Ibid.
112 days.	Recovered.	Progress of case complicated by attack of mania à potu.	Id.	Ibid.
Nearly 2 years.	Recovered.	Back stiff, and occasionally painful. Transferred to Veteran Reserve Corps.	Id. [id.]	Cuyler U. S. A. Hospital Record.

No.	AGE, OCCUPATION, ETC.	MODE OF INJURY.	DESCRIPTION OF INJURY; PROGRESS OF CASE, ETC.
338	Engineer, aged 31.	Struck by fly-wheel.	Contusion of brain; fracture of vertebræ in lumbar region; fractures of right thigh and both legs.
339	Laborer.	.....	Fractured vertebra with backward projection; paralysis; bed-sores.
340	Laborer.	.....	Paralysis from an old fracture of spine.
341	Officer.	Gunshot wound.	Fracture of right arm; ball ploughed up right buttock and loin, exposing several lumbar vertebræ, which were crushed.
342	Laborer, aged 31.	Struck by falling timber.	Fracture of dorsal spine, and ruptured urethra; paralysis; retention of urine; bladder tapped through rectum.
343	Soldier.	Struck by mass of earth.	Fracture of spine; locality not indicated.
344	Laborer.	Fell from building.	Fractured spine; complete paralysis.
345	Laborer.	Explosion of blast.	Fractured spine; complete paralysis.
346	Laborer.	Explosion of blast.	Fractured spine; complete paralysis.
347	Carter, aged 35.	Run over by cart.	Stunned; soon became restless; hematuria; sensation of lower extremities gone, but motion perfect.
348	Boy.	Thrust head between spokes of wheel.	Distortion of spine; fractures of 3 or 4 spinous processes; no paralysis.
349	Baker.	Wheel of cart passed over back.	Two vertebræ depressed; a barber tried with hands and knee to press in the others to correspond; an abscess followed his efforts, which failed.
350	Laborer, aged 20.	Fell from tree.	Fractured vertebra.
351	Female, aged 40.	Fell from a cherry-tree.	Fractured vertebræ; treated on a water-bed.
352	Male.	Stabbed in tumult.	Blade broken, and end fixed between third and fourth lumbar vertebræ.
353	Male..	Stab from dagger.	Paralysis; retention of urine and feces; fever; sweating.

TIME UNDER OBSERVATION.	RESULT.	REMARKS, AUTOPSY, ETC.	AUTHOR.	REFERENCE.
60 hours.	Died.	Congestion of brain and lungs; fractures of body of fourth lumbar, and of processes of twelfth dorsal and all lumbar vertebræ; fractured rib; cord unaltered.	Id. [Ash-hurst.]	Episcopal Hospital Record.
Several months.	Not improved.	.....	Id. [id.]	Ibid.
Several months.	Not improved.	.....	Id. [id.]	Ibid.
Few hours.	Died.	Spinal cord involved.	Bintot.	Mémoires de Méd. Militaires, 3d S., t. xvi.
5 months.	Not improved.	Paralysis remained, and urine passed involuntarily through rectum.	.....	Lancet, 1866.
Several years.	Relieved.	Vertebral column ankylosed nearly at a right angle.	Bégin.	Op. cit.
Several months.	Recovered.	Paralysis gradually disappeared.	J. Cloquet.	Dict. de Méd., t. ix.
Several months.	Recovered.	Paralysis gradually disappeared.	Id.	Ibid.
2 years.	Recovered.	Able to walk; paralysis of bladder and rectum, and loss of sensibility.	Id.	Ibid.
Few hours.	Died.	Two vertebræ separated from intervertebral substance; fractures of ribs and pelvis; lacerations of liver, kidney, and pancreas.	B. B. Cooper.	Guy's Hospital Reports, 2d S., vol. ii.
.....	Recovered.	"Quickly recovered without any particular attention." Deformity remained.	A. Cooper.	Disloc. and Fract. of Joints.
Several years.	Relieved.	Paralysis remained; had regained power over bladder and rectum. A fistula led to vertebræ which were carious.	Fabricius Hildanus.	Op. cit.
77 days.	Recovered.	.....	Ined.	Penn'a Hosp. Record.
21 days.	Died.	.....	Id.	Ibid.
.....	Recovered.	After two years Hildanus extracted the fragment of blade.	Fabricius Hildanus.	Op. cit.
3 days.	Died.	.....	Tulpius.	Obs. Med., Lugd. Bat., 1716.

