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John Duncan

[1] Epidemics Book I Read Constit. S. Sydenh. Soc. Transl

[2] On Chronic Diseases Book I Chap. 7.

Paraplegia is a disease which seems to have been regarded by the ancients rather as a particular manifestation of paralysis from apoplexy than as arising from causes peculiar to itself. Hippocrates[1] talks of apoplexy of the leg, and mentions paraplegia, using the word in this sense, as epidemic in Thasus during a winter. It is indeed difficult from the variety of meanings to understand their doctrines on the subject. From the derivation it was, doubtless, originally synonymous with hemiplegia, which has always been used as now; but this was speedily changed. Aretaeus[2] states that Apoplexy, Paraplegia, Paresis (and) Paralysis

Paralysis are all generically the same; and proceeds to define the first as a loss of sense and motion in the whole body, paraplegia as a part, and paralysis as a remission in the power of motion only. In this sense it seems to have been often used, It has now, however, come to be applied to that form of paralysis which affects only the lower part of the body, generally but not always accompanied by anaesthesia. —

Paraplegia is to be regarded as a Symptom of some change in the Spinal Cord or its Envelopes; for, although loss of power in the legs may be the first Symptom remarked in general paralysis of the insane, on closer inquiry it will be found that in that disease some mental defect is present and the motions of the tongue deficient in precision or Strength. We shall accordingly divide our Subject into 1. The lesions of the Cord producing paraplegia which are characterized by increased Vascularity and Secondly 2. Those in which the amount of blood is diminished, while in a 3. Class we may arrange several other Causes not reducible to the above. It will

will be found that between the first and second in typical forms there exists a well marked distinction in symptoms and treatment, while the diagnosis of the third is often extremely difficult.

There are two classes of symptoms common to all lesions of the Cord, one the result of diminished motive power, the other of impaired sensation. From the aesthetic change results that peculiar feeling of elasticity between the Sole of the foot and the ground which is so often described by patients, and which seems to convey the impression that indian-rubber, wool or something soft and compressible intervenes. It gives rise also in part to the difficulty in maintaining equilibrium, to the straddling gait, and the forcible stroke of the heel upon the ground in walking. The slow swaying motion, which is to be observed in every one when standing upright without support, is immediately increased in the paraplegic; and as might be expected it seems easier to be steady during progression than when standing still. In this manner a patient may be walking fast and tolerably well, keeping, of course, the feet far apart, when if suddenly stopped he will sway and totter for some time

[1] Diseases of Nerv. Syst. Vol II p 395: 6 Sydn. Soc. Trans.

time to apparently a most dangerous extent. This unstable equilibrium is greater in the dark or with the eyes shut, and, although even in the healthiest it requires a stronger effort of the will to remain steady without than with the assistance of sight, in the far advanced paraplegic it is utterly impossible. He uses sight in fact more than either touch or the muscular sense, and keeps his eyes fixed on his feet or some object that may assure him he is perfectly erect, and when the disease has proceeded farther he is even unable to sit with them closed. This sign Rhombergs states is pathognomonic of Tabes Dorsalis which with him means disease of the Spinal Cord as a transmitter of impressions, as of motion and Sensation; but in this he is not altogether correct, as it depends on the anaesthesia which though very often is not always present". (1) Two Cases of hemiplegia have, moreover been mentioned to me in which the patients were quite unable to stand in the dark. I had not an opportunity of seeing these Cases; but, as they were described, the patients stood well on both feet until the gas was put out or the Eyes closed when they

(10) Brown Sequards Central Nervous System p 129, note. ~

(11) See also on this subject case by Sir C. Bell. Nerv. Syst. p 204.

they suddenly staggered and sometimes fell. This may have arisen in two ways. It may be that there was loss of muscular sensibility, for on this depends the symptom we are discussing; or it may be that the patients, suddenly deprived of the support of one leg when standing upon both, naturally, as would happen with all staggered to the side. Rhomberg's assertion is again proved to be somewhat loose from the fact that paraplegics may exist, though it rarely does so, without the required anaesthesia and consequent impaired equilibrium in the dark. I would merely refer to a case related by M. Brown Sequard[o] in which the patient, deprived of Cutaneous sensibility but retaining the muscular, was able to walk perfectly without looking at the feet. It is unnecessary to enter into further proofs that this depends on the muscular sense: it is sufficiently proved by this case and another interesting one of Sir C. Bell's to which I would refer[11]. There are various other symptoms arising from anaesthesia. A want of precision in all locomotion, an impossibility of stooping to pick things up, extreme difficulty in turning, all arising from a want of means

(1) De la Moelle Epiniere I p 294.

(2) Central Nervous System p. 126.7.

means of directing the muscular power. The various kinds of anaesthesia usually go together, but by several cases it is proved that touch, feeling of hot and cold, muscular sense, sense of tickling may be lost individually. Such cases are recorded by Ollivier[1]; and by Segard[2] who gives a considerable list; but we shall probably recur to this in speaking of the mode of determining the locality of Spinal lesions.-

No particular symptoms need be recounted under the head of loss of volitional power. Force in all motions is wanting, and this may proceed to the extent of complete immobility, and of course aids in producing many of those phenomena which are due principally to anaesthesia. Nor is it necessary to refer more particularly to the vasomotor and reflex systems as these depend more on the site than the character of the disease. Such are the phenomena that may arise in any case of paraplegia; and we shall now consider those arising from increased vascularity of the Spinal Cord. It is sufficient generally to state that they consist of referred sensations, pain along the Spine with or without

changes in the

(1) Oliveira Tomo II p 239.

without pressure from without, and signs of irritation in motor nerves or some part of the reflex apparatus, such as twitchings, convulsions, cramps and spasms. Perhaps the most striking symptom of inflammatory disease is the sense of constriction at the upper limit of the paralysis. We shall discuss these more in detail under the various heads.-

I. Inflammation of the Spinal Cord.

A. Meningitis.-

This form of disease may assume either the acute or chronic shape. The latter, however, is extremely rare and when it is present alone so closely resembles a chronic congestion of the meninges that it need hardly be considered apart. Cases of uncomplicated meningitis are rare.-

Acute. An acute attack begins in various ways,- with one person by a weakness of the legs, with another by numbness, with a third by constipation and retention of urine as in the unexampled case of Gabriel Francois" who was four days in hospital before

before anything farther appeared. It is rare for the legs to become at once paralyzed and when paralysis does occur it is often due more to the pain or motion than to an absolute loss of power. The pressure on the nerves as they issue from the spinal canal is, indeed, the great cause of the paraplegia. More frequently, however, than in any of these ways the disease begins with pains in the vertebral column, and as it progresses they become very severe. Occurring in the lumbar or lower dorsal region, they are propagated thence downwards to the paralyzed limbs, upwards along the spine. In the latter they are greatly increased by motion, and, although Ollivier denies it as a rule, according to most authors by pressure. Tonic spasm of the long dorsal muscles is a frequent and distressing occurrence; producing perfect opisthotonos with irregular remissions and exacerbations. The cause of this it is not easy to discover. It is probably not the irritation of motor nerves traversing the meninges; for that is found to give rise to clonic spasm and convulsions. And perhaps the most likely view is that which refers

refers it to an impression on the sensitive fibres acting reflexly through an irritated cord. Besides this tonic dorsal spasm, all kinds of clonic spasm in the paralysed parts are common in meningitis. The aesthetic changes are very various. Sometimes there is hyperaesthesia; but, perhaps most frequently, the sensibility is neither increased nor diminished. Referred sensations, however, are constant, as tingling, pricking, formication, numbness, and, if it can be reckoned as such, a sense of constriction, as well as intense neuralgic pains shooting through the limbs in all directions.-

The usual inflammatory symptoms, fever, hard, quick, bounding pulse, hot skin, flushed face and hurried perspiration, give farther evidence of internal disease.- The prognosis is very unfavourable. Creeping up the paralysis becomes general and complete, delirium may or may not come on, and between the 7th and 30th days the patient dies in coma. Our hope is that a lingering may be substituted for a rapid death, that the acute may pass into the Chronic, of which the symptoms are to a certain extent the

Same

same, but milder and occupying an inter-
=mediate place between acute meningitis and
Congestion of the Cord. The main difference is
that in the chronic quick alterations in the
patients Condition take place from irregularly
periodic attacks of Congestion and Effusion.
The pain or pressure is not great, though
motion intensely aggravates the suffering. We
look forward happily to a more distant date
for the almost inevitably fatal result. There
is no recorded case of Cures on which absolute
reliance can be placed; but it is to be remem-
=bered that the Cord is not usually Examined
when a patient dies of a non-nervous disease.

