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POSSIBLE CEREBRAL ORIGIN OF THE SYMPTOMS USUALLY CLASSED UNDER "RAILWAY SPINE."

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RECENT investigations have shown that the terms "spinal concussion" and "railway spine," long in use to designate a set of symptoms following severe injury, are not only inexact, but misleading, in that they direct attention to the spine as the seat of a disturbance which may be, in part at least, situated in the brain.

In the extensive literature on "railway spine" attention seems for a long time to have been drawn away from the fact that the brain is at least as liable to injury from a jar as the spinal cord, while under the ambiguous name "spinal concussion" have been grouped all the nervous symptoms following accident, even in those cases in which organic lesions have been found in the spine on post-mortem examination. This is evidenced, for example, in the work of Erichsen on this subject.

In 1881 Dr. Hodges[1] made an important step towards the classification of these injuries by insisting on the separation of the organic from the inorganic affections of the spinal cord following accident.

Page[2] has shown that the former are exceedingly rare as long as the vertebral column remains intact. With regard to inorganic injuries to the cord in an accident he regards the term spinal concussion as one having little or no support in fact, and is inclined to class the symptoms hitherto attributed to spinal concussion under hysteria without committing himself to any exact theory as to the physiological sequence giving rise to the hysterical condition.

[1] Boston Medical and Surgical Journal, vol. civ., p. 361.

[2] Injuries of the Spine and Spinal Cord, Herbert W. Page, A. M., M. C. Philadelphia. 1883.

Dr. J. J. Putnam,[1] after reporting two cases in which typical hysterical symptoms were found following injury, has emphasized the importance of seeking among the seemingly vague set of symptoms those which are typical of hysteria, a disease generally acknowledged to have its seat in the cerebral (certainly not in the spinal) centres.[2]

That the brain should be the chief sufferer from an accident rather than the spinal cord seems reasonable, both in consideration of its physiological and of its anatomical relations.

With regard to the former, the cerebral centres represent a far higher development of function, and to perform this function must have a more delicately organized intimate structure than the lower centres of the cord, which preside over the more simple reflex activities of the body. This fact alone should render them more liable to derangement from a jar as resulting from a fall or collision in which both brain and cord must participate.

With regard to the anatomical relations of the two organs, the spinal cord hangs suspended in a cavity much larger than itself, and is surrounded by an amount of loose areolar adipose tissue and fluid so great in relation to its own weight as to diminish materially the liability to injury from a shock; the brain, likewise enclosed by an unyielding case of bone, and itself much heavier than the cord, lies in comparatively intimate connection with its case, the dura mater of the brain forming, in fact, the periosteum of the skull. Certainly the facts bear us out in the supposition that the cerebral centres do suffer, whether directly or reflexly, for although pain in the back, weakness in the extremities, etc., seem generally to draw attention to the spine, these symptoms are

[1] Boston Medical and Surgical Journal, September 6, 1883.

[2] Dr. Putnam informs me that since the publication of his article he has met with a third case suffering from typical hysterical hemianæsthesia after accident (railway).

rarely unattended by irritability, fretfulness, emotional tendency, and inability to confine the attention. These can only be the result of derangement in the higher cerebral centres. Now if careful search elicits such abnormalities of sensation and motion as can only be attributed to cerebral disturbance, it must be acknowledged that the brain rather than the spinal cord is to be credited with being the chief seat of the difficulty. This conclusion is alone a great step towards clearing up these cases, whether the disturbance of function in the cerebral centres be considered due to simple concussion, vaso-motor irregularity, or to reflex influence from injury to other (for example, abdominal) organs. The physiological arguments on the latter points are still so obscure as to render it hardly advisable to discuss them here.

The practical importance of seeking to classify the nervous symptoms resulting from injury is evident. "Railway spine" has offered and will continue to offer a frequent subject for litigation, and any classification of symptoms which will enable us to bring it, if only in part, under a form of disease already understood, and which will enable us to distinguish the real from the feigned, must be of the greatest practical value.

That such symptoms really do exist is shown, for example, by a case recently reported in its main particulars by Dr. Putnam,[1] and fully by the writer.[2] The case was that of a fireman, not a claimant for damages, who, after a severe fall on his side from his engine, suffered, amongst other symptoms, from mental excitability and despondency, with a tendency to weep on slight provocation. Examination revealed left-sided hemiparesis and hemianæsthesia limited sharply by the median line. He also had lost to a certain degree, and in the manner characteristic of hysteria, the senses of sight, hearing, smell, and taste on the left side. The temporary disappearance of the symptoms

[1] Boston Medical and Surgical Journal, September 6, 1883.
[2] Archives of Medicine, New York July, 1883.

on the application of the magnet showed that they were of functional, not organic, origin, and their seat (involving the head and special senses) absolutely precluded spinal origin.

