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SPINAL IRRITATION AND SOME POINTS IN THE DIAGNOSIS OF AFFECTIONS THAT MAY BE MISTAKEN FOR IT.

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Reprint from
"ALIENIST AND NEUROLOGIST,"
St. Louis, July, 1889.

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Spinal Irritation and Some Points in the Diagnosis of Affections that may be Mistaken for It.*

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IN considering the subject which forms the title of this paper, I desire to call attention to some points in the differential diagnosis of certain diseases of the spinal cord and its membranes, and of caries of the spine. The organic diseases of the cord and surrounding structures, in the vast majority of instances, are easy of recognition, but functional disturbances in this portion of the body are common and often confusing, and, occasionally, the symptoms of an organic lesion are illy developed, or masked by those of other affections, it may be, in a distant portion of the body. Chronic degeneration (system lesions) of the cord are rarely difficult of recognition, but a formidable array of symptoms, supposed by some to be due to anæmia of the cord, and by others, to anæmia or congestion of the cord and adjacent structures, at one time nearly resembling gross organic lesions, and at another being easily accounted for on the theory of temporary perversion of function, are confusing and most sorely tax the skill of the diagnostician.

It is probable that straining or tearing of the ligaments of the spinal column may result in beginning caries, and caries in turn in inflammation of the spinal dura. The

*Read before the Colorado State Medical Society, June, 1889.

irritation may extend directly from certain ligaments to portions of the dura mater, especially to those portions of the membrane which surround the spinal nerves in their passage through the intervertebral foramina. In such cases it is often difficult to determine whether we have a spinal pachymeningitis, secondary to caries, or one that has directly followed injury to the ligaments of the vertebræ. Some of the text-books on surgery (Gross) describe a "chronic rheumatic arthritis" of the spine. In such a condition the ligaments do not probably always escape, and from the close proximity of certain of the ligaments to the spinal dura it is not unreasonable to suppose that the latter may become secondarily affected. So far I know of no positive proof from *post-mortem* examinations confirming me in my belief that affections of certain spinal ligaments give rise to pachymeningitis, but after a careful study of the positions of these ligaments and their relations to the intervertebral foramina through which the spinal nerves with their dural coverings pass, it seems strange to me that writers, especially those on nervous diseases, have not referred to the probable connection between the affections of certain spinal ligaments and chronic inflammation of the spinal dura in the neighborhood of the intervertebral foramina unassociated with caries of the spine.

I recognize the fact that caries of the spine, even in the adult, is not a very infrequent disease, but it is an impression with me, amounting almost to a conviction, that those who regard external spinal pachymeningitis as tantamount to caries may be in error. Cases of incipient spinal caries, on account of the prominence of certain nervous symptoms, are more frequently referred to the specialist in nervous diseases than to the surgeon, yet, with the single exception of Gowers, the former, in their works devoted to the consideration of nervous affections, have left to the latter the task of giving a full and clear description of the symptoms diagnostic of spinal caries. What I shall have to say to-day will relate mainly to the

diagnostic symptoms of chronic spinal meningitis, spinal caries, incipient myelitis (congestion of the spinal cord?) and that large group of symptoms supposed to be due to spinal irritation. I do not hope to make the diagnosis of these affections easy, for it requires considerable diagnostic skill and a thorough knowledge of the structures, functions and diseases of the cord, its membranes and adjacent parts to enable the most skillful to make a satisfactory diagnosis. Despite the greatest precaution and care a case is occasionally met with that baffles the diagnostic acumen of the best.

Before studying the symptoms of the diseases to which I wish to direct attention, I desire to pass in brief review the structures that immediately surround the cord, affections of which may give rise to or modify the diseases of the latter.

The vertebral canal is formed by the bodies of the vertebræ, their pedicles and laminæ. The ligaments of the vertebræ which are found principally within the spinal canal, and may, when diseased, affect, by pressure or otherwise, the spinal cord, its membranes, the vascular supply or the spinal nerves as they pass into the intervertebral foramina, are the posterior common ligament and ligamenta subflava. The posterior common ligament is separated from the dura mater of the spinal cord by "loose filamentous tissue, very liable to serous infiltration." The spinal dura mater is separated from the bony walls of the canal by a quantity of soft fat, or loose areolar adipose tissue, and a plexus of veins. It is attached to the circumference of the foramen magnum, and to the posterior common ligament of the vertebræ by means of fibrous tissue. It is pierced separately on each side by the anterior and posterior roots of the spinal nerves, and forms fibrous sheaths for them, short in the upper portion of the cord, but longer in the lower.

