THESIS for GRADUATION.

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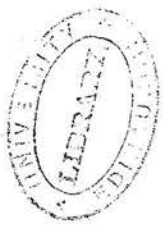

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Introduction.

By "Myelitis" is understood an Inflammation of the tissues forming the Spinal Cord.

The term, however, includes very many and different forms of the inflammatory process; for not only may the disease be Acute, Subacute or Chronic according to its activity, but also may owe its origin to a great variety of causes.

For example, there are those forms of Myelitis due to the extension of inflammation from neighbouring parts, as from the membranes in Spinal Meningitis, or from the diseased Vertebrae in Pott's curvature; also those forms, mostly chronic, due to the pressure of Tumours; and again those forms following some injury to the Spine, as fracture or punctured wound.

In this thesis, however, it is intended

tended to discuss none of these, except incidentally, but rather to direct attention to those <u>idiopathic inflammations</u> to which the substance of the Cord is liable, which are sudden in onset, acute in character, rapid in their course, & more or less dangerous to life.

It is to these latter cases that the name of "<u>Acute Myelitis</u>" properly belongs, and such cases are generally understood when the term is used; though, of course, the acute process may be associated with one or other of the above enumerated conditions.

Considering the rarity of cases of Acute Myelitis as above defined, I have been exceptionally fortunate in the number of cases that have come directly under my observation and care; and it will be more

particularly with reference to these cases, together with a few selected from public records, that I shall endeavour to discuss the disease. Before proceeding to the actual consideration of the morbid process it is intended to first give an outline of the better known facts as to position, structure & function of the Cord, dwelling more particularly on those which will be especially concerned in the Acute Myelitic process.

A. The Spinal Cord in health.

1. Its position & general relations.

The Cord may be roughly regarded as a prolongation downwards into the body of brain matter; this retaining some of its brain properties, but acting in a higher degree as a distributor of the brain's influence throughout the body generally.

It lies towards the posterior aspect of the body in its mesial plane, in a canal hollowed out in a flexible boney column, formed of a series of ringed bones, between each of which it sends a symmetrical pair of nerve-trunks to the tissues in its vicinity.

Above, through the Medulla, it is directly continuous with the base of the brain; below, it ends in a small thread or Filum terminale; whilst throughout its whole length of about

seventeen inches it forms a kind of key-board or centre to which all the nerves of the body converge.

Closely investing it we have a thin, vascular, fibrous membrane or Pia Mater, which sends various longitudinal folds and irregular processes into its substance.

So invested it lies in a bag or tube composed of an extremely tough fibrous membrane or Dura Mater; the space between this & the investing membrane forming a closed cavity lined by a serous membrane (the so-called Arachnoid) which secretes a lubricating fluid.

This Cerebro-spinal fluid is in direct fluid continuity with that contained in the corresponding space between the brain membranes, and also through the various fissures and canals with that contained in the

ventricles and other spaces in the brain & cord.
The Cord thus hangs suspended, as it were, in the Spinal Canal, being steadied & kept in position by its ligaments (denticulate) and the Spinal nerves passing off laterally through the Spinal Foramina.

2. Structure.
a. Naked Eye. The Cord is seen to consist of a cylinder of deeper-coloured or "Grey" Matter, with a rind of lighter-coloured or "White" Matter, these resembling those of the brain but with their respective positions reversed.
The "Grey Matter" in cross section of the cord is seen to form two back-to-back crescents, one in each lateral half of the Cord; and between them run two sets of cross fibres or Commissures

measures, the front one being of White, the back one of Grey fibres.

Between these Commissures and occupying the centre of the cord is seen the Central Canal, a minute tube commencing above in the 4th Ventricle, running in the long axis of the cord in almost its entire length & lined throughout by a layer of columnar ciliated epithelium.

The <u>White Matter</u> is so disposed around the Grey, as to form with it a flattened cylinder. It is deeply grooved in the mesial line, both anteriorly & posteriorly, to form the Anterior & Posterior Median Fissures, and less deeply grooved on each lateral aspect by two depressions or furrows from which arise, each by several separate strands, the roots, anterior & posterior, of the Spinal Nerves. The two Mesial fissures divide

the White substance into two lateral halves; while the less marked lateral depressions roughly mark off each lateral half of White Substance into an Anterior, Lateral and Posterior Division or Column.

b. Microscopic structure.

Under the micros-cope the White Matter is shown to consist essentially of nerve fibres; each fibre is seen to have a central thread or axis cylinder and an inclosing envelope of an oily nature, the White Substance of Schwann.

These fibres have a general arrangement along the long axis of the cord a, beyond their division into Anterior, Lateral and Posterior Columns indicated above, have been further subdivided into tracts or strands, according as their conducting function seems to differ, and as they are found

affected in different diseases.
The Grey Matter shows both fibres & cells. The fibres are numerous, excessively fine and branched, dividing & joining to form a minute and delicate network. They are mostly without sheaths & some of their terminations can be traced into direct connection with the branched processes of the cells. The cells lie scattered about in the above network but also more or less aggregated in certain positions; for example they are seen to be particularly numerous & large in the anterior broad horn of the crescent. They are also numerous but smaller in the posterior horn & again they form a group, situated about midway between the two cornua & just inside the grey matter, known as the Inter-

medio-lateral group of Lockhart Clark.
All the cells are nucleated & have large branched processes.
Some of the fibres entering the cord from the nerve-roots have been traced into direct connection with these cells through their processes.
All these various delicate structures are supported and bound together by a delicate stroma of connective tissue or <u>neuroglia</u>, which is a direct continuation inwards of the processes of Pia Mater above described.
The <u>Blood-supply</u> of the Cord is from the small arteries of the Pia Mater, these running chiefly in the involutions of the membranes lying in the Anterior & Posterior Median Fissures of the Cord & entering the substance of the Cord with its processes.

