

Watson (B.A.)

abol

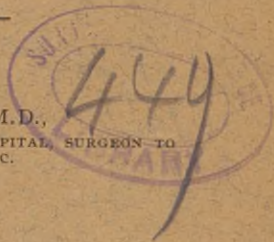
Compliments of the Author

The Relation of Concussion of the Brain
and Spinal Cord to Inflammatory
and Other Morbid Conditions
of These Organs.

BY

B. A. WATSON, A.M., M.D.,

CONSULTING SURGEON TO THE BAYONNE HOSPITAL, SURGEON TO
JERSEY CITY HOSPITAL, ETC.



*Read in the Section of Surgery and Anatomy, at the Forty-second
Annual Meeting of the American Medical Association,
held at Washington, D. C., May, 1891.*

presented by the author

Reprinted from "The Journal of the American Medical
Association," July 18, 1891, *XVII*, 99-104.

CHICAGO:
PRINTED AT THE OFFICE OF THE ASSOCIATION
1891.



THE RELATION OF CONCUSSION OF THE
BRAIN AND SPINAL CORD TO IN-
FLAMMATORY AND OTHER
MORBID CONDITIONS IN
THESE ORGANS.

BY B. A. WATSON, A.M., M.D.,

CONSULTING SURGEON TO THE BAYONNE HOSPITAL, SURGEON TO
JERSEY CITY HOSPITAL, ETC.

It is certainly apparent to all the members of the medical profession that brain and spinal surgery has received during the last quarter of this century an unusual and likewise unprecedented amount of attention. It is likewise equally apparent that great progress has been made by those who are devoted to this branch of surgery; it therefore becomes highly necessary, that he, who is about to enter this field of medical literature, should first discover some dark spot or disputed question, on which he thinks he may possibly throw a few rays of scientific light. The traumatism of the brain and its membranes have been more fully studied than those of the spinal cord. Undoubtedly this may be accounted for in

part by the fact, that the first mentioned organ is much more frequently the seat of these lesions than the latter. I shall therefore direct the greater portion of my attention especially to lesions following traumatic injuries of the spinal cord and its membranes.

It seems necessary to call attention to certain errors as a preliminary to the consideration of our first inquiry. One of the most important of these has been expressed by Mr. Erichsen in the following language:¹ "The consideration of the effects that may be produced on the spinal cord by *slight blows*, whether applied to the back or to a distant part of the body, is not altogether a matter of modern surgical study arising from the prevalence of railway accidents, but had, long antecedent to the introduction of modern means of locomotion, arrested the attention of observant practitioners." Since the above statement was made it has been clearly demonstrated to be erroneous by anatomical and experimental investigations. The anatomical studies have shown that the spinal cord is the best protected organ in the body, and experimentation has fully confirmed this position. The experiments which I made on dogs—the total number being 141—which were arranged and conducted for the especial purpose of producing concussive lesion in the spinal cord and its membranes fully convinced me that it required *a very severe blow*,

¹ On Concussion of the Spine. A New and Revised Edition. London: Longmans, Green & Co. 1882.

which must even be delivered on certain limited areas of the body, in order to accomplish this object. I am likewise satisfied that this conclusion must necessarily follow a careful study of my report entitled "An Experimental Study of Lesions Arising from Severe Concussions."²

It should be furthermore stated that the lesions produced in the spinal cord and its membranes were rarely apparent to the unaided eye, but were readily revealed under the microscope. This statement, however, does not apply to those cases in which there were either fractures or dislocations involving the vertebræ; since the lesions here were comparatively coarse.