The visceral layer of the arachnoid membrane surrounds the roots of the spinal nerves and forms sheaths for them up to the point of their exit through the dura mater.

The pia mater is intimately adherent to the spinal cord, forming its neurilemma, investing each of the filaments of the spinal nerves, and giving a sheath to each of the nerves themselves. It aids in maintaining the cord in position during the movements of the body, and has been called from this circumstance the central ligament of the spinal cord.

The spinal cord at birth reaches as low as the third lumbar vertebræ; in the adult, not lower than the lower portion of the body of the first lumbar or upper portion of the body of the second (Gray, Allen). Fehct thinks the cord reaches a little lower in the female than in the male (Allen). Its position in the canal is closer to the bodies of the vertebræ than to their arches, although it is not far removed from the pedicles of the bones. The cord is raised in extreme flexion of the spine. The anterior portion of the cord is supplied by a larger artery than the posterior, and the upper portion of the cord has a less precarious blood supply than the lower. The arterial pressure is much less in the cord than it is in the brain.

Experimental results following ligation of the abdominal aorta have shown that the posterior columns of the spinal cord, unlike the anterior columns, are not entirely and directly dependent upon the lumbar of the branches of the abdominal aorta for their blood supply. Seguin, in the *Annual of the Universal Medical Sciences*, says:

> In 1884 Ehrlich and Brieger made observations upon the histological alterations of the spinal cord after this operation (ligation of the abdominal aorta); and recently Singer has repeated the experiments. In animals (rabbits?) killed twenty-four or thirty-six hours after ligature of the abdominal aorta below the renal arteries for one hour, he found granular degeneration of the multipolar cells. On the fourth day there was destruction of the myeline and of the axis cylinder in the anterior horns, the antero-lateral columns and the anterior nerve roots. After five weeks section showed shrinkage of the entire gray substance, absence of multipolar cells; the antero-lateral columns and the anterior nerve roots (with exception of a few fibers) were degenerated. The peripheral nerves were extensively degenerated and the muscles sclerosed.

On the other hand, the posterior ganglia, the posterior roots and the posterior columns were normal, although during life anæsthesia had been present. In the anterior commissure were a few normal fibers.

The veins of the cord emerge principally from the posterior median fissure. The large venous plexus in the spinal canal receives the blood from the veins of the structures immediately over the spinal column, from the bodies of the vertebræ and from the spinal cord and its membranes. It is important to bear in mind that the veins of the cord cannot be distended by injecting the venous plexus within the spinal canal. A spinal nerve is formed by the union of an anterior and a posterior root which unite immediately after the emergence of the latter root from the ganglion by which it is surrounded. The ganglia are situated externally to the dura mater. In the extreme upper cervical region (1st and 2nd) the ganglia are placed on the arches of the vertebræ over which they pass; the ganglia of the sacral and coccygeal nerves are in the spinal canal, while those of the remaining spinal nerves are found in the intervertebral foramina. "The intervertebral portions of the spinal nerves are inclosed in tubular sheaths of dura mater and are surrounded by the veins of the vertebral plexus and by lymph vessels."

The spinal nerves are much less likely to be subjected to undue pressure after they emerge from the intervertebral foramina than during their passage through them. On each side of the spinal column are situated the ganglia of the sympathetic nervous system, by affections of which the blood supply and the nutrition of the cord may be modified.

It may appear to some that I have gone into unnecessary anatomical detail in reference to the structures surrounding the cord, but to such I can only say that when we come to study the complexus of symptoms included under the head of spinal irritation, a term made to include symptoms apparently due to opposite conditions of the blood supply of the parts, we shall then see the

necessity of a more thorough anatomical knowledge of structures, affections of which may modify the functions of the cord.

Spinal Irritation.

The affection which has received the name of spinal irritation is supposed by Hammond to be due to anæmia of the cord; by the Griffin brothers, who first gave a clear description of the disease and whose opinion Allan McLane Hamilton accepts, to irritation of the sympathetic ganglia, which may be attended by anæmia or congestion, depending on the degree of irritation to the sympathetic ganglia; whilst Dr. V. P. Gibney has advocated the view that it is a meningeal affection, usually resulting from an injury of some kind (Transactions of the American Neurological Association, for 1877). Under the head of Spinal Neuralgia, Gowers, in his work on Nervous Diseases, describes symptoms similar to those found in spinal irritation.

After a careful study of the records of numerous cases of what, for lack of a better name, I shall term spinal irritation, although with our imperfect knowledge of the pathology of the affection, spinal hyperæsthesia or neuralgia, seems to me, equally appropriate, I am convinced that the clean-cut cases of spinal irritation due to anæmia are less numerous than those complicated by symptoms of a mixed condition.