No.	AGE, OCCUPATION, ETC.	MODE OF INJURY.	DESCRIPTION OF INJURY; PROGRESS OF CASE, ETC.
354	Drummer.	Comrade threw sword at him.	Wound on right side of back of neck; paralysis of right upper extremity; anaesthesia on left side.
355	Male.	Struck by saddler's hammer.	Hammer cut muscles of neck; penetrated between atlas and axis, and divided cord.
356	Male, aged 34.	Stab from dagger.	Wound between eleventh and twelfth dorsal vertebrae, on right side; paralysis of right leg.
357	Male, aged 59.	Stab from knife.	Wound of right side of neck; paralysis of motion on right side.
358	Male.	Fell with chisel in pocket; chisel stuck in his back.	Wound on left side of lower dorsal vertebrae; when chisel pulled out, it was found that part in wound was 5 inches long.
359	Soldier.	Bayonet wound.	Wound between twelfth dorsal and first lumbar vertebrae; hyperaesthesia; no paralysis.
360	Male, aged 28.	Wounded by a policeman.	Sword wound between ninth and tenth dorsal vertebrae of right side; paralysis, etc.
361	.....	.....	Punctured wound near third dorsal vertebra; paralysis of right foot; dyspnoea; involuntary discharges.
362	Male, aged 29.	Gunshot wound.	Paralysis; ball entered between seventh cervical and first dorsal vertebrae.
363	.....	Stab of cervical region.	Loss of motion and ptosis on side of lesion, and loss of sensation on opposite side.
364	Male.	.....	Dislocation of fourth cervical vertebra; incision showed no fracture; dislocation reduced, and patient improved.
365	Soldier.	Gunshot wound.	Wound of dorsal spine; ball removed; paralysis; on fifth day, Louis extracted loose pieces of bone; paralysis diminished.
366	Soldier, aged 25.	Struck head in diving.	Paralysis, etc.; a dislocation was diagnosticated.
367	Boy.	Fell over high rock, striking buttocks.	Trunk bent forward; paralysis, which gradually passed off; curvature remained.
368	Female.	Fell from window, striking buttocks.	Trunk bent forward; paralysis, which gradually passed off; curvature remained.

TIME UNDER OBSERVATION.	RESULT.	REMARKS, AUTOPSY, ETC.	AUTHOR.	REFERENCE.
20 days.	Not improved.	No improvement in condition described.	Boyer.	Brown-Séguard, Centr. Nerv. Syst.
.....	Died.	Almost instant death.	J. L. Petit.	Dorsey, El. of Surg., vol. i.
8 months.	Relieved.	Walked with cane or crutch.	T. Peniston.	N. O. Med. and Surg. Jour., 1851.
6 days.	Died.	Blade broken between sixth and seventh cervical vertebræ; right anterior column of cord divided.	.....	Ibid.
5 years.	Relieved.	Paralysis began to disappear after fifteen days. After five years, still walked with crutches.	Hurd.	N. Y. Jour. Med., 1845.
7 days.	Died.	Wound of spinal cord and cerebro-spinal meningitis.	Gama.	Brown-Séguard, op. cit.
4 years.	Recovered.	After four and a half months could walk with a cane; numbness of right leg remained.	Vignés.	Ibid.
.....	Relieved.	Foot did not regain power.	Schwandner.	N. Syd. Soc. Year Book, 1859.
3½ days.	Died.	Cord cut in two by fragment of ball which lodged in canal.	Gross.	Op. cit.
.....	.....	Wound of cord.	J. Hughlings Jackson.	Lond. Hosp. Rep., vol. i.
6 days.	Died.	Hemorrhage in cord.	Walker.	Brown-Séguard, op. cit.
12 years.	Recovered.	Still had to walk with cane.	Louis.	Archives Gén. de Médecine, 1836.
23 days.	Died.	Rupture of posterior ligament between third and fourth cervical vertebræ.	A. J. Phelps.	Am. Med. Times, vol. vii.
.....	Recovered.	Laceration of intervertebral ligaments.	Liston.	Elements of Surgery.
.....	Recovered.	Laceration of intervertebral ligaments.	Id.	Op. cit.

