AN ANALYSIS OF NINETY-THREE CASES
OF
WRITERS' CRAMP AND IMPAIRED
WRITING POWER;
MAKING, WITH SEVENTY-FIVE CASES PREVIOUSLY REPORTED,
A TOTAL OF ONE HUNDRED AND SIXTY-EIGHT
CASES.

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ON February 12th, 1878, I had the honour of communicating to this Society a paper containing an analysis of 75 cases of "Writers' Cramp and Impaired Writing Power."¹ I wish now to supplement that paper by communicating some of the details of 93 additional cases, making a total of 168.

For the purpose of reference, and to avoid confusion, the cases which form the basis of the present paper are numbered from 76 to 168.

My first series of cases was arranged in 6 groups, viz. :

1. Paralytic (6 cases).
2. Spasmodic (5 cases).
3. Degenerative (9 cases).

¹ 'Medico-Chirurgical Transactions,' vol. lxi.

4. Neuritic or neuralgic (20 cases).
5. Writers' cramp proper (31 cases).
6. Anomalous (4 cases).

With the present 93 cases certain changes in this classification are necessary.

Class 1 as then constituted is omitted, because with the exception of 2 cases of paresis from pressure on nerves the present series contains no case of definite nerve paralysis.

In Class 2 (spasmodic) 4 out of the 5 cases were consequent on cerebral lesion. These 4 will therefore be placed in the new paralytic (cerebral) group. Cases 16 and 17 clearly were cerebral, and so also was probably Case 75 (congenital left-handedness).

Nos. 73 and 74 (locomotor ataxy and general paralysis) will be placed in the degenerative group, and I shall omit No. 72.

Further, for the purposes of comparison I shall include groups 4 and 5 in the same class, which I shall speak of as the neuro-muscular groups.

Thus, by the omission of Nos. 1, 2, 3, 4, 5, 6, 11, and 72, there remain 67 of my previous series available for comparison with the present 93, and these 67 may be thus arranged :

1. Paralytic (cerebral), 7 cases.
2. Degenerative, 9 cases.
3. Neuro-muscular, 51 cases.

Adopting the classification for my present 93 cases I have :

1. Paralytic, 13 cases (10 cerebral).
2. Degenerative, 14 cases.
3. Neuro-muscular, 66 cases.

Paralytic group.—20 cases, of which 13 belong to the new series. Of these 13 cases No. 76 was possibly (?) due to lead-poisoning, and Nos. 77 and 86 were cases of paresis due to pressure on nerves ; 8 (78, 79, 80, 81, 82, 83, 84, 85) were cases of paresis due probably to long antecedent cerebral paralysis. None of them were coarsely

hemiplegic, and in all the evidence of previous cerebral paralysis had to be carefully searched for. An attack of hemiplegia, even though it be slight and occur no matter how early in life, always, I believe, leaves its mark. Patients are often said to "recover" from attacks of right hemiplegia and are able to follow their occupations without apparent difficulty. It is, however, in the performance of a delicate muscular act such as writing, which requires a maximum amount of steadiness and firmness, that the previous cerebral damage asserts itself. The writing is shaky or slowly executed, or executed with a certain sense of difficulty.

In elderly people who come complaining of writing with difficulty the evidence of slight hemiplegia must always be looked for. Persons also who state that "they have always had a difficulty in writing" must be examined carefully for evidence of hemiplegia, a trouble which is by no means uncommon in early life, but which, I believe, is often not suspected, because the movements of an infant are too little specialised to enable defects to be noticed.

When I speak of "hemiplegia," a term which it is convenient to use, it must be understood that I include under it such a condition as brachial monoplegia from cortical lesion.

Among the cerebral cases are included 3 of congenital left-handedness (1 in the previous paper and 2 in this), because I believe this defect to be due to lesion or anomaly of the left cerebral hemisphere. Of these cases (75, 87, 88) only one wrote with his left hand, which he did fluently, and gave a normal slope to his letters. He was left-handed for fine work (writing, playing flute, and violin) and right-handed for coarse work (hammer, knife, cricket). The left hand and foot were bigger than the right, and the left boot was the first to wear out. Both this patient and No. 87 had injured the left arm (dislocation of shoulder and fracture of arm) in early life, but this had not cured the left-handedness. In 87 the right clavicle was shorter than the left, a defect which was noted by

me in another case of left-handedness not included in this paper, and in whom there was excess of knee-jerk on the right side. In No. 83, who had presumably suffered from infantile hemiplegia, there was observed a faulty development of the right clavicle. Nos. 87 and 88 were left-handed in everything except writing, and it is, perhaps, to be regretted that they were not taught to write well with the left hand instead of badly with the right.

In 16 out of the 17 cerebral cases there was a general clumsiness in delicate acts other than writing. There was altered irritability of one or other of the muscles of the right hand in 6 cases.

Nerve tenderness was observed in 5 cases, and tremor in 5 cases.

Degenerative group.—23 cases, of which 9 (12, 13, 14, 15, 18, 19, 20, 73, 74) belong to the old series and 19 (89 to 102) to the new.

Of these 2 (12, 93) were apparently slight cases of *disseminated sclerosis*, 2 (89, 90) of *paralysis agitans*, 3 (73, 92, 102) of *posterior sclerosis*, 2 (94, 97) of *lateral sclerosis*, 5 (13, 15, 18, 19, 20) of *muscular atrophy and fibrillary tremor*, 1 (74) was a case of *general paralysis*, 1 (14) had marked tremor of right hand and foot, 1 (91) showed signs of emotional weakness, was colour blind, but had no change of the discs; 3 (96, 98, 101) had rheumatic thickenings of finger-joints or muscles; 1 (95) was gouty, and 2 (99, 100) were alcoholic.

Of these 23 cases 6 had diminution in the faradic irritability of certain muscles, 2 only had nerve tenderness, and in 14 tremor was a marked symptom. In 11 it was noted that there was difficulty in other acts than writing.

This and the preceding group embrace 23 cases. Thus rather more than a fourth of the total 168 cases have been referred by me to lesions of the nerve-centres.

Neuro-muscular group.—117 cases (51 in the old series, and 66 in the new).

This group is formed partly *per viam exclusionis*, i. e. by the exclusion of cases marked by symptoms which are

generally acknowledged to point to lesions of the nerve centres.

The most important objective symptoms observed in this group were (in addition to writing difficulty)—

(a) Tenderness of one or other of the nerves of the arm.

(b) Changed faradic irritability of muscles.

(c) Tremor.

The presence of nerve-tenderness is frequently recorded in my previous series, but it was not so systematically looked for as it has been in the cases of the present series.

My observations on cases of writing difficulty, extend over a period of sixteen years, and it must be remembered that in the earlier years I was not alive to the importance and frequency of nerve-tenderness as a symptom. I believe, however, that in all the cases of the present series nerve-tenderness has been searched for.

The discovery of nerve-tenderness requires care and method, and exact comparison of the relative tenderness of the corresponding nerves of either arm. The best method of procedure is, I believe, as follows :

The patient stands facing the observer with the arms bare ; he is then requested to *rest* his hands with the palms upwards on the shoulders of the observer ; the arms must *really rest* on the shoulders, and be without muscular effort of any kind. To test the tenderness of the median nerves, the observer must cross his hands, and, grasping the patient's elbows, exert pressure with the pulp of either thumb just to the inside of the biceps tendon. The pressure on either side is made simultaneously, and if one median nerve be more tender than the other, this becomes clearly manifest, indeed, in well-marked cases the patient will shriek out or writhe under a pressure on the one side, which causes him no discomfort on the other. I think there is no difficulty in arriving at a just conclusion as to the relative tenderness of the median nerves.

To test the musculo-spiral nerves the observer's hands need not be crossed. He must grasp the lower ends of

the arms, and exert pressure with the thumbs above the outer condyle of the humerus, close to the fold of the supinator longus. The ulnar nerves are best reached just above the olecranon.

