

RECENT PAPERS ON CONCUSSION OF THE SPINAL CORD.

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It is almost impossible in the present day to write on concussion of the spinal cord without reference to the subject of railway injuries ; but whether the connection be illicit or legitimate, there can be no doubt that, by itself, concussion of the cord is of intrinsic interest to surgeons and neurologists, because of the uncertainty there always is in deciding whether in company with, or, what is of greater importance, without, an injury to the spine the cord has really been injured by concussion alone, and because of the question, whether late secondary degenerative changes in the cord can have this origin, even when there are no immediate symptoms of injury. It is now pretty well agreed, we think, that true concussion of the cord occurs with extreme rarity, and although a considerable number of cases have been recorded as examples of concussion-lesion, it is nevertheless certain that in many of them sufficient attention has not been paid to the possibility of the cord having been injured in some less obscure manner. If we put aside certain cases which may fairly be excluded—those for example, in which there has been fracture-dislocation of the spine with direct contusion of the cord—and look for examples of true concussion amongst those where the cord has been injured without obvious structural damage to the spinal column, then we ought also to exclude those cases in which the history of the accident makes it highly probable that the cord has been locally damaged by severe and sudden bend. This point has been dealt with by the writer in his work on 'Injuries of the Spine,' &c., which has been noticed in previous numbers of 'BRAIN,' and cases of the kind are there recorded which in his judgment cannot fairly be regarded as instances of true concussion. To that work nearly all recent writers on "Concussion of the Spinal Cord" make reference, and MM. Duménil and Petel in the series of papers before us¹ deal at considerable length with the objections which we have raised, not, as they seem to think, against the very existence of concussion of the cord, but against the too ready assumption of concussion as the cause of cord injury in particular cases, and therefore against the supposed commonness of this kind of injury, especially in a peculiar form of accident. They

¹ 'Archives de Neurologie,' Nos. 25, 26, and 27 (1885).

themselves record a case which is to them a clear example of concussion-injury, a case, moreover, in which, as they believe, a true system-degeneration had origin in concussion pure and simple. It is a case of much interest and importance; but, before examining it, we would point out that nowhere have we said that concussion of the cord is an impossibility and has never occurred, and cases are even recorded in our work which, as far as can be told, are explicable only on that hypothesis, notably the well-known case of Dr. Bastian's and a few others. Nor have we denied that the famous railway-accident case of Mr. Gore *may* be a case of concussion-lesion; but we have asserted, and do again assert, that there is a gap in the history of that case which renders it a not unequivocal example of such an injury, that it is a case, therefore, on which no lasting doctrine should be based, especially when it is remembered that the post-mortem appearances were singularly like those of posterior sclerosis as found in *tabes dorsalis* (locomotor ataxy). It is difficult to conceive how an effect so general as concussion can fall only on limited tracts of the cord, and to explain such cases it has to be assumed that a "predisposition" to disease allows concussion to exert a morbid influence.

The consideration of a large number of recorded cases, and the experience of surgeons, alike show, we believe, that true concussion of the spinal cord from the ordinary accidents of everyday life is amongst the very rarest of injuries, and that being so, it is at any rate improbable that concussion should be a common result of any one peculiar form of accident, such as a railway collision. The question, however, is far too important to be decided by a mere improbability, and the writer therefore investigated the whole matter of the spinal injuries of railway accidents, bringing to bear upon that investigation the personal experience of several hundreds of cases, many of them being inquired into long after the accidents, and calling to his aid the experience of others by the method known as "collective investigation." The result of that inquiry was to show, that not only are injuries to the *spinal column* and the soft structures outside it extremely common in railway accidents, but also that the "railway spine," as it has been called, is not, and has no resemblance to, concussion of the spinal cord—a conclusion which neither shuts out, nor indicates a disbelief in, the possibility of there being such a thing as concussion of the cord, or that the cord *may* be injured by concussion even in railway collisions. Not only as the result of any and every form of accident, but also as the result of the special form of accident met with in railway collisions, concussion of the spinal cord is amongst the very rarest of injuries, using the word "concussion" to signify an effect upon the cord of the same nature as the effect upon the brain from a concussion-blow, the results of which may vary from simple shake of the brain-mass to actual contusion or laceration of its substance. The case, however, recorded by MM. Duménil and Petel, is not a case of railway injury. It is given at great length, and it is impossible to do more than refer to its salient features here.