In this case at least these symptoms enabled us to classify the nervous injury under the head of hysteria. Not the vague hysteria of former times, but the functional disturbance of the cerebral centres which modern research, as set on foot by Professor Charcot, has shown to follow given laws, and to offer pathognomonic characteristics.

The importance of always searching for hysterical hemianæsthesia in cases of injury is the greater in that just this set of symptoms, besides failing to attract the patient's attention, may, and frequently does, pass under the eyes of careful medical observers unnoticed unless especially sought for.

It may be well at this point to mention briefly the chief symptoms to be looked for in establishing hemianæsthesia in a hysterical patient or in a sufferer from "railway spine."

It is not in place here to mention the numerous precautions and counter-tests always necessary in examining into subjective conditions. The left side is by far the oftener attacked. On the side affected loss of sensation appears, varying in degree from inability to feel a light touch to complete loss of feeling, so that a pin can be thrust through a fold of the skin while the patient's eyes are closed without his knowledge. It is, perhaps, not superfluous to remind the observer that the eyes must invariably be closed during the testing, for if the patient sees, he is apt to think he feels, that his skin is touched. This is, perhaps, the principal reason why the anæsthesia generally escapes the patient's notice. If doubt exists as to loss of sensation, comparison with the corresponding point on the other side of the body is an essential aid unless that side happens to be also anæsthetic. The disturbances of special sense (though rarely suspected by the pa-

tient on account of their unilateral character), when present, offer marked peculiarities. Substances readily smelled with both nostrils open are unperceived (supposing the anæsthesia to affect the left side) with the right nostril closed. If the tongue be protruded with the eyes shut and the patient told to draw it back when he tastes anything, it remains quiet while quinia, for example, is placed on the affected side, but is drawn back instantly when it is placed on the other.

The sight with the affected eye is feebler than with the right, the field of vision is concentrically retracted, and the patient is unable to distinguish certain colors with the unaffected eye closed. The first to disappear is generally violet, then green and yellow; red and blue usually persisting unless the degree of anæsthesia is excessive.

The hearing (allowance being of course made for disease of the ear itself) is less acute on the affected side, perception for sounds conveyed through the bone and that for high tones being first lost.

Symptoms not to be overlooked are mental irritability and emotional tendency.

In order to absolutely establish the diagnosis a large horse-shoe magnet, or electro-magnet, should be placed near some spot of the anæsthetic side and left quietly there for say an hour. In the majority of cases the anæsthesia will be diminished, and perhaps entirely disappear or pass to some other part of the body, oftenest to the corresponding spot on the other side, which constitutes the so-called transfer.

The fact that many observers claim that the mind and not the magnetism is the potential factor in this phenomenon does not lessen its diagnostic value, as its presence in either case absolutely establishes functional anæsthesia.

With regard to the motor functions in this disease, there exist as a rule a certain degree of paresis affecting all the muscles of the side involved, so that the grasp, for example, as measured by the dynamometer, is decidedly feebler than on the sound side.

The reflexes are generally altered in character, degree, or both, the tendency being towards exaggeration.

The writer has recently had opportunity to examine a patient exhibiting the symptoms of hysterical hemianæsthesia in a characteristic manner, with no plausible explanation of their origin except the explosion of a shell in the patient's vicinity. The case, though not coming under the class ordinarily designated "railway spine," is interesting in connection with the discussion of that subject, as strengthening one link in the chain of evidence, in that it substantiates the fact that hysterical hemianæsthesia may follow a mechanical shock.

It should also be remarked beforehand that the purely functional symptoms in the case were complicated to a slight degree by the presence of certain organic changes for which no other plausible origin can be found than the concussion produced by the accident. These organic changes are atrophy of the optic nerves (probably secondary to the concussion), rupture of both drumheads and purulent inflammation of both middle ears, and (probable) hæmorrhage into the inner ear on the right, which was the side on which the shell exploded.

The temptation is great to assume an organic origin for the symptoms which have been classed as hysterical, but careful study of their nature renders such an assumption extremely improbable.