As to the pathological significance of nerve-tenderness, I shall have something to say hereafter.

Out of the 66 cases (of the present series) which fall into the neuro-muscular group, there were 13 in which nerve tenderness existed apart from change of muscular irritability, 21 in which change of muscular irritability existed without nerve-tenderness, 32 in which these symptoms concurred.

The neuro-muscular group is thus divisible into three sub-groups.

SUB-GROUP A.—*Nerve-tenderness without change in muscular irritability* (13 cases).

In 12 the right median nerve was tender.

In 1 both medians were tender, in 1 all the nerve trunks were tender, in 1 the musculo-spiral and median were tender, and in 1 the nerve-tenderness was very doubtful.

Seven cases suffered from gout, rheumatism, dyspepsia, or alcoholism.

Four cases had tremor.

Three are noted as being crippled in acts other than writing.

The previous duration of the trouble in this group was relatively not long. In the 9 cases in which this fact is recorded these periods were, eighteen months, thirteen months, twelve months, nine months, six months, "two or three months," "some weeks," "a few weeks," one month.

SUB-GROUP B.—*Change of muscular irritability without nerve-tenderness (21 cases).*

By change in muscular irritability is meant merely a change in the irritability to faradism, tested by a comparison of the effects of equal currents applied to corresponding muscles in either hand or arm.

The hands are placed symmetrically and at absolute rest (usually hanging over the back of a chair). One rheophore is then fixed to the nape of the neck, while the other (a rheophore of small surface) is applied delicately to the muscles which it is wished to test. Having determined the least strength of current which will cause the contraction of a muscle (and I usually begin with the first dorsal interosseous) on the left (and presumably healthy) side, the same current is then applied to the corresponding muscle on the right side, and any difference in the effect is noted. When it is stated that the muscular irritability is depressed or heightened it means that the muscle responds to the current less readily or more readily than the same muscle on the left side.

To detect the differences requires some care but not more care than is required to detect the alterations of tone observed in the eye-muscles in severe cases of diplopia.

Each of these 21 cases had muscles manifesting a decrease of irritability. In 3 there were muscles manifesting an increase of irritability alongside of others which showed a deficiency.

The first right dorsal interosseous (1st R. D. I.) was affected thirteen times.

The abductor and opponens pollicis eight times.

The second right dorsal interosseous six times.

The fourth right dorsal interosseous and flexor longus pollicis were affected twice, the third dorsal and fourth palmar interosseous each once, and the extensors of the thumb and small muscles of the little finger each once.

In 8 cases there was trouble (pain, enlargement, creaking) in one or other of the joints, and in a ninth there was a family history of rheumatic gout.

In 11 cases there was tremor.

Four are noted as being crippled in acts other than writing.

In 18 cases the previous duration was noted, and it will be observed that it is longer than in the previous group in which no change in muscular irritability was detected. Thus we have recorded periods of fifteen years, thirteen years, "many years," "some years," "years," six years, six years, three years, three years, fourteen months, "some months," one year, "a few months," four months, two months, two months, one month.

SUB-GROUP C.—*Nerve-tenderness and change of muscular irritability combined* (32 cases).

Nerve-tenderness occurred in the median only in 28 cases, the ulnar only in 2 cases, and in the median and musculo-spiral combined in 2 cases.

As regards muscular irritability, decrease only occurred in 20 cases, increase only in 8, and a combination of the two conditions in 4.

As regards the muscles affected we have:

The first right dorsal interosseous, affected nineteen times.

Other interossei seven times.

Abductor and opponens pollicis seven times.

Extensors of thumb four times.

Flexor brevis pollicis three times.

Flexor longus pollicis twice.

All the muscles of the hand three times, and supinator longus, supinator brevis, serratus magnus, and pectoralis major each once.

In 2 cases there was a history of sprain of the wrist

(153, 162), and one (140) had had his right hand smashed in a mangle twelve years previously.

Creaking of the right shoulder occurred in 3 cases, 9 are noted as being dyspeptic, gouty, or alcoholic.

Tremor was noted in 18 cases.

In 11 cases there was disability in acts other than writing.

The previous duration was for the most part considerable, in only 3 cases was it less than a year. In the whole 66 cases of the neuro-muscular group the previous duration was less than a year in 11, or 16.6 per cent.

In sub-group A the previous duration was less than a year in 6, or 46 per cent.

In sub-group B the previous duration was less than a year in 5, or nearly 24 per cent., and

In sub-group C the previous duration was under a year in 3, or 9.4 per cent.

It is dangerous to form conclusions on averages of small numbers, but these figures point in the direction that some time is, as a rule, necessary for the production of change in muscular irritability.

In the whole series of cases in both papers we find that of the muscles whose irritability was found altered:

The interossei were affected seventy-nine times.

Abductor and opponens pollicis twenty-eight times.

Extensors of thumb twenty-three times.

Flexors of thumb thirty-two times.

Muscles of little finger nine.

And other muscles only rarely and exceptionally.

In the present series of 93 cases nerve-tenderness (N. T.) was noted fifty times, and in the subjoined table its distribution in the groups and its association or otherwise with altered muscular irritability (A. M. I.) is shown.

	N. T. only.	A. M. I. only.	N. T. + A. M. I.	Neither N. T. nor A. M. I.
Paralytic (13 cases) . . .	4	4	1	4
Degenerative (14 cases) . . .	0	3	0	11
Neuro-muscular (66 cases) . . .	13	21	32	0
Total cases (93) . . .	17	28	33	15

Of the 50 cases in which nerve-tenderness was noted it is to be observed that in all but 8 it occurred in the *median nerve*. I wish to call particular attention to the fact that the *muscles* in which change of irritability has been most frequently noted (the *interossei*) are supplied by the *ulnar nerve*.

What is the pathological significance of altered muscular irritability?

We have seen it occurring in every group, cerebral, degenerative, and neuro-muscular, so that it has no absolute value for localising the writing trouble in the brain, cord, nerve, or muscle.

It is probable due to some change in the muscle or intra-muscular nerves, and it seems probable also that such change may be primary or secondary to a lesion in brain, cord, or nerve.

This paper is strongly confirmatory of the fact pointed out in the previous paper that depressed muscular irritability in cases of "writers' cramp" is observed more often in the muscles of *pen-prehension* than in those of *pen-movement*, *i. e.* in muscles which are subjected to very prolonged contraction and therefore very liable to get over-fatigued.

It is possible that fatigue in a muscle is produced with undue readiness when the voluntary motor stimulus is impeded at any point. The man with cerebral paresis is very conscious of muscular effort when he tries to write, and the same is true of patients in whom the conducting power of the nerves is interrupted by inflammation, congestion, or pressure.

Case 77 is very instructive on this point. It was that of a boy, aged twelve, in whom a congenital fracture of the clavicle had caused pressure on the brachial plexus. The case was brought before the Clinical Society by Mr. Barker. The boy had peculiar trouble in writing, so that the case had been spoken of as one of writers' cramp. In this case there was very slight but quite obvious wasting (or non-development) of the pectoralis major, and

the muscles of the right arm and hand. The electric irritability was, however, normal in all the muscles except the first right dorsal interosseous, in which the irritability was depressed. The patient was a lad of unusual intelligence, and had worked hard at his writing lessons, which caused him fatigue and pain. It would seem as though the pressure on the plexus had necessitated increased effort, and had predisposed to the fatigue of the muscles of prehension and the lessening of the electric irritability in at least one of them, and that probably the most important. The pressure on the nerves of the brachial plexus was relieved by operation, and some weeks later I saw the boy writing without difficulty, and I found on examination that the depressed irritability of the first right dorsal interosseous no longer existed. It must be remembered that not only had the pressure been removed but the boy had had a prolonged period of rest.