The statement that a rupture of the spinal membranes has occurred, or that there has been a gross hæmorrhage into the substance of the spinal cord, or between the cord and its membranes, is certainly not entitled to credence unless coupled with the acknowledgment of either a fracture or a dislocation of a vertebra. This statement is based on my examination of the lesions found in the spinal cord, and its membranes, and I am so thoroughly convinced on this point, that I feel fully warranted in making this positive statement. The so-called "railway spine" includes true concussion arising from blows, falls, gunshot wounds, lightning strokes, electric shocks, etc., likewise contusions on the back, sudden flexions of the spinal column, sprains,

² P. Blakiston, Son & Co., Philadelphia, 1890.

wrenches, and twists. Dr. John A. Lidell says, in discussing the consecutive effects of some of these injuries, that:³ "Among the remote effects of *sprains, wrenches and twists* of the spinal column, are chronic *inflammation of the vertebral joints* that are implicated, which is, often suppurative in character, *destruction of the articular cartilages and the intervertebral substances* that are involved, and *caries or necrosis* of the adjoining vertebral bodies." In such cases, the destructive process begins more frequently at the junction of the vertebræ with the intervertebral substances than in the intervertebral substances or vertebræ themselves, because, as Mr. Hilton has pointed out, we know that in accidents, at least as far as we have been able to discover, "the most frequent lesion in injury to the spine is a partial severance of the vertebræ from the intervertebral substance."

A number of illustrative examples have already been presented, and inasmuch as this topic has already been pretty thoroughly discussed, no apparent need exists for presenting any additional instances of the same sort. I will, however, take space to present a very instructive case, in which there simultaneously occurred lumbo-sacral abscess and suppurative spinal meningitis, in consequence of a blow on the spinal column.

The following abstract made from the report of the history of this case supplies the essential

³ International Encyclopædia of Surgery, Vol. IV, p. 870 et seq. Edited by John Ashhurst, Jr., M.D., Wm. Wood & Co., New York. 1884.

points: A healthy lad, of 15 years, was struck by his playmate on the back with the fist. He thought little of it at the time, but was admitted to Guy's hospital nine days afterwards; was treated with leeches and somewhat recovered, but the pain soon returned and fever ensued. "An abscess formed on the right side of the sacrum, which was opened, and continued to discharge, the flow of pus being increased by pressure on the abdomen. He continued to get worse daily, having much irritative fever and severe pain in the back. During the last week of his life he was exceedingly restless, and often delirious; and he complained of pain in all parts of his body, but particularly in the extremities. On one or two occasions he had loss of power over the bladder and rectum, but had no other symptoms of paraplegia, and could move freely in bed." He died twenty-two days after the casualty.

Autopsy.—An aperture in the integuments at the right side of the sacrum led into a very extensive abscess, external to the peritoneum, which occupied the forepart of the sacrum behind the rectum, and external to the ilia on both sides behind the psoas muscles. The bones were exposed but not diseased. Although the abscess had discharged externally on the right, it was most extensive on the left. It had burrowed up to the left side of the last lumbar vertebra and the sacro-vertebral foramen into the spinal canal. When the theca was opened, it was found to contain a quantity of greenish pus, spread over its

inner surface and over the cord itself. The spinal dura mater (theca) at the point indicated, was softened and destroyed, and the cauda equina was lying bathed in pus which filled the sacral canal. The membranes of the cord were inflamed throughout the whole extent, and there was purulent effusion as high as the dorsal region. The spinal dura mater was thickened, and its inner surface had lost its smoothness and transparency, and was of a dull green color. Pus could be squeezed out from beneath the visceral arachnoid in considerable quantity. The spinal cord itself was firm, and the microscope revealed no morbid condition in its substance. On opening the cranium, traces of acute arachnitis were found over the whole surface of the brain, greenish-colored lymph being effused into the sub-arachnoid tissue, especially at the base. The inner surface of the dura mater, around the foramen magnum and on the adjacent part of the occipital fossa, was of a greenish color, from lymph effused upon it. Bronchial tubes filled with tenacious mucus. Lumbar and bronchial glands slightly enlarged. All other organs entirely healthy.