The common signs of inflammation
destruction of substance are to be found in
an after death Examination. There is usually
moreover an Exudation of a yellow or green-
=ish yellow colour, Coagulable and fibrinous
or purulent or sanguineo-serous, which gravitates
to the bottom of the Canal when fluid and
is generally most extensive at the posterior
part of the Cord. The pia mater is the
membrane most affected, but the inflammation
may be and often is often is the result of
injury

injury, Caries, or tubercle of the vertebrae, propagated through the dura mater. The disease is common in conjunction with myelitis and there seems always to be some congestion of the cord.

B. Myelitis. 1 Acute.

The acute myelitis is nearly always accompanied by Meningitis. So constantly indeed is this the case that before the time of Ollivier the two were described under one name as rachialgitis, spinitis &c. There are several recorded cases, however, in which the myelitis seems to have been uncomplicated, judging from the symptoms during life and the post mortem appearances; and the nature of these may perhaps be best illustrated by a reference to the case mentioned by D^r Burrows and those related by Ollivier. D^r Burrows patient was attacked in convalescence from a common catarrh on the evening of the 14^th of a month and died on the 18^th by gradual ascension upwards of the paralysis. The paraplegia was complete, but sensation was seemingly impaired not

(2) Illinois

not nearly to the same extent. There was no pain on percussion of the Spine, no involuntary action of the muscles, and indeed the reflex motions seemed to be altogether destroyed as the usual stimuli did not give the usual result. The urine was normal, but dribbled away and required to be drawn off. The bowels were constipated. The negative statements are to be viewed in reference to the fact that the patient was comatose and increasingly so from admission till death; although on being roused he gave curt, rational answers. The dyspnoea was very great. The autopsy shewed ramollissement of the cord up to the highest dorsal vertebra and slight effusion in the sheath. In the case of Auguste Nettat (2), the symptoms in many respects the same differ in the following. He had two previous attacks probably of the reflex or congestive character. The third, fatal on the 12th day accompanied pneumonia. There were convulsive movements of the limbs, and some pain on touch or motion amounting in fact to hyperaesthesia of all the sensative nerves. There was lumbar softening with so great an induration of the rest

[2] Oliver p 419

rest of the cord that it creaked on being cut.
The patient, Dubois in whom the autopsy showed complete solution of continuity at the 6th dorsal vertebra but on whom it must be added there was slight injection of the arachnoid had somewhat different symptoms in so far as the pain was very severe and was accompanied by cramps in the limbs, vomiting, icterus, and petechiae. The dyspnoea was excessive and the patient died on the 8th day.
The results to be obtained from a study of these cases are not very definite, but they give the foundations for diagnosis between myelitis and meningitis and certainly separate both from what we shall consider as not inflammatory lesions. It is interesting to remark that, while Ollivier (2) asserts that hyperaesthesia is always due to Meningitis, in the two cases we have quoted one, referred to as pure myelitis, suffered from exalted sensibility and the other, in which there was some injection of the meninges had not, judging from the history, the slightest change in this respect.—

2 Chronic. Chronic inflammation of

thus

of the tissue of the Cord from its greater frequency and the longer time afforded for observation has been more accurately studied, and there is moreover, a very general agreement among writers on the subject, satisfactory as proving, if they did not copy each other, the correctness of their remarks. —

The disease begins by weakness and a sensation of Cold in the limbs, with perhaps some vomiting, headache, or other signs of gastro-enteric derangement. Almost invariably there is a very excruciating pain in the spine more or less severe which is propagated both upwards and downwards. This goes on for some time and the disease progresses till, when the physician is sent for, the symptoms are much as follows. On pressure forcible or even gentle the pain in the back is very severe, even when, as sometimes happens, it is slight, partial, or absent if undisturbed. I have myself seen one or two such. —

Sensation may be seriously affected. Hyperaesthesia is rare, as in general the grey matter is the seat of the lesion, so that if the white columns should tend to give rise

to

(11) This case is seemingly opposed to the statement of M.B. Sequard that unless the grey matter be free from disease there cannot be hyperaesthesia.

to it, the destruction of conducting tissue in the centre of the cord is sufficient to mask it. But cases occur now and again in which sensability is not diminished and I have met with three of exalted sensation. Two very marked ones are recorded in one of which (1) the secto cadaveris showed all but the posterior columns destroyed, while in the other although there was no autopsy the symptoms of myelitis were clear. Usually however, a loss of sensation is of early occurrence, and those phenomena, which we referred to diminished muscular sense, are extremely well marked. But in this respect there is the greatest difference in individual cases. Some walk with eyes fixed on the ground, others with head erect, and the latter, comparatively few in number, have generally little anaesthesia of any kind; for it is to be observed that the variously endowed sensation conductor are closely intermingled in the cord. Under the head of meningitis we referred to the sense of constriction at the upper limit of the paralysis. This is not always severe in myelitis, but it is rarely altogether absent.

On

On what it depends has not yet been clearly ascertained; but it probably arises from a cramp of the abdominal Muscles in those parts, which receive their nervous supply from congested and irritated roots issuing from the vertebral column just above the seat of the inflammation. Referred sensations are a most important symptom of myelitis. They consist of formication, a feeling of the foot or leg being as it is called asleep, pains in various parts of the paralyzed limbs, thighs, knees, ancles, or, as in one case I saw, in the calf of the leg. These pains may be, but are not always, due to the cramps to be speedily mentioned, and the galvanic irritation of nerve extremities consequent as has been proved on this and all other muscular contraction. The neuralgia may be present without the cramps and it occurs though there be little or no anaesthesia. Sensations of heat and cold are not so common; but, when felt they bear no relation to the real temperature of the part; unless it be accepted as a fact, what probably is such, that the legs are generally found to be cold when they are felt to be hot by the

patient

[11] Path. Anat. Vol III p 439.

patient. Coldness of the parts is, in truth, usual and depends on a contraction of the blood vessels, due to vaso-motor excitement. When complete disorganization of the lower end of the cord has taken place, there is increased heat and perhaps oedema from paralysis of the vessels. The alteration rarely amounts to more than an abnormal liability to be affected by external changes in the temperature. It is sometimes accompanied by atrophy of the legs, which, however, from some cause or other seems more often to be a result of myelitis from fractured Vertebrae than from most other forms of that lesion. In these cases it occasionally goes to a very distressing extent.—

To conclude the sensational effects of myelitis there is an Experiment, first pointed out by M. Brown Sequard,[1] which is of some diagnostic value. The passage of warm or very cold substances from above downwards along the spine produces a normal feeling, till it is brought to the upper limit of the influence past whose burning pain is its effect. If this be true, and from all I can learn it is so, we have an important means not only of

diagnosing

diagnosing myelitis but of assigning to it its locality in every case.-

The degree in which motor power is affected is very various, ranging from the slightest difficulty in progression to complete paraplegia; and this variety is due partly to the extent of the spinal affection,- partly to its site. The paralysis is evenly distributed over all the muscles.-

The reflex apparatus is seriously involved in myelitis. Unless the lumbar bulb be affected, there are twitchings, cramps, convulsions or spasms in the paralysed limbs which may be very slight especially in the early stages of the disease, amounting only to an occasional giving way of the knees or passing twitches completely under the patients control when his attention is directed to them. As the separation from the brain becomes more complete, these also become more violent; jactitations continue for many minutes at a time; and what may orginally have been clonic pass into tonic spasm of portions or groups of muscles maintained for days and weeks. These may arise from one of two causes.-