The cases coming under my observation have invariably occurred in persons whose general health has been below normal, although many of the patients were apparently well nourished, and in some the face and eyes presented a congested appearance.*

While women are by far the most numerous sufferers, it is not infrequently found in over-worked or worried men who lead sedentary lives and are irregular in their habits of eating and sleeping. Persons of a nervous, irritable and hysterical temperament are commonly the subjects of spinal

*Since the above was written I have seen E. G. Whittle's book, entitled "Congestive Neurasthenia, or Insomnia and Nerve Depression."

irritation. A marked feature of the symptoms of certain cases of spinal irritation is their variability. At one time one symptom or a group of symptoms are prominent, and at another a different set may absorb the patient's whole attention. This is not the condition in all cases, but it depends upon the emotional state of the patient. While I am far from claiming that all cases of this affection are principally hysteria, yet I am persuaded that hysteria plays an important part in a fair proportion of them. The longer the affection has lasted in an aggravated form, as a rule, the more of the hysterical element will there be mixed up with it. In such cases the patient is not only hysterical and irritable, but the mind is often affected, sometimes almost to the point of insanity. Insomnia is a frequent and almost constant symptom of spinal irritation, especially when the upper portion of the spine is the seat of tenderness. Headache, sometimes located in the forehead and over the eyes, at other times in the top and back of the head, while in another class the pain is limited to one or both temples, is often the principal symptom for which the patient seeks medical advice. Sometimes the patient is a more or less constant sufferer from a dull, heavy pain in the head, and is periodically attacked with megrim, lasting from a few hours to a day or two. A full feeling in the head with a sense of constriction around the forehead is often complained of. The scalp is frequently tender to the touch and is the seat of more or less pain. Disturbances of vision are not infrequent and a ringing noise in one or both ears is quite common. Vertigo is often troublesome while the patient is in the erect posture. It is usually, but not always, relieved by the recumbent posture. In some cases the vertiginous sensation is increased on the patient's lying down. I have recently had one such under my care. A drawing sensation in the muscles of the back of the neck has been complained of by a number of my patients. An irritable, spasmodic cough with more or less difficulty in breathing is present in a certain proportion of cases. The

difficulty in breathing does not usually amount to more than a sense of oppression or weight upon the chest. Aphonia has been met with quite frequently by some observers, but so far, I have seen only one case in which the loss of voice was associated with an irritable spine. Cardiac distress, palpitation, vascular throbbing, flushes and epigastric pulsation occur in a number of cases (Radcliffe) and seem to result from irritation in special portions of the spine and are often associated with nausea, vomiting and sometimes pain in the gastric region. Eructations, nausea, vomiting and retching are familiar symptoms of spinal irritation, and according to my experience the more the hysterical element predominates the more frequent and troublesome the gastric disorder. Pain in the stomach seems to have been met with only when the dorsal region of the cord was the seat of tenderness. Neuralgic pains, next to spinal tenderness, are the most constant symptoms in spinal irritation. I have never seen a case in which they were absent. They are irregular, shifting from place to place, intermittent or periodical; may occur in any portion of the body, although their seat is determined to a great extent by the portion of the cord affected. Mental or physical fatigue, straining or twisting of the back or anything that exhausts the patient brings them on or increases them. They are often relieved or greatly lessened by the recumbent posture in uncomplicated cases due to spinal anæmia. The bladder is sometimes irritable when the lower portion of the cord is affected, but there is no paralysis of the sphincter of the bladder or anus. Hyperæsthesia is a very common symptom and is sometimes quite extensive and distressing. Hamilton says that anæsthesia may be present, but so far I have not met with a single case of spinal irritation uncomplicated by neuritis or organic spinal disease or a predominating hysterical element in which anæsthesia was present.

I think Dr. Radcliffe is correct in stating that numbness is not due to spinal irritation, but to some complicating circumstance. The disturbances of motility that sometimes

occur are probably of a hysterical nature. They include paresis, paralysis and chronic muscular contractures. Radcliffe says: "Partial paralysis of the limbs occurs in cases of spinal irritation, but it comes late and is due to vascular changes, probably congestion or myelitis or spinal exhaustion."

Chronic muscular contractures are found associated with some cases of spinal irritation, but in these there is probably a hysterical element. Hammond has reported fibrillary twitchings, chronic spasm of muscles and general chorea. The reflexes and the muscular irritability probably remain nearly normal. In some cases in which the hysterical element seems to predominate there is an increase of the knee-jerk. The temperature in the uncomplicated cases remains nearly normal.

