THESIS for GRADUATION.

H. Whitby Phillips
M.B.; C.M. (1881).
The Infirmary
Bolton-le-Moors.

April 1886.
CONTENTS

Introduction
Definition of Acute Idiopathic Myelitis.

A. The Spinal Cord in Health.
   1. Position and General Relations
   2. Structure
   3. Function

B. The Spinal Cord in a State of Acute Idiopathic Inflammation.
   1. Pathology
   2. Malignant Physiology

C. Cases Illustrative
   Seven clinical records

D. Etiology

E. Treatment
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 Vertebral 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 intender...
tended to discuss none of these, except incidentally, but rather to direct attention to those idiopathic inflammations 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 "Acute Myelitis" 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 bony 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 clefts 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 and 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 (denticelate)
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 deep-
coloured or “Grey” Matter, with
a core of lighter-coloured or
“White” Matter), these resembling
those of the brain but with
their respective positions re-
versed.
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 Com-
missures.
mossares, the first 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 white matter is so disposed around the grey, as to form with it a flattened cylinder. It is deeply grooved in the medio-lateral line, both anteriously and posteriously, to form the anterior and 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, anterius and posterior, of the spinal nerves. The two posterior 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 microscope 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 enclosing envelope of an oily nature, the white substance of Schwann. These fibres have a general arrangement along the long axis of the cord and, beyond these divisions 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 and cells. The fibres are numerous, exceedingly fine and branched, dividing and 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 in 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 corners 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 neuroglia, which is a direct continuation backwards of the processes of Pia Mater above described.

The Blood-supply of the Cord is from the small arterics of the Pia Mater, these running chiefly in the vinculations of the membranes lying in the Anterior & Posterior Median Tissues 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 and 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 funiculus. 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 funiculi respectively; and they run directly into the corpus 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 and 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, and distributed.

---

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 of one kind of nerve influence that they have to conduct infinitely vary, but also this influence has to be conducted in two, or three, or opposite directions according as it arises from or has to be conveyed to the nerve centre.

Centripetal and 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 dis-
puted points in this connection
as I shall content myself with
simply mentioning what seem
to be the best established facts
or most likely hypotheses.
It is from the antero-lateral
columns and the anterior
Cornue of grey Matter lying
adjacent, that the exclusively
motor fibres forming the anterior
cots 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 particular-
ly from the study of diseased
conditions, that certain sets
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-
Text-book of Physiology
fear to run immediately across the cord to its other side & thence up 2 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. 598)

Every impulse, volitional or sensory, is brought directly into relation with the grey matter of the cord, before leaving or directly on 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, as 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 Column 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 inferred 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 then broken up into distributed proportionately to the different centrifugal fibre going to the particular muscles, so as to produce the desired co-ordinated movement.

In the same way it may be supposed that the grey matter of the Posterior Commissa acts as regards centrifugal impulses; for each peripheral impression must affect several nerve-terminations at their fibres; consequently the impression will arrive at the grey matter of the Posterior Commissa 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 simple fibre there to produce its effect or 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 reflex action, follows very easily from the above: for, given a series of local motor mechanisms also a series of similar analogous sensory mechanisms, it needs but the connecting fibre or network between the two, to produce through them a motor effect by a sensory eipulse.

And when the higher centres are not receptive, what more likely than that the
sensory impression should diffuse itself to produce its effect on the associated or neighbouring motor area.

In 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 and 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 or 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 natur-
urally between them, that we
shall have the "uncontrollable-
reflexes."
So close indeed may this con-
nection be that the reflex may
result unknown to the higher
centres (unconsciously), as is the
case with the venous con-
tractions 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, defec-
tion, etc.
The only other function of the
Cord, that it concerns lies to
consider is that seen in its
action as a Trophic centre,
presiding over the growth and
nourishment of the tissues
generally.
Now each cell is consequently
such tissue composed of a col-
SECTION of such cells, possesses inherent in it the power of growth and a resulting power of selecting and assimilating such material as is fit for its use. These cells or 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 subsist 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 and die.