The purulent infiltration of the spinal meninges which was observed in this case, occurring coincidentally with the formation of a lumbar-sacral abscess, but without the production of paralysis, could scarcely have happened unless the sacro-vertebral articulation had previously been opened, both externally and internally, by disease of the articulation itself, in such a manner

as to allow the products of inflammatory action to flow freely out of it, as well as into the spinal canal. Otherwise the suppurative meningitis would pretty certainly have caused paralysis by compressing the spinal cord with its inflammatory products.

The clinical history of this lad's case, interpreted by the post-mortem appearances, appears to have been as follows: The blow on the back wrenched the sacro-vertebral articulation, and caused a suppurative inflammation to be lighted up therein, particularly on the left side; and in consequence of this, purulent matter escaped in an outward direction, and led to the formation of an immense lumbo-sacral abscess; it likewise escaped in an inward direction, and caused the theca vertebralis to become softened and perforated, and extensively destroyed, and a diffuse suppurative inflammation, which extended upward to the brain, to be kindled in the spinal arachnoid.

It has been aptly said that "in all science error precedes the truth, and it is better it should be first than last."⁴ I have cited the case reported by Dr. Lidell, with all its details, in order that I might bring forward some of the results of my observations, made during my recent experiments, which afford a correct and rational explanation of the conditions revealed by that post-mortem examination. There will be found in

⁴ Walpole.

the report of my experiments eleven cases in which there was rupture of the ligaments of the sacro-lumbar articulation. There were marked pathological changes in the organs and tissues within the pelvic and abdominal cavities in six of these cases, which were immediately connected with the rupture of the ligaments of the sacro-lumbar articulation. Let me here present the following abstracts from post-mortem examinations, for the purpose of giving a correct idea of the lesions:⁵ "Autopsy. This examination revealed a rupture of the ligaments between the last lumbar and the first sacral vertebræ, deep and extensive ecchymoses over the entire post-sacral and right lumbar regions. A profuse extravasation of blood into the abdominal cavity, marked engorgement of the kidneys. Brain apparently normal, slight increase of the cerebro-spinal fluid in the cavities, and the cord was congested, to the middle of the dorsal region."

"Autopsy.⁶ This examination revealed the following lesions: Both kidneys congested; the chymosis in the connective tissue covering the anterior surface of the last lumbar and the upper sacral vertebræ. The brain and spinal cord apparently hyperæmic. The removal of the integument over the sacral and lumbar regions showed an ecchymotic condition of the muscles. There

⁵ An Experimental Study of Lesions Arising from Severe Concussions," by B. A. Watson, A.M., M.D., p. 32, Exp. 4.

⁶ *Ib.*, p. 35, Exp. 10.

had been a rupture of ligaments between the last lumbar and upper sacral vertebræ.”

“Autopsy.⁷ This examination revealed the following lesions: Both kidneys congested; bladder distended with urine; extensive ecchymoses in the lumbar and pelvic regions, involving psoas muscles; brain perfectly normal. The spinal cord was hyperæmic downward from the lumbar enlargement, including a portion of the cauda equina; rupture of the ligaments between the last lumbar and the first sacral vertebræ.” The essential point which Dr. Lidell has overlooked in his comments on the case which he has reported, are the pathological conditions of the organs and tissues within the pelvic and abdominal cavities. It was the *existence of these lesions which gave rise to the inflammation and suppuration* within these cavities. The post-mortem examination of Dr. Lidell’s case sufficiently demonstrates this position. Dr. Lidell says:⁸ “the blow on the back wrenched the sacro-vertebral articulation, and caused a suppurative inflammation to be started up there.” The autopsy in the case fails to show that there is any erosion of the bones or cartilage within this articulation, and its history reveals the fact, that it was only immediately before death that there was the slightest indication of paraplegia. It is therefore certain that the wrench which he mentions consisted in producing a rupture of the ligaments of the sacro-lum-

⁷ *Ib.*, page 40, Exp. 24.