A man, aged 60, fell from a height of about five feet vertically upon his head. There was complete loss of consciousness for about an hour, and when he came to himself there were all the evidences of a severe injury to the cord in the lower cervical region, complete paralysis of the lower limbs, almost but not quite complete paralysis of the upper, that of *the right arm being more marked than the left*, such movements as were possible being performed by the shoulder muscles, and diaphragmatic breathing. For a day there was abolition of sensation below the umbilicus, loss of control over the sphincters, &c. Sensation gradually, but never completely, returned in an irregular manner, and was replaced by hyperæsthesia in various parts, and shooting-pains in the limbs. At a later period there was marked rigidity in the lower limbs, with hyperæsthesia here and there, and variable attacks of pain in the extremities. There was pain on moving the neck, mostly at the level of the sixth cervical vertebra, but no discoverable deformity. The case is recorded with minutest detail from day to day, and seems to be divided into two periods: the first, of forty-seven days without fever, and a gradual, though very slight, tendency to restoration of function; followed by a second period of five months, which was ushered in with shivering, and was marked by various disturbances of motion and sensation, bed-sores, purulent urine, seemingly indicative of a more active myelitis, and then the patient died.

Post-mortem, both spine and membranes were perfectly healthy, but we read that "*à la partie supérieure de la région dorsale, la coupe présente une dépression au niveau de la corne antérieure droite,*" and that, microscopically, there was found degeneration; commencing sclerosis of the crossed pyramidal tracts, slight in the cervical region, apparently less marked in the lumbar than in the dorsal, but in the dorsal more so than in the cervical region; and also "granular degeneration of the motor cells of the grey substance, especially in the dorsal region." From all the circumstances of this patient's history it is perfectly clear that his illness and death, and the post-mortem appearances, were due to the accident, but it is by no means so clear that the original lesion was caused by concussion. Nay, this seems to be one of those very cases where sufficient allowance has not been made for the possibility, and here the exceeding probability, of the cord having been locally damaged by severe and sudden bend. The man fell vertically on his head, and was momentarily pivoted, so to say, with his head downmost, his body uppermost, and his neck intervening; and, with the tremendous leverage of the body-weight, his spine and spinal cord were inordinately bent somewhere in the cervical region. The spine itself—with its great flexibility in this part—does not give way; but the cord yields under the sudden strain, yields most in its anterior parts, if we assume that the bending was backwards rather than forwards. He has pain about the region of the sixth cervical, and somewhere about that level the cord is obviously severely damaged, for he is almost completely paralysed, and diaphragmatic breathing alone re-

