Splints in the Treatment of Flaccid Paralysis.

Clinical Notes of Three Cases.

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Introductory Remarks.

Reasons for adoption of this method of treatment.
The treatment of Diseases which affect the Nervous System as a practical entity is still in its infancy and however much the objects of our attention in this particular branch of our profession may excite our sympathy and compassion we have to confess that in many ways that is as far as we can get.

Indeed as we all become more or later to the spectacle of disease and distress yet none of us can view with quietude the subject of paralysis in any one of its many forms. None of us but feels somewhat rebellious when he realises his impotence when faced with the problem of alleviation or cure.

We are constantly on the watch for knowledge of any new line of treatment which promises anything of success and anything calculated to strengthen our hands in this direction is received with open arms.
In working our object is always to cure where possible and failing that to benefit, and we desire to do either of these in the shortest possible time.

Recently I had become acquainted with a new method of treatment adopted in cases of "Infantile Paralysis" (so-called) and certain analogies between this disease and the common condition "Peripheral Paralysis" induced me to follow the same idea in the latter.

I have now tried the method, to be described later, in 3 cases—two of Peripheral Paralysis and one of Infantile Paralysis and my results have been so extraordinarily encouraging and convincing as to cause me to publish them for consideration.

Before entering into a description of the cases and the results to be deduced therefrom it might be well to devote space to a brief consideration of the facts which suggest the line of treatment and what their treatment is.
We know that in cases of Peripheral Neuritis recovery occurs even though the duration of treatment, associated by the severity of the case, be long. We are cognizant of the fact that a great deal of recovery takes place in cases of Infantile Paralysis even after years.

Naturally we wish this recovery to be as speedy and as complete as possible and a closer investigation of pathological involvement and physical changes in these two conditions has helped us considerably.

In the condition of Peripheral Neuritis we know that there is a toxic influence exerted on the nerve fibres and on the associated connective tissue; that fibres degenerate and are replaced by connective tissue; that as the result of this there is degeneration of muscular tissue and impairment of muscular activity amounting in certain cases to total inactivity.
But we are also taught by our success in treatment that the amount of muscular disability produced is no criterion of the amount of total nerve destruction, no guide as to the amount of mobile recovery that will occur as the result of careful and accurate treatment.

In the absence of the phenomenon known as the Reaction of Segregation we are accustomed to give a very hopeful prognosis.

In the condition colloquially known as "Infantile Paralysis" we are guided by the same factors, but our prognosis knowing as we do the respective pathological changes is necessarily more guarded.

I do not in this paper propose to discuss pathology. Such is well known and I am going to deal only with the clinical results of treatment.
Knowing therefore that the nervous destruction cannot be nearly so complete as physical disability would seem to suggest we must perform with an explanation for the tardiness of recovery in so many cases.

When this is found we establish a firm position from which to attack the problem of successful treatment and rapid recovery.

We find what we seek when we study more closely certain mechanical changes which occur in the affected joints.

For consideration of what these changes are we will keep before our minds a typical case in which there is marked "drop foot."

For this to occur we know that there is primary damage to the nerve cells or their axons supplying the extensor muscles of the leg.

The associated structures suffer in various ways:
I. The trophic influence of the nerve cell is interfered with or destroyed and the muscles and their tendons waste from want of what we might term "nutritive effect."

II. The beneficial and tonic influence of active use is lost and muscles atrophy considerably from want of this alone.

III. The weight of the foot influenced by gravity and by the pressure of bed-clothes etc. produces stretching of weakened structures.

IV. Uninjured and active muscles still exercise a pull on the affected member and the flexor muscles in the particular instance under consideration thus unconsciously increase the amount of "drop foot."

V. The longer the disability lasts the more likely are we to get the formation of adhesions which fix...
the joint in its new position of
deformity and present its more or
less forcible replacement into the
normal position.

Bone changes soon which
further increase the deformity and
tend to make it permanent.

From our knowledge that the healing
nerve cell is that which leads an
active existence and that the least
way of benefiting a damaged one is
to give it carefully regulated work
so do.

We realize that for the nerves
more or less damaged to produce
a motive effect on the muscles
as affected above, they have
undertaken a difficult task to
perform. And this is the joint
where we step in and try a mechanical
device render their task as easy
as it is possible to make it.
The motor element of the nerve has to gather in a long slack of stretched muscle and tendon in the first place.

Damaged as it is it may still exercise some trophic influence.