Laterally from the Cord are given off the Spinal Nerves.

These nerves are larger, as is also the corresponding part of the Cord (Brachial & Lumbar enlargements), at those positions where the limbs have to be supplied with nerves. They come off at a more or less acute angle downwards, the angle becoming more acute the further down the cord they are given off.

Each Spinal Nerve has two roots of origin from the Cord, one from each lateral furrow. Each root starts from the Cord as a series of separate strands; these strands are quickly gathered together to form the root, after which the roots join to form the Spinal nerve.

Both roots are composed primarily of white fibres, and the anterior root remains entirely so. In the posterior root however

there is interpolated between its fibres a small mass of grey matter the "ganglion of the Posterior root".
These strands of origin of the roots form a continuous series arising from the antero-lateral and postero-lateral furrows respectively; and they run directly into the cornua of the crescents of the Grey matter, into connection with the cells of which, as before said, some of the fibres have been directly traced.

3. Its Functions.
In the same way that the Cord has been shown to consist of two distinct anatomical elements — White & Grey Matter — so its functions are in great part those belonging respectively to these two divisions of its substance.
Thus the White Matter is con-

cerned in the Conduction of the various kinds of nerve influence, while the Grey Matter (though in a peculiar manner also subservient to conduction) is the medium through which such nerve influence is regulated modified & distributed afresh.

The function of conduction, as performed by the fibres of the White Matter, is by no means a simple one; for not only does the degree & even kind of nerve influence that they have to conduct infinitely vary, but also this influence has to be conducted in two, & these in opposite, directions according as it arises from or has to be conveyed to the nerve centre.

Centripetal & centrifugal impulses are, there can be no doubt, conveyed by separate and distinct sets of fibres, and there seem

also good grounds for believing that the different varieties of each have likewise special fibres for their conveyance.

It is, however, needless here to discuss the doubtful and disputed points in this connection & I shall content myself with simply mentioning what seems to be the best established facts & most likely hypotheses.

It is from the antero-lateral columns and the anterior Cornua of grey matter lying adjacent, that the exclusively motor fibres forming the Anterior roots of the Spinal Nerves pass out; from this fact and from experiments pointing to the same conclusion these parts have come to be identified with centrifugal conduction. It would seem, more particularly from the study of diseased conditions, that certain acts

of fibres contained in these parts are more especially concerned in motor conduction. These are known as the Pyramidal or Motor tracts, Crossed or Direct, according as they decussate or not in the Medulla. Motor conduction would appear to follow, more or less closely, the direction of these fibres and like them to cross to opposite sides in the Medulla though perhaps also, and to a less extent, in the Cord itself (Foster). Hence it follows that the left side of the brain controls the right side of body & vice versa.

For Precisely the same reasons as above the conduction of centripetal impulses has come to be associated with the Posterior part of the Lateral Columns together with the neighbouring Posterior Horn of Grey Matter. In this case the line of conduction in the Cord would ap-

pear

* Text-book of Physiology -

pear to run immediately across the cord to its other side & thence up & into the brain.
It is impossible to further define the paths of the different varieties of sensation with any certainty in the present state of our knowledge; suffice it to say that though probably having distinct tracts of fibres for their conduction, they all run much in the same direction, this being that indicated above. Conduction, from point of origin of impulse to its termination, is not simple; "that is, no impulse passes uninterruptedly along a fibre but rather by a more or less intricate system of relays". (Foster* p. 5-98.) Every impulse, volitional or sensory, is brought directly into relation with the grey matter of the cord, before leaving it directly or entering, as

the case may be, the Spinal Cord; and indeed, as has been mentioned, the nerve fibres of the roots have been traced into direct connection with its cells.

Hence each impulse so passing through grey matter, will be not merely conducted but also probably in some way altered or modified.

Foster (loc: cit. Chap V. Sec. 3) describes it as probable that the grey matter of Anterior Cornua, standing in above relation to centrifugal or motor impulses, forms a series of "local motor mechanisms," through which certain muscular coordinated effects are produced by a simple impulse from the will.

Thus it may be imagined that the following is the method by which a voluntary

movement is produced:—
A motor impulse, starting from the brain, passes straight down perhaps a single fibre of the cord, to the grey matter in connection with the motor root of the particular spinal nerve through which the effect is to be produced; it is there broken up & distributed proportionately to the different centrifugal fibres going to the particular muscles, so as to produce the desired coordinated movement.
In the same way it may be supposed that the Grey Matter of the Posterior Cornua acts as regards centripetal impulses; for each peripheral impression must affect several nerve-terminations & their fibres; consequently the impression will arrive at the Grey Matter of the Posterior Cornua by several fibres; in the grey matter

these will be all run into one & the sum total or equivalent will be sent on to the brain by possibly a single fibre there to produce its effect on consciousness.