The symptoms vary according to the region of the spine affected. When the cervical spines are tender, vertigo, dizzy feelings, insomnia, scalp tenderness and pain, localized and diffused pain in the head, face and neckache, a drawing sensation in muscles of back of neck, noise in ears, disturbance in vision, nausea and vomiting and cardiac and respiratory symptoms, together with all kinds of radiating pains from this portion of the spine may be complained of. Motor disturbances may also be present. Pain in the stomach, according to Hammond and Radcliffe, do not occur with cervical tenderness of the spine unless the dorsal portion is affected. In the twenty-five cases of spinal tenderness limited to the cervical region, given by Hammond, vertigo was present in eleven; headache in fifteen; noises in the ears in eight; disturbances of vision in four; fullness and sense of constriction around forehead in several; mental perversion (in some almost to the point of insanity and in others but slight) in all; deranged sleep in all; neuralgic pains in seventeen; nausea and vomiting (but no pains in the stomach) in fifteen; and perverted motility in eighteen.

The author here referred to observed fibrillary twitchings and clonic spasms of the muscles of the neck in

several; general chorea in three; contractures of the flexors of the arms in two; and aphonia in four. Cardiac irritability, flushing and sweating of the face and neck, irritable cough, and sometimes a sense of weight on the chest, are not infrequently met with in spinal irritation affecting the lower cervical and upper dorsal regions.

When the dorsal portion of the spine is the seat of tenderness all kinds of visceral disturbances are common, such as spasmodic cough, difficulty in breathing, cardiac distress, with palpitation, vascular throbbing and flushes. The epigastric pulsation is said to be most frequent in connection with tenderness of the dorsal region. Nausea, vomiting, gastric and sub-mammary pain are among the symptoms found in tenderness of the dorsal region. The sub-mammary pain is often only noticed when pressure is made over the tender spines.

When the lumbar region of the spine is the seat of tenderness, neuralgic pains in the legs, groins, abdomen, uterus, ovaries, bladder and rectum are common symptoms. The bladder sometimes becomes quite irritable. Hammond has met with cases of incontinence of urine. The sphincters of the bladder and anus are probably never involved in uncomplicated cases. Paralysis or spastic contractures of the muscles of the legs has been occasionally observed, but it is probable that the paralysis is purely hysterical and follows spinal irritation rather than occurring as a symptom of it.

There are a few important symptoms connected with spinal irritation that require a little more detailed consideration.

Spinal Tenderness.—While this is not always a prominent symptom in every case of spinal irritation, yet it appears to be almost invariably present when properly sought for. Radcliffe considers it a pathognomonic symptom (Reynold's "System of Medicine") and Hammond says it is a constant symptom and he never regards a case as one of spinal irritation without the spinal tenderness is found when properly sought for. In the cases

coming under my observation, spinal tenderness, though varying considerably in degree, has been invariably present. The Griffin brothers found it present in 143 of 148 cases and Flint in 53 of 58. The tenderness is not always complained of and the patient's attention may be first attracted to it while the spine is being carefully examined to determine the cause of some obscure nervous symptoms. The spinal tenderness is always increased by pressure over the spines, or in the spaces between them. Spinal tenderness as a symptom of spinal irritation does not lose in importance when we remember that spinal pain in uncomplicated cases of spinal meningitis, myelitis and spinal congestion (?) is not increased by steady pressure. The tenderness is rarely limited to one spine, but as a rule, several spines are tender and in some cases the tenderness extends throughout the entire spinal column. The dorsal region is the most frequent seat of tenderness, the cervical the second, and the lumbar the least. In 148 cases of spinal irritation observed by the Griffin brothers, 156 given by Hammond and the 34 recorded by Flint, the seats of tenderness may be thus tabulated:

	GRIFFIN BROS.	FLINT.	HAMMOND.
Cervical Region - - -	23	..	25
Cervical and Dorsal - -	46	3	37
Dorsal (alone) - - -	23	21	45
Dorsal and Lumbar - -	15	10	19
Lumbar (alone) - - -	13	..	15
Whole Spine - - -	23	..	15
Total - - - -	143	34	156

Radcliffe says: "The pain in the back may be brought on or exaggerated by lifting, twisting or straining the back in any way, or by mental effort." I have found that fatigue from any cause, physical or mental, aggravates the spinal discomfort, but more especially when the patient is in the erect posture. In some cases strong pressure is

required to develop the pain and in others the slightest touch is complained of. Radcliffe says that the pain in some cases is as if a nail were driven into the part, in others as if a hard ball were in the part, while in a third the pain is of a neuralgic character.