1 Reflex power may be so excalted by congestion of the ganglia or afferent filaments (and it generally is so in myelitis above the lumbar enlargement) that the slightest stimulus, the moving of the bed clothes, a breath of air &c &c, is sufficent to produce a discharge through the motor filaments. I have seen one case in a lad of an extremely nervous temperament, in which the slightest mental emotion was capable of giving rise to excessive quivering of the palsied legs. But in myelitis the reflex power may be entirely destroyed while the symptoms we have described yet excist; and we must then look for some other cause. And I think it will be found (2) in the congested and irritated state of the motor nerve fibres in the anterior portions of the cord or the anterior roots of the nerves: and the effect is similar in kind to the referred sensations produced by a like irritation of the sensational parts of the cord or of the posterior nerve-roots. It is difficult, perhaps, to account for the occasional character of the symptoms; but, if we take into account the varying degrees of stimulus or amount of blood in parts just beyond inflammatory disease

cured, there are cases of seeming arrestment. Seven to nine years is not an uncommon duration and one case is recorded in which the paraplegia continued for 29 years. We anticipate (unless death be occasioned by intercurrent disease) a time sooner or later when by the gradual extension upwards of the paralysis, by the formation of bed-sores and by mal-nutrition, the sufferer will be carried off exhausted, suffocated, or comatose.—

There are several post mortem appearances associated with myelitis. Perhaps the most common - certainly so when it has been acute and then very often matter is also to be found, is ramollissement of the cord in its red or yellow variety. Both of these have been distinctly shewn to be inflammatory. On the other hand certainly the most rare is abscess of the Cord. The only case I have been able to discover is one of Abercrombie's in which, while hemiplegia was produced, all its symptoms were of the character already described. Hemiplegia from the nature of the lesion is more likely to be produced than a paralysis of both sides of the body.—

Undefined

disease and the effects of motion position and other alterations on this morbid condition we may form some idea of their causation.—

The muscles of the bladder and rectum almost invariably become affected and necessarily so if the paralysis progress. The involuntary muscles of these organs become as a rule first paralysed and this produces retention and constipation; but the sphincters very soon grow incompetent also; and, unless great care be taken, the patients life becomes unbearable. In some cases, by far the least common, spasm of the Sphincter vesicae with paralysis of the bladder continues till death. The conversion of urea into Carbonate of ammonia, so common in the inflammatory spinal diseases, is especially constant in myelitis, even when the other urinary affections are not to be observed. According to many the change takes place in the bladder and there are two hypotheses advanced on this supposition. Some hold that the urine by long and frequent retention induces in its own decomposition a catarrhal affection of the bladder which again reacts on its contents.

Others

Others, who are probably correct (for we do not find this change in other cases of retention) maintain that the irritation of the mucous membrane precedes the ataxia, and forms the ferment which produces it. In the same way the diseased mucous acts as a ferment in the prostatic diseases of old people. There are not wanting facts which would lead us to suppose that the decomposition of the urea takes place in the kidney, that it is secreted as Carbonate of ammonia. Experiments have been made by frequently passing the Catheter; but, so long as we know nothing of the ferment, if there be such, and of its rapidity of operation, they are comparatively unsatisfactory. It is a view suggested also by the fact already mentioned that the change is most frequent in myelitis.

As in Meningitis the prognosis is very unfavourable. The acute is almost certainly fatal in a few days and our only hope, rarely realized, is that it may pass into the subacute form. In the chronic creeping myelitis the patients life may be preserved for years; and, while it has never been

cured

Undefined suppuration is a not unusual appearance, which cannot be distinguished from those already mentioned, during the patients lifetime. Next in frequency to red softening is induration of the cord which by many is described as a separate disease. Oliver, however, while he does so, points out the great analogy that exists between induration, and those lesions to which he confines the term "myelite". It is impossible, indeed, in examining his cases to discover any material difference in symptoms. In more cases perhaps, there was hyperaesthesia; and he states himself, though it is hardly borne out by facts, that the paralysis is usually more complete. But even though this be true, it would simply prove that inflammation in the upper part of the Spinal marrow is most likely to be followed by induration. In the case of the Marquis de Causans quoted from Portal there was little but anaesthesia at first, although the paralysis afterwards became very complete. Decided symptoms of inflammation and congestion surrounded, in this case as in others, the indurated part even at the Rectus Cadaveris.

Atrophy

Atrophy of the cord below the seat of disease is a frequent result of prolonged myelites and of all chronic paraplegia. There seems to be an increase in the Spinal fluid proportioned to the amount of atrophy. Want of use is the probable Explanation of this loss of substance which resembles closely the atrophy of old age.-

C. Congestion of the Spinal Cord and its Envelopes.-

Congestion is of two kinds, active and passive; the former is the first stage of inflammation not necessarily going that length, the latter is due to obstruction of the Venous blood. Active congestion may or may not pour out a rapid plastic or Serous effusion; the passive always throws out the watery parts of the blood. The difference is in fact the same as in other parts of the body. In symptoms we have no sufficiently diagnostic means to differentiate in individuals what slight difference there may be we shall point

point out as we go on. Nor have we any very sure boundary line between congestion and inflammation, although a good guess may very generally be hazarded.-

There are referred sensations.- numbness alternating with tingling is characteristic. Brown Sequard has observed that the fingers and toes are the most frequent seats of these sensations; and one patient, whom I saw, while he admitted on Questioning that he had pains in the thighs and elsewhere, laid great stress on severe pains under the nails of his great toes which had preceded and continued during his illness. There may be no sensations of this sort however, and Olliver gives several cases of obstructive congestion in which they did not exist. There may be pains in the spine similar to those of meningitis or myelites; but more commonly this is slight amounting only to uneasiness and little affected by motion, pressure or percussion. They are, as one might suppose, more severe in the active than the passive congestion. The constriction of the abdomen is usually to be observed. Hyperaesthesia

is

(1) That this was not myelitis was shewn by his gradual improvement up to the time he was last seen: not Meningitis: there was no great dorsal pain, no Opisthotonos (and by the same fact. It may have been reflex paraplegia, but the Symptoms all tended to congestion).

is a sure indication of a slightly increased activity of the blood vessels in some part of the cord; and in congestion it is frequent. Excessive vascularity, however, tends to anaesthesia, which accordingly masks the others, and the result in most cases is normal sensation or rather a tendency to anaesthesia. Much depends upon the part affected.

The loss of motor power is usually incomplete but may very rapidly pass into general paralysis. Beginning in the legs or even in the arms it extends, often in a few days, to the rest of the body and the pulmonary muscles. This Quick diffusion constitutes its great danger, added to the circumstance that it affects early the involuntary muscles, as the rectum, bladder &c. The access of the attack, moreover, is often sudden. A girl convalescent from Enteric fever got out of bed for the first time, walked a few paces and dropped down. "A man, whose case I received from a friend, was seized in walking home after being cold and wet all day with all the symptoms of a sudden congestive attack, with difficulty

dragged

dragged himself home, and awoke next morning with, what is unusual in this disease, complete paraplegia. The amount of fluid effused prevents in many instances convulsive movements in the limbs, although they sometimes do exist. It has the effect also of diminishing reflex power.

The causes which affect the involuntary muscles naturally affect also the vaso-motor system, and produce ulcerations and bed-sores to a troublesome extent.

The following symptoms are almost pathognomonic for without them we would not be justified in classifying a case under this head and I do not know that they occur with any other lesion. The power over the limbs is greater when lying down than in the erect posture, and for the very evident reason that the effused fluid excerts all its pressure on the lower part of the cord under the latter condition, while in the former it is diffused through the vertebral and perhaps the cranial hollows. On rising, however, after a nights rest or from having long been recumbent, the paralysis

is

is greater, and the patients constantly tell you that they are worst in the morning. This is also to be accounted for mechanically, by the gravitation of the blood towards the medulla spinalis. It is interesting to know that in some of these patients the decubitus is on the side or belly.—

From these remarks it must be evident that congestion without effusion cannot be distinguished from myelitis or meningitis; and it is not astonishing when we remember that this kind of congestion is the first stage of ramollissement, induration and suppuration.—

The prognosis is not so bad as the spinal affections already mentioned. In the child indeed it is favourable; and it is so even in the adult under certain circumstances, as when it results from an acute disease of some sort or from a removable venous obstruction. In other cases, especially when the cause of the lesion is not very apparent, we have hardly better hopes than in myelitis.—

The congestion of the membranes

is most marked in the pia mater, and that principally in the lumbar region. Dilatation of the vertebral veins is a common post mortem appearance, and as in other dropsies obstructive diseases of the pelvic and thoracic viscera are common. When the effusion is chronic the serum is yellowish or reddish, while in the acute it is clear though sometimes tinged with blood. One result of Congestion is thickening or ossification in the arachnoid. This ossification according to Rokitansky(1) is in the form of numerous concavo-convex scales "towards the periphery of the cylinder" imbedded in the arachnoid and projecting rather inward. They are due to repeated attacks, doubtless, of active Congestion and the effusion of liquor sanguinis.-