Occasionally the irritability of one or more muscles has been found exalted. The reason of this is doubtful. Occasionally I have found a muscle *supplied by a tender nerve* manifesting exalted irritability, but this is by no means invariable. I feel sure that the practice of massage increases the irritability of muscles.

It must be remembered that change in the irritability is judged by no fixed standard but only by comparison with the opposite limb, so that we are always liable to the fallacy that a relative change may not really mean an absolute change from the physiological normal. For example, when we find the right first dorsal interosseous more irritable than the left, this fact may really be due to an abnormal depression in the irritability of the left first dorsal interosseous.

It must be remembered also that a muscle which manifests excess of irritability is not necessarily more efficient than the corresponding muscle of the opposite limb. Some authors have spoken of a condition of "irritable weakness," a condition which is probably a fact. Not only have the muscles shown great differences in their

readiness to respond to equal electric currents, but their mode of contraction has often been obviously different to the eye ; the muscle, which is presumably healthy, contracting forcibly and moving its point of insertion vigorously, while the muscle which shows deficiency of irritability contracts in a hesitating, jerky, and unsatisfactory manner.

The feeling of contraction (under electric stimulation) is often very different on the two sides, at least this is what patients say ; but the fact has not been systematically recorded because of the great difficulty of making a satisfactory record of such a fact.

For the same reason the record of cutaneous sensibility has not been systematically made although, to judge from expressions used by patients, change has frequently been present.

What is the pathological significance of nerve-tenderness ? It is recorded fifty times in the present series of 93 cases, viz. forty-five times in the neuro-muscular group, five times in the paralytic group, and not at all in the degenerative group. The conditions under which nerve-tenderness occurs are very varied.

It is oftenest and best observed in neuralgia of the fifth nerve. Whether the neuralgia be definitely due to central change or peripheral irritation or constitutional cause we often find every accessible branch of the nerve more or less tender on pressure, and the tenderness, marked during a paroxysm, is absent or scarcely noticeable in the intervals between the attacks.

In paralysis of the facial from exposure to cold, we usually find the trunk of this purely motor nerve more or less tender at its point of emergence from the stylo-mastoid foramen.

In "sciatica" every accessible branch of the nerve is often tender, and even when the sciatica is due to intra-pelvic irritation we find tenderness of the ultimate branches, notwithstanding that the source of trouble may be nearly a yard distant from some of the tender twigs.

I have noticed great nerve-tenderness in cases of lead palsy and in cases of muscular atrophy, but without any other evidence of neuritis.

In true neuritis of a mixed nerve we find not only nerve-tenderness, but changes in sensibility, neuralgia, causalgia, trophic change, muscle wasting, and often distinct evidence of swelling of the nerve involved.

In chronic rheumatic conditions and in gout the nerve-trunks are often tender, and this without any good evidence that they are irritated by thickenings or bony out-growths.

Nerve-tenderness may certainly be produced by excessive muscular exertion. I have seen such a condition in laundresses, who state that they have strained the arm from wringing clothes, and also in men who have made excessive muscular effort, and notably in one gentleman whose musculo-spiral nerve had become excessively tender from prolonged use of a heavy fishing-rod.

In some of my cases the nerve-tenderness was associated with dyspepsia and alcoholism.

Mr. Barker's case (No. 77) may be again alluded to. In this patient all the nerve-trunks of the arm were very tender before the removal of the pressure on the brachial plexus, but after the successful operation this tenderness quickly disappeared.

From this résumé it appears, therefore, that nerve-tenderness may, in regard to its cause, be

1. Functional (neuralgia).
2. Central.
3. Peripheral.
4. Due to cold.
5. Due to rheumatism.
6. Due to inflammation (neuritis).
7. Due to muscular exertion.
8. Toxic (lead, alcohol, gout).

In my case of impaired writing power the median nerve has most often been found to be tender. Muscular failure is most often evident in the muscles of pen-prehension and

notably in the interossei. When these small muscles of pen-prehension fail, bigger muscles (such as the superficial and deep flexor of the fingers and the long flexor of the thumb) take their place, and I believe that the tenderness of the median nerve is dependent upon the over-use of these (median) muscles.

In the early days of these cases it is possible that one or more of the deep branches of the ulnar nerve may have been tender in association with over-use of ulnar muscles, but this, of course, is only a surmise.

No thickening of any nerve-trunk was detected in these cases.

Trophic lesions were not common. In No. 77 (Mr. Barker's case) the nails of the affected arm grew slowly. No. 78 was troubled by coldness and blueness of the hand. No. 102 had a congenital brown mark on the inner side of the right arm. No. 128 had pitting of the right finger-nails. No. 130 had a crop of moles on the right arm and a lichenous rash on the right forearm. No. 144 had brittleness and furrowing of the right thumb-nail, and No. 149 had throbbing of the thumb after writing.

"Gout," "rheumatism," and creaking and thickening of joints were tolerably common.

Tremor was a very common symptom and is recorded in 87 out of the total of 168 cases. It is a symptom of varied significance and appears to be liable to occur with defects at any part of the motor path.

In some few instances the tremor was of very limited extent. No. 121 had tremor of the thumb only, accompanied by slight wasting of the abductor and opponens pollicis. No. 122 had tremor of the middle finger only. No. 150 had tremor of the far-phalanx of the thumb only, and in this case there was deficient irritability of the extensors of the thumb as well as of the abductor and opponens. No. 160 had tremor of the thumb from a similar cause.

Tremor of limited area may thus point to the fact that

the muscles moving the joints about which the tremor occurs are especially affected.

Obvious spasm was rare. No. 82 had slight athetotic movements, but, as a rule, it was hardly possible to say, from merely watching the act of writing, why the writing failed.

There were some exceptions to this rule, however, and these were instructive.

No 76 suffered from extreme flexion of the far-phalanx of the thumb, associated with paralysis of the extensor of that phalanx.

No. 117 suffered from a collapsing of the phalangeal joint of the thumb and rotation towards the index, associated with weakness of the extensor primi internodii and abductor and opponens.

No. 127 (like 76) suffered from flexion of the far-phalanx of the thumb associated with weakness of the extensor. Nos. 140 and 144 were very similar cases.

In Nos. 129, 131, 139, and 140 there was inability to keep the forefinger on the pen, associated with weakness of the first right dorsal interosseous.

No. 156 did not use his thumb while writing, and in this case there was weakness of the flexor brevis pollicis and tremor of the thumb.

In No. 163 the phalangeal joint of the thumb collapsed, and it was noticed that faradisation of the flexor longus pollicis caused tremor of the thumb.

When writing is made impossible by some decided and recurring spasmodic action, we may expect to find either *deficient* irritability in the muscles which normally antagonise, or *excess* of irritability in the muscles which normally produce such movement.

The examination of the ninety-three cases comprised in the present paper tends to confirm the statements put forward in the previous paper.

The most important change has been the suppression of what in the previous paper was called the group of "true writers' cramp" and its amalgamation with the neuritic

group to form the new neuro-muscular group with its three subdivisions.

This is a distinct gain as constituting a step towards a *pathological* as opposed to a *symptomatic* nomenclature. Impaired writing power or "writers' cramp" is but a symptom, and our object must be to refer every case of impaired writing power to its proximate cause.

More than a quarter of my total cases of impaired writing power have been due apparently to recognised morbid states of the brain and spinal cord, and it must be borne in mind that the act of writing, an act which requires at once so much delicacy and firmness, would certainly afford evidence of slight changes in the nerve-centres, of changes so slight as not to be likely to materially interfere with the performance of coarser and less sustained muscular exercises.

Every case of so-called "writers' cramp" requires a very careful and prolonged examination, for my experience tends to show that hardly any two cases resemble each other in all particulars. By methodical examination we must first exclude all recognised morbid states of the nerve-centres or nerves, joints, ligaments, and muscles. The results of our examination having been to this end negative, we find nothing objectively wrong except altered muscular irritability, nerve-tenderness, or tremor; but it must be observed that I have never failed to find one or more of these conditions present. These conditions must indicate some pathological change, although we may be in great doubt as to the precise nature of this change.