mains. The symptoms, moreover, seem to show that this lesion could not have been a concussion-lesion, and that the whole cord, at any rate, was not affected by concussion; for let it be noted that the man was unconscious for an hour, and there therefore was concussion of the brain. Concussion, it is assumed, next fell on the cord about the level of the sixth cervical, and involved the whole of the cord beyond that point. But why should, how indeed could, that portion of the cord which intervened between the brain and the sixth cervical have been excluded from the force or effect of the concussion, transmitted, as it must have been, from the vertex of the head? That it was not involved in the concussion is pretty evident from the fact, that diaphragmatic breathing remained, the cord origin of the phrenics being quite unaffected, being indeed above the level of the gross lesion, which had been determined, it seems to us, by bend at a particular point, and not by concussion at all. It is suggested, however, that the sclerotic degeneration was also due to, and was a later consequence of, concussion of the cord. It is true that no special evidences of injury could be found at any one point of the cord, 169 days, that is, after the accident, and that the authors therefore, do not attach much importance to the "depression" previously named; but this degeneration looks very like a true secondary degeneration spreading from some point of lesion in system-tracts, having a chief tendency to spread downwards, and getting less marked the further it was removed from that point. In other words, the case was probably one of secondary degeneration of the crossed pyramidal tracts after a local lesion of the cord, a thing more likely to have occurred than for those tracts to have been specially picked out and exclusively affected by concussion. It was no unusual circumstance that at a period remote from the accident the patient should have been attacked with a somewhat diffused myelitis, but there is no evidence that that was in any way the result of concussion. One cannot help thinking that the interpretation here put upon the case is more consonant with the facts than is that which attributes the phenomena, immediate and secondary, to concussion and concussion-lesion of the spinal cord. Apart, however, altogether from this case, the paper is of much value, for the authors endeavour to elucidate the symptomatology of concussion of the cord. They especially point out the differences which they believe exist between concussion symptoms and those due to intraspinal hæmorrhage, though we doubt whether it is warrantable to draw any very precise conclusions from their own case. And here we think they have misunderstood the contention of the writer, who has attributed some of the recorded cases of supposed concussion to hæmorrhage. In the work referred to we quoted a case of Mayo's, where a man had a violent blow on the lower part of the back and died in four hours, blood being formed in the spinal canal, with perfect integrity of the spine and spinal cord. Evidently, say the authors, it was not extravasation of blood which killed the patient in four hours. Clearly not; the history

indeed throws no light on the actual cause of death, which nevertheless *may* have been due to shock from concussion of the cord, an explanation which at the very best is simply hypothetical. The history of that case, however, suggested a probable explanation of a case of Sir A. Cooper's in which there was no necropsy, and also showed that even a violent blow such as the patient received direct upon the spine, caused no structural injury to the spinal cord, an evidence of the secure protection of that organ within the spinal canal.

The following are the conclusions at which MM. Duménil and Petel arrive. (1.) That there is such a thing as concussion of the spinal cord; and (2), that it is the cause of consecutive inflammatory mischief which (3) may assume the form of a "systematic" myelitis; and (4) that concussion of the cord may exist as a latent condition, and reveal itself only by secondary troubles, which may take the forms of a simple transient congestion, or of an incurable sclerosis. Notwithstanding the authors' own case and that of Mr. Gore, conclusion 3 yet lacks, we believe, the foundation of an absolutely unequivocal case, for, as we pointed out in a previous number of 'BRAIN,'¹ the cases of *tabes dorsalis* of supposed traumatic origin which were collected from various sources by M. Petel, are surrounded with doubt. It seems to us, moreover, that conclusion 4 ought only to be based on definite examples, for several cases which fall in this category, amongst them being the perennial case of the Count de Lordat, have been in all probability cases of local spinal injury with few or no symptoms at first, but in which there was gradually set up a local pachymeningitis, followed by later degeneration in the cord.

A case recorded by Professor Verriest² is briefly as follows. A heavy mass of coal fell on the lumbar and sacral regions of a man aged thirty-four. He was picked up insensible, and was found palsied in all his limbs. Great pain in the lumbar region extended up the whole column. Next day he vomited a large quantity of blood, and in three days power began to return in the right arm, then in the left, and lastly in the legs. He gradually improved, but his muscular power remained very feeble. The reflexes were but little altered, and sensibility was only slightly lowered. He had pain on pressure of the spine and on movements of the trunk. He was then lost sight of for twenty months, when he was found in a most feeble state; wasted, easily fatigued, his reflexes exaggerated and sexual power gone; subject to vomiting and dyspnoea; with a slow pulse, his intellect feeble, and double optic neuritis. This case is regarded by the author as one where concussion was the starting-point of an insidious meningitis and myelitis, and we cannot help thinking that it is much more suggestive of concussion than the case of MM. Dumenil and Petel, difficult though it be to account for the insensibility on any mere concussion theory. The double optic neuritis points in all probability to a meningitis which had spread up to the base of the

¹ Vol. II. p. 440.