D. Extravasation of blood in the Spinal Canal.-

I shall notice haematorachis here because it is greatly due to excessive vas-

-cularity

vascularity of the cord and its membranes, and I would merely premise that it may also owe its origin to disease of arterial tunics.—

The premonitory symptoms are frequently those of slight cerebral congestion with perhaps an uneasy feeling in the spine. But it may come on without these or it may take place in the course of a thoroughly established paraplegia. It comes on suddenly, more suddenly than any other paralytic affection, unless it be in some rare instances the effusive congestion after acute disease. The symptoms vary infinitely according to the seat of the extravasation. Suppose the blood effused in large quantity in the meninges, the mechanical effects of pressure would be mingled with signs of congestion. The case could be diagnosed from effusion only by the sudden seizure and the absence of those characteristic symptoms to which I already referred. Generally, however, the quantity is not large enough to produce this effect, and it shows itself then by irritating pressure on the part in which it

it coagulates. Let the blood again be effused into the substance of the cord, and it is nearly always in this case into the gray matter, and we have very different symptoms. In this form the loss of sensation is great without much loss of motion: in that precisely the opposite happens. In this there are referred sensations from nerves involved in the lesion without convulsion or very marked motor phenomena: in that convulsions are constant, referred sensation nil. In this the sphincters are paralyzed; in that only by consecutive disease. In both, however, the presence of another lesion modifies the symptoms. In looking over a considerable number of cases I have been unable to find any in which congestion myelitis or some other cause or effect was not present. Sometimes white softening, extravasated blood and myelitis in the same subject are to be found; and then the order of causation is that in which I have written them. The prognosis is not good. People recover though not often and there is always great danger of a second extravasation. The effects of a small clot and the possibility of recovery are well shown

(11) Bronssais, it is right to remark, distinguishes softening as sometimes primitive, sometimes the result of inflammation but gives neither p. m. differences, nor the characteristic symptoms. Cours de Pathologie I. IV p 144.

In the same way Andral thought some cases of white softening might be due to irritation Path. Anat. p 748.—

shown in a case recorded by Cruveil in which an old encysted clot was formed and a new one surrounded by inflammation. Four years before death she had pain and hemiplegia (it is as illustrative as if it had been paraplegia) from which she gradually recovered. There was pain in the spine. Ollivier and Brown Sequard assert however, that there is no recorded case of cured paraplegia from hematorachis.—

II Lesions of the cord not characterized by increased vascularity, rather by diminished.—

A <u>White Softening</u>.—

Among the older writers on the subject there are none who distinguished this from the other forms of ramollissement.—Lallemand, Andral, Ollivier, Bronssais" regarded all as the result of inflammation, and many of the modern writers assert that yellow white and red softening have the same symptoms and Etiology. From these causes and the consequent difficulty

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(11)

Many present the now ascertained symptoms but most have no accurate description of the dissection). —

in comparing cases" as well as from the fact that I have not had an opportunity of meeting with a case, I shall give but shortly the results of the most recent labours on the subject and principally those of M. Brown Sequard. Its importance is great, as next to inflammation it is the most common cause of paraplegia or at all events quite equals in that respect the reflexe and congestive.-

The symptoms which in the earlier part of the paper might it was stated be present in any form of paraplegia are especially well marked in this, possibly from the fact that there are none other to interfere with their manifestation or draw attention from them. It is unnecessary to recapitulate, and it may just be observed that anaesthesia is perhaps a little longer of manifesting itself than in the inflammatory disease particularly in regard to common sensation. Anaesthesia however always comes on, and is often very complete. Most of the other means of diagnosis are negative. There is no pain

in

on the back with or without pressure and percussion. The reflex power remains normal. There are no spasms, convulsions or twitchings, nor are there any referred sensations.

The prognosis is bad as the lesion depends on atheroma or other degeneration of the arterial tunics.

The name of the affection is taken of course from its appearance. Rokitansky associates it closely with the yellow variety, but that is more often inflammatory if not always so. He states that all the intervening shades of colour are to be found. In some cases there seems to be an exudation of serum which has assisted in loosening, separating, and breaking down the structures of the cord; but mal nutrition from arterial disease is generally the sole and efficient cause of the softening. The whole thickness of the cord may be converted into a soft pulpy mass protruding when cut, and in which hardly a trace of nerve fibre or cell can be found. The whole pathology of the disease both in brain

and

and cord is involved in some obscurity. It is to be remembered that myelites may often co-exist.

B. Reflex or Induced Paraplegia.

We shall now consider a disease which, whatever its nature, is certainly not dependent on increased vascularity of the cord, nor indeed on any very cognizable change in that organ. It is the reflex paraplegia of Graves, Rhomberg, Brown Sequard and others, a name not perhaps very fortunate as implying a theory indubitably correct but not quite universally accepted. Paralysis of the lower extremities has long been observed as a sequel to various acute diseases especially of the abdominal organs; and in the horse it was well known that renal affections might terminate in loss of power over the hind legs. Very often myelitis or congestion was found after death; but in the greater number no change whatever could be detected by the most careful Examination in later times even with Micros-

copic

microscopic aid. They were referred to the head of Spinal irritation or of idiopathic paraplegia, but of which however, may safely be Expunged from our nomenclature, even although we may not be able to classify as yet a large number of cases. The symptoms however, are tolerably distinct and sufficient to constitute them a division by themselves.

The Signs of a passive congestion of the cord Somewhat resembles those of reflex paraplegia; but those of myelitis are essentially distinct. In the cases which we should have no hesitation in referring even during life to this division of our Subject, there is more resemblance to white Softening. The Symptoms are to a large extent negative.—

It comes on as a sequence to some other disease or Constitutional affection of the body and progresses rapidly varying however, with the alterations in the cause, of that continue to act. And this is the diagnostic mark, when the other symptoms have been taken into account. The following case is typical following as it did in-

flammation

[11] Graves Clinical Medicine vol I p 548.

inflammation of the intestines and peri-
-tonitis. "The lower extremities were quite
"useless. The paralysis, however, was confined
"to the Muscles; there was no diminution of
"sensibility in the limbs; no numbness pain
"or formication, and the muscular functions
"of the bladder and rectum were apparently
"uninjured". (1)

The gradual extension of the paralysis
upwards is very rare but is often becomes
pretty complete. The affection of bladder and
rectum is not common; but the above case
is followed by one, in which, while in other
respects precisely similar, there was slight
paralysis of the contractile powers, of those
organs. In both patients, as in most others,
the amount of power over the limbs in
the horizontal position was very much
greater than in the erect. The same symp-
-toms occur over and over again resulting
from cold, enteritis, urinary, prostatic and
other affections, and all it is to be observed
getting better rapidly, although in a few
some weakness may long remain. It
must not be supposed that sensation

always

always remains normal, indeed it is generally diminished but very rarely to a great extent. Moreover we may have, though rarely, tingling and pricking sensations as in a case by Dr. Stokes, or feelings of coldness and numbness as in Miss F's case related by Dr. Carmichael of Dublin, but the feeling of abdominal constriction never existed and the referred sensations are seldom severe. There may be pain in the spine. The symptoms of motor or ganglionic irritation such as cramps are infrequent. Very different from congestion and above all inflammation, reflex paraplegia is not characterized by any change in the urine, as might be anticipated from the fact that the bladder is rarely attacked. I have gathered these symptoms more from a study of recorded cases than from the writings of authors on the subject, and although in many the test of the microscope had not been applied, their analogy to those in which it had been used is a fair warrant for referring them to this head.

Let us enquire into the

nature

(1) Op. Cit vol I p 549.
(2) Ibid " p 553.

nature of the malady. While the existence of reflex paraplegia was asserted by many whose opinion carried weight, and was stated by them to be totally distinct in everything from inflammation, their theories by way of Explanation were so eminently unsatisfactory that men rejected not only them but the facts on which they depended. Dr. Gyle accordingly suggested the term "Induced" as less capable of being misunderstood and misapplied than reflex or Sympathetic; but the term is unimportant if the attacked idea be correct and it is already too firmly established to be altered. The following is Dr. Graves' explanation. "The impression made by inflam-
"matory on the nervous filaments distributed
"to the coats of the intestine is propagated
"to the Spinal cord and from thence reacts
"on the muscular functions of the lower
"extremities"(1). This he applies to urinary and other reflex paraplegia(2). Mr Stanley states that the "irritation" (certainly a convenient word) "is propagated through
Sentient nerves to the Spinal cord (and
thence

(1) Med. Chir. Trans. Vol XVIII p 260.