Hammond thinks the dull, heavy pain, when not constantly present, is brought on by firm pressure, while the sharp pain is elicited by light pressure and is usually attended by hyperæsthesia. The latter symptom, judging from my own experience, is present in a large majority of cases of spinal irritation. Neuralgic pains or various sensory disturbances, depending upon the region of the spine which is the seat of tenderness, may be brought on or increased by pressure over the sensitive spines. In a case, recently coming under my care, pressure over a sensitive cervical spine produced a sharp pain in the forehead, a dizzy feeling, ringing in the ears, pains in the shoulders and arms and a choking sensation in the throat; and in another, pressure over the upper dorsal region increased the sub-mammary pains that were present. Radcliffe believes that in cases of spinal irritation attended with spastic contractures the spinal tenderness is comparatively slight. In a case that was referred to me a short time ago, there were hyperæsthesia and great tenderness of the entire spine associated with torticollis. Before leaving the subject of spinal tenderness, I would like to observe that from the results of repeated examinations of persons in apparent health, I have frequently found the fifth and sixth cervical spines slightly sensitive to firm pressure, while the other spines were very tolerant of strong pressure, but in none of these cases were there any radiating pains so commonly complained of in spinal irritation.

The condition of prolonged muscular contractures that occur in a small proportion of the cases of the affection under consideration resembles the so-called hysterical contractures. The flexor muscles of the lower limbs are most commonly affected, but those of the arms and hands and even the muscles of the jaws (in rare instances) do not

escape. In some instances the flexor muscles of one or both hands are so firmly contracted that the finger nails bury themselves into the flesh, and in other cases, torticollis, extending over weeks or months, exists. The contractures are painless and usually pass off suddenly (Radcliffe).

Paresis or paralysis which is often found in connection with cases of spinal irritation does not seem to me to be properly a symptom of the disease, but rather a sequela of it, and due not to spinal irritation, but to a hysterical condition, or probably vascular changes in the cord, as congestion (?) or myelitis (Radcliffe). The muscular weakness may affect the arms or legs, but more commonly the latter.

Symptoms of spinal irritation may arise in the course of organic lesions of the spine or cord, or a person suffering from an irritable spine may have other and graver spinal troubles added, thus complicating symptoms and necessitating a thorough and careful examination before a definite line of treatment is adopted. The following case will illustrate some of the points here referred to:

H——, a physician about 40 years old, of large physique and florid complexion, but with an irritable or so-called nervous temperament, practiced medicine a number of years in New York city before coming to Colorado, about eight or ten years ago. While in New York he worked very hard and suffered for a number of years from insomnia, irritable spine, tenderness over the intercostal nerves and neuralgic pains in various portions of the body. Finally lung trouble, which decided his coming to Colorado, developed. During the first few years of his stay in Colorado he slept well, his general health improved, he gained fifty or sixty pounds in weight, but his spine remained slightly irritable and he suffered from neuralgic pains radiating from the spine. The last three or four years, as his work and mental strain increased, insomnia again became troublesome and spinal tenderness with neuralgic pains returned to such an extent that he was unfitted for prolonged mental or physical exertion. The latter part of January, 1889, shortly after straining his back in carrying a patient from the operating table to her bed, his back became so painful that he was unable to

leave his room, his temperature rose to 103°, insomnia became intense and pain in the head was complained of. I saw him four days later in consultation with Dr. Elsner. His temperature in the evening was 102.5°, pulse 100 and irritable, respirations twenty. He complained of pain in forehead, eyes, intercostal regions and throughout the entire length of the spine. He was more comfortable while sitting than lying. Lying on his back was positively painful. The spinal pain was lessened by lying in the prone position. The special senses were normal, there was no anæsthesia, but there appeared to be a condition of general hyperæsthesia all over the cutaneous surface. The scalp was very tender and the seat of considerable pain, and slight numb sensations were complained of in the arms and legs. There was no paralysis or paresis. He had an irritable cough, but no bronchial or vesicular râles were detected.

The spine was tender to slight and firm pressure throughout its entire length. The seats of greatest tenderness were at the junction of the cervical and dorsal regions and in the lumbar region. The spinal pain elicited, or rather increased by firm pressure, was of a dull, heavy, throbbing character, and it remained augmented several minutes after we had completed the examination of the spine. The pain complained of in the back before the examination of the spine by pressure was a dull, heavy, uncomfortable sensation. The intercostal nerves were tender to the touch. There was no muscular twitching or shooting pains in the arms or legs. The appetite was poor and the bowels constipated The patient was restless, easily irritated and decidedly uncomfortable. The urine was acid, high-colored, scant, but free from albumen and sugar. The diagnosis was an engorgement of the vessels of the spinal canal with a threatened or incipient meningo-myelitis superadded to a condition of spinal irritation. The spine was leeched and dry-cupped, alternate applications of heat and cold were applied for several hours and these followed by blisters. Broken doses of calomel were given at short intervals and a teaspoonful of the fluid extract of ergot was administered thrice daily. The patient was kept on his side, or in a semi-prone position and the diet was restricted for a few days. The spinal tenderness decreased at once and within a few days the temperature had fallen to 101° with amelioration of all the other symptoms. By the end of the