If this be true, then the Grey matter of the Cord forms a very important link in the process of conduction.

Another important function of the Cord, namely <u>Reflex action</u>, follows very easily from the above; for, given a series of local motor mechanisms & also a series of similar or analagous sensory mechanisms, it needs but the connecting fibre or network between the two, to produce through them a motor effect by a sensory impulse.

And when the higher centres are not receptive, what more likely than that the

sensory impression should diffuse itself & produce its effect on the associated or neighbouring motor area.

In ~~such~~ such a case "Inhibition" might be held to be the direct contrary of this. That is, the higher centres being intensely receptive, any sensation would be at once received & absorbed; the corresponding motor area meantime being held ready & under control, to perform any such action as may be necessary. In such a case the sensory impulse passing to the brain would be profoundly modified & altered before being allowed to pass down the cord again to show itself in some probably more intelligent action than the associated reflex.

It will only be in those cases where the passage between two such areas is so easily travelled

or the resistance so slight, that the nerve influence runs naturally between them, that we shall have the "uncontrollible reflexes".

So close indeed may this connection be that the reflexe may result unknown to the higher centres (unconsciously), as is the case with the vermicular contractions of the intestines, etc; or it may simply require the consent of the will to proceed, as in the case of the organic reflexes, micturition, defecation, etc -

The only other function of the Cord that it concerns us to consider is that seen in its action as a <u>Trophic centre</u>, presiding over the growth and nourishment of the tissues generally -

Now each cell & consequently each tissue composed of a col-

lection of such cells, possesses inherent in it the power of growth & a resulting power of selecting & assimilating such material as is fit for its food. These cells & tissues, by virtue of a nervous system, are brought into a harmonious whole, each cell or tissue being more or less subordinated to the general purpose it has to subserve in the composite whole. Coming thus to form only units in a complex mechanism, the cells lose to a great extent the power of separate existence; and on the withdrawal of that influence which unites them together into one organism, they break aloof & die.

This would seem to explain such trophic changes as are seen as the result of the withdrawal of nerve influence, partial or complete, following Myelitis or other

diseases of the Spinal Cord in the human subject.

The Trophic changes shown, will vary in degree according to the extent to which the changes progress in the Spinal Cord; being merely of the nature of impaired nutrition, (atrophy or wasting), in the lesser degrees; whilst in more advanced lesion there will be the formation of bullæ, bedsores, & actual sloughs of large extent of tissue.

The Spinal Cord, unlike the Brain, would seem to possess no power of <u>automatic action</u>; though it is difficult, without supposing some very limited power of this kind, to account for those unconscious & involuntary movements seen in certain cases of complete Paraplegia.

Such then is the mechanism &

such its mode of working in health; it now comes for us to consider it as affected by an acute inflammation, both as to the results to itself & also the signs by which it is manifested in the body generally.

B. The Spinal Cord in a state of Acute Idiopathic Inflammation.

1. Morbid Anatomy.

Inflammation may attack any or all of the parts of the Cord according to circumstances. For instance, different & determined strands of fibres of white matter may become the seat of a low, chronic & peculiar form of inflammation, producing peculiar clinical diseases according

to the set of fibres affected.
Again a somewhat similar process may locate itself in certain parts of the Grey Matter, producing also characteristic symptoms as in Infantile Paralysis, etc.
The acute idiopathic inflammation of the Cord or Acute Myelitis differs however essentially from these; not only in its acute character, but also in ~~the~~ fact that, though starting primarily in the Grey Matter, it involves more or less completely the whole thickness of the Cord at the seat of the disease.
It is then the "Central Grey matter" that the process primarily attacks & in which it has its chief seat; though of course the White Matter is necessarily affected, from its propinquity to the inflamed area in the first place, from extension

of the disease to it in the sec-
ond.

The foci of inflammation may be single, and, though involving the whole thickness, limited in extent. On the other hand there may be several inflammatory foci scattered up & down the Cord -

The grey matter, thus inflamed, becomes increased in bulk; the white matter inclosing it gives way uniformly around it; so that at the site of the inflamed area the cord presents a swelling or bulging of its substance.

The degree of bulging is proportionate to the stage at which the inflammation has arrived, being slight in the earlier stages & gradually becoming more marked till suppuration occurs, when the abscess may even burst through the surface -

※ page 60.

The cord taken Post mortem from Case VI.* may be instanced.
In this case there were several foci of inflammation, distributed equally through the length of the Cord, at distances of 1½ inches the one from the other. The swellings, corresponding to these foci, were most marked in the lumbar region of the Cord, where indeed they had become actual abscesses, one of which was discharging on the posterior surface. They then became gradually less marked as they were placed higher in the cord, till in the Cervical region they were only just distinguishable. With the decrease in size the stage to which the inflammatory process had attained became proportionately less advanced.
In no instance & at no part did the inflammation extend beyond the cord to the membranes; these

indeed were always perfectly healthy with the exception of a degree of vascularity of the Pia Mater immediately over the larger inflamed areas.