"the impression thence transmitted through
"both sentient and motor spinal nerves to
"the limbs - here occasioning an impair-
"-ment both of sensation and the power of
"motion".(1) Rhomberg is cautious. It is
"probably", he says "not too bold an hypothe
"-sis, if we explain reflex paralysis by
"assuming the existence of similar nervous
"centres for the upper and lower extremities,
"and their connection with centripetal fibres
"derived from the various organs". These
are anything but satisfactory and explain
nothing. The fact remains that in para-
-plegia resulting from abdominal disease
and other causes of a like nature there
is functional without perceptible structural
lesion of the cord. It is hardly necessary
to enter into proof of this assertion. It has
long, as I before observed, been noticed in
the horse and in man as following
intestinal disease or irritation. M. Hervis
gives two cases in which it followed
severe purgation, in the one from a
large dose of colchicum wine, in the other
an immense draught of some Quack
medicine

(1) Aretaeus on Chronic Diseases. Book II. Cap 3 & 5.

given that there is no visible lesion unless it be a bloodless condition of the Medulla Spinalis.-

Dr Gull in the last volume of Guy's Hospital Reports has endeavoured to refute their arguments by the following counter assertions.-

1. That it is on cutting the Roots or Ligaments muscles paraplegia is produced and not by Extirpation of the Kidney, a fact opposed to urinary not to reflex paraplegia.

2. That he has never seen blood-vessels contract on tying the tubis of a kidney, and that it is impossible from the amount of anastomosis that only one half should do so. But the fact that he has not seen it does not negative M. Brown Sequard's Statement that they did so, and certainly a part of one or any number of vessels may contract alone under nervous influence.

3 Dr Gull asserts, for he opposes the reflex theory altogether, that the Symptoms are not those given by M. Brown Sequard but closely resemble myelitis. I can

medicine. The same holds good as to the genito-urinary system, so much so that there is a term urinary paraplegia. Even Aretaeus has remarked a paralysis resulting from disease of the Kidney and gonorrhea. Cases by Rhomberg, Graves, Stanley Hunt, Leroy d'Etiolles, Esmarch, Ragu, and a host of others have been recorded. There is a diphtheritic paraplegia, a paraplegia from cold, wet, fever, and many things else, without in many cases the least structural lesion. The question then is, what is the nature of the disease? To call it functional is simply a cloak for our ignorance and means merely that we have not discovered the Exact physical change. I think this is not so. Is the change then a myelitis, a meningitis, or any of those we have discussed but in a form difficult to discover? This view is not without support; for there are cases of myelitis in which the Microscope alone can detect the fact. But all of these were during life different in their Symptoms from reflex paraplegia. What then can we discover as

to

to the true state of affairs? Brown Sequard has offered an explanation extremely probable as agreeing with all the phenomena already recorded, which is moreover supported by other strong arguments. It is that chronic tonic contraction of the blood Vessels of the cord is produced through the vaso-motor apparatus, a stimulus applied to the periphery of afferent nerves in the abdomen or Elsewhere acts through the nervous centres and the efferent fibres on the vertebral vessels. This would of course cause mal-nutrition. In local anaesthesia by snow and ice we have the contraction of the blood vessels producing such mal-nutrition of the Extremities of nerve fibres that they cease to perform their function for the time. He has supported his view by the following:-

1 The Experiments of Cowhain at once producing paraplegia on Extirpation of the Kidney.-

2 The fact that on tying the hilus of the Kidney he has seen the vessels of the same side of the Cord contract.-

3 The negative statement already

given

can only say that I have taken my statements from cases of Graves and Rhomberg and that they agree very perfectly with those of Brown Sequard. The theory is not proved to demonstration, but it is at present the only one worthy of acceptation.

Our prognosis depends greatly on that of the disease with which the paraplegia is associated, the length of time it has lasted, and its manner of attack. Generally it is very favourable, and the paralysis may be expected to disappear with or soon after its exciting cause. — Sometimes, however, we know not why, more frequently when cold or such like has originated it, it lasts for years and may pass into myelitis or remain for life, an incomplete case. Perhaps when the mode of attack is gradual, the case is also slow.

III. Various lesions

which cannot be reduced to the other heads.

I now only remains to say a few words

on

on Tumours within the Vertebral canal, on concussion, fracture, and curvature, on myelitis, and on the effects of certain poisons which produce paraplegia.-

A. Pressure by tumours, altered Vertebræ &c.

Tumours, when of a benign character and when they do not produce inflammation, compress the cord and give rise to atrophy; when malignant they implicate, as they do on other parts of the body, the surrounding tissue. In fracture and caries producing curvature, when the irritation does not cause a myelitis or meningitis, the result is also due to compression. Let us then consider these in their relation to pressure, for we have already spoken of inflammation; and I would only observe before proceeding that the pain on pressure or motion is of course greater, and is more constant altogether in inflammation from fracture than from other causes; and that the diagnosis is founded on the history and an examination of the spine. It is to be observed that fracture

fracture with considerable displacement need not produce paraplegia. In one case last summer under the care of Mr. Spence in the Infirmary which I had an opportunity of watching, there was not the slightest symptom of the sort. The man had sustained a fall from a house, and the spine of the tenth dorsal vertebra protruded a good deal.

The symptoms of a paraplegia due to pressure from tumours or otherwise vary according to the seat of the compressing body. At that point there is pain on pressure. The parts below have their reflex function somewhat increased as being healthy in proportion to their degree of isolation from the controuling will, and this causes twitching and the other results mentioned as due to such a condition. Unless the tumour press upon the roots of nerves, when clonic or tonic spasms would also occur, there are no referred sensations. The Confinement of motor and sensational irritation to the distribution of the affected nerves is the special symptom of compression from this cause. As tumours &c are usually

pretty

pretty high up vesical paralysis is apt to be produced. By a reflex action on the medulla oblongata true epileptic fits may take place.

The most common forms of tumour are the Encephaloid, tubercular, syphilitic and fibrous; and of course, Except perhaps in the syphilitic the prognosis is very bad.

We may hope for a better termination to fracture as the paraplegia may be due more to concussion than anything else and may speedily pass away; and there seems to be a certain ability in the cord to adapt itself to its altered situation, as the canal is larger than is necessary merely to contain it. I know of one case, a child, that was paraplegic for two or three years from fracture and recovered. It was seized by enteric fever and kept in bed for some weeks. On rising it could walk. It may be that constant motion (the fracture was in the upper dorsal region) prevented complete union; kept up a chronic disease of the bones and a constant irritation and congestion of the cord, and that healing and

healthy

(1) Olliviers. Traité de la Moelle Epinière vol I p 510.

healthy action were induced by rest.-

B Concussion

In Concussion there is paralysis of motion with anaesthesia generally. It is as a rule accompanied by pain, sometimes very intense, in the affected limbs, of which the temperature may be altered. There is considerable pyrexia.-

The injury is of course a mechanical one, yet more but the functional lesion is discoverable. Whether it consist in a rupture of nerve fibres, a disturbance or disruption of their central conducting axis-cylinder, or a shaking up of the contents of the nerve cells or destruction of these last themselves or all of them together has not yet been ascertained. That it is something of the sort is proved by the occasional instances in which one side of the cord is alone injured!! In these cases there is paralysis of one side with anaesthesia of the other.-

The prognosis is favourable.

Rec

The only danger to be guarded against is the occurrence of inflammation as indicated by pain or pressure, twitchings, inflammatory fever, and the other signs of acute or chronic myelitis.

C. Hysterical paraplegia

The protean hysteria appears in this shape as it does in that of any other disease. Its symptoms resemble as a whole those of reflex paraplegia, and as a result of genito urinary systemic irritation it may very properly be so classed. But the cause must be borne in mind as the treatment for hysteria is to be employed. To show how difficult the diagnosis may be in the first instance I need only say that pain in the back, referred sensations, twitchings and convulsions, contraction of the trunck, loss of power and sensation (the latter, however seldom) and difficult micturition, may each and all be observed in hysterical paraplegia. But the pain in the back seems confined to the skin, and as to the paralysis

"it

[11] Sir Benjamin Brodie. Lectures on Local Nervous Affections. Lecture II. pp 47. 48.