II. CASES IN WHICH RESECTION OF THE SPINE

No.	AGE, ETC.	MODE OF INJURY.	DESCRIPTION OF INJURY; SYMPTOMS, ETC.
1	Male, aged 26.	Fell from second story.	Spinous processes of 3 dorsal vertebræ crushed in; cord compressed; extension had failed to reduce displacement; operation performed on second day.
2	Male.	.....	Depressed fracture of seventh cervical vertebra; operation on eighth day.
3	Male.	.....	Fracture of seventh cervical vertebra; operation on sixth day.
4	Male, aged 25.	.....	Fractured spine; operation on fourth day.
5	Male, aged 26.	.....	Fractured spine.
6	Male.	.....	Fracture of dorsal spine; totally paralyzed below; operation on twelfth day.
7	Male, aged 31.	.....	Fractured spine; operation on second day.
8	.....	.....	Fractured spine.
9	.....	.....	Fractured spine; no deformity.
10	.....	.....	Fractured spine; operation on thirteenth day.

HAS BEEN PERFORMED FOR TRAUMATIC CAUSES.

PARTS RESECTED.	RESULT.	REMARKS.	OPERATOR.	REFERENCE.
Portions of 3 dorsal vertebræ; a luxation found, which could not be reduced.	Died.	No relief followed operation; convulsions; at autopsy cord found to be torn through; death on fourth day according to South—on nineteenth, according to Heyfelder.	Cline, Senior.	New Jour. of Med. and Surgery, vol. iv.
Portion of seventh cervical vertebra.	Died.	Died a day or two after operation.	Wickham.	Lancet, 1827.
Portion of seventh cervical vertebra.	Died.	Died next day.	Oldknow.	Hutchison, Am. Med. Times, 1861.
Portions of twelfth dorsal and first lumbar vertebræ.	Died.	Slight relief followed operation; died in about 2 weeks of cystitis.	Tyrrell.	Heyfelder, Résections.
Portion of twelfth dorsal vertebra.	Died.	Slight relief; death in about a week from pleurisy.	Id.	Med. - Chir. Rev., vol. x.
Portion of seventh dorsal vertebra.	Died.	Slight relief after 2 days; death on next; autopsy showed dislocation of seventh from eighth, and fracture of body of ninth dorsal vertebra.	Barton.	Packard's Malgaigne.
Portions of twelfth dorsal and first lumbar vertebræ.	Died.	Slight relief followed operation; death in 10 days; fracture of body of first lumbar vertebra; cord healthy.	D. L. Rogers.	Am. Jour. Med. Sci., O. S., vol. xvi.
.....	Died.	.....	Attenborow.	Heyfelder, op. cit.
Portion of ninth dorsal vertebra.	Died.	Cord not compressed, but completely divided; death in 4 days.	Laugier.	Ibid. and Malgaigne.
Portions of eleventh and twelfth dorsal vertebræ.	Died.	Slight relief; death in 13 weeks from dropsy, etc.; cord healthy.	Holscher.	Brown - Séquard, op. cit.

No.	AGE, ETC.	MODE OF INJURY.	DESCRIPTION OF INJURY; SYMPTOMS, ETC.
11	Male.	Fell from horse.	Fractured spine; operation after 2 years; ankylosis.
12	.....	Blows of stick.	Increasing paralysis; operation after 6 months.
13	Male.	.....	Fracture of ninth and tenth dorsal vertebræ; paralysis.
14	.....	.....	Fractured spine; operation in 5 hours.
15	.....	.....	Fractured spine.
16	.....	.....	Fractured spine.
17	.....	.....	Fractured spine.
18	Male, aged 41.	.....	Fractured spine; operation next day.
19	Male, aged 35.	Fell 15 feet from scaffold.	Depression and crepitus over eighth and ninth dorsal vertebræ; paralysis; priapism; on third day prominence replaced depression; operation on tenth day.
20	Male.	.....	Fracture of cervical spine; paralysis; operation after 5 days.
21	Male, aged 21.	Limb of tree fell 60 feet on him.	Fracture of spine; insensible for 3 days; paralyzed; operation after 3 months and 11 days.
22	Male.	.....	Fractured spine.