The patient, examined in conjunction with Dr. H. W. Bradford and Dr. E. D. Spear, is a man forty-one years of age, an American, formerly a lamplighter. There seems to be nothing in his family history pointing to nervous or mental disease. He was himself well and stout until he entered the army in 1861. Up to this time his sight and hearing were good. In 1862 a shell exploding near him he staggered to a tree unable to see or hear. Sight was recovered, and hearing to a certain degree. From this time on the patient experienced recurring "blurs" before his eyes, with in-

tervals during which he saw very well. From the time of the accident the hearing remained so poor that the patient's neighbor had to pluck his sleeve in order that he might answer to his name at roll call, and he became unfit on this account for single picket duty. The hearing was from the first worse on the right.

In October, 1864, he was shot through the left thigh, the ball doing also some injury to the testicle. Patient remained about three months in the hospital, during which time he remembers numerous attacks of blindness similar to those experienced after the bursting of the shell. When he began to walk about in the hospital he was troubled by pains in the back, running down the leg, and in the testicles. On attempting to walk at that time he found that motion was greatly impaired in the left leg, which was atrophied, felt numb, and was drawn up so that the heel could not be put to the floor. The leg shook violently on attempts at motion. The flesh and strength returned in the left leg in perhaps two years, though the patient has noticed ever since the war that motion was not so strong in the left as in the right limb, and that the toe is inclined to drop in walking. He complains now of no pain anywhere, but of occasional "drawing" and "crawling" sensations in the back of left leg, numbness in the left hand and fore-arm, and sometimes a sensation of being struck in the back. No shooting pains, never saw double, no gastric symptoms, never headache. Occasional attacks, of short duration, of dizziness with tendency to whirl round (he does not know in what direction), nausea, and buzzing in the left ear. Patient is much more irritable than before the war, but shows no loss of memory or power of concentration. There is a history of loss of sexual desire and power dating from time of the war. He has noticed ever since that time that the strength of the left arm, formerly nearly or quite as good as that of right, is much impaired. Patient denies venereal infection, even gonorrhœa, and says that he has never been subject to sore throat, and has neither had

eruption on his body, nor falling out of hair. He relates that while soldering about two years ago some of the hot solder ran through the fly of his pants and burned the back of his penis. The only history of severe injury to be elicited, other than the explosion, is that some months after leaving the hospital in 1862 he was struck on the head by a freight train drawn by mules. He was knocked down, somewhat stunned, but was able to get upon the car. Recovery said to be rapid, and without nervous or other symptoms.

Physical examination. The patient is a short stout man of intelligent mien and good muscular development, excepting that all the muscles of the left arm are decidedly smaller and less resistant than those of the right.

On the scalp exists a cicatrix high up in the occipital region a little to the left of the median line. This cicatrix is broadly linear, two and one half centimetres in length, non-adherent, non-sensitive, and shows no loss of substance. On the dorsum of the penis, well back from the glans, appears a superficial white oblong cicatrix, 0.7 centimetre in length.

The cicatrices representing the course of the shot received in the thigh are as follows: a horizontally linear cicatrix 2.5 centimetres in length, situated at the outer extremity of the fold of the left buttock, and showing considerable loss of substance; a horizontally linear cicatrix 1.5 centimetres long on the inner side of anterior surface of the left thigh, opposite the scrotum, representing considerable loss of substance, quite sensitive, pressure on it causing tingling sensations down the leg; a linear cicatrix four centimetres in length on the outside of the left scrotum, running downwards and inwards from a point opposite the cicatrix on the thigh, and forked at its upper end; a small cicatrix in the posterior perineal region (where the ball was extracted).

No enlarged glands found. The pupils are of average size, alike, and react both to light and to (attempts at) accommodation. The patient's gait is somewhat

uncertain on account of blindness, but is not ataxic; the only peculiarity noticed is a slight tendency to scrape the left toe in walking.

Motion. No ataxia. On testing the strength of the various muscles all muscles on the right side prove very strong, those of the left arm and leg only fairly so. The grasp as measured by the dynamometer bears the relation of (left) 22 to (right) 40, repeated trials giving the same result.

Measurements of the upper arm show (right) 30.5 centimetres, (left) 29.5 centimetres. Fore-arm (right) 27.5 centimetres, (left) 26 centimetres. Calf (right) 33.5 centimetres, (left) 33.5 centimetres. Reactions to the faradic current, strong on the right, are lessened on the left. Patellar reflex is increased on both sides, especially on the left.