"it is not that the muscles are incapable
"of obeying the act of volition, but that the
"function of volition is not exercised."(1)

D. There are certain herbs which also produce this form of disease. The Lathyrus Sativa, L. Cicera, and Ervum Ervilia have all been noticed as giving rise to it. Dr. Irving states that a kind of paraplegia is very common near Allahabad, in which, while slight aches were felt in the loins and limbs, no symptoms but loss of power could be discovered; and on enquiry it did not seem to shorten life. It was universally attributed by the natives to kessaree dāl (L. Sativa) which is sometimes used as food, but in many cases it appears to be immediately induced by exposure to cold and wet. Dr. Lindley mentions the Ervum Ervilia as rendering horses paralytic and when in bread producing weakness of the legs in man. Rhut and the Lathyrus are both referred to by Dr. Taylor as poisonous in food and the latter so expressly forbidden in some parts of the Continent. Read

Paley

palsy and that from arsenic very rarely are paraplegic and are easily diagnosed.

E. I would merely refer to what can hardly be called a paraplegia as it generally affects one limb only, - that, namely, which arises from pressure on the nerves going to the legs. It is very easily diagnosed. The pain in the limbs is very severe resembling that from pressing the ulnar nerve, while there are no symptoms of spinal affection. Its exciting cause, moreover, is the gravid uterus which presses on the sacral nerves; but which it must be remembered may in some constitutions and under unknown conditions give rise to a reflex paraplegia.

Means

of

Diagnosing the Locality of Spinal Lesions.

To this we would for a few moments direct

direct attention; but thoroughly to understand it we must know also the physiology of the cord and the nerve-roots. I shall enter into no arguments on that subject; but I shall state what appears to me tolerably well ascertained and endeavour to show the assistance in diagnosis to be thus obtained.

1. The posterior nerve-roots are composed of centripetal, the anterior entirely of motor nerves.

2 A portion of the posterior root of each nerve is destined for reflex action and terminates in the nerve cells of the anterior of the cord. The remaining fibres are for sensation and pass upwards principally in the posterior part of the gray matter, though some occupy the anterior gray and even a very few the white half of the medulla Spinalis. After reaching the cord the filaments of this root take their directions to reach the anterior. Some go straight inwards, others pass upwards for a short distance in the posterior and lateral white columns, while others again do the same in a downward course. The gray

matter

(1) The expression is perhaps not strictly correct but it makes to understand.)

(2) Sir C. Bell on the nervous System p 429 shews that Lead poisoning is in affection always of muscles having a combined action.—

matter is thus the principal channel for sensational influences. There is however the greatest difference of opinion as to whether the posterior columns are channels of sensation. Brown Sequard says not at all. Van der Kolk says almost the only ones.—

3 To the anterior roots the orders of the will are conveyed downwards by the gray matter and the anterior and lateral white columns. Owsjannikow,- and more recently his observations have been confirmed by Van der Kolke showed by anatomical facts and other arguments that in all probability the filaments in these parts of the cord ended in nerve cells whence the anterior roots were derived.—

4 Van der Kolk has gone far to prove that the Spinal cord may be regarded, in so far as it is a reflex centre as divided into segments or ganglia in the same manner as in some of the lower animals. Ganglia exist receiving like Leyden jars" their charges from the will or the periphery and discharging by the anterior roots.[21]

5

5. Motor fibres decussate in the medulla oblongated: Sensitive throughout the cord. portion in columns

In addition to these facts the effects of pathological states must be taken into account. In some parts of the back, nerve fibres are excitable in their course; that is, the application of stimuli causes sensations referred to their distribution. In other parts they are not so, as in the cord. Now inflammation and even congestion heighten this faculty if it do exist, call it into operation if it do not. Let us see what can be deduced from these facts.

Sensation it is evident will be diminished under any of three conditions, a destruction of the posterior nerve roots, of the posterior and potero-lateral white columns in a large portion of their extent (a small portion is not sufficient from the short distance that sensational fibres traverse them) and lastly, a destruction of the gray matter, for the fibres in the other columns are too few to be taken into account. The amount of destruction, correspond of course to the degree

(11) Pressure, if on the Central Canal produces various degrees of anaesthesia by action on the Gray matter, if on the membranes by action on the Nerve roots.

degree of anaesthesia. Now if we find the symptoms of a myelitis and among them complete anaesthesia we should conclude that ramollissement or some other of its results had taken place in one of the parts already mentioned, and we should be justified in suspecting the gray matter to be involved, as it is almost unprecedented that the roots and rare that so large an extent of the posterior column is involved while the gray substance remains healthy. If again it be hæmatorachis with complete anaesthesia, the blood has probably been extravasated in the gray portion of the cord as that is the usual locality in which it occurs when it is not meningitic. both signs of a tumour it is evident that the growth must exist in the central part or if outside must be unusually long. And so of all the other para-plegias. Complete loss of sensation, however, is extremely rare and can only one of these lesions. The extensive distribution of sensory filaments throughout the cord prevents this condition. A diminished amount of sensibility is as we have seen the general

rule

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rule, and may be referred to any of the above parts, the gray matter in almost all cases the most likely, nearly certain when there is much anaesthesia. In some cases, however, there may be no loss of sensation nay even hyperaesthesia while the channels for sensory conduction are extensively altered; and we cannot, therefore, safely conclude that normal sensation proves the Entirety of the parts we are discussing. This is to be accounted for as follows. An alteration of the posterior white columns with the gray matter healthy, tends to produce marked hyperaesthesia, and so gives a means of diagnosing the lesion. But, moreover, even when a considerable part of the gray matter has been destroyed, the hyperaesthesia may mask the anaesthesia that would otherwise be sufficiently apparent and a normal sensibility would be the result; for it would seem that the filaments from the different parts of limbs are thoroughly intermingled in the cord, so that one part does not retain sensation while another loses it. There are cases recorded in which a whole zone of the white Columns and some portion

of

of the gray matter have been destroyed without producing anaesthesia, a result partly due to the fact that the majority of sense-fibres pass up in the centre of the cord, partly to this masking of the loss in one set by the excess from the other. When with a complete paralysis of motion the sensibility is normal we are justified in supposing an alteration of the kind we have referred to.-

In complete loss of motor power one of the following lesions must have occurred, destruction of anterior nerve roots, or of gray matter extensively or in combination with the anterior and antero-lateral white columns; and in these again the destruction corresponds to the loss of power. It is rarely complete if the nerve roots be affected; but if the symptoms be those of meningitis or congestion, we suppose it due to the roots. In the gray matter the destruction must be considerable before the paralysis becomes complete; but a mere zone is sufficient for the purpose of at the same time the motor white columns be the situation of disease. When we diagnose a myelitis or haematorachis

or

These vary according to the nature of the lesion; but the same cause may, under different circumstances produce different effects. Our knowledge is very imperfect; but I shall refer to a few ascertained facts. These are, then -

A. A set of causes which operate by irritating the extremities of centripetal nerve-fibres. Of these are, - Cold and wet, which often give rise to paraplegia in three or four of its different forms according probably to the degree and length of exposure. They may cause a contraction of the blood vessels of the cord, which remains after their cessation and may thus excite reflex paraplegia. Cases of this kind are referred to by Graves, Watson, Moore and Brown Sequard. Or again exposure may cause, what is equally a reflex paraplegia were the name not already applied, a congestion of the cord, perhaps by the exhaustion of the contractility in the vascular muscular fibre under the force of the stimulus. And this congestion may in the first or by

many

or such like this is our method of accounting for great loss of motor power.-

It might be supposed from the decussation points of the fibres and the effect of a lesion in the posterior columns, the destruction of a lateral half of the Cord produces paralysis of the same side with hyperbesthesia and anaesthesia without loss of power in the opposite.-

These facts are all borne out by cases in which post mortem examinations have been made.-

The means of discovering in what part of the length of the cord disease is seated are to be found principally in a knowledge of the anatomical distribution of the nerves. The origin of those which are distributed to the paralyzed parts must necessarily be at or below the seat of the disease. How much of the cord upwards and downwards is destroyed we can tell by the extent to which reflex power is conserved. To take an Example. There may be paralysis of the lower limbs from an affection of the whole lumbar bulb; and

there

then the whole reflex power is taken away also; for the meeting point of afferent and efferent nerves is no longer equal to its function. Or again there may be paraplegia from disease in the lower dorsal region just above the bulb, when, especially if it be myelitis, reflex action is increased; for it is certain that, the greater the isolation of a healthy portion of the cord, the greater is the reflex action of which it is the centre. Higher than the legs it is of course difficult to apply this test; but I have already mentioned the application of cold or heat to the spine as likely to be of use in myelitis. —

Etiology of Paraplegia

We shall consider this part of the Subject under two heads, the exciting and the predisposing causes of the Spinal lesions we have described.