In my previous paper I spoke of the condition as "chronic fatigue," and I see no reason why this name should not be maintained.

Dr. Augustus Waller, in his very able investigations into the process of fatigue, reported in the 'British Medical Journal' for July 17th, 1886, states that a fatigued muscle is (a) less excitable, (b) shortens less, and (c) can do less work. In my clinical investigation I have shown that in cases of impaired writing power certain muscles have been

found manifesting these three conditions, and that the affected muscles are precisely those upon which the prolonged strain of the act has mainly fallen. Dr. Waller has shown that in fatigue induced by over-stimulation of a nerve, at death, and after nerve section, it is at the motor end-plate (the junction between nerve and muscle) that conduction is first interrupted. Dr. Reid, working with Dr. Waller, has shown that when stimulation takes place from the brain, failure of conduction occurs first in the cord where the ganglionic cell forms a junction between the fibre of the pyramidal tract and the fibre of the anterior nerve-root.

Dr. Waller has also found that muscle, the nerves of which have degenerated, is more rapidly exhausted than normal muscle, a statement which finds some clinical confirmation at p. 310 of this paper, where I stated that "it is possible that fatigue in a muscle is produced with undue readiness when the voluntary motor stimulus is impeded at any point." This is because, as is well known, when a block occurs in the motor path, degeneration of the nerve takes place in the parts beyond the obstruction.

Finally, a few words may be added as to the treatment of conditions of impaired writing power.

Clearly to talk of "a cure for writers' cramp" is about as rational as to talk of a cure for lameness. The first step towards treatment is diagnosis.

It seems needless to insist on the necessity of rest, or to enter at all fully into methods of treatment discussed in my previous paper.

It is necessary to state that the great majority of the patients whose cases are recorded in the present paper were seen by me only once or twice, so that where no record is made of the result of treatment it must be inferred that the result is not known.

The results, where known, were as follows :

No. 76 (possibly due to lead) is reported as "improved somewhat after a ten weeks' use of the galvanic current."

No. 77 was completely cured by Mr. Barker, who removed the pressure on the brachial plexus.

Not much improvement was to be expected in Cases 78—97, in which the trouble was presumably central.

No. 98, a rheumatic clerk, æt. 39, with marked tenderness over the cervico-dorsal vertebræ, completely recovered after blistering the tender vertebræ and the administration of saline purgatives with iodide of potassium.

No. 99, who had been told that he was suffering from "writers' cramp," "a disease of the spinal cord," was treated for alcoholic dyspepsia and completely recovered.

No. 101, who had rheumatic finger-joints, was relieved by blistering certain tender points in the hand, and cured, at least for a time, by massage.

No. 107 completely recovered after blistering the tender nerves, undergoing massage, and taking a tonic.

No. 109 completely recovered after giving up alcohol and taking a holiday.

No. 110 completely recovered after a course of saline purgatives and a holiday.

No. 113 was completely cured by wearing a piece of capsicum plaster over his tender median nerve.

No. 114 was completely cured by saline purgatives.

No. 115 (with no objective symptoms) was completely cured by massage.

No. 119, whom I saw in October last, and for whom massage was prescribed, is, I hear, no better. He has wasting of the right dorsal interosseous muscle.

No. 120 (a dyspeptic and rheumatic clerk) was improved by wearing a capsicum plaster over the shoulder, massage, arseniate of iron, and a dinner pill.

Nos. 121, 122, and 123 derived no benefit from massage. (The previous duration of these three cases was six years, thirteen years, and "years.")

No. 126 was much improved by massage.

No. 143 was cured by blistering the tender nerve and massage.

No. 146 had derived no benefit from massage (his

nerves were exquisitely tender when I saw him, and he was gouty).

No. 149 found massage of no use.

No. 158 (a rheumatic secretary) was much improved by a course of hot baths, blistering the tender median nerve, and taking Donovan's solution.

No. 159 was much improved by blistering the median nerve and massage, which caused marked increase in the size of the arm.

No. 162 was much improved by blistering the median nerve and regulating the bowels.

Nos. 163 and 167 were much improved by similar measures.

No. 168 was much improved by blistering the median nerve and using the galvanic current.

As shown in the above record, the methods of treatment which met with a fair measure of success were directed :

1. To the improvement of the general health by diet, regulation of the bowels and the administration of tonics and alteratives (especially arsenic).

2. To applying counter-irritants over painful nerve-trunks wherever they were to be found.

3. To promoting the circulation and nutrition in the affected limb by means of massage, hot baths, and the electric current.

It is probable that the mode of action of massage is similar to that of the galvanic current.

It will be remembered that I have previously recorded a few cases in which the persistent use of galvanism was productive of great benefit. I have now to record several others in which the employment of massage proved very serviceable. At the same time it must be borne in mind that the paper contains the record of six cases in which massage was of no use.

I think I may state conclusively that massage is not useful so long as the nerve-trunks are tender. Indeed, in one or two cases I have seen patients with markedly

tender nerves made worse by massage. The tenderness of the nerves must first be subdued by blistering before massage is commenced.

With regard to massage, I have come to the conclusion that a great mystery is made of it without cause. Doubtless it is an art which requires strength, practice, patience, and common sense. I have employed three or four masseurs and with good results.

No mechanical contrivances for throwing the strain of writing on to a new set of muscles is in any sense curative, although this may prove of service in enabling a certain small amount of writing to be done.

In the employment of type writers only such are to be recommended as are worked by a key-board. Those which involve the permanent grasping of a handle are often very fatiguing.

For details of cases see Appendix.

(For report of the discussion on this paper, see 'Proceedings of the Royal Medical and Chirurgical Society,' New Series, vol. ii, p. 250.)

APPENDIX.

*Tabulated details of the 93 cases specially dealt with in
the preceding paper.*

GROUP 1.—

No.	Name, age, sex, occupa- tion.	Date.	Previous duration.	Loss of function other than writing.	Muscles.					Tremor.	Pain.
					Which affected.	Para- lysis.	Spasm	Wast- ing.	Electric irritability.		
76	H. W., 47, M., Manager	4/3/80	4 or 5 years	Buttoning, carrying a bag	R. & L. ext. sec. in- ternod. poll. R. & L. ext. ossis metacarpi. R. & L. primi inter- nod. }	...	...	...	No response Very defective	Slight, of both hands	...
77	F. Q., 12, M.	-8/85	Congenital	All acts, slightly	R. pectoralis major. Muscles of ball of R. thumb. All muscles of R. arm. 1st R. D. I.	...	...	Slight Slight Slight	... Normal Defective	...	...
78	W. W., 35, M., Butcher	18/3/78	1 year	All acts, both coarse and delicate	?	?	No	No	Normal	R. hand	No
79	H. H., 58, M., Cashier	20/4/83	6 months	All delicate acts	...	...	...	...	...	...	...
80	F. S., 23, M.	23/9/83	5 years	All fine acts	...	...	...	...	...	R. hand	...
81	D. L., 12, M.	15/8/82	Congenital	General clumsiness	...	...	...	...	...	...	...
82	C. A. P., M., Clerk	16/10/81	A year	All fine acts	...	...	...	...	...	...	...
83	C. S. V., 21, M., Student	23/1/84	?	...	...	...	...	...	...	...	...
84	— R., 60, F.	8/5/85	...	All actions with R. hand	...	...	...	...	...	...	...
85	C. J. C., F., 46	22/9/86	10 months	Cannot crochet	...	...	...	...	...	R. hand, slight	...
86	R. T., 27, M., Clerk	24/4/84	Since childhood	...	R. abd. and opp. poll. R. flex. brev. poll. R. abd. and flex. brev. min. digit. 1st and 2nd R. D. I.	...	...	...	Defective Defective Defective	R. hand	...
87	G. A. B., 21, M., Medical student	23/5/79	Always	...	...	...	...	...	Some excess ...	...	...
88	R. A., 44, M.	31/3/82	2 years	Lifting tea-cup to lips	R. flexor brev. poll.	...	...	...	Defective	...	...