⁸ Previously cited.

bar articulation, and likewise, as very frequently happens in those cases, some pathological lesions within the pelvic and abdominal cavities. The simple wrenching of any joint in a healthy subject unattended with pathological lesions, has been amply shown to be a comparatively trivial injury, which does not lead to serious inflammatory complications or death.

The one hundred and forty-one experiments, which I made on animals, does not afford a *single example* which justifies the conclusion that injuries to the vertebral articulations are a whit more serious than those produced in the carpal and tarsal articulations; and, consequently, analogous reasonings may be here employed with entire propriety. We cannot pass over the history of Dr. Lidell's case without pointing out a glaring absurdity, which may possibly have had its origin in carelessness. In this report we are informed that a healthy boy, aged fifteen, "while playing with another lad, received a blow on the back with the fist," and in the absence of any additional statement bearing on this injury, we are left to infer that the pathological changes and even the death of the patient were caused by this blow. He who has examined the anatomical structure of the spinal column will readily perceive the absurdity of this statement. The blow *inflicted was entirely inadequate for the production of the results* which followed, unless there has been omitted from this report the most important factor in the history of this case. It is

true the force of the blow might cause the lad to fall—and if at this point, the history of the case showed that the boy fell across a bar, raised a few feet from the ground, in such a manner that his feet remained on one side while his head was on the other, then the very important factor of leverage having been added, which would result under these circumstances in the production of a sudden flexion of the spinal column, would certainly bring within the limits of possibility the occurrence of the injuries which are reported in the autopsy.

It is scarcely necessary to mention the fact, that nearly all the injuries grouped together under the unfortunate cognomen of "railway spine"—so far as their remote effects are concerned—take their origin, either directly or indirectly, in inflammatory processes. Consequently the consideration of the following queries assume importance:

1. Do inflammatory and other morbid changes take their origin in traumatic injuries of the spinal cord and its membranes as frequently as the writings of Mr. Erichsen imply?
2. Do inflammatory and other morbid changes ever arise from traumatic injuries which are entirely uncomplicated by immediate symptoms?
3. How soon are the inflammatory and other morbid changes developed after the receipt of traumatic injuries in the cord, etc.?

In our consideration of the first question it is scarcely necessary to give a negative reply to

those who have perused the writings of Mr. Erichsen on this subject; since they have already reached this conclusion. Furthermore, the mere assumption that serious results frequently arise from wholly unimportant injuries *is not sustained* by clinical observations or experimental investigations. However, Mr. Erichsen, in writing of those cases in which the patient has received no blow or injury upon the head or spine, but in which the whole system has received a severe shake or shock, in consequence of which an immediate lesion, probably of a molecular character, is sustained by the spinal cord, and disease of an inflammatory character, or of a disorganizing nature, is developed in it, the inflammatory action eventually creeping up to the membranes of the brain, says that the cases "although *necessarily more frequent* in railway than other injuries, do occasionally occur as a consequence of ordinary accidents." A perusal of Mr. Erichsen's writings has completely failed to convince me that he has supplied any basis for the support of the opinion advanced in the above statement.

In order to demonstrate the correctness of this opinion, which conflicts with the positive knowledge we possess on this subject—and which cannot be supported by analogous reasoning—he should clearly establish the following facts, viz.:

1. *That no disease of the brain or spinal cord existed at the time of the occurrence of the alleged*

⁹ On Concussion of the Spine, Nervous Shock, etc., p. 95. New York: Wm. Wood & Co. 1875.

accident. 2. That the consecutive inflammation did arise from traumatism, and was not due in part, or wholly, to a vitiated constitution. This evidence is entirely wanting; and, consequently, we must maintain that Mr. Erichsen's statement should be excluded in cases of medico-legal evidence.