first week the temperature was nearly normal, but the pulse kept frequent (110) and irritable. It was necessary to repeat the blisters frequently for the relief of the spinal pain. The hyperæsthesia was still well marked, appetite poor and insomnia obstinate. The ergot and calomel were discontinued, a pill composed of extract of nux vomica, phosphide of zinc, and arsenious acid, was ordered and a more generous diet insisted upon. The improvement in all the symptoms, especially the spinal tenderness, was continuous for several days, but at the end of the second week from the time I first saw him, the external saphenous and posterior tibial nerves of the right leg, the musculo-spiral and several superficial nerves of the left arm and all the nerves of the left hand became very painful. Several nerves in other portions of the body, while not the seats of severe pain, were sore and sensitive to the touch and hindered free motion of the limbs. Our patient was unable to walk or stand without great suffering. The pain in the nerves of the right leg and left arm was so great that the limbs had to be bandaged and elevated. Blistering over the course of the nerves gave some relief. The condition amounted to one of multiple neuritis. About this time the heart's action became very rapid (110 to 130) and irritable and we began to fear lest the innervation of the heart should become involved. By the end of the fourth week he was gradually improving from the neuritis; the pain had nearly all disappeared, but the limbs felt numb and were used clumsily. The irritable condition of the spine was slight, sleep was better and the appetite good. During the next two months he gradually but slowly improved and, contrary to advice, resumed his practice. April 25, 1889, he is much better, but not free from spinal tenderness. Free stimulation, tonic treatment and a generous diet seem to benefit him, at the present time, the most.

A careful study of the symptoms of the case that I have reported shows the necessity of caution, lest, in a case presenting an irritable spine and most of the other symptoms of spinal irritation, we should be led into the error of treating it for spinal anæmia, or in accordance with whatever other special theory is held as the cause of spinal irritation. The more I study the disease the more firmly am I convinced that it is a collection of symptoms that may be

caused by various conditions. I might report numerous other cases of this affection associated with grave organic lesions. I have recently seen a case of caries of the spine in a person who presented many symptoms of spinal irritation.

Nature of Spinal Irritation.—Post-mortem examinations have thrown no light upon the pathology of this disease. It is essentially a functional disease, so far as our present knowledge of its pathology goes. That it is a perverted function of the parts, due to irritation from some cause, the symptoms seem to indicate. The affection, to me, is always indicative of a lowered condition of the general health, is found in the majority of instances in women, usually associated with a nervous, irritable temperament, and not infrequently with hysteria. It seems to me that spinal irritation is frequently a local manifestation of the condition known as neurasthenia, and that it may have as the cause of the local symptoms, spinal anæmia, or irritation of the sympathetic ganglia or membranes of the cord. In some instances it appears to be a neuralgic condition depending upon the lowered state of the general health. The disease does not always denote too little blood in the parts affected, but an abnormal condition of the spinal circulation, giving rise to imperfect nutrition and perverted function. It is probable that local anæmias, and states of engorgement of the blood-vessels, especially the veins, may exist at the same time in the cord and surrounding structures. I desire to emphasize what I have already indirectly expressed, that I do not believe spinal irritation is a separate and distinct disease, but a complexus of symptoms resulting from an abnormal condition and perverted function of the spinal cord, its membranes, or the sympathetic ganglia controlling the spinal circulation, produced by injuries to the spine, or a lowered condition of the general health from various causes.

Diagnosis.—If, as there is reason to believe, no case should be regarded as one of spinal irritation, unless