Paralytic (13 cases).

Nerve-tenderness.	Joint trouble.	Trophic change.	Supposed cause.	
None	...	...	?	Seen with Mr. Pye-Smith, of Sheffield. No lead line, but possibly due to lead poisoning. Holds pen with fore phalanx of thumb flexed at right angles, and the lead pencil is marked with notches made by the R. thumb-nail. On faradising the extensors of thumb the metacarpal bone and near phalanx are extended, and the fore phalanx strongly flexed, and at the same time there is quivering of 1st R. D. I. Improved somewhat after 10 weeks' use of galvanic current.
R. median. R. ulnar. R. musculo-spiral	...	Nails of left hand grow faster than those of right	Congenital fracture of clavicle causing pressure on R. brachial plexus	Mr. Barker's case (see 'Clin. Soc. Trans.,' 1886). The boy was operated upon. Within a few months he could write perfectly (the handwriting having previously been tremulous, and accomplished only by effort), the tenderness of nerve-trunks had disappeared, and loss of irritability of R. D. I. had disappeared also.
None	None	R. hand easily gets cold and blue	...	Has not been well since having smallpox seven years ago. Slight contracture (hemiplegic?) of right hand. Phalangeal joint of thumb collapses when he tries to write. Numbness of right radial region of hand. Tenderness over 3rd dorsal vertebra. Suffers from headache and depression. A sexual hypochondriac.
...	...	...	...	Hand constantly tends to flex. Voluntary interosseal movement very defective. Probably hemiplegic. Grasps pen very tightly.
R. median, slight	...	...	...	Tongue furred. Systolic basic murmur.
...	...	...	...	Clumsiness of right hand. Due to congenital right hemiplegia.
R. median	...	...	...	Always clumsy at fine hand-work as a schoolboy. Tongue deviates to right. Slight contracture of right flexor tendons. Slight athetotic movements of right hand when extended. Heart normal. No history of fits. Had scarlet fever eight years ago.
R. median	...	...	Infantile hemiplegia? blow on left temple? over-work	Severe illness as a baby. Faulty development of right upper limb. Right shoulder droops. Right clavicle $\frac{1}{2}$ " shorter than left. Right hand smaller than left. Right hand perspires when he writes, and electric sensibility is less in right than left hand, although irritability is equal at the two sides. Three years ago fell from his bicycle, struck his left temporal region, concussed his brain, and suffered from loss of memory for some months. Lately has been working (and writing) hard for an examination.
...	...	...	...	Drags right foot a little. Pain on left side of head. Hemiplegic.
R. median, R. musculo-spiral	...	...	...	Has been in India. Gouty history. Knee-jerk better marked on left side than right side. Holds pen very tight, and moves whole arm for stroke-making. Hemiplegic?
None	...	...	...	Some wasting, right pectoralis major. Hip disease as a child. Used crutches till he was 13. Now walks with a crutch-handled stick, which has caused bruising and subcuticular hemorrhage on ulnar side of palm. Has a dread of writing in public. Cannot oppose right thumb to base of little finger without effort.
...	...	...	...	A left-handed man, strong, athletic, over 6 feet high. Measures from mid-sternum to tip of left coracoid process $8\frac{1}{2}$ ", to tip of right coracoid process $7\frac{1}{2}$ ". Left hand round base of fingers $8\frac{1}{2}$ ", right hand $8\frac{1}{2}$ ". Formerly a clerk, but gave it up because of writing difficulty. Has special difficulty with up-strokes, and always makes a six by means of two curved down-strokes, (, . Broke his left arm when a boy, <i>æt.</i> 5. A left-handed bowler and "right-handed bat" at cricket. The 1st and 2nd R. D. I. are more irritable than 1st and 2nd L. D. I.
...	...	...	...	Left-handed, even for billiards. Left forearm measures in circumference $\frac{1}{2}$ " more than right forearm. Often hears a "click" on outer side of right forearm. Slopes his letters the wrong way, \.

GROUP 2.—

No.	Name, age, sex, occupation.	Date.	Previous duration.	Loss of function other than writing.	Muscles.					Tremor.	Pain.
					Which affected.	Para-lysis.	Spasm.	Wasting.	Electric irritability.		
89	M., 71 M., Colonel	29/12/81	?	...	...	...	...	...	...	Both hands	...
90	J. T., 67 M., G. T., 45, M., Ware- houseman	30/5/82	?	...	...	...	...	...	...	R. arm, R. leg Both hands	...
91	P. W., 55, M., Business manager	13/9/82	27 years	...	...	...	...	...	...	Both hands	...
92	J. B., 46, M., Banker	24/5/83	"Some years"	Playing billiards	1st and 2nd R. D. I.	...	...	...	Lessened	R. hand	...
93	...	8/12/85	...	...	...	...	...	...	...	Both hands	...
94	P. L., 33, M.	4/7/85	...	...	...	...	...	...	...	...	...
95	T. I., 56, M., Manu- facturer	...	...	...	...	...	...	...	...	...	...
96	Mrs. S., 28, F.	26/4/82	?	Holding anything with finger and thumb All prolonged acts	1st R. D. I.	...	...	...	Very deficient	None	Yes
97	W. B., 46, M., Clerk	1882	3 months	...	...	...	...	...	...	Both hands	...
98	F. E., 39, M., Clerk	7/6/79	?	...	...	...	...	...	...	None	After writing
99	A. D., 35, M., Banker	20/5/81	...	...	...	...	...	...	...	...	...
100	H. H., 33, M., Ne'er-do- weel	24/9/78	Many years	?	...	...	...	...	...	Marked of both hands	No
101	Lady L., F., 50	1884	...	All acts with the hand ?	...	...	...	...	...	...	Yes
102	T. G., 42, M., Clerk	21/10/86	2 years	?	R. abd. and opp. poll.	...	...	...	Defective?	R. hand slight	In knees (fulgurant?)

Degenerative (14 cases).

Nerve-tenderness.	Joint trouble.	Trophic change.	Supposed cause.	
...	...	...	...	Very gradual onset; due to senile tremor.
...	...	...	...	Paralysis agitans, which has been coming on for years. Optic discs small and white.
None	...	...	...	Colour-blind, very emotional, cries easily, temperate, optic discs normal.
None	...	...	...	Tongue foul; gouty; knee-jerk lessened. Occasional diplopia and lightning pains. Case of posterior sclerosis?
None	...	...	Overwork, worry	An old injury of left median nerve has caused wasting of muscles of ball of left thumb which renders comparison of electric irritability of no value. Optic discs are greyish in colour. Doubtful pre-systolic murmur. Father died, æt. 45, of paralysis. Is pale. Grasps pen very tightly, and the pen slips between index and mid-finger.
...	...	...	...	Difficulty in writing following a fall from his horse. When seen he was paraplegic with all the signs of lateral sclerosis affecting the right arm as well as the legs to some extent.
...	...	...	...	Gouty; writing difficult, caused by slight contraction of the palmar fascia.
No	R. 1st metacarpophalangeal	...	...	Pain over 1st R. D. I. when she holds anything. The right thumb creaks when flexed. Whole arm aches. The 1st R. D. I. is tender to touch, and a deep-seated thickened band can be felt in it. Ordered blister and mercurial ointment to rub in. Result?
None	...	...	...	Tremor of tongue; excessive knee-jerk on right side. For some months he has noticed that dipping the hands into cold water causes an immediate desire to evacuate the bowels. This does not occur with hot water, nor when the feet are dipped into cold or hot water.
None	Hips, shoulders, wrists, fingers	...	...	Rheumatic. Has had lumbago and muscular rheumatism. Tenderness over cervico-dorsal vertebræ. Writes well enough except for the pain. Completely cured by a blister over the tender vertebræ with saline purgatives and iodide of potassium.
...	...	...	Drink	Had been told he was suffering from "writers' cramp and disease of the spinal cord." Was treated for alcoholic dyspepsia and completely recovered.
...	Finger-joints often "crack" after writing	...	Drink	Gouty dyspepsia. Father a drunkard; mother nervous.
...	Finger-joints thickened	...	...	Rheumatic or gouty? Tender points between metacarpal bones. Her condition fluctuated, but she was much relieved by massage.
None	None	Congenital brown mark on inner side of R. arm	Writing?	Right side of chest smaller than left. Knee-jerk absent on both sides. Pale; has lost flesh rapidly. Memory impaired. Optic discs a dead white in centre. Has had much domestic worry. Separated from his wife.