On section through one of the upper swellings the grey matter was seen distinctly swollen and of a pinkish hue.

Taking one lower down the cord the grey matter became in addition soft & friable; and in the case of the lowest the contents were of a creamy fluid consistence.

It was only in the last case that the White matter was involved directly in the process, it having become thinned by the pressure from within & also softened by extension of the inflammation to it.

In such a cord we have a complete pathological record of the disease; because we have

represented in it all the degrees possible of the Myelitic process; and from it we may formulate the various pathological states associated with cases of the disease of varying severity. Dividing into stages then we may have:—

1st A small patch of the grey matter in some part of extent of cord, may from cold or other cause become acutely congested; the bloodvessels at that spot will dilate, the tissues swell & blood plasma will be poured out around, and along with it a few white blood corpuscles.

Here the process may stay & never go beyond this "Acute Congestion"; in which case things will gradually return to the normal.

On the other hand the condition may go on & we shall then

have
2nd Blood Stasis, proliferation of White Blood corpuscles & connective tissue cells, together with cloudy swelling of the nerve fibres & cells.
Here again by resolution & absorption a complete recovery is possible but the process going on we get:-
3rd Breaking up of covering of nerve fibres, leaving axis-cylinders bare, fatty degeneration of the nerve cells, further proliferation of the connective tissue or neuroglia cells & the whole nerve substance becomes soft & friable. Should the inflammation stop here we might expect to have a partial recovery; the inflammatory products being absorbed and the place of the distroyed nerve tissue being taken by increased formation of neuroglia from its proliferated cells.

But the inflammation may progress even beyond this to
4th Total destruction of nerve elements at the spot affected, & a breaking down into detritus with a formation of the fatty granular cells, known as "Gluge's inflammation globules".
If death do not supervene, even at this stage it is possible that absorption may take place, with the formation of a cicatrix or cyst (fluid or solid) in the cord. In such a case of course there will be paraplegia & the symptoms will be permanent.
Finally in very rapid & very acute cases we may get
5th a multiplication of inflammatory foci, scattered throughout the length of the cord; these perhaps advancing so far as to produce a complete breaking up of the whole of the substance of the cord, when we

have the condition known as "Ramollissement."
In such cases of course recovery is impossible & death inevitable.
Such then may be said to be the different pathological stages of the disease, & with one of them or another, every case of acute myelitis may be more or less closely identified.

We may now proceed to discuss what we might expect to be the effect produced on the working of the mechanism by the lesions above described.

2. Morbid Physiology.
According to the relative degrees of severity of the process, so of course, within a certain limit, will the symptoms vary.
In the severest forms, where the grey matter is both severely &

extensively involved, the structure of the cord will be so affected, & its mechanism so thrown out of gear, that the clinical signs manifested will be almost purely those resulting from the total withdrawal of nerve influence from those parts of the body to which it naturally extends.

Hence in such a case we should expect an absence of all centrifugal & centripetal conduction (as evidenced by loss of volitional & sensory power), abolition of all reflex action, & trophic changes of a severe kind.

This, as a matter of fact, is what we really get, with as a consequence death, either immediate or delayed.

But even in less severe cases — where, for instance, only a portion of grey matter is affected & this in say, the dorsal region — the cord

being so essentially a conducting structure, even in such a case all centripetal & centrifugal impulses between periphery & brain will be more or less arrested at the inflamed area, giving rise to loss of conscious sensation and voluntary motion. But in this case the grey matter, below & above the inflamed area, will still be in a condition to perform its functions as regards nutrition & the translating of impulses afferent into efferent impulses, not only so indeed, but sharing probably more or less in the general congestion & hyperæmia, these functions may be exalted & as a consequence we should have increased reflexes of all kinds, while nutrition remains unimpaired -

Again the inflammatory process may not produce such changes as to

altogether prevent conduction, through the cord, but may merely hinder, delay or pervert it, producing as clinical equivalents numbness, tingling, pricking, etc, with partial paralysis of muscles or paresis. The grey matter, as above, being over-active from hyperæmia, these symptoms will probably be associated with increased manifestation of reflex action & its various modifications.

The symptoms in all intermediate conditions will be the same in kind, only varying in degree, they will however vary, to some extent, with the seat of the inflammatory process in the cord, according as it is high up in the cervical region or lower down in the dorsal or lumbar regions - the variation being almost entirely in the extent of the body surface involved.

The Cord itself not probably being a sentient structure, we hardly might expect severe pain at the seat of the disease; as a matter of fact we have such pain, but of a peculiar character. This constricting-tight-cord or "girdle pain" is usually felt round the body at the level of the seat of disease in the cord; it is doubtless a referred sensation, i.e. it is probably due to the morbid process being appreciated by the brain & referred by it to the peripheral terminations of the nerves arising from that part of the cord.