I Exciting causes.

These

many subsequent attacks pass into myelitis or meningitis.-

Other irritations of the Skin produce the same effects. Graves gives a case of Erysipelas. So irritations of the mucous membrane produce the disease; and it is more than likely that the diphtheritic paralysis operates in a similar manner, although Mangault (de la paralysie diphtheritique) maintains, and doubtless in many instances with justice, that in the anaemic Condition, the frequent paralytic affections of the soft palate, vision, articulation &c there is evidence of a General neurosis produced by some blood poison. Irritation of the mucous membrane of the intestines by worms or in enteritis is among the most frequent causes of reflex paraplegia. Innumerable Cases are cited by Brown Sequard of this acting as an exciting Cause, as well as of affections of other abdominal organs, among which may be reckoned as most common those of the Kidney, bladder, prostate, urethra, and uterus. The ulcerations of enteric fever, however, perhaps as frequently

(1) Brown Sequard. Paraplegia p. 18.

frequently excite congestion as any other Spinal disease, and the same may be said of the Kidney; while both sometimes produce myelitis. Diseases of the thoracic organs more rarely result in paraplegia; but instances are not wanting of such a complication in diseases of the lungs and pleura. In children, teething produces now and then paraplegia of the Congestive kind; but it is doubtful how far we are justified in arranging it under this head. Neuralgia and disease of the knee joint are mentioned as causes.-

B Causes operating through the Circulatory System.

I have already referred to the effects of certain poisons, and to the probable blood poisoning in diphtheritis. This deterioration of the blood, is doubtless also in operation in fevers and some other diseases which occasionally give rise to paraplegia; but it is certainly the enteric irritation which is effective in typhoid.

Atheroma

Atheroma and analogous diseases of the nutritive apparatus are the great causes of non-inflammatory softening. Obstructive diseases of abdominal and thoracic organs give rise occasionally to venous congestion with effusion.—

Congestion is also a result of the suppression of any habitual fluxe, as the catamenia, haemorrhoids &c &c. I know not whether to include spermatorhea under this head or the former. It not only gives rise to reflex paraplegia but, according to Rhomberg, as often to white softening.—

C. Local Causes.

Causes which act locally are very numerous and give rise to inflammatory and even other forms of paraplegia. Caries of the vertebrae is a common cause of meningitis; and fractures and dislocations of these bones produce the same affection as well as myelitis, congestion, and even simply atrophy or absorption from pressure. Concussion may occasion all but the last. Inflam-

mation

(a) Cours de Pathologie vol IV p 165.

Inflammation of the kidney, besides acting through the nervous system, may pass by contiguity of tissue along a vein to the spinal cord. Tumours not only give rise to their own symptoms and so form a distinct class; but also very often excite congestion, sometimes myelitis.

Acephalocysts and other foreign bodies are mentioned by Broussais[o] as exciting inflammation of the cord.

The exhaustion of nervous power produced by forced marches and such like may be reckoned as partly a local cause: at all events it is certain that many soldiers are laid up after such undertakings.

II Predisposing causes.

A. Age.

Paraplegia as a whole is confined particularly to no age; but the various times of life have a very different proclivity to certain forms of the disease. Perhaps in childhood it is more rare than in adult life

life, though quite as common as, if not more so than, other paralytic affections. The period of detention is most liable to paraplegia. Dr. West has given a table to show that this and other paralyses occurring between 8 Mos. and four years of age bear the proportion of 3 to 1 at any other time under Eight. The reflex and congestive are the most frequent in the young; but it may be Congenital from malformation; and Olivier gives the case already quoted of Auguste Mettral aet 22 months, who had acute uncomplicated myelitis. One case has been related to me which could hardly be other than haema-torachis. A child previously in perfect health suddenly while playing dropped down paraplegic. I have seen the child since its recovery, and curiously enough it has varus in both feet, a consequence of the disease. Such being the case it is somewhat absurd to class the whole under the head of infantile paralysis; even although the diagnosis of the particular disease may be somewhat difficult. Between the Years of thirty and fifty is said to be the time at

(o) These Statistics taken from Hospital practice are curious when viewed in relation to the Returns of the Registrar General which show a precisely similar number of males and females in proportion to the total number of the Sex.

at which tabes dorsalis or rather softening takes place, and it is undoubtedly the case with reference to the non-inflammatory. The exciting causes of myelitis, however, are so powerful and so evenly distributed through life after puberty that any tendency of this sort which may exist is considerably modified. Other forms of paraplegia cannot well be referred to any particular age.

B. Sex.

There is a most remarkable difference between the sexes and one not easy to be accounted for. According to Rhomberg the proportion of male to female patients is as 8 to 1 in cases of softening. But it is probably exaggerated, as the tables of M. Brown Sequard show in this as in other paraplegia (except hysterical) that the males are about 4 to 1 female. It may arise from the greater exposure of the male sex to the causes of the disease; but this does not I think explain so great a disparity(?).

C

C. Diathesis

Paralysis of the lower extremities seems sometimes to assume an hereditary form and to attack members of the same family, whether from some peculiarity of constitution common to them all or from their being subject to the same causes it is difficult to say in the paucity of cases. I have heard of two. One, a lady whose disease made a noise in the Midwifery world, as it was attributed most absurdly to chloroform, had a brother and uncle in the same condition. The other, belonging to a family, in which nervous diseases were rife, had four or five near relatives afflicted with paraplegia.

D. The Habits and Mode of Life will of course have a great effect in predisposing to this disease. Vicious habits in Youth, excesses of all sorts, which tend to exhaust and injure the nervous system, are very powerful in their effects. Paraplegia is particularly liable to appear in those who have, as it is said, "seen a

"great

"great deal of life".-

E. It is right to remark that many things, already noticed as excating causes, may also act as predisposing. While thus fever by the blood-poison may of itself give rise to paraplegia in predisposed habits, it will without doing so make the action of a cause of congestion or myelitis more sure. We find that cases of this kind as given by all authors, and especially by Ollivier are extremely common as a sequence of acute disease. And it is not to be wondered at; for the vital powers still in an exhausted state are being tasked to the utmost to repair the waste. A little more and they go wrong.-

Treatment.

We come now to the cause and End of all medical investigations, and we shall find that recent discoveries in the physiology and the pathology of the nervous Centres have been

been productive of the best results. I shall merely mention what, according to our knowledge now, are the best and most approved plans of treatment.-

Paraplegia is to be treated in reference to the two great classes under which we have discussed it. In the inflammatory state our object is to reduce the amount of blood in the cord, and to remedy, if possible, the mischief already produced: in the non-vascular condition to increase the quantity of nutritive fluid when the atrophy or other consequences of the disease will be remedied. Formerly Strychnia was supposed to be the drug for all forms of paralysis, an idea probably entertained on account of its decided power of increasing the vital action of the cord as a centre for reflex action. The tendency now, as in all other reactions, is to deny its efficiency altogether, and many maintain that in no instance has it ever been known to do good. The proper course is probably intermediate, though it is certainly less often successful than otherwise. I have seen it used in

Dr. Ven

Some cases, inflammatory and not so, without the slightest benefit; in one, if not indeed in two, with the most decided injury. In one case, however, of hemiplegia (probably from white softening of the brain) I have seen increased power in the arm and leg follow its administration, though without permanent advantage. In the Lancet of 22d March 1862 there is a notice of administration, with concurrent improvement to a marked extent, of 1/30 of a grain of Strychnia thrice daily with several grains of Sulphate of Zinc. The case was one of fractured vertebrae with at first complete paraplegia, and if the return of motor power is to be ascribed to the Strychnia and not to coincidence or other means, it is certainly very remarkable.