Sensation. All forms of sensation are markedly diminished on the entire left side to the median line, with the exception of an area over the abdomen bounded above by the line of the ribs, below by Poupart's ligament, and outwardly by the axillary line (the line of demarkation is quite sharp, but the above is only an approximate description of its situation). The diminution of sensation is somewhat less on the head and face than on the trunk, but is bounded here also sharply by the median line. A pin can be thrust through a fold of the skin on the left leg without causing the least pain, and only strong pressure is perceived at all. All attempts to surprise the patient by painful stimuli over the anæsthetic area prove futile.

Special sensations. The senses of *smell* and *taste*, normal on the right, are entirely absent on the left. The general anæsthesia is marked on the inside of the mouth, and pinching of the left side of the tongue is not felt. The left side of the tongue shows signs of having been severely bitten (probably due to the anæsthesia, the patient stating that he finds himself very awkward in the mastication of his food on the left side).

Sight. The patient can only distinguish light from darkness.

Hearing. On the right absent for all sounds both by air and bone. On the left greatly impaired for all sounds by the air. Low voice only heard at one foot. All tones heard equally well up to 35,000 vibrations (König's rods). The tuning-fork on the teeth is heard only on the left. A large tuning-fork placed on the left mastoid bone is heard with difficulty even with the ear shut (indicating defective hearing for sounds through the bone on the left).

Examination of the eyes by Dr. Bradford shows white atrophy of both disks.

Examination of the ears by Dr. Spear shows old purulent inflammation of both middle ears, with cicatricial healing of the membranes.

This case, though not coming under the head of those commonly classed under "railway spine," is interesting in this connection as illustrating the fact that a distinctly hysterical hemianæsthesia may follow cerebral concussion. There seems no other plausible way of explaining the symptoms excepting through injury by shock, as there is nothing in the patient's antecedents or in his own temperament previous to the injury to lead to a suspicion of simple hysteria, a disease of great rarity in the male. The supposition of cerebral hæmorrhage or tumor as causing this set of symptoms, involving equally all sensory and motor functions of one side of the body, is improbable in the extreme, while the impairment of these functions is so characteristic of hysteria as to render this the only probable explanation. The complete deafness in the right ear and the complete blindness, although probably also resulting from the injury, must be looked on as extraneous to the hysteria.

With regard to the hearing. The immediate result of the concussion from the bursting of the shell was probably the rupture of both drumheads, and the starting of an inflammation in both middle ears. The ab-

solute deafness by the bone on the right renders it not improbable that still further lesion of the auditory structures took place, perhaps a hæmorrhage into the inner ear. The deafness in the left ear is about that which would naturally result from a purulent inflammation, excepting, perhaps, the slight deafness by the bone. Whether this is due to the inflammation, to the hysteria, or to deeper lesion, similar to that on the right, it is impossible to determine, but the latter seems eliminated by the fact that all tones are heard up to 35,000 vibrations.

The blindness (which is so excessive as to mask the amblyopia characteristic of hysteria which would have been expected on the left) is of course due to the atrophy of the optic nerves, a result of cerebral concussion not without precedent.[1] That this atrophy is due to an attack of typhoid fever from which the patient suffered two years ago is negatived by the fact that atrophy was diagnosticated at the Eye and Ear Infirmary previous to that sickness. The fact that this patient was a claimant for legal restitution can have but little influence on the genuineness of the symptoms. In the first place the hysterical symptoms were not at all essential to his claim, and in the second place they were so absolutely typical of a disease as yet little known, even amongst the medical profession, as almost to preclude simulation, to say nothing of the repeated unsuccessful attempts to expose deceit.

The fact being tolerably well established that the patient's condition results from injury, it is not impor-

[1] Erichsen (Concussion of the Spine, 1875, page 236) says: "If such serious organic mischief can declare itself in the interior of the globe as a consequence of a general jar or shake of the head, it is not unreasonable to suppose that in many of those cases that we witness, in which, after a general shock to the system, obscuration and impairment of vision gradually manifest themselves, and in which white atrophy of the optic disk is discovered by ophthalmoscopic examination, the injury to the eye, functional and organic, is due to a shake or jar of its nervous structures, by which their nutrition becomes seriously but slowly impaired, and organic changes become secondarily developed in them."

tant for us to discuss the question whether the accident on the railway or the explosion of the shell was the ætiological factor. The apparent greater severity of the latter shock, together with the fact that the deafness and other symptoms, as far as can be learned, dated rather from the time of the explosion, seem, however, to throw the weight of evidence in favor of that accident.

With regard to the question of syphilis, there is no way of deciding absolutely whether the alleged is the real cause of the cicatrix on the penis, but in the absence of other symptoms we have no right to assume that this disease exists, because of the cicatrix.