There are certain muscle phenomena, seen in certain forms & at certain stages of the acute Myelitic condition, to which it is necessary to devote a short space.
Every muscle of the body is naturally irritable & also

* Sharkey on Chr: Nerve Spasm
in Cyclotomain Lecture 1886.

naturally possesses a certain degree of tension or tone — Now both muscle tone & the muscular irritability are liable to become excessive in degree in certain nerve disorders & as the result we get certain clinical phenomena known as 1. Muscular rigidity or contracture 2. Increased Tendon reflex & 3. Clonus, either knee, ankle, etc, according to situation —

These conditions are most commonly seen in other & Chronic forms of Spinal mischief; more particularly in disease affecting the Lateral Columns, as in Spastic Spinal paralysis & Descending Degeneration. In these cases they have been almost conclusively proved[x] to depend upon interference with the motor or pyramidal tracts, before referred to, by which the Spinal Motor centres are cut

off from the control of the higher centres & so "run riot."
These manifestations of abnormal muscular tone & irritability are however also seen, 1st in the preliminary stages of Acute Myelitis & 2nd become a marked feature when the disease has become Chronic & the limbs Paraplegic - In the first case, that is when the disease is only commencing, these phenomena cannot depend on any disease of the so called Motor tracts, as no such disease can be said to exist. In such circumstances the explanation of their occurrence must be as follows:-
If these manifestations are dependant, from whatever cause, on an increased functional activity of the Spinal Motor centres, then surely such increase of function may result not only from the cutting off

of the inhibitory or restraining influence supplied through the motor tract from the brain, but also from a simple hyperæmia of the tissues composing them. Such hyperæmia or congestion of the grey matter has been shown to exist in the early stages.

In the later chronic stages, where they coexist with paraplegic symptoms (these being dependant upon distruction of the Cord in one part of its extent), the phenomena can be explained on the first hypothesis; because in the seat of the old inflammation the motor tracts will be distroyed or disorganised, while below it the grey matter will be unaffected; & as a consequence of the suppression of function of motor tract resulting, will show a "permitted hyper-phys-

* Hughlings Jackson as quoted in above Gulstonian Lecture by Sharkey.

"iological activity, the Spinal centres"
"being "let go"."

Having thus seen the Cord under both the healthy & the Acute Myelitic conditions, it now becomes necessary to bring to bear on these considerations actual cases, observed & recorded, of the disease.

In detailing the cases they have been arranged as far as possible in a gradually ascending series, from the simplest forms of the disease to those more severe, in order that the symptoms in each may be compared together & associated with their probable pathological significations.

Both cases selected from a series of "Spinal Congestion".

Co Cases of Acute Myelitis.

Case I.

Patrick ly—. hawker, aet. 50. Got thoroughly wet when burying his wife. This was followed by numbness & tingling of toes & fingers, arms & legs, and body generally. The legs also became very weak & almost useless so that he could hardly walk. The muscles of Legs occasionally started involuntarily and felt stiff on attempted movement. The reflexes were uniformly increased. These symptoms continued for a few days & then passed away as they had come, leaving no ill effects behind.

Case II.

Thomas H—. Also a hawker. Was admitted to Hospital com-

complaining of some numbness of the legs, with stiffness & weakness of the muscles & their occasional involuntary jerkings; also a tight constricting feeling round the loins -

He dated illness from a night spent out sleeping on the damp ground.

When examined it was found that sensation, both tactile and to pain & temperature, in both legs was blunted. The skin reflexes were rather more than naturally marked. The muscular irritability, as shown by the unnatural stiffness of the legs, both on attempted voluntary as also on passive movement, by the exaggerated tendon reflexes & tendency to clonus in the ankles, together with the twitchings of the muscles, was considerably increased.

The Organic reflexes took some

time to act, especially in the case of micturition, when evident spasm of the sphincter had to be overcome.
The "girdle pain" was very marked round the loins & mapped out fairly closely the limits of altered sensation.
There was no rise of temperature & few other constitutional symptoms, except slight gastric disturbance & constipation —
No sloughing or other trophic changes occurred.
Mild antiphlogistic remedies with general treatment & confinement to bed, promoted a rapid return to health & patient left the hospital quite relieved of symptoms.

In both these cases the symptoms, in varying degrees, point to a condition rather of what would usually be dis-cribed as,

and what in actual fact is,
"Acute Congestion of the Cord"
than Acute Inflammation.
We cannot, however, but regard
them as instances of the initi-
atory stages of Acute Myelitis
proper; particularly when we
compare the symptoms generally,
with those premonitory of the
acute disease as are hereafter
detailed; & there can be
little doubt that had the
process advanced but a little
further, we should have
had in both instances well
marked examples of that dis-
ease.

In both cases there is evidence of
1. Impeded conduction & 2. over
activity of the Grey matter.
All the sensory phenomena to-
gether with loss of power in
the legs point to the former
while the increased muscular

* From Lancet Vol I. -/84. p. 1121.

irritability, increased tone & too easily excited reflexes are evidence of the latter.

Beyond the acute congestion there was no further change; this passing away completely there was a total disappearance of symptoms in both cases.

*Case III.

J. H—. Boy aged 15.

Marked syphilitic history & constitutional taint.

During the previous two years he had shown premonitory symptoms (consisting in weakness of legs, with shooting pains, muscular twitchings, & incontinence of urine) & these a week previous to admission were followed by an acute attack.

When he came under observation at the Salford Royal Hospital there was total paralysis, both of sensation & motion, with

rigidity of the muscles & generally marked increase of muscular irritability in both lower extremities. All the reflexes in paralysed parts were exaggerated. The girdle pain was well marked & there was actual paralysis of the bladder, with commencing trophic changes in the shape of an incipient bedsore.