It has acting through the muscles - to attack the problem of the adhesions which form in a long-persisting case.

We wish therefore to adopt a device which will keep the foot in a normal position until the stretched structures recover their tone. We wish to act early in order to prevent adhesions & bony changes in a false position.

We wish above all to promote trophic influence which is a great factor in rapid recovery and which I find is a direct result of early & continuous correction of abnormal position.
With these facts before us we are in short in a position to consider and that, practically, the best means of assisting the damaged structures and of countering any and all pernicious influence at work.

We succeed by a simple device.

In the case under consideration we apply a back splint to the leg. To this we have a foot piece set at an angle of about 100°. This keeps the foot up at about the normal angle, takes the strain off the weakened structure, counters the pull of active opposing structures and from the point of view of rapid and complete recovery becomes an ideal agent in treatment.

Once applied the splint is kept on until recovery is complete. No fixed time can be given for any stated case.
Robert Jones, discussing the treatment of Poliomyelitis Anterior Acuta in the British Medical Journal of Dec. 9th, 1911, a discussion which first suggested to me the idea of adopting the treatment in cases of Paralytic Acute, says:

"The first stage of treatment is to correct existing deformity and when this is corrected the limb should be kept immovable until the ligaments, muscles and even bone have become of normal shape and length. To break the continuity of treatment is to invite disaster and bring about relapse. The slightest stretching of a muscle on the point of recovery disables it again."

He advocates the keeping on of the splints for six or even twelve months, and though he is famous for his orthopaedic surgery he says:

"No case should be operated on before twelve months have been spent in endeavouring to restore the function of the paralysed muscle."
Clinical Notes of Three Cases

Summary and Deductions

In Conclusion
I have now had the opportunity of applying these ideas in 3 cases as mentioned above. All were of severe type and thus serve as a true test of the efficacy of this method. Two were cases of Peripheral Paralysis in which I am not aware of the idea having been adopted hitherto. The third was a case of "Infantile Paralysis."

A brief description of these three cases and their progress I will now set before you.

**Case No. 1**

Mrs. Summer Housewife Oct. 30.

Admitted to Paddington Hospital, London 10th Feb. 1912.

Complaint: Paralysis of both hands, both legs and feet. Gradual onset. Pains in the calves. Total inability to stand or walk.
Her husband is a beer-drinker and the important factor in her history was chronic alcoholism lasting several years.

History was difficult to elicit and facts as to the special forms of alcohol taken were not forthcoming.

I did not see her on admission and in fact not until 16 weeks later when I took up duties at this institution.

During that period she underwent the usual treatment by means of traction, massage, hypnotic hypodermically.

My predecessor was able to inform me that he had not been able to see the slightest degree of benefit from this treatment and was inclined to believe there was some permanent mental injury.

Her condition was then as follows:—
Sensory Examinations

Dizziness in both hands and feet, and shooting pains in the calves of the legs. Sensibility to touch active everywhere.

Appreciation of sensations of heat, cold, and pain was impaired on the dorsum of both feet as far up as the lower end of the tibia.

Tickling of the soles produced a sensation of extreme discomfort.

Deep pressure of the calves of both legs produced excruciating pain.

Special senses were all active.

There was no mental involvement.

Kernig's sign was not then in evidence though it was told things that suggested it had been there on admission.

Pupils equal, reacted readily to light and accommodation.

There was slight lateral nystagmus.
Motor Functions.

Organic reflexes. Active.

Plantar reflex. Absent on both feet but the attempt to elicit it produced marked discomfort.

Abdominal reflex. Absent on both sides.

Ankle gips. Absent.
Knee " absent.

Reflexes. Ankle, plantar, supinator gips, all absent.

Both feet were markedly dropped and there was complete inability to move them or the toes. The legs could be drawn up but the movement was weak and together with extension at the knees easily overcome.

There was double wrist drop but there was slight response when an attempt was made to raise the hands.
There was impairment of all the joint play of both hands which seems to indicate that the lumbricals and interossei were not involved. This was corroborated on instituting movements which required the use of these muscles.

Both calves were flabby and the extensor muscles were greatly atrophied.

Involved muscles all reacted slightly to tetanus and there was no R.B.

A certain continued rapidity of pulse suggested spinal involvement.

There was nothing else abnormal.

NB.
As mentioned before she had had 16 weeks of treatment previously on orthodox lines and the benefit had been pronounced-nil.

Further treatment & progress:-
May 30th 1912.