GROUP 3.—*Neuro-muscular.* SUB-GROUP A.—*Nerve-*

No.	Name, age, sex, occupation.	Date.	Previous duration.	Loss of function other than writing.	Muscles.					Tremor.	Pain.
					Which affected.	Para-lysis.	Spasm.	Wasting.	Electric irritability.		
103	J. V. C., 30, M., Clerk	9/2/86	13 months	?	...	...	...	...	Normal	Both hands R. hand	...
104	W. H., 26, M., Clerk	28/4/86	18 months	...	...	...	...	...	?		...
105	S. P., F., 41	9/8/86	1 year	?	?	...	...	...	...	...	...
106	Miss W., F.	2 ^d /12/81	...	...	...	...	...	...	...	...	...
107	Miss B., F., 24, Artist	7/11/82	...	Delicate drawing and all work with R. hand All acts with R. arm All acts requiring steadiness	...	...	...	...	...	...	R. arm
108	Mrs. H. W., F., 38, Journalist	16/4/83	...		...	...	...	...	...	...	...
109	W. B. O., 38, M., Govt. clerk	9/5/78	?		...	...	...	...	...	R. hand	...
110	P. B. A., 33, M., Barrister	17/6/78	A few weeks		...	...	...	...	...	...	R. shoulder and arm after writing
111	B. A., F., 38	10/4/84	6 months	...	...	...	...	...	...	R. hand	...
112	A. P. S., 32, M., Clerk	5/12/84	2 or 3 months	...	...	...	...	...	...	None	...
113	A. C., Major	-/11/83	Some weeks	...	...	...	...	...	...	...	...
114	M. O., 64, M., M. D.	16/9/85	1 month	...	...	...	...	...	...	...	...
115	W. L., 31, M., Merchant	24/11/83	9 months	...	...	...	...	...	...	...	...

GROUP 3.—*Neuro-muscular.* SUB-GROUP B.—*Altered*

116	J. H. A., 32, M., Solicitor and banker	6/6/83	2 months	...	1st R. D. I.	...	...	...	Defective	...	...
117	McN., 60, M., Captain	4/8/83	14 months	...	R. abductor opp. poll.	...	...	...	Very defective	...	...
118	A. E. C., 27, M., Clerk	28/10/83	1 year	...	R. ext. primi inter. nod. poll.	...	...	...	Very defective	None	...
119	J. R., 37, M., Secretary	16/10/86	4 months	...	1st and 2nd R. D. I.	...	...	...	Very defective	None	...
120	T. C. K., 35, M., Clerk	2/9/84	15 years	...	R. flex. long poll.	...	...	...	Very defective	None	...
					1st R. D. I.	...	...	Slight	Diminished	Both hands	Shoulder Triceps Arms
									Very defective		

tenderness without altered muscular irritability (13 cases).

Nerve-tenderness	Joint trouble.	Trophic change.	Supposed cause.	
R. median	...	...	Writing	No marked difference of electric irritability. To wear capsicum plaster over tender nerves. To take arsenic.
R. median	...	...	Writing	Was practising shorthand when difficulty commenced. The hand gets "cramped." The nerve is exquisitely tender. Ordered blister to median.
R. median	...	...	...	Dyspeptic. Liable to attacks of "dumb hysteria." Father suffers from writing trouble. A sister liable to attacks of hemiplegia, which last 4 or 5 days.
R. median ?	...	...	...	No objective change anywhere. Says she writes with difficulty, but writing is good. Has suffered from "nervous exhaustion." Has had rheumatism. Some very doubtful tenderness of right median nerve.
R. median very tender	...	...	...	Some dyspepsia. Blister to tender nerve. Massage. Iron and quinine. Recovery complete. Has a sister who suffers in the same way.
All nerve-trunks of R. arm	...	...	...	Works hard "in society." Ordered blister, warm douche, &c. Result?
R. median	...	...	Drink	Drinks too much. A brother died of general paralysis. Optic discs normal. Recovered completely after giving up alcohol and taking a holiday.
R. median	...	...	Sedentary occupation	Uric acid in urine. Liver enlarged. Recovery complete after a course of saline purgatives and a holiday.
R. median, R. musculo-spiral	...	...	...	Leucorrhœa, constipation, dyspepsia. Gouty? Blisters ordered for tender nerve-trunks.
Both medians	...	...	...	The hands get "cramped" after writing a few words. Very thin; liable to spasmodic asthma. Spots of eczema about body. Tongue clean. Urine normal. Family history negative.
R. median	...	...	...	Military secretary. Capsicum plaster worn over tender nerve completely cured him.
R. median	R. shoulder	...	...	Foul tongue. Rheumatic. Shoulder-joint creaks. Completely cured by saline purgatives.
?	...	...	...	No objective symptoms. Has been writing a book. Completely cured by massage.

muscular irritability without nerve-tenderness (21 cases).

None	...	...	Lifting heavy weight and worry	A family tendency to "rheumatic fever."
...	R. phalangeal of thumb	...	...	Sudden onset with swelling of thumb and creaking of the joint. The phalangeal joint of thumb forms a re-entrant angle when writing and rolls towards index finger. Veins of both arms are big, but no evidence of pressure in mediastinum or elsewhere.
None	R. carpus	...	...	Sudden onset. There is a nodular swelling just above the wrist-joint. Patient states that "ten years ago a bone used to come out in the situation of the present swelling." Has worn a strap round the wrist ever since. A strong muscular man.
None	...	...	...	General health perfect. To have hand and arm shampooed.
...	R. shoulder	...	...	Writing painful. Dyspeptic. Always better in cold crisp weather than in warm damp weather. Much improved by wearing a capsicum plaster over shoulder, massage, arseniate of iron and a dinner pill.