At the time of observation general constitutional symptoms were hardly present, both temperature & pulse being normal or nearly so -

For some six days the condition remained the same, after which a prickling felt in the legs & a gradually returning control of the bladder, showed a commencing subsidence of symptoms.

In a few days sensation had completely returned & recovery

gradually took place, with in the end a total relief of symptoms. In three months from first onset he left the hospital cured

Here the symptoms are those of an actual Inflammation of the substance of the Cord, though commencing with those of an Acute Congestion - In point of fact, this case is either of the two first quoted cases, carried a step further. Instead of paresis we have paralysis; instead of abnormal sensations we have complete abrogation of the function; in addition we have commencing trophic changes & paralysis of the bladder. Here also the reflexes were exaggerated & associated with increased muscular irritability.

As to the actual state of the cord the absence of conduction &c

* Under my own observation & care.

would seem to point to an acute inflammation of its grey matter, & by implication of its white also, in a limited area; associated (as evidenced by the increased functional activity) with a consequent congestion of grey matter below inflamed area -
The recovery would be by resolution; &, inflammation not having gone on to distruction of tissue elements, the relief from symptoms was in the end complete -

× Case IV.

John W—. act 22.
A fine healthy young man, with no history of previous ill health or syphilitic taint:
By occupation he was a labourer, though at onset of illness he was temporarily out of work.
He rose in the morning in his

usual health. His first symptom was a feeling of tightness in the abdomen, which gradually localised itself in the back - On trying to pass his water in the middle of the day, he found the passage "would not open" (evidently from spasm of sphincter). The pain in back now increased & became associated with stiffness across the thighs; this last gradually becoming so marked that he could not walk. He now got alarmed & took a cab to a friend's house, where, lying on a sofa, he fell asleep. On waking some hours after he found the lower limbs & lower part of body had become completely dead & powerless. He was carried home & put to bed. In the morning his condition had deepened & having passed no water since the previous morning a doctor

was called in & a large amount of urine was drawn off with the catheter. He was now brought to the infirmary, where it was found that the motor paralysis was complete, & the sensory almost so, in the whole of lower part of body & legs. The reflexes were totally abolished & the bladder completely paralysed. Pain had gone; temperature was almost normal, but the pulse extremely rapid (150 per minute). Although from the first on a water bed, large sores began to form in various places, as for instance on the toes, heels, buttocks, sacrum, etc & the legs rapidly wasted. The urine, taken off with the catheter, was light coloured and in large quantity; in a few days from commencement of attack it became alkaline purulent & foetid. The Temperature now

took rapid runs up to 104 Fahr: during severe rigors, accompanied by sickness & vomiting. Death was looked upon as in near prospect.

However at this point an amelioration of symptoms took place; the bedsores, which had become actual sloughs, ceased to extend; the urine improved in character, and the constitutional symptoms subsided, and during the next few weeks he gradually settled down into a state of absolute paraplegia. His water trickled away as secreted into a vessel placed to receive it; his legs, very much wasted, were completely paralysed so far as voluntary movement & appreciation of sensory impressions were concerned; but (and this I think an important fact) they showed involuntary movements, jerkings, drawing up & even actual kicking, to

a most remarkable degree; so much so indeed that they had to be padded to prevent the bruising & abrasion that would otherwise have been caused by their knocking together.
Another important point to be noticed, as showing the return of reflex action in the cord, was the fact that the legs were always drawn up when the soles of the feet were tickled, though he was unconscious of both the sensation & the movement. He seemed however in time to regain a slight degree of sensibility but this was only very faint & always delayed. The pulse remained extremely rapid & the motions like the urine were passed involuntarily. Peristalsis sometimes however, especially after working medicine, was often extremely painful. The general health gradually

improved up to a certain point, but otherwise the state remained stationary. He, after an interval of some months, was removed home & there attended. Here he lay a long time, till at last the constitution broke down & he died exhausted. The illness lasted altogether about 1½ years.

A Post Mortem examination was made at the house & the Cord removed.
The Membranes of the Cord were healthy in every particular & also the surface of the Cord itself.
On section the Grey Matter was atrophied, especially in Dorsal region, & had, particularly at that part, a decided pink or red tinge. No other morbid appearances could be discovered.

From this case we can, I think,

draw the following conclusions:-
1st From the evidence we have of the total withdrawal of nerve influence, we may infer that the Cord was the seat of a very severe inflammatory process, involving its whole thickness at a certain point; the rest of the cord below that point also to a certain extent sharing in the process.
2nd That in the part most severely affected (the dorsal region) the inflammatory process ended in absolute disintegration of the nerve tissue; this accounting for the permanence of the symptoms; whilst the rest of the cord below recovered so far as to be available as a centre for the automatic (?) movements of, a reflex action in, the lower extremities.

* also under my own care -

The previous good Health, absence of cause or premonitory symptoms, the rapidity of onset, together with the absence of serious constitutional disturbance, the extreme rapidity of pulse maintained throughout, all form points of interest in the case.

Case V.