Back splints were applied to the legs with foot piece as previously described. Hands were similarly treated with splints on the flexor aspect.

There was a little force required to get the feet into the required position and during the ensuing two days there was great discomfort and aching in the calves from stretching of the muscles. This later wore off.

June 14th 1912.

A fortnight later.

There is slight movement of the toes of both feet. The movement of the fingers is free.

June 20th 1912.

All the toes now move freely.

July 3rd 1912.


There is slight dorsiflexion of
the left foot. Both hands can be readily dorsiflexed.

**July 8th 1912**

The left foot can be well dorsiflexed. There is a slight movement of dorsiflexion of the right foot. There is free movement at both wrists & the splints have now been taken off these.

**July 30th 1912.**

There is fairly free movement of both ankles.

**August 21st 1912.**

All the splints are now off. Patient was up for the first time and walked with assistance. Ankle ached as the result of the unaccustomed exercise.

**September 25th 1912.**

Patient walked out of hospital 16 weeks after the
Spirits were first applied and after a previous 16 weeks of absolutely abortive treatment.

She has since returned several times to report progress and her cure is now complete provided always that she does not revert to her previous bad habits.

It may be advanced that the 16 weeks early treatment in this case prepared the way for the beneficial action of the spirits in the second 16 weeks. Certain it is that in the latter period improvement was early, progressive & led up to final cure.
Case No. 11

Mrs. Margaret Palmer, Wife, Aged 39.

Admitted November 15th 1912.

Complaint: Tremor and weakness of both hands. Inability to walk.

Pains and cramps in the calves of both legs.

Her husband died about a year ago and since then patient has had frequent recourse to alcoholic solace.

She drank chiefly stout and beer but admitted occasionally taking spirits. She was frequently inebriated.

History:

About six weeks before admission patient began to notice an unsteadiness in her gait and that her hands were becoming tremulous. At the same time she first felt what she describes as "ramps" in the legs. She tried to brace herself up with increased amount...
of alcohol but instead of improving became progressively worse until she was quite unable to walk or even to stand.

She suffered from pain and needles in feet and hands and excruciating pain in the calves.

She gradually lost the power of her legs until she became quite unable to move her feet at all and noticed that these were markedly "dropped".

Her hands similarly dropped at the wrist & she could not raise them.

In this condition she came to hospital and on examination the state of affairs was as follows:

**Nervous System.**

Sensory functions. Her feet and hands felt cold and numb. She experienced at intervals an acute sensation of pricks & needles in these members.
The appreciation of touch was dulled over the soles of both feet.
She readily distinguished everywhere between hot & cold objects.

Sucking of the soles of the feet produced great discomfort.
The sense of pain was superficially dulled all over both feet and hands but not above the wrists or ankles.

Slight deep pressure produced extreme agony in the calves.
She readily distinguished between weights of moderate difference.

Sight. Optics equal. Reaction to light and accommodation readily.
Go mystagogus.

Hearing. Quite acute.
 Taste. Unimpaired.
 Smell. Formally active.
Motor Functions:

Organic Reflexes: Active.

Plantar response: fairly flexor.

Abdominal reflex: intact.

Cranial reflex: absent.

Knee "  "

Biceps "  "

Tendons "  "

Sphincters "

Jaw "

There was a marked tremor of the hands and muscles of the face and tongue. The tremor was a coarse one intermediate between that of Paralysis Agitans & Exophthalmic Goitre.

Voluntary Movements.

There was marked double wrist drop which could not be corrected by any effort of the patient.
Both feet were drooped and movement of the toes or at the ankle was quite in abeyance.

The patient was quite unable to stand even with support.

She could flex both legs at the knees and extend them but
the movement was easily commenced by resistance.

Coordination in hands & legs was markedly impaired.
There was no R.B. though the extensor muscles of both legs were greatly wasted.

Sensorimotor Function. Both feet were inclined to be puffy especially on admission when they had been hanging for some time.

Cerebral & General.

Patient seemed a little stupid on admission but after a day or two this wore off and she then
looked an active interest in her treatment.

Her memory was quite good and Korsakov's was not in evidence.
She slept badly for the first few nights.

Locomotor System.

There were no bow changes.
Quadriceps were impaired as mentioned above the condition being one of florid paralysis of the extensor muscles of the arms & legs with cramps and rather coarse tremor.

Treatment & Progress.

Sept. 14th 1912.

Back splints as before applied.
Associated treatment by massage
and Ladderian was carried out.