We have now devoted our attention to the consideration of the material points involved in our first query; but it would seem proper in this connection to give some additional thought to the consecutive results of concussive accidents. Mr. Erichsen says:¹⁰ "Whatever may be the nature of the primary change that is produced in the spinal cord by a concussion, the secondary effects are clearly of an inflammatory character, and identical with those dependent on chronic meningitis of the cord and sub acute myelitis." The term concussion, as employed in the above quotation, evidently refers only to traumatism of the spinal cord and its membranes, but elsewhere the same author in speaking of sprains, twists and wrenches of the spinal column, says,¹¹ "It is important to bear in mind that the vertebral column is more apt to suffer in these strains of the spine than in the other forms of injury that we are discussing, and that in serious cases the full force of the mischief appears to be expended in the spine itself independently of its contents, which escape uninjured." The views expressed by Mr. Herbert

¹⁰ *Ib.*, page 157.

¹¹ *Ib.*, page 128.

Page on this subject are as follows :¹² " Happily there is no doubt of the exceeding rarity of spinal meningitis as an immediate result of localized injury to the vertebral column ; and I know of no case in which meningeal inflammation has been caused by injury of some part of the body remote from the spine." The experimental study of concussion of the spinal cord has satisfied me on the following points : 1. True concussion of the spinal cord from blows, falls, lightning strokes, etc., is an exceedingly rare occurrence. 2. Secondary results, such as inflammation, suppuration, etc., very seldom follow the traumatism—owing to the fact—that the punctate hæmorrhages, etc., are generally widely diffused in various parts of the spinal cord—while the pathological lesions are so slight as not to supply inflammatory foci. However, the danger arising from a true concussion of the spinal cord produced by gun-shot injuries, the lodgment of a musket or rifle ball in the spinal column, is attended with much more danger from consecutive inflammation, etc., than those traumatisms which have been previously mentioned, because of the following peculiarities : 1. The pathological lesions are more concentrated—resembling in this respect the ecchymoses arising from a concentrated contusion. 2. The lodgment of a ball in the spinal column is very liable to give rise to a septic inflammation, pus formation, dis-

¹² Railway Injuries, page 21. Philadelphia : P. Blakiston, Son & Co. 1891.

eased condition of bone, extension of the inflammatory products to the spinal membranes, and even the cord itself. It must be universally admitted that gunshot wounds, fractures and dislocations involving the spinal column, are very serious traumatisms, frequently producing death immediately, or within a few hours; even when this result does not follow, the danger is very great from the consecutive sequelæ.

Let us now take up the consideration of the second query: "Do inflammatory and other morbid changes ever arise from traumatic injuries which are entirely unaccompanied by immediate symptoms?" The conclusions reached by a careful analysis of the above question, must depend, to some extent, on the interpretation which we give to this query. The fact must be admitted that it is not only possible for a patient to receive, under certain circumstances, severe traumatic injuries, of which he remains a longer or shorter period wholly unconscious, and these occurrences are by no means very rare. I can now recall a number of instances of this character occurring to officers and soldiers during the excitement of battle, while I was serving with the army. It also occasionally happens that drunkenness dulls the sensibilities in certain cases to such an extent as to render the patient oblivious to an injury which he may have received, while the same condition will more or less embarrass and sometimes even deceive the surgeon who is attempting to make an examination. These

statements possess only an indirect bearing on the question under consideration. The question relates to the immediate existence of symptoms and not to the observance of the same. A critical examination of this question in the same direction indicated in the above sentences, brings us to the following query: "Are results ever produced without causes?" *i. e.*, "Do inflammatory and other morbid changes ever arise from traumatic injuries, which have failed to produce any lesions?" My experimental studies of the lesions of the cerebro-spinal axis have clearly demonstrated the fact, that pathological changes are occasionally produced in this centre, some of which were even apparent to the unaided eye, while others required the aid of the microscope; but which were not followed by any symptom indicative of these lesions during the life of the animal. The question will now be naturally asked with reference to these cases: Would they not have developed inflammatory changes at a later period? I have not before me the data which would justify me in positively asserting that this result *was absolutely impossible*; but I can aver that, in all these experiments, one hundred and forty one, there is not *a single* case which *warrants giving an affirmative answer*. Surgical observations and analogous reasoning fully support the results obtained by our experimental research, not only with reference to the brain and spinal cord, but likewise in other organs of the body. Mr. Erichsen says in his recent work