This would seem to explain such profuse 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 bullae, bedsores, actual sloughs of large extent of tissue.

The Spinal Cord, unlike the Brain, could seem to possess no power of automatic action; 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 of
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 and also the signs by which it is manifested in the body generally.

IB. 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 strands of fibres of white matter may become the seat of a low, chronic, a peculiar form of inflammation, producing peculiar clinical diseases according
to the set of fibres affected.
Again a somewhat similar pro-
cess may locate itself in certain
parts of the grey matter, produc-
ing also characteristic symptoms
as in Infantile Paralysis, etc.
The acute idiopathic inflammation
of the Cord or Acute Encephalitis
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 in-
volves 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 prim-
arily attacks in which it
has its chief seat, though
of course the White Matter is
necessarily affected, from its
propriety to the inflamed area.
in the first place, from extension
of the disease to it in the sec-
ond.
The focus of inflammation may
be single, and, though invol-
vorying the whole thickness, limited
in extent. On the other hand, there
may be several inflammatory
foci scattered up a 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 in-
flamed area the end presents
a swelling or bulging of its
substance.
The degree of bulging is propor-
tionate 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.
The cord taken post mortem from Case F. 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 and friable; and in the case of the lowest the contents were of a creamy fluid consistency.

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 case we have a complete pathological residuum of the disease; because we have
represented in all the degrees possible of the inflammatory process; and from it we may formulate the various pathological states associated with cases of the disease of varying severity. Dividing into stages they 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 blood vessels at that spot will dilate, the horns swell, a blood plasma will be poured out around, and along with it a few white blood corpuscles.

Here the process may stay or 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
fascial cells, together with cloudy
swelling of the nerve fibres —
cells.

Here again by resolution + absorp-
tion a complete recovery is possible
but the process going on we-
just:—

3rd. Breaking up of covering of
nerve fibres, leaving axio-cylinders
bare, fatty degeneration of the
nerve cells, further proliferation
of the connective tissue or neuro-
glia cells + the whole nerve —
substance becomes soft + friable.
Should the inflammation stop
here we might expect to have
a partial recovery; the inflam-
mmatory products being absorbed
and the place of the destroyed
nerve tissue being taken by in-
creased formation of neuroglia
from its proliferated cells.
But the inflammation may progress even beyond this to the total destruction of nerve elements at the spot affected, with a breaking down into detritus with a formation of the fatty granular cells, known as "glial inflammation globules."

If death do not supervene, even at this stage it is possible that absorption may take place, with the formation of a cicatricial 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 and very acute cases we may get a multiplication of inflammatory foci, or streules, 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 "Rassemblerment."
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 l
extensively involved, the structure of the cord will be so affected, and 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 and centripetal conduction (as evidenced by loss of volitional sensory power), abolition of all reflex action, a typical 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—a thing in any way, 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 motion — the translating of simple afferent into afferent impulses, not only so indeed, but sharing probably more or less in the general congestion & hyperemia. These functions may be elevated to as a consequence we should have increased reflexes of all kinds, while motion 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 prevent it, producing as clinical equivalents numbness, tingling, prickling, etc., with partial paralysis of muscles or pareses. The Ipex Mother, as above, being more active from hyperemia, these symptoms will probably be associated with increased manifestation of reflex action in 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 a "quaddie 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 i also
Sharkey on Dr. Rerv Spasms in Epileptoma: Lecture 1886.
naturally possesses a certain degree of tension or tone. Now both muscle tone and muscular irritability are liable to become excessive in degree in certain nerve disorders so as the result we get certain clinical phenomena known as 2. Muscular rigidity or contracture 2. Increased tendon reflexes 1. Clonus, either knee, ankle, etc., according to situation.