328 WRITERS' CRAMP AND IMPAIRED WRITING POWER.

No.	Name, age, sex, occupation.	Date.	Previous duration.	Loss of function other than writing.	Muscles.					Tremor.	Pain.
					Which affected.	Para-lysis.	Spasm.	Wast-ing.	Electric irritability.		
121	J. C., 40, Goldsmith	-/10/84	6 years	...	Abductor and opp. poll.	...	...	Yes	Deficient	Thumb	Back
122	R. C., 36, M., Account-ant	27/6/85	13 years	Shaving and "scooping the meat out of an egg"	1st and 2nd R. D. I.	...	...	...	Very defective	R. mid-finger	...
123	C. G., 28, M., Banker	7/4/84	Years	...	1st R. D. I.	...	...	...	Very defective	R. hand	...
124	A. McN., 33, M., Bank cashier	1/12/79	Some months	...	Flex. brev. min. digit. Right interossei	...	...	...	Very defective Some excess	No	Ulnar side of palm after writing
125	W. W., 31, M., Clerk	20/1/80	...	...	1st R. D. I., R. abd. opp. poll. 4th R. D. I.	...	...	...	Defective	R. hand	...
					4th R. palmar I.	...	...	...	Defective	Triceps Biceps	
126	B., 51, M., Merchant	4/9/83	...	Playing violin	1st R. D. I.	...	...	...	Very defective	Pect. major R. hand	...
127	A. R., 32, M., Merchant	20/12/81	4 weeks	...	Ext. sec. internod. poll.	...	...	...	Diminished	R. hand	...
128	R. B., 30, M., shorthand-writer	7/12/86	2 months	?	Muscles of ball of R. thumb	...	...	...	Diminished	Both hands	...
129	C. J. T., 31, M., Reporter	20/6/80	A few months	...	1st and 2nd R. D. I. R. flex. brev. poll.	...	...	...	Defective ? Excessive ?	None	...
130	S. C., 35, M., Clerk	17/5/83	3 years	...	R. abduct. and oppo-nens poll.	...	...	...	Very defective	R. hand when extended	R. hand when writing
131	E. W., 38, M., Clerk	1879	2 or 3 years	...	1st R. D. I.	...	...	...	Markedly defective	...	...
132	F. C. C., 32, M., Clerk	5/5/79	6 years	...	Muscles of ball of R. thumb R. abd. min. digit.	...	...	...	Excessive	...	...
133	T. S., 35, M., Govern-ment clerk	1878	3 years	Winding watch	1st and 2nd R. D. I.	No.	No.	No	Defective Very defective	R. hand	No
134	H. M., 32, M., Merchant	1878	Many years	?	1st and 2nd R. D. I.	No	No.	No	Defective ?	No	No
135	C. F. M., 29, M., Clerk and agent	7/2/82	?	...	R. abductor and opponens	...	...	Yes	Very defective	...	Cervical spine after writing with L. hand
136	W. M., 31, M., Clerk	3/6/82	Some years	All acts soon cause fatigue	R. abductor and opponens poll. R. flex. long. poll.	...	...	...	Defective	Both hands	R. hand and fore-finger
						...	...	...	Defective		

WRITERS' CRAMP AND IMPAIRED WRITING POWER. 329

Nerve-tenderness.	Joint trouble.	Trophic change.	Supposed cause.	
None	...	...	...	Occasional fibrillary tremor in ball of right thumb. Not improved by massage.
...	...	...	...	Writing, &c., bad. Cannot keep wrist on the desk. Is scored by the actual cantery on either side of the spine which was applied some years ago. Derived no benefit from a seven weeks' course of massage. Ordered to faradise 1st and 2nd R. D. I. systematically.
...	...	...	...	Some tenderness of cervico-dorsal vertebrae. Occasional jerking of the scapula? Ordered massage. Six months later was <i>in statu quo</i> .
None	Sprained wrist from a fall six years ago	...	A sprain and writing	Strokes made by moving whole hand. Worse when watched; nervous.
...	...	...	Writing	Has used a very fine pen.
...	...	...	Playing violin	Passionately fond of the violin and has fatigued 1st R. D. I. by holding the bow. Much improved by massage (September 29th, 1883).
...	...	...	...	Far phalanx of thumb flexes forcibly into the palm when he writes Tremor of right hand during attempts to forcibly extend the right thumb. Faradising right ext. sec. internod. poll. causes great pain; flexion of far phalanx of thumb and tremor. This does not occur on the left side.
None	R. carpus R. thumb	Nail of R. forefinger pitted	...	Right metatarso-phalangeal joint of thumb enlarged, prominence over right carpus between bases of 1st and 2nd metacarpal bones. To paint the joints with iodine, hot sea baths, massage.
...	...	...	Over-writing	Hand weak. In writing "the thumb bends back and forefinger slips up the pen." Holds pen between thumb and mid-finger. Dyspeptic; nervous.
None	...	Crop of moles on R. arm and lichenous rash on R. forearm	Writing against time	—
...	...	...	Writing?	Holds pen between thumb and mid-finger. When writing forefinger becomes extended. Strokes are made by movement of pronation and supination.
...	...	...	...	When writing he supports his hand on the tip of the little finger, which he maintains rigidly abducted.
No	Near phalangeal of R. mid-finger R. shoulder creaks	None	Writing Fall from horse Sunstroke in 1869	Nervous and melancholic. Magazine writer.
No	Phalangeal enlarged	No	?	Never could write well. Forefingers of both hands crooked and everted towards radial border.
None	Carpus	...	...	Pain in cervical spine. Carpal bones prominent on the back of both wrists. Right forefinger slips up the penholder. Writes with the hand and the thumb cannot be abducted.
None	...	...	Excessive writing	In 1876 had to take eight months' rest on account of "nervous prostration." Right median nerve shows lessened irritability to faradism. Temperate in all things. Has pain in back and limbs.

330 WRITERS' CRAMP AND IMPAIRED WRITING POWER.

GROUP 3.—*Neuro-muscular.* SUB-GROUP C.—*Nerve-tenderness*

No.	Name, age, sex, occupation.	Date.	Previous duration.	Loss of function other than writing.	Muscles.					Tremor.	Pain.
					Which affected.	Para-lysis.	Spasm.	Wasting.	Electric irritability.		
137	D. S., 35, M., Master printer	19/8/81	2 years	...	1st and 2nd R. D. I.	...	...	...	Very defective	R. hand	Both arms
138	H., 45, M., M.D.	13/10/81	10 years	All prolonged acts	Muscles of R. hand, especially 2nd R. D. I.	...	...	...	Excessive	...	...
139	H. W., 30, M., Architect	1882	2 years	...	R. abductor and opponens poll. 1st R. D. I.	...	...	...	Excessive Diminished	R. hand (occasionally when excited)	...
140	R., 33, M., M.D.	26/10/83	2 years	...	Extensors of thumb 1st R. D. I. and R. abductor and opponens poll.	...	...	Yes	Defective Defective	...	...
141	G. B., 27, M., Clerk	4/1/84	3 years	Billiards, piano	R. flexor long. poll. R. serratus magnus R. pectoralis major	...	...	Yes	Excessive Defective	None	R. shoulder R. axilla R. forearm
142	J. W. W., 40, F.	20/3/82	14 years	Tires after carrying anything	1st R. D. I. R. abductor and opponens	...	...	Yes	} Very deficient	...	...
143	W. A. B., 34, M., Solicitor	13/5/86	15 months	?	1st R. D. I.	...	...	...	Diminished	...	...
144	J. R. V., Clerk	30/12/85	?	...	R. abductor and opponens R. ext. 2nd internod.	...	...	...	Increased Decreased	R. hand	...
145	A. M. S., 45, F.	6/26/85	9 years	...	All muscles of R. hand	...	...	...	Excessive	R. hand	Yes
146	Dr. B., 55, M.D.	28/10/85	3 years	?	1st and 2nd R. D. I.	...	...	...	Excessive	No	R. hand
147	C.T., 34, M., Reporter	1883	6 months	...	1st and 2nd R. D. I.	...	...	...	Defective	R. hand	In arm at night
148	W. H. H., 55, M.	11/11/84	25 years	...	1st R. D. I.	...	...	...	Excessive	R. hand	...
149	D. C., 33, M., Clerk	14/8/88	...	...	1st R. D. I. R. abductor and opp. poll.	...	...	...	Defective? Defective?	Both hands occasionally	...
150	R. B., 30, M.	5/10/80	2 years	Weakness when carrying a tray	R. extensors of thumb R. abd. and opp. poll. Muscles of R. hand	...	...	...	Defective Far phalanx of thumb	In arm	...
151	H. E. P., 45, M., Indian civilian	27/4/81	3 years	...	...	...	...	...	Excess (slight)	R. hand	...
152	J. T., 47, M., School-master	20/7/81	...	...	R. & L. 1st and 2nd D. I. R. & L. 3rd and 4th D. I.	...	...	...	Defective? Excessive?	R. hand	...

and change of muscular irritability combined (32 cases).