“On Concussion of the Spine:”¹³ “There is a continuous chain of broken ill health, between the time of the occurrence of the accident and the development of the more serious symptoms. It is this that enables the surgeon to connect the two in the relation of cause and effect. This is not peculiar to railway injuries, but occurs in all cases of progressive paralysis after spinal concussion.” It would appear from this quotation that Mr. Erichsen fully concurs with us in the opinion, that the production of a traumatic pathological lesion is always indicated by immediate symptoms, when the degree of injury has been sufficient to entitle it to our consideration. Observation has taught us that the existence of a pathological lesion affords insufficient proof that this injury will be followed by inflammation or other morbid changes. In fact, every surgeon can recall to mind cases of severe traumatic injuries of the brain in which there were extensive lacerations or contusion of this organ; but in which the secondary changes were entirely absent or very slight.

The same remark may also be made in regard to gross injuries in other parts, since the same general physiological and pathological principles prevail in the cerebro-spinal axis as in the other organs of the body. It is therefore entirely proper to introduce in connection with discussions of injuries of the cerebro spinal axis, in

¹³ A new and Revised Edition London: Longmans, Green & Co., 1882, page 158.

many cases, analogous reasoning drawn from studies and observations made in other parts of the body. It must be admitted, as a general rule in surgery, that the more extensive and the more destructive the primary traumatism, the greater will be the danger from secondary disorganizing processes. Does it not, therefore, seem absurd to attribute to a single punctate hæmorrhage, or even a half dozen of these little pathological lesions, the power of exciting a disorganizing process in a *healthy spinal cord* which may ultimately produce the death of the patient? Is there a single well authenticated case in which such a result has followed from such a cause?

Let us now proceed to the consideration of our third question, which has a very important bearing on medico-legal cases and likewise on the diagnosis and treatment of myelitis arising from syphilitic disease. Mr. Erichsen says:¹⁴ "It would appear that surgeons and writers on diseases of the nervous system have included four distinct pathological conditions under this one term, 'concussion of the spine,' viz.: 1. A jar or shake of the cord, disordering, to a greater or less degree, its functions without any lesion perceptible to the unaided eye. 2. Compression of the cord slowly produced by the extravasation of blood. 3. Compression of the cord by inflammatory exudations, serum, lymph, or pus within the spinal canal; and 4, chronic alterations of

¹⁴ On Concussion of the Spine, p. 16. London: Longmans, Green & Co., 1882.

the structure of the cord itself as the result of impairment of nutrition consequent on the occurrence of one or other of the preceding pathological states, but chiefly on the third."

We have already paid our respects in full to those subjects included under the headings 1 and 2, but we have yet to deal with those embraced under headings 3 and 4.

There exists no reason to doubt that inflammation, having its origin in the spinal cord or its membranes, may be either acute or sub-acute, or that the former need be developed at an earlier day than the latter. The important question before us for our consideration, however, is how soon do traumatic inflammations arise after the receipt of the traumatism? This question can not be definitely answered—the answer must necessarily be a mere approximation. Nevertheless, I think that observation and experimentation fully justify the statement that traumatic inflammation commonly makes its appearance within four days after the receipt of the injury. In support of the above I will here present a series of experiments, which consisted in fracturing the right leg of twenty rabbits:¹⁵ "This was done without producing a single compound fracture. The temperature details were as follows: Average temperature before the fracture, 102.6°; average temperature two hours afterwards, 102.6°; subsequent daily average temperature, first,

¹⁵ Amputations and their Complications, p. 525. By B. A. Watson, M.D. Philadelphia: P. Blakiston, Son & Co., 1885.