² 'Revue Médicale de Louvain,' No. 12, 1885.

brain, while all the symptoms may be accounted for by a widely diffused spinal meningitis with irritation or involvement of nerve-elements. That being so, it is not altogether improbable that the real cause of the mischief was originally an intraspinal hæmorrhage, and it is at any rate clear that there was no intervening or latent period, but a steady progressive degeneration started by the injury sustained.

Dr. Dana's paper "on Spinal Concussion and the nature of its Sequelæ," and the discussion which followed it,¹ dealt more largely with concussion of the cord in its relation to railway injuries. A large number of cases of supposed concussion are collected by Dr. Dana, whose concise and impartial remarks on each of them will well repay perusal. In the debate which followed, Dr. Hammond referred to a case which he "could not conceive as anything else than a concussion," where a woman had fallen, doubled-up, thirty-five feet on her buttocks. There was no fracture, and when seen three months afterwards by him, she "was still suffering from paraplegia, and incontinence of urine and paralysis. Hypochondriasis and hysteria had also developed to an extreme degree. I do not think there was any hæmorrhage in her case, because I do not think hæmorrhages of the spinal cord are recovered from. She suffered not only from motor troubles, but from sensory disturbances likewise; also from atrophy of her limbs, showing that the injury involved the whole segment of the cord, both the sensory and motor parts. Yet she has recovered, and I do not believe, therefore, that in her case there was any destruction of the cord. I cannot conceive that there could have been anything else than a concussion." One would have thought that the scientific imagination of Dr. Hammond might have conceived something else, say, for example, "spinal anæmia," or "spinal hyperæmia"; but we cannot gather from his remarks what is exactly meant by "concussion" in this somewhat obscure, or inadequately reported case—whether "concussion" is used to indicate cause or effect.

Dr. Weber made the observation, that while he would not say there was no such thing as concussion of the spinal cord, "he believed that a good many cases which are considered as such are not, in spite of the symptoms pointing that way, dependent on concussion of the spine, but upon concussion of the brain"—a criticism which applies with becoming force to many of the cases referred to by the speakers in this very debate. These are the chief of Dr. Dana's conclusions: 1. That the term "spinal concussion" is a misleading and often incorrect one, and that the symptoms which are usually associated with that name are really symptoms of traumatic neurasthenia—a term which covers a well-recognised symptom-complex—hysteria and hypochondriasis, associated more or less with symptoms of injury to the vertebral muscles and ligaments, and to the spinal nerves; that, in other words, spinal concussion is mental shock and physical bruising . . . 5. That the prognosis of railway or traumatic neurasthenia and hysteria is

¹ 'New York Medical Record,' Dec. 6, 1884.

very good, so far as steady improvement is concerned, not so good as regards complete recovery. 6. That concussion of the spinal cord alone, followed by temporary loss of function, or by myelitis, does occur in rare instances. 7. That, in the predisposed at least, injuries and jars may set up chronic myelitis, without there being a lesion of the spinal column."

What then is the conclusion of the whole matter? Erb has given it in 'Ziemssen's Cyclopædia.'¹ "We do not yet know what changes, if any, constitute the basis of the concussion proper. . . The diagnosis is in many cases so uncertain, and the want of satisfactory evidence from autopsies so great, that the history of the disease is still surrounded by darkness. . . It is therefore rather rash to entertain a decided opinion regarding the *proper nature of concussion of the cord*. It seems to be certain that the anatomical report is a negative one. The most common view, therefore, is that which supposes only molecular changes in the finer nerve-elements to have occurred, giving rise either to an immediate and complete functional paralysis of the latter, or forming the commencement of further disturbances of nutrition, which at a later time may result in degenerative inflammation. . . Much remains to be done in the more correct estimate and clearer definition of cases; the first thing consists in collecting accurate reports of cases, avoiding, more carefully than has hitherto been done, the intermixture of other sorts of lesions." These words, "avoiding the intermixture of other sorts of lesions," should be borne in mind by every one who has the opportunity of observing, or who attempts to describe, a case of that seemingly rarest and most elusive of injuries, concussion of the spinal cord.

¹ Vol. xiii. p. 344.