Nerve-tenderness.	Joint trouble.	Trophic change.	Supposed cause.	
R. median	...	...	...	Onset sudden, with a "twitching of the fingers."
R. median	...	...	...	Worse when mentally agitated. Special difficulty with a small t at the beginning of a word.
R. median (very marked)	...	...	Excessive work at a competition drawing and domestic trouble	The right forefinger will not keep on the pen. When he writes with left hand the right hand is gradually extended and will not keep on the paper. Some loss of electric sensibility in skin of right hand. Right median nerve very irritable to faradism.
R. median	...	...	Injury	Never could write fast. When 14 had the hand smashed in a mangle. In writing phalangeal thumb-joint is forcibly flexed, and the forefinger slips up the penholder. Ordered to faradise the wasted extensors of thumb (the ext. secund. internod. is specially defective in irritability).
R. median	..	...	...	Writing good. Probably a case of neuritis affecting upper part of brachial plexus, and extending to long thoracic, anterior thoracic, and median nerves.
R. median, R. ulnar, R. musculo-spiral	...	...	Dyspepsia. Came on after confinement	To blister tender nerves. Says the hand is "numb." Dyspeptic.
R. ulnar	...	...	Writing	Pain and cramp on ulnar side of hand. Ulnar nerve very tender behind olecranon and above wrist. Cured by blistering the nerve and massage.
R. median	...	R. thumb-nail much furrowed and brittle	Writing	Writing is stopped by forcible cramp-like contraction of the far phalanx of the thumb. Ordered to blister right median and employ massage.
R. median, slight	...	...	...	The application of faradism is painful in right hand but not in left. To blister right median and take arsenic.
R. median, R. musculo-spiral	...	...	Gout	Gouty. Had been undergoing a course of massage without benefit (hence the increased irritability of muscles). There is grating felt in the sheath of flexor tendons of middle finger close to head of metacarpal bone.
R. median	...	...	Excessive writing	Says that "short hand" tires him more than long hand.
R. median	...	...	...	Some defective sensation on right side. Very stout, breath alcoholic. Is troubled with "general pulsation" after meals. Veins over front of thorax are too full, but no other evidence of mediastinal growth or heart disease.
R. median	...	...	Dyspepsia	The thumb "throbs" after writing. Tremor worse in hot weather, "when temperature is over 60° F." Dyspeptic. Improved by blister over median nerve. Massage was of no use.
R. median	...	...	Over-writing	—
R. median	...	...	...	When he writes there is involuntary contraction of mid-finger. Father was hypochondriacal. A brother epileptic.
R. ulnar	...	...	Alcohol	Sleeps badly. Indulges freely in alcohol.

332 WRITERS' CRAMP AND IMPAIRED WRITING POWER.

No.	Name, age, sex, occupa- tion.	Date.	Previous duration.	Loss of function other than writing.	Muscles.					Tremor.	Pain.
					Which affected	Para- lysis.	Spas- m.	Wast- ing.	Electric irritability.		
153	F. C. T., 19, M., Med. student	1/2/78	Some years	Dissecting	Flex. brev. poll.	?	No	?	Defective	No	Yes, after using hand
154	E. W., 44, M., Actuary	28/11/78	3 years	...	1st R. D. I. R. flex. brev. min. digit.	...	...	...	Markedly defective	R. hand	...
155	J. G., 35, M., Law writer	2/4/82	...	...	R. flexor brev. poll.	...	...	...	Very defective	Both hands, but most of right R. thumb	...
156	J. B., 45, M.	3/5/82	2 years	Weakness of thumb for all acts	R. flexor brev. poll.	...	...	...	Defective	...	...
157	C., 31, M., M.D.	17/4/84	8 or 9 years	...	R. flexor long. poll. R. extensors of thumb	...	...	...	Very defective	...	...
158	R. W. R., 32, M., Secretary	1/8/84	2 years	All work	1st R. D. I.	...	...	...	Very defective	R. hand	...
159	A. K. H., 36, Secretary	1885	Some months	...	1st R. D. I. Flex. brev. min. digit.	...	...	...	Defective Defective	...	...
160	E. J. W., 40, Bank manager	-/8/86	3 months	...	Ball of R. thumb	...	...	...	Slight excess	R. thumb	...
161	L. V., 34, M., Surgeon	5/6/82	3 years	Playing piano, lifting wineglass	1st R. D. I.	...	...	...	Excessive	...	...
162	T. N., 32, M.	25/7/82	3 years	...	1st R. D. I.	...	...	...	Very defective	R. hand	...
163	E. F. B., 27, M., Bank clerk	29/8/82	18 months	...	1st R. D. I.	...	...	...	Very defective	R. hand	...
164	G. W. B., 46, M., Law clerk	21/9/82	13 years	Grasp of R. hand defective	1st R. D. I.	...	...	...	Very defective	...	...
165	W. L., 35, M., Bank clerk	26/2/83	2 years	...	2nd R. D. I.	...	...	...	Excessive	...	...
166	S. C. R., 55, M., Jeweller's traveller	12/3/83	Some years	Lifting cases, car- ving, wind- ing watch, and tuck- ing in the ends of paper parcels	R. supinator longus R. supinator brevis Flexor carp. ulnaris	...	...	...	Defective Defective Defective	R. hand	...
167	W. R. Q., 37, M., Account- ant	7/4/83	2 months	...	1st R. D. I?	...	...	...	Defective?	...	...
168	C. L., 59, M., U.S.A.	7/4/83	20 years	Both hands soon tire	1st & 2nd R. D. I.	...	...	...	Defective	...	...

Nerve-tenderness.	Joint trouble.	Trophic change.	Supposed cause.	
R. median	Wrist	None	Sprain of wrist. Fall from horse when 9 years old	Was not allowed to throw the cricket ball at school because of liability to strain the wrist. Has pain in front of wrist irrespective of work. Thinks the pain is in one of the tendons.
R. median	...	...	...	Writes with left hand.
R. median	...	...	15 hours engrossing per diem	Writing very difficult and tremulous.
R. median very tender	...	...	...	Very thin. Holds pen between fore- and mid-fingers with thumb flexed into palm. There is an abrasion on radial side of metacarpophalangeal joint of right forefinger from pressure of the penholder. Is worse when fatigued and overdone. To blister median nerve.
R. median	...	...	...	Sleepless. Dyspeptic. Began when he was much worried.
R. median	R. shoulder	...	Writing	Creaking of right shoulder. Urine phosphatic. Much improved in two months by hot baths, Donovan's solution, and a blister to the tender median nerve.
R. median	...	...	...	In writing the hand is supinated and the right ring finger is flexed. Greatly improved by massage, which caused marked increase in the size of the arm.
R. median	R. shoulder creaks	...	...	Writing is stopped by an internal rotation of the thumb. A very nervous subject; dyspeptic.
R. median	...	...	...	Jerking of hand. Served eight years in tropics. Three attacks of intermittent fever. Dyspeptic. Gouty?
R. median	...	...	Fall from horse on to R. hand?	Urethral stricture. Foul tongue. Voluntary interosseal movement of right hand very defective. Ordered to blister median nerve and regulate the bowels. Was much improved when seen again on October 10th, 1882.
R. median	...	...	...	When holding pen phalangeal joint of right thumb is re-entrant. Faradisation of flexor long. pol. causes tremor of hand, and of 1st R. D. I. causes more movement of neighbouring muscles than of the muscle faradised. Tongue furred and tremulous. To blister median and treat dyspepsia. Much improved on October 7th, 1882.
R. median	...	...	...	History of syphilis.
R. median very tender	...	...	...	Is obliged to raise his elbow before he can write. Ordered to blister right median nerve.
R. median	...	...	...	The electric irritability of right musculo-spiral and ulnar nerves diminished and of right median increased. Ordered to blister median nerve and to take Donovan's solution.
R. median	...	...	...	Dyspeptic. Gouty. A "free liver." To blister median and take saline purgatives. Great improvement.
R. median	...	...	...	Of studious habits. Has suffered from "nervous exhaustion." Ill-defined weakness of legs as well as arms. To blister median nerve and use galvanic current. Great improvement.