102.6°; second, 102.6°; third, 103.1°; fourth, 103.1°; sixth, 103°; eighth, 103.1°; tenth, 102.8°; twelfth, 103°; fifteenth, 102.8°; seventeenth, 103.2°; nineteenth, 103°; twenty-second, 103°."

In the case of the brain and spinal cord, when there is no open wound communication with these organs, the danger of inflammatory action is greatly diminished. Furthermore, the trivial character of lesions produced by concussion, *and also the exceeding rarity of this traumatism*—except when it is produced by lightning strokes, electric shocks or gunshot wounds—all combine to impress me with grave doubts in regard to its being followed by inflammation. In fact, *there is not sufficient proof to justify the conclusion* that any case of traumatic myelitis, or meningo-myelitis, has ever had its origin from molecular disturbances or any pathological lesion which was invisible to the unaided eye in an otherwise healthy spinal cord or its membranes.

Let us now briefly examine the history of concussion, in order that we may, if possible, discover how these troublesome errors were engrafted on the profession. The history of concussion dates from 1705, when M. Littre published his famous observations. A prisoner struck his bowed head against the wall of his cell and fell dead. The inspection of the head failed to reveal a contusion, tumor or wound in the scalp, or a fracture of the skull. The cranium was opened, when it was discovered that the

brain did not nearly fill the interior of the skull, while the entire brain substance seemed harder to the touch—more compact than usual. This observation has been reported hundreds of times, and it was long claimed that it demonstrated the fact that a violent shaking of the substance of the brain was capable of producing death without any appreciable lesion. Permit me here to call attention to the fact that in the report before me there is no evidence to show that there was any post-mortem examination made of any portion of the spinal column, spinal cord or its membranes, or other portion of the body, except the head. The autopsy of the head, viewed in the light of modern science, is entirely worthless, while the position in which the head was placed at the moment the injury was inflicted suggests the possibility of a fracture or dislocation in some portion of the cervical region of the spine. It may be well to call attention to the fact that in this case, and all the other cases of concussion reported prior to the middle of the present century, the microscope was not employed to aid in the discovery of the pathological lesions. Post-mortem examinations were very rarely made even in cases of concussion of the brain, and, consequently, the case reported by M. Littre was accepted as a typical one. M. Littre, at the time he reported this case of so-called concussion of the brain, had become famous in the medical profession and therefore the following may be very properly applied to him: "Great errors seldom

originate but with men of great minds."—Petrarch. Mr. Erichsen, in writing on concussion of the spine, in 1875, remarks:¹⁶ "There is little opportunity, reason, or excuse for a post-mortem examination of that structure, which is probably the one that is least frequently examined in the dead-house, viz., the spinal cord, as it is the one the correct pathological investigation of which is attended by more difficulties than that of any other organ of the body. . . . So rare are post-mortem examinations of these cases that no instance has occurred to me in hospital or in private practice in which I could obtain one, and with one exception, I can find no record in the transactions of societies or in the periodical literature of the day of any such instance. The only case, indeed, on record with which I am acquainted, in which a post-mortem examination has been made of the spinal cord of a person who had actually died from the remote effects of concussion of the spine from a railway collision, is one that was published in the 'Transactions of the Pathological Society,' by Dr. Lockhart Clark. He had been in a railway collision, and without any sign of external injury, fracture, dislocation, wound, or bruise, began to manifest the usual nervous symptoms. He gradually became partially paralyzed in the lower extremities, and died three years and a half after the accident." There is no reason to believe

¹⁶ Concussion of the Spine, Nervous Shock, etc., p. 177 et seq. New York: Wm. Wood & Co., 1875.

that this man died from even the remote effects of the traumatism. The history of this case entirely fails to connect the disease from which the patient died with the railway collision. Therefore it may be properly said of those who base an argument on this and all similar cases:

“When people once are in the wrong,
Each line they add is much too long;
Who fastest walks, but walks astray,
Is only farthest from his way.”

—*Prior.*