I Treatment of Inflammatory Lesions.

In these Strychnine is most certainly to be avoided, for by the Experiments of Van der Kolk and others its most indubitable effect is to produce an increased flow of blood

blood through the cord, forcible enough in some cases to result in slight extravasations. Van der Kolk states that in two dogs which he poisoned by Strychnine, the Gray matter of the lumbar bulb was highly congested, and in one small effusions of blood had taken place from over dilatation of the capillaries. We must look for remedies that diminish the amount of blood, and in Ergot of Rye and Belladonna we find two most important medicines, both acting by contraction of the vessels. They have been generally used without any exact knowledge of their powers and merely from the general nervous symptoms they produce. The most contradictory statements have accordingly been made as to their Therapeutic value. D. Wood says "Ergot has recently "been employed with supposed efficacy in "paraplegia after the cessation of all "excitement or inflammation in the Spinal "column, supposing the affection to have origin"ated in this condition". Kelly on says of Belladonna that it was at one time generally stated by writers that it must not

not be used in acute inflammation; but that it is now known this does not contra-indicate its use. And this opinion is certainly correct. They are both depressors of the Circulation and to be used precisely in the inflammatory forms of paraplegia. Half a grain of the Ecstract of Belladonna may be given thrice daily, or seven grains of Ergot, or perhaps still better, what I have seen used with advantage gradual and up to the present time, three grains of Ergot with a quarter grain of Belladonna made into pill. The medicines require, as one might expect, a considerable time to produce an effect.

Stramonium may be tried, but the experiments as yet are not sufficiently numerous to allow of any decided opinion as to its efficacy.

Hyoscyamus and Indian Hemp are often useful, not only in diminishing the amount of blood in the cord, but also by producing sleep in cases where insomnolence is a symptom. Opium from its known properties is obviously inadmissible

inadmissible for this purpose. Mercury is a remedy that has of course been applied to this as to almost every other disease, and not, it is said, without effect. From its proved action in preventing and remedying adhesive and perhaps other inflammations in certain parts of the body, it may have a Curative effect in some forms of paraplegia. I have seen it pushed to slight salivation in two cases of myelitis without benefit if not with injury.

Iodide of Potassium, which in modern practice seems to have taken the place Mercury held with older physicians, and which is at all events safer, has been used purely Empirically in inflammatory as well as all other forms of paraplegia, and according to M. Brown Sequard and others who have had much experience, with the greatest success. One would be inclined certainly to try its absorbent effects in case of tumors or haematorachis of some standing; and without doubt, so strongly is it recommended, it ought to have a fair trial in other affections perhaps in conjunction with

with Ergot and Belladonna. In congestions &c with effusion of Serum no remedy it is said is nearly so successful as the iodide of potassium.-

Diuretics may be given in some cases of hyperaemia of the cord and they will probably be found most useful in venous or obstructive congestion, as they are in many dropsies elsewhere.-

Attention must be paid to the general health of the patient, and a nutritious diet with a moderate and judicious use of stimulants will often do great good of itself.-

There are various local measures which may be resorted to with some hope of success. The more powerful counter irritants must be used, if at all, with caution; for there is as we have seen a great tendency to the formation of sloughs. In the early stages, however, they may very properly be applied; and the milder forms as blisters and Cowgans Castery are useful especially in meningitis. The cold shower bath and alternate cold and heat to the Spine have been recommended.

Belladonna

Belladonna plasters are a good adjuvant to the internal administration of that drug. The position of the patient in bed is, according to Brown Sequard, of some importance. That by the effect of gravitation and otherwise the blood may be diminished in amount in the cord, he directs the patients never to lie on the back, but to keep the limbs dependent and warm. I have already referred to a case by Ollivier in which the natural decubitus was on the side and belly.

II Treatment of non-inflammatory disease of the Cord.

Treatment in reflex paraplegia is of course to be directed in the first instance to the removal of the exciting causes whether urinary, enteric or otherwise; and it is wonderful how frequently the paralysis disappears with or shortly after the disease that produced it. By the use of narcotics locally or such substances as are likely to interfere with reflex action we endeavour to

to prevent the operation of the disease upon the Cord whilst we are engaged in its cure. Infections suppositorus and such like of opium, Belladonna, Hyoscyamus, &c are the means employed according to the situation. At the same time we use other remedies directed to the affection of the Spinal marrow.—

Strychnia is evidently a remedy for diseases of the cord in which the amount of blood is diminished, and it has been employed with great advantage in cases of reflex paraplegia. In all the medical papers, repeated instances are mentioned, which prove it to be a most reliable drug in this respect. It acts by increasing the amount of blood and by a specific action on the tissue of the Cord increasing also the reflex power. This last is proved by the fact that direct application produces even tetanic spasms. For the former purpose it may be united with opium which has the same effect and is often useful as a narcotic. The dose is about gr. 1/30 thrice daily to be discontinued on causing spasm

Spasm. In white softening it must be used with caution, especially if there be evidence of diseased arterial coats, as it is then apt to produce extravasation. For this Iodide of Potassium is recommended, but our main reliance must, I think, be placed on good diet, Cod liver oil, and improvement of the blood by iron or quinine, the former in preference to the latter. Sulphur is used for both forms of paraplegia internally and as a bath, and is approved of by Graves and Brown Sequard. Phosphorus is employed in Germany.—

Of local measures there are several. Great benefit is sometimes derived from causing the patient to lie on his back with the limbs raised, and the result of a night's rest in this position may be a temporary increase of power in the morning. Various means are used to cause contraction of the blood-vessels in the reflex paralysis to such an extent that relaxation from exhaustion may follow. Ice-cold water in the form of douche is employed, or, if that cannot be borne, it may be tried

tried extremely hot, or the one may be made rapidly to alternate with the other. Counter-irritation has not been successful in accomplishing that object when applied to the Spine; but it seems to have been beneficial in the Shape of mustard or blisters to the thighs or calf. This last is strongly recommended by Graves, and Oliver, who knew nothing of the disease, gives a case which from the Symptoms must have been one of induced paralysis following fever and in which this treatment singularly hastened convalescence.

There are various other remedies which have been tried, but the success of which has been so equivocal that I have thought it unnecessary to say much about them. Of these are Cantharides, Copper, Ammonia, Phosphorus, the preparations of Zinc and such like. For the last of these, however, a stronger case may be made out than for most of the others. Its good effect in Epilepsy are often so marked, that it appears probable it may also be successful lower down in the Cord in a

Similar

similar affection; and I have already mentioned one case with a fortunate result in which it was one of the drugs employed.

Such are the remedies directed to the cure of the disease.-

There are others of which some mention must be made before concluding whose object is to relieve the results and so delay the progress to a fatal issue.-

The utmost care must be taken to prevent the formation of bed-sores. In some kinds of the malady they are, as we have seen, much more apt to form than in others; and in these by frequently changing the points of pressure, by the use of the water bed if possible, and by the most scrupulous attention to cleanliness we may hope to prevent them long. This last point, when the paralysis has extended to the bladder and rectum is of the most vital importance. If they threaten to form speedily, a plaister should be applied. After their formation various applications have been recommended to promote cicatrization. All the appliances

for

for other ulcers must be used according to the character of the sore. Collodion has been vaunted as having a specific effect; but to say the least of it, it is doubtful. Brown Sequard has proposed, as likely to stimulate the vaso-motor system which is at fault, the use of ice in a bladder for ten minutes to be followed by a warm poultice for an hour or two. This is found to be also extremely useful in preventing them.

We must endeavour to prevent also the atrophy and general mal-nutrition of the paralysed parts, and for this purpose Galvanism is often beneficial in stimulating the faulty Capillary action. The patient may indulge nightly in a foot bath cold or hot as suits his fancy or individual peculiarities, and in the free use of Coarse towels, the flesh brush or Shampooing.

In the athalinity of the urine and consequent irritation of the bladder which is almost perfectly characteristic of myelitis, appropriate diuretics must be used to correct the tendency. Uva ursi, as an

ether

other irritations of the bladder, will doubtless do good; but Turpentine and Copaiba are also employed. The Catheter must of course be introduced when required.—

Such is the treatment which appears, according to our present knowledge yet very imperfect, most suitable for the different kinds of paraplegia; but, doubtless, as we become more thoroughly acquainted with nervous function, it will require very considerable modification.—

John Duncan