The splints were applied when
the condition was one of complete
inability to move feet or toes.
Nov. 21st 1912.

Patient can now move all the toes of both feet and slightly dorsiflex both feet at the ankles. Pain in the calves which was aggravated by the application of the spirits has now greatly diminished.

Nov. 27th 1912.

All the movements of the affected parts are better performed though requiring great concentration on the part of the patient.

Dec. 2nd 1912.

Improvement is maintained. Movements are now very free & the "wrist drop" is nearly corrected. The feet have not been allowed to extend yet but the dorsiflexion is much stronger.
Dec. 10th 1912.

The mints are now quite able to support the hands with the "drop" corrected. Both feet are apparently normal. Splints were removed but as there was a slight tendency for the left foot to 'drop' they were reapplied.

Dec. 14th 1912.

Splints were removed today. Both mints of foot 'drop' is corrected. The ankles were bandaged and the patient allowed to get out of bed. She walked a few steps with assistance.

Dec. 24th 1912. **Cure**

Patient walked out of hospital cured. The "Splint Treatment" was carried on for only 5 1/2 weeks. The case was secured early & though a bad one it amply testified to the extreme worth of the method adopted.
In this particular case there was no preliminary trial of treatment with medicinal agents nor indeed were these employed at all.

The splints were regarded as the "tempo de force" and the result of weakened structure obtained through their application combined with massage and traction produced rapid complete restoration of function.

In exactly one month's time after admission to hospital all deformity was corrected and the normal tone of the muscles restored and after a further ten days devoted to walking exercise cure was pronounced complete.

This case differs from the previous one and the one to follow in that the treatment was adopted from the commencement and what this means is evidenced when one considers the satisfaction of recovery in all ways.
Case No. 111

Annie Dellaham Schoolgirl Oct. 13

Admitted 29-9-12

Complaint: Complete inability to move either foot, to walk or even to stand. Weakness of both thighs.

Duration: 6 weeks.

History: Patient is a school girl and the endeavour to elicit history was thus rather difficult.

Patient about seven weeks before admission had what is described as a fever lasting several days.

She was confined to bed and had pains in all her limbs, in her head, neck and down her spine.

There was no rash and she was always in full possession of her mental faculties.
When the pain subsided she experienced weakness of both arms from the shoulder downwards but not amounting to paralysis. It was more of the nature of a paresis.

At the same time both legs were found to be completely paralyzed as regards standing or movement of any nature.

She was treated for six weeks by her family doctor. The treatment took the form of traction, massage & passive movement.

Ultimately an endeavor was made to get her to walk but as she says this failed because she could not stand even with assistance.

Under this treatment the hands and arms improved until complete power returned to them.

No improvement could be elicited in the legs which
remained flaccid and helplessness with dropped feet.

The only change noted was that they became cold and blue and wasted considerably.

As a last resort having been pronounced incurable by her doctor her parents brought her to this hospital.

On admission her condition was as under:

**Sensory Functions.**

No abnormality of any description could be discovered despite careful test. Especially was there an absence of any tenderness in the calves.

**Motor Functions.**

Organic reflexes all active.

Plantar reflex absent in both sides
Three girls.
Left absent.
Right showed a faint response.
Ankle joint both absent.
All other deep reflexes were normal.
Both feet were "dropped" and completely inert. The toes could not be moved.
Calves were flabby and atrophied and the extensor muscles wasted.
Both legs could be drawn up at the hips and extended again but the movement was easily overcome by resistance.

NB. With the exception of the tarsal group of muscles on the right side all muscles gave the normal reaction to faradism.

This one group gave an indefinite Reaction of Regeneration.
Both legs and feet looked blue on hanging and became a little oedematous.

There was a condition of sclerosis in the facial region and of lumbosacral in the lumbosacral region and an admission patient was wearing a plaster cast so if possible correct this.

**Diagnosis:**
Polymyelitis Anterior Acuta.

**Treatment and Progress.**

Sept. 30th 1912.

Back splints applied as described and daily application of the Faradic battery & of massage.

**Sept. 30th 1912.**

Chryslamine gr. 1/60 hyps. daily.

Oct. 4th 1912.

The small toe of the left foot moved slightly.
Oct. 9th 1912.
The small toe on the one next to it moved.

Oct. 13th 1912.
The four small toes of the left foot could be moved.

Oct. 16th 1912.
All the toes of the left foot could be extended & flexed.