spinal tenderness is present, our chief concern in the diagnosis would be to distinguish spinal irritation from the other diseases of the cord and surrounding structures attended by spinal tenderness, were it not for the fact that spinal irritation and graver affections of the parts may exist together. In examining a case of supposed spinal irritation, we should bear in mind the symptoms of congestion of the cord and its membranes (incipient inflammation), chronic spinal meningitis and caries of the spine. That congestion or hyperæmia may be temporary and unattended by serious results, every observer has had an opportunity to satisfy himself, but that it is the early stage of inflammation is also true. How long an organ can be the seat of congestion without leading to structural changes, largely depends upon the delicacy of the structures of the organ involved, and the degree and character of the congestion. It seems to me incredible that any structure so delicately organized as the spinal cord, can be congested for weeks, months, or even years, without tissue change taking place. In the descriptions of congestion of the spinal cord, given by Hammond, Radcliffe, Hamilton and others, many of the symptoms, and some of the morbid changes, clearly indicate a condition that pathologists term inflammation. It is more than likely that the large venous plexus of the spinal canal is subject to considerable temporary engorgement, and were it not for the wise provision of nature, that the veins of the cord cannot be injected by distention of this plexus, into which the veins of the cord empty, vascular diseases of the cord would be of much more common occurrence. I am not aware that the vessels of the spinal membranes are thus protected from over-distention. If they are not they must suffer whenever the venous plexus of the canal becomes distended. It is evident that congestion of the cord may and does take place, but what I am contending for is, that if the condition is more than temporary, judging from what we know of congestion in other organs, it becomes inflammation, and should be so regarded and

treated. In accordance with the views here expressed, let us study the differential diagnosis between spinal irritation, incipient myelitis (congestion?) in which the membranes are probably also slightly affected, chronic spinal meningitis and caries of the spine:

Spinal Irritation.	Incipient Myelitis.	Chronic Spinal Meningitis.	Spinal Caries.
Spinal tenderness—always brought out or increased by pressure, and usually extends over a considerable region of the spine.	No spinal tenderness to steady pressure.	No spinal tenderness to steady pressure in cases of external pachymeningitis and it is slight and insignificant to steady pressure over the tips of the spines when the inner surface of the dura and the other membranes are involved, in uncomplicated cases.	Spinal tenderness limited to one vertebra; in rare instances to two or three adjacent ones, and corresponds to region of the pain in the back.
Pain in the back usually, but not always complain'd of. It may be sharp and lancinating or dull, heavy and boring in character. Pressure always increases it.	Pain in the back is a constant symptom, and is dull and aching in character. Occasionally a sense of heat in the cord. It is increased by lying on the back, by standing when lower portion of the cord is affected by a sudden blow or jar, as in taking a false step. Lessened by lying on belly or sides. Locomotion simply uncomfortable.	Pain in the back a constant symptom, sometimes mild, at others very severe. It is greatly exaggerated by every movement of the spinal column. Muscles of the back stiff and often contracted.	Pain in the back a constant symptom, and varies with the degree of inflammation. It is often dull and heavy, increased by motion, especially when cervical vertebræ are affected, as in moving the head. Direct and lateral pressure increases the pain.
Headache, ringing in ears and scalp pain.	No head symptoms unless associated with spinal irritation.	No head symptoms.	No head symptoms unless cervical vertebræ are affected.
Hyperæsthesia (general).	Hyperæsthesia (local).	Hyperæsthesia (local).	Hyperæsthesia (local).
No anæsthesia.	Anæsthesia may be partial.	Anæsthesia (local).	Local anæsthesia may occur, but rare in the early stages.
No numbness or formication.	Sensation of pins and needles, tingling in fingers and toes. Sometimes the numb sensation is so great as to make the limbs feel like a lump of lead. All symptoms below upper level of the cord affection.	May be spots or areas of paræsthesia.	May be spots or areas of paræsthesia. Rare in early stages.

Spinal Irritation.	Incipient Myelitis.	Chronic Spinal Meningitis.	Spinal Caries.
No sense of constriction around the body.	A sense of constriction may be felt around the body or limbs, but probably never to a severe degree unless decided changes have taken place in the cord.	Rare unless the cord has been pressed upon.	Rare unless the cord has been pressed upon, therefore not an early symptom in the majority of cases.
Varying and shifting neuralgic pains in shoulders, arms mammary region, intercostal nerves, pelvis and legs, depending upon the seat of the spinal irritation.	Pains may be felt in body and limbs, but they are not a marked feature.	Eccentric pains radiating to the parts supplied by nerves passing through the inflamed membranes	Radiating pains from the affected region.
Irritable cough, tight feeling in the chest, cardiac palpitation, flushing of the face, nausea, vomiting and pain in the stomach.	Sense of dyspnœa and cardiac palpitation.	Heart and lungs never affected in chronic spinal meningitis, except when the cervical region is involved, and the disturbance then is usually due to secondary involvement of the cord.	Respiration and the heart's action may be affected when the cervical verteorœ are the seat of caries. In such cases the cervical sympathetic ganglia may be affected on one or both sides.
May be mental disturbance.	None.	None.	None.
Insomnia, irritability, restlessness, and hysterical manifestations common.	Insomnia, restlessness and an uncomfortable feeling. Rarely any hysterical manifestations.	Not among the usual or prominent symptoms.	Insomnia may result when caries involves the cervical vertebræ.
No irregularity of the spines.	No irregularity of the spines.	No irregularity of the spines.	Irregularity of the spines the rule. When the cervical region is affected there may be thickening of the tissues over the spine and turning of the head to one side.
May be paralysis of a hysterical nature and usually limited to legs.	Incomplete paraplegic paralysis. Patient may be unable to walk, but able to move the legs when sitting or lying in bed.	May be paresis or paralysis of groups of muscles. It results from severe pressure on the spinal nerve roots or from pressure on the cord.	May be paresis or paralysis of groups of muscles It is not an early symptom and results from pressure on the spinal nerve roots or from pressure on the cord.
There may be spastic contractures of the muscles of the limbs, but they are always painless.	No spastic contractures of the muscles, unless the disease has passed the incipient stage.	Spastic contractures of the muscles often a marked feature of the disease. They are always more or less painful.	There may be spastic contractures of small groups of muscles, but they are rare, and do not occur early.