PARTS RESECTED.	RESULT.	REMARKS.	OPERATOR.	REFERENCE.
Portions of 4 dorsal vertebræ.	Relieved.	Sensation partially restored; no improvement as to motion; final result not stated.	Alban G. Smith.	N. A. Med. and Surg. Jour., vol. viii.
Arch of seventh cervical vertebra.	Died.	Death in 3 weeks; body of vertebra fractured, and substance of cord found in mediastinum; death from sloughing of wound.	Mayer.	Heyfelder, op. cit.
Arches of ninth and tenth vertebræ.	Died.	Slight relief; death in 2 weeks from peritonitis and enteritis.	South.	Brown - Séquard, op. cit.
Portions of upper dorsal vertebræ.	Died.	Death in 8 days.	Blackman.	Hutchison, loc. cit.
Portions of lumbar vertebræ.	.....	Compression relieved; "patient did well;" result not stated.	Edwards.	Brit. and For. Med. Rev., 1838.
.....	.....	"Said to have recovered."	Blair.	Ballingall, apud Hutchison, loc. cit.
.....	.....	"No particular benefit."	Goldsmith.	Gross, op. cit., vol. i., 2d ed.
Portion of tenth dorsal vertebra.	Died.	No relief; body of vertebra fractured; no displacement.	Stephen Smith.	Hutchison, loc. cit.
Portions of eighth, ninth, and tenth dorsal vertebræ.	Died.	No improvement; death in 20 days; fractures of eighth, ninth, tenth, and eleventh dorsal vertebræ (3 last through bodies); cord torn and disorganized; pleura penetrated by spicula; pleural sac contained serum and pus.	Hutchison.	Ibid.
Portions of fifth and sixth cervical vertebræ.	Died.	Slight improvement at first; autopsy showed effusion at base of brain.	G. M. Jones.	Brown - Séquard, op. cit.
Portions of 4 lower cervical and 2 upper dorsal vertebræ.	Died.	Sensation returned; death in 18 days from disease of lung, which existed before.	H. A. Potter.	Hurd, N. Y. Jour. Med., 1845.
Portions of fifth, sixth, and seventh cervical vertebræ.	Died.	Death in 4 days; autopsy showed fracture of skull.	Id.	Am. Journ. Med. Sci., N. S., vol. xlv.

No.	AGE, ETC.	MODE OF INJURY.	DESCRIPTION OF INJURY; SYMPTOMS, ETC.
23	Male.	Fell 20 feet.	Fracture of cervical spine; paralyzed; first operation after 3 or 4 days; second operation after 3 years.
24	Male.	Sack of corn fell 17 or 18 feet on neck.	Prominence of first lumbar vertebra; paralysis; bed-sores; operation on thirty-seventh day, under chloroform.
25	Male, aged 31.	Thrown from horse.	Backward projection of vertebra in lower part of spine; paralysis; bed-sores; operation on thirty-seventh day. (Exact nature of injury not stated; probably fracture.)
26	.....	.....	Fractured spine.

PARTS RESECTED.	RESULT.	REMARKS.	OPERATOR.	REFERENCE.
(1st.) Portions of fifth and sixth cervical vertebræ; (2d.) portions of fourth, sixth, and seventh.	Not improved.	Scarcely any improvement from first operation, and none from second.	H. A. Potter.	Ibid.
Portion of twelfth dorsal vertebra.	Died.	Slight improvement; death in 17 days; fracture of body of first lumbar vertebra; cord unhurt.	R. Mc Donnell.	Ibid., vol. 1.
.....	Relieved.	Five months afterward had regained power over bladder, and sensation in rectum, but could neither stand nor walk.	Samuel Gordon.	Ibid., vol. li.
.....	Died.	.....	Tillaux.	Bulletin de Thérapeutique, quoted in Brit. and For. Med.-Chir. Rev., 1866.