Oct. 26th 1912.
There was a slight attempt at dorsiflexion of the left foot in addition to movement of the toes.

Oct. 29th 1912.
All these movements were better performed.

Nov. 10th 1912.
Improvement of the left foot maintained but there was no change in the condition of the right foot & toes.
Nov 12th 1912.

Dorsiflexion of the left foot was well performed and there was slight dorsiflexion of the right foot but no movement of the right toes.

Nov 16th 1912.

For the first time the second and third toes of the right foot were moved.

Nov 19th 1912.

All the toes of the right foot were moved and dorsiflexion of both feet was well performed. The right foot however tended to invert owing to peroneal weakness.

Nov 28th 1912.

The patient was up for the first time and walked a little with support. The right foot dropped a little and was involved.
The stumps were still kept on during the resting period.

25. 29th 1912.

Patient again walked with support & stood erect unassisted.

26. 30th 1912.

Walking was much better performed. The patient stood without support and also walked a few paces unassisted but was very unsteady.

She cannot yet rise from the sitting position.

The left knee joint is fairly present and the right one more marked but sluggish.

Plantar reflexes are still bilaterally absent.

Dec. 11th 1912.

Patient now walks with the aid of a stick. Stumps are dispensed with. The right foot still tends to twist.
Dec. 13th 1912.

The patient now walks very well without the aid of a stick. The tendency of the right foot to invert is scarcely noticeable. There is free movement of both feet in all directions now and complete recovery is only a question of a little home & continued exercise.

It is now ten weeks roughly since she was admitted to this hospital and sixteen weeks since the onset of the paralysis.

Dec. 19th 1912. Cure

Patient walked out of hospital perfectly recovered and as it were viewing life through rose-coloured spectacles. On admission she was a child doomed by medical opinion to the life of a paralytic.
She left with this verdict refused and with the purpose of an active life before her instead of a mere existence.

In Summary one might draw attention to the following facts:

I

All three cases were of their kind bad cases and in some way there any movement of the affected feet or toes on admission.

II

Two of them I and III prior to the application of splints underwent in other hands a course of treatment long considered appropriate. In neither case could one perceive the slightest possible benefit from this treatment.
Both these cases informed by their previous medical advisers that cure was hopeless. Benefit sought recovered completely the power of walking unsupported.

And there is in my opinion absolutely no doubt in affirming that in these two cases as in the third benefit was due to the resting of weakened structures and the minimising of counteracting influences by the mechanical contrivance applied.

The spirits once on were not removed until all possibility of relapse had vanished. Recovery under their influence was rapid, progressive, and complete.

It might be worthy of mention that in all three cases the toes were the first to recover.
There are certain general facts to be deduced which might be worthy of mention:

(a) Damage to the nervous elements is not so severe as physical disability would seem to indicate.

(b) Recovery from such damage as exists is rapid and the tonic influence of an active muscle on a damaged nerve is a factor to which we have perhaps attached too little importance in the past.

(c) In no case of this description should an opinion based on a hopeless prognosis be advanced without thorough and patient examination and treatment.
(a) Pathological changes such as have been described have been often derived from investigations of cases which have been chronic for years and in which an initial destruction has been aggravated by the chronicity and consequent disease of damaged structures.

This disease has perhaps reacted on undamaged parts.

Thus we can conceive an atrophy of undamaged muscle fibres from want of use and similar changes in nerve cells and axons.

We can conceive that this may be aggravated by connective tissue replacement of damaged fibres involving healthy fibres just as a nerve may be invaded by involvement in callus.

This connective tissue contracting as it's work as time goes on would compress and destroy any healthy, involved fibres and a Post System examination after years would...
Thus seem to reveal a primary condition of destruction quite compatible with what our opinion based on physical disability might have led us to believe.

This idea is put forward very tentatively and is suggested by the rapidity and completeness of recovery following early and correct treatment.

In conclusion I may say that as the result of the effects produced in these three cases by this form of treatment my faith in it is firmly established.

The neurologist or practitioner who can approach a case of this description with confidence sufficient to guarantee benefit gains greatly.
Perhaps I have been fortunate in my cases. Cases vary greatly in degree of course but I think I am right when I say that these three were stringent tests of the efficacy of the method.

And I am confident that others doubtless employing the same or similar methods now are meeting with equal success.

Undoubtedly the greatest amount of recovery is to be expected from a rational treatment based on anatomical & physiological and pathological factors and such a treatment is embodied in that which I have just discussed.