Spinal Irritation.	Incipient Myelitis.	Chronic Spinal Meningitis.	Spinal Caries.
Sphincters of bladder and rectum unaffected. Bladder may be irritable.	No paralysis of bladder or sphincter ani in uncomplicated cases (Radcliffe). Sphincters not affected (Hamilton). Bladder may be paralyzed, often generally affected (Hammond). Rectum and abdominal muscles paretic, giving rise to obstinate constipation (Hammond). (Are not the above symptoms of myelitis?)	The sphincters are affected only in the event of destructive pressure on the cord or certain spinal nerve root.	Sphincters unaffected except in extreme cases.
Deep and superficial reflexes normal.	Reflexes variable. May be increased, decreased or normal.	Reflexes often increased. Greatly increased when cord is pressed upon high up. They are lessened or abolished when lumbar region of cord is pressed upon, or when the nerves from the same region are greatly affected by pressure.	Sometimes early excess of plantar reflex.
Electro-muscular contractility normal.	Electro-muscular contractility normal.	Electro-muscular contractility but little impaired unless the function of the cord or nerves are disturbed sufficiently to give rise to nutritive changes.	Change from the normal of electro-muscular contractility is a late symptom.

The chief diagnostic symptoms may be briefly stated as follows:

Of Spinal Irritation.—Spinal tenderness, usually extending over a considerable portion of the spine, increased or brought out by pressure, always present. Hyperæsthesia and insomnia the rule. Visceral disturbances and neuralgic pains—in various portions of the body, increased, often, by pressure over the sensitive spines, occurring in a person (usually of the female sex,) of a nervous temperament, after a more or less exhausting physical or mental strain, are very characteristic.

Of Incipient Myelitis.—Dull, heavy pain in back uninfluenced by steady pressure over the spine, but increased

by lying on back, blows to spine, jarring of the body, and lessened by lying on sides or in the prone position, are the principal local symptoms referred to the spine. The sensory symptoms are tingling, sense of pins and needles, numbness, hyperæsthesia, rarely anæsthesia, and the motors—if any are present—incomplete, paralysis of a paraplegic form.

Of Chronic Spinal Meningitis.—These are spinal and radiating pains, symptoms of pressure on spinal nerve roots, signs of pressure on cord (rare), history of cause, especially spinal caries, injuries to spine, etc.

Of Spinal Caries.—These consist of deep and limited spinal tenderness, corresponding to slight irregularity of the bones, early excess of cutaneous reflexes (plantar, etc., but not a constant or very important symptom according to my experience), spinal nerve-root pains, spots of anæsthesia or hyperæsthesia, corresponding to deep pain in the spine.

The point may be raised by some that in the tabular view of the differential diagnosis of spinal irritation from incipient myelitis, chronic spinal meningitis and spinal caries, that under the head of incipient myelitis, which is supposed to be similar to "spinal congestion" of several authors, I have given symptoms more nearly resembling myelitis than spinal congestion. This I grant, but all the symptoms given under the head of incipient myelitis may be found in the writings of Hammond (Diseases of the Nervous System), Hamilton (Nervous Diseases), and Radcliffe (Article on Spinal Congestion, in Reynold's System of Medicine), and are intended by them to be descriptive of "spinal congestion."

It seems to me that if "spinal congestion" were dropped from the list of diseases of the spinal cord and membranes, much confusion would be saved. Some of the most eminent writers on diseases of the nervous system (among whom may be mentioned Gowers and Spitzka) ignore it as a separate and distinct disease, regarding it merely as the first stage of myelitis.