James C. T— act 50.
A Traveller, very tall, dark & thin. Some four months previous to the acute attack, had been troubled with weakness of the left leg & severe constipation. He then "laid up" with it & recovered in some 4 or 5 days. Three weeks previous to admission to Hospital on September the 13th - /84. he took a long journey, during which he was much worried & could not always get proper accommodation - As a consequence

as he thought, and while still away from home, the leg again became affected becoming both weak & numb. He then went to Droitwich for the salt baths. Getting no benefit he came home to Bradford and applied for admission to the Infirmary. At this time he could just manage to walk supported on both sides. On being put to bed it was found that now both legs were semiparalysed. Tendon reflexe was increased & ankle clonus present especially in left leg. The muscles started involuntarily. Sensation in parts was fairly good, but patches of skin here & there were completely anaesthetic. Skin & plantar reflexes were all well marked in both legs. The bowels were extremely costive & tongue was much furred but the temperature & pulse were little affected.

His water was passed involuntarily during sleep but only with difficulty when awake from spasm of the sphincter. He complained greatly of pain in the stomach but not of actual girdle pain. The symptoms gradually increased & three days after sensation & motion were both paralysed, the water dribbled away unconsciously, skin reflexes disappeared but the involuntary contractions of the legs still continued - Soon after all signs of nerve influence vanished & the condition became one of complete Paraplegia. The legs wasted rapidly & large bedsores formed especially over the sacrum.
Bladder troubles were present but not to a great degree & catheter had only occasionally to be used. There was a nasty sloughy condition of the glans Penis resulting from the trick-

ling away of the water.
He now gradually, as in previous case, settled down into this condition; the only thing to note being, that the involuntary movements of the legs became very marked & the muscles were stiff & much wasted.
No improvement taking place, he was sent home, where he died exhausted some short time after. A Post Mortem could not be obtained.

In this case, the disease, having once set in, ran a very similar course to the previous case & to it the conclusions there drawn also apply.
Here however we must in addition note:-
1st the threatening of attack some months previous & recovery from it.
2nd the prolonged onset in the

* also under my own care.

acute attack.
3. the fact that in its origin it was more or less unilateral.
4. the general similarity of the symptoms in the first instance with those discribed as associated with acute congestion of the cord –

Case VI.*

Joseph B—. aged 43.
A travelling showman of rather dissolute habits. Alcoholic but not syphilitic history.
Was admitted to the Bolton Infirmary complaining of having lost all power in his legs.
He attributed it to getting wet.
When he came under observation the lower limbs & lower part of body were found to be absolutely paralysed, there being no power of movement or feeling & no signs of reflex action.
The Tendency to sloughing was

very marked, especially over all bony prominences & this was associated with rapid wasting of the limbs. The Bladder was completely paralysed & the water had to be withdrawn night & morning. It was large in amount, fetid, alkaline & loaded with mucus.

These symptoms coexisted with those of Acute Bronchitis.

Exhaustion was extreme, and he rapidly sank & died. some three weeks after commencement of attack.

After death an examination of the Cord was made.

The Membranes were found perfectly healthy. The Cord (discribed at page 27.) was seen to present a series of circumscribed swellings, at equal distances throughout its length, involving its whole thickness & more marked as they were placed lower in the Cord

On section they were found due to swelling of small portions of grey matter bulging out the white matter around it.
The state of grey matter in these bulgings varied, from acute congestion in the uppermost, to abscess in the lowermost.
The intermediate grey matter was fairly healthy, only showing a slight pink colour from congestion.
The creamy fluid from the abscess, under the micros-cope, was shown to consist of broken down nerve tissue & cells like pus cells.
A section made, through one of upper swellings, showed a commencing disintegration of the grey matter; this indeed being so friable that a perfect section was not possible - Over its whole extent there was a general indistinctness of structure, the cells especially could only be just made out.
The white matter seemed healthy.

In this case we have the disease in its severest & most dangerous form. It came on quickly advanced rapidly & very soon proved fatal; while the symptoms throughout were those of a total withdrawal of all nerve influence from the parts affected.

In its clinical features it closely resembles the two previous cases in their worst stages & differs merely in the greater severity of the inflammation producing a more rapidly fatal termination.

It may be that the rapidity of its course was due to the fact that, in addition to the disease, there was an already much debilitated constitution.

Pathologically, the state of the cord found after death was extremely interesting from the fact that not only were

* from Medical Times & Gazette
1861. Vol I p. 331.

there several foci of inflammation, but also these were all in a different (& a gradually ascending series of stages) phase of the inflammatory process; thus presenting a complete pathological picture.
Had the man's strength not failed in all probability we should have had a total distruction of the substance of the cord.

Case VII.

John C—. aged 55:
Admitted into St Bartholomew's Hospital suffering from paraplegia. Two days before, he was in his usual good health except for a cold.
When walking home from work, the legs became somewhat weak & numb. This symptom increased so rapidly, that he could hardly get home, & while undressing to get into

bed the paralysis became complete. He also lost power over the bladder. There was no history of injury. He was fairly nourished & of sallow complexion.

On admission the lower extremities, as regards motion, were completely paralysed; sensation was impaired but he was conscious of firm pressure. There was no involuntary action of the muscles. The urine had to be drawn off. The tongue was furred the bowels costive & pulse quick (120 per minute).