These conditions are most commonly seen in other Chronic forms of Spinal mischief, most particularly in disease affecting the Lateral Columns, as in Spastic Spinal paralysis Descending Degeneration. In these cases they have been almost conclusively proved 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 seem, 1st in the
preliminary stages of acute
myelitis, 2nd become a marked
feature when the disease has
become chronic & the limits Para-
plegiae. In the first case, that is
when the disease is only com-
mencing, these phenomena can
not depend on any disease
of the so-called Motz tracts, as
no such disease can be said
to exist. In such circumstances
the explanation of their occur-
rence must be as follows:-
If these manifestations are
dependent, from whatever cause,
on an increased functional
activity of the Spinal Motor
centres, then surely such in-
crease 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 hyperemia of the tissues composing them. Such hyperemia or congestion of the grey matter has been shown to exist in the early stages.

In the later chronic stages, where they coexist with paralysis symptoms (these being dependant upon destruction of the cord in some part of its extent), the phenomena can be explained on the first hypothesis, because in the rest of the old inflammation the motor tracts will be destroyed or disorganized, 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-activity"
Hughlings Jackson as quoted in above geological lecture by Charley.
"Diseases, 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 or 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 signification.
Both cases selected from a series of "Spinal Congestion".
Cases of Acute Myelitis.

Case I.

Patrick F. — A broker, aged 50.

I got thoroughly wet when burying his wife. This was followed by numbness and tingling of toes and fingers, arms and legs, and body generally. The legs also became very weak and 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 T. — Also a broker.

Was admitted to hospital con-
Placing of some numbness of the legs, with stiffness and weakness of the muscles; their occasional involuntary jerking; also a tight constriction feeling round the lumbosacral region. 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 ankle, 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 "ciddle pain" was very marked around the loin - mapped out fairly closely the limits of altered sensation.

There was no rise of temperature a few other constitutional symptoms, except slight gastric disturbance and constipation. No sloughing or other trophic changes occurred.

Mild antiphlogistic remedies with general treatment - confinement to bed, promoted a rapid return to health, a 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 described as,
and what in actual fact is, "Acute Congestion of the Cord" rather than Acute Inflammation. 
We cannot, however, but regard them as instances of the initial stages of Acute Infiltritis proper; particularly when we compare the symptoms generally with those premonitory of the acute disease as are hereafter detailed; for 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 disease.

In both cases there is evidence of:

1. Impeded conduction
2. Over-activity of the grey matter
3. The sensory phenomena together with loss of power in the legs point to the former, while the increased muscular
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.

T. H. Boy aged 15.

M. a. syphilitic history & constitutional taint.

During the previous two years he had shown premonitory symptoms (consisting in weakness of legs, with shooting pains, muscular twitching, & 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 paraplegia, loss of sensation & motion, with
rigidity of the muscles a generally marked increase of muscular irritability in both lower extremities. All the reflexes in paralysed parts were escaped. The pinacle pain was well marked if there was actual paralysis of the bladder, with commencing trophic changes in the shape of an incipient bed sore.

At the time of observation general constitutional symptoms were hardly present, both temperature and 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 to 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 paralytic we have paralysis; instead of abnormal sensations we have complete abrogation of the function; in addition we have commencing trophic changes a 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 etc.
Under my own observation and care.
would seem to point to an acute inflammation of its prey matter, as by implication of its coloboma, in a limited area; associated (as evidenced by the increased functional activity) with a consequent infection of prey matter below inflamed area.

The recovery would be by resolution; acute inflammation not having gone on to destruction of tissue elements, the relief from symptoms was in the end complete.

*Case IV.*

John W—— age 22.

A fine healthy young man, with no history of previous ill health or syphilis in family.

By occupation he was a laborer, 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 waters in the middle of the day, he found the passage "would not open" (evidently from spasm of sphincter). The pain in back now increased and became associated with stiffness across the thighs; this last gradually becoming so marked that he could not walk. He now got alarmed and took a seat to a friend's house, where, lying on a sofa, he fell asleep. On waking some hours after he found the lower limbs a lower part of body had become completely dead and powerless. He was carried home and put to bed. In the morning his condition had deepened and he 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 and legs. The reflexes were totally abolished; the bladder completely paralyzed. Pain had gone; temperature was almost normal, but the pulse extremely rapid (180 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 colored and in large quantity; in a few days from commencement of attack it became alkaline purulent and fetid. The temperature now
took rapid runs up to 104 Figs., during severe rigors, accompanied by sickness and 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 paralyzed, 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 and 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 urines were forced 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, returned 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, a hard, particularly at that part, a decided pink or red tinge. No other marked 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. — aged 50.