The Upper extremities at first were not affected, but the paralysis rapidly extended upwards & involved the arms, soon after which patient became comatose.

On the 3rd day the general state was worse; water in large quantity was drawn off with catheter & bowels moved involuntarily.

The paralysis now involved almost the whole body & reflex action was totally abolished. The next day there was in addition partial paralysis of the face & he gradually sank & died.
At the autopsy, the Spinal fluid was said to be increased in quantity & the cord, at level of upper dorsal vertebra, was found markedly softened & of a light yellow colour. There were also slight changes, more or less congestive in character, in the brain substance - also slight pathological changes in other organs but these unimportant.
Dr Burrows' remarks on the case are so interesting & so much to the point that I quote them almost in their entirety:-
"The extreme rarity of acute in-"
"flammation of the substance of"
"the Spinal Cord & the comparative"
"unfrequency of examinations after"

" death of this portion of nervous "
" system, render this case both in "
" teresting & instructive - If the mans "
" statement was to be relied upon "
" he was in his usual health to "
" within 48 hours of admission into "
" hospital & yet in that interval of "
" time such serious mischief had "
" taken place in the Spinal Cord "
" that the patient had become com-
" pletely paraplegic as far as the "
" lower half of the body. The loss "
" of Muscular power over the lower "
" extremities, over the bladder & rectum, "
" the impairment of sensation in the "
" same parts, together with the absence "
" of Spinal irritation & the inability "
" to rouse any reflex movements "
" would seem to indicate the ex-
" istence of dis-organisation of the "
" substance of the cord even at "
" the time of his admission ---- "
" There is every reason to suppose "
" that the disease was excited "
" by the direct action of cold "

*Myelitis with softening of the Spinal cord — death & autopsy — clinical remarks. Lancet. 1843. page 627.

#A case of Acute Idiopathic Partial Myelitis. British Medical Journal Vol II. 1885 pr. 295.

"upon the surface of the body." "the history of other similar cases" "leads to the conclusion that" "Acute Myelitis or Inflamma-" "tion of the Spinal cord —— is" "usually induced by exposure" "to a low temperature."

In all essential points this case agrees with the previous cases & to it the remarks passed upon them equally apply.
In one point however it differs from them & that is in the larger extent to which the cord (& even the brain) was involved, this producing corresponding symptoms in the larger extent of the body affected by paralysis.

Other recorded cases have been noted* but showing no distinctive features I have ~~has~~ not given them "in extenso" as in above cases.

In the above seven clinical records we have very fully told the features by which the disease may be distinguished at the bedside.

They form a fairly perfect series & show us the disease in its clinical aspect from the simplest to the most severe forms.

The symptoms manifested are almost uniformly those which we previously showed we might "à priori" expect & the Post-Mortem results, where obtained, furnish us with valuable information as to the pathology of the process.

It now only remains to add a few words as to the causation & general treatment of the disease.

II. Etiology.

As Dr Burrows remarks (p. 66.), in the majority of cases of Acute Idiopathic Myelitis the direct cause would seem to be exposure to cold. There are, no doubt, adjuvant causes such as hereditary (especially syphilitic) taint, previous hard muscular or mental labour, injuries, strains & so on - It would seem, however, in some cases (Case IV) to attack individuals previously quite healthy & without apparent or discoverable cause -

In fact, in the same way that we have acute inflammations occasionally attacking other organs, Kidneys, Lungs, etc without assignable reason, just in the same way may we have from some peculiar individual predisposition an inflammation of the Spinal Cord.

All conditions tending in any

way to weaken the constitution & render it liable to disease, such as, nervous exhaustion, alcoholism, syphilis, overexertion & so on, they all will probably exert their influence, but rather as determining the severity of the disease & its final termination, than as affecting its location in the cord -

/

IIIs. Treatment -

In its ultimate results Acute Myelitis, when once fairly established, is extremely fatal.
Excluding the two cases of Acute Congestion, only one of the recorded cases recovered; all the rest being either immediately or in the long-run fatal -
Little unfortunately can be done in the way of treatment from the very nature of the disease.

As soon as the premonitory symptoms show themselves, the patient should at once be placed on a water bed & the greatest care taken to avoid all irritation, so apt to result in the fearful bedsores & sloughs.

Thus perfect rest, with careful & discriminating nursing, are most important.

The catheter, where paralysis of the bladder exists, should be used as little as possible & always with scrupulous care as to cleanliness & manipulation, from it result, I have little doubt, those severe rigors & constitutional symptoms, which when they occur are so distressing to the patient.

Beyond this, no local treatment is either advisable or possible, except perhaps gentle application of electricity in the later stages to help return to health.

Constitutional treatment may be conducted on general lines, as in the case of an acute inflammation elsewhere; always of course bearing in mind the peculiar features of the case resulting from the withdrawal of nerve influence from certain of the tissues.
Mildly antiphlogistic remedies, such as minute doses of mercury, together with medicines to increase the action of the skin & kidneys are perhaps the safest to employ-
The disease is however preeminently one in which it is dangerous to interfere with anything approaching the heroic in treatment-
Nature & nursing do the best for the patient-

The End-

See over.

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