A yardman, very tall, dark hair. Some four months previous to the acute attack, had been troubled with weakness of the left leg & severe constipation. There "laid up" with it — recovered in some 7 or 8 days.

Three weeks previous to admission to hospital on September the 13th — 1884. 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 Forteau 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 semi-paralysed. Tendon reflexes were 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 constipated; 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 kidney pain. The symptoms gradually increased - three days after sensation and 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 weaked rapidly a 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 strongly condition of the anus and penis resulting from the trick-
Any 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 to recovery from it.

2nd. the prolonged wrest 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 described as associated with acute congestion of the cord.

Case VII.

Joseph B., aged 48.
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 asso-
ciated with rapid wasting of the
limbs. The Bladder was completely
paralysed & the water had
to be withdrawn night & morn-
ing. 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 at-
tack.

After death an examination of
the Cord was made.

The Membranes were found per-
fectly healthy. The Cord (described
at page 27.) was seen to present
a series of circumnscibed swell-
ings, at equal distances through-
out 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 bulging 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 microscope, was shown to consist of broken down nerve tissue & cells like pus cells.

A section made, through one of upper swellings, showed a commencement discrete portion 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 and 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 most stages a difference 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
there several forms of inflammation, but also these were all
in a different (i.e. 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 destruction
of the substance of the cord.

Case VII.

John E., 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 and of
yellow complexion.
On admission the lower extremities,
as regards motion, were
completely paralyzed; sensation
was impaired but he was con-
scious of pain 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 par-
alysis rapidly extended up-
wards and involved the arms, soon
after which patient became
comatose.
On the 3rd day the general state
was worse; water in large quan-
tity was drawn off with catheter
& bowels moved involuntarily.
death of this portion of nervous system, under this case both in the tests in instructive. If the man's 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 pelled 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 cause any reflex movements would seem to indicate the existence of disorganization 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.
"upon the surface of the body;" "the history of other similar cases" "leads to the conclusion that " "acute Myelitis or Inflammation of the Spinal Cord — is " "usually induced by exposure " "to a low temperature."

In all essential points this case agrees with the previous cases as 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 (or even the brain) was involved, this producing correspanding symptoms in the larger extent of the body affected by paresis.

Other recorded cases have been noted but showing no distinctive features I have 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 to 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-Protestant results, where obtained, furnish us with valuable information as to the pathiology of the process.

It now only remains to add a few words as to the causation of the disease.
Etiology

As Dr. Burrows remarks (p. 36), 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 heredity (especially syphilis), tainted, previous hard muscular or mental labour, injuries, scarifications, and so on. It would seem, however, in some cases (Case 36) to attack individuals previously quite healthy without apparent or discoverable cause.

In fact, in the same way that we have acute inflammation 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, 
epilepsy, necrosis, or 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.

The Treatment
In its ultimate results acute meningitis, 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—i.e., the greatest care taken to avoid all irritation, or apt to result in the painful lesions—sloches—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 in 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 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.
BIBLIOGRAPHY.

Lancet
British Medical Journal
Medical Times & Gazette
St. Bartholomew's Hospital Reports
British & Foreign Med. Chir. Review
Foster's Physiology
K pilot's do
Lees's Anatomy
Turner's do
Lyceum Pathology
Sims Woodhead's Practical Pathology
Bristol's Medicine
Niessen's Practical Medicine
Notes on Lectures on Nervous System
by Granier Stewart
Diseases of Spinal Cord Iyovers
Ditto --- --- B. Bramwell
Ditto --- --- Evans Reeves
Diseases of Nervous System Romberg
Ditto --- --- Ross
etc. etc. etc.