A FURTHER CONTRIBUTION
TO THE STUDY OF
RHEUMATOID ARTHRITIS.

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IN a former paper I endeavour to show, from the study of the statistics of 500 cases of rheumatoid arthritis, the truth of the statements made by certain authors, that the causes of rheumatoid arthritis are such as might be expected to act upon the central nervous system, and that the distribution of the lesions, and the order of invasion of the joints, lend support to the theory of the nervous origin of this disease.

Continuing the subject I propose, in the present paper, to examine certain other phenomena of rheumatoid arthritis, with a view to seeing whether or not their occurrence supplies any further evidence of the truth of that theory.

In many cases muscular atrophy, the condition known as "glossy skin," as well as certain sensory disturbances, are met with, and the question is whether these conditions

are to be regarded as integral parts of the disease, or whether they are merely secondary changes, following upon the damage to the joints, not resulting from disease, but exemplifying the general law that the irritation of articular disease of any kind is communicated to the spinal cord, and so brings about reflex changes, such as reflex muscular atrophy, and a spasmodic condition of the muscles in the neighbourhood of the affected joints.

Dr. Ord is inclined to take the former view in regard to some cases of the disease, and in his address to the British Medical Association at Belfast, speaking of a *certain group* of cases of rheumatoid arthritis, he said:—"In fact as they present themselves to me, these are cases of progressive dystrophy of joints, marching with progressive atrophy of muscles, and with atrophy of other tissues of the limbs."

Dr. Charcot, on the other hand, regards the muscular atrophy of rheumatoid arthritis as merely an example of arthritic muscular atrophy, more marked than usual, in this disease, on account of the severity and long duration of the joint lesions.

The demonstration by MM. Pitres and Vaillard¹ of the fact that peripheral neuritis is present in some of these cases, suggests that the changes in the nerves may be the cause of some of these dystrophies.

These observers find that the peripheral nerves are the seats of important changes in cases of rheumatoid arthritis, and they have met with such changes in all the three cases which they have examined, but that the neuritis does not apparently play a primary part in the production of the articular lesions, since the nerves supplying the affected points may exhibit only trifling changes. They regard it as the probable cause of some of the sensory symptoms, and as standing in a constant relation to the muscular and cutaneous atrophies.

This explanation of the production of the dystrophies is opposed by the fact that, in rheumatoid arthritis, the

¹ 'Revue de Médecine,' June 10th, 1887.

tendon reflexes are usually exaggerated, and this exaggeration is frequently well marked when the muscles are conspicuously atrophied, a fact hardly consistent with the production of the atrophy as a result of peripheral neuritis. On the other hand, increase of myotatic irritability is a characteristic of all forms of arthritic muscular atrophy, being well marked in cases in which injury to joint has been followed by the wasting of neighbouring muscles. Moreover, the increase is not confined to the affected limb, both knee-jerks being not infrequently exaggerated when there is synovitis of one knee.

The occurrence of such increase of myotatic irritability in cases of rheumatoid arthritis is therefore only what is to be expected if the atrophy of the muscles is merely secondary to the joint lesions; but, on the other hand, we have the fact that MM. Pitres and Vaillard found advanced changes in the nerves which supplied the atrophied muscles, and it is upon this fact that their view that the neuritis is the cause of the atrophy is based.

Although the increase of reflexes in this disease is widely recognised, I am not aware that any systematic examination of these phenomena in a number of cases has been hitherto carried out. I have therefore tested the jerks in fifty cases of rheumatoid arthritis which have recently passed through my hands, and the results are embodied in a table which is appended to this paper.

To ensure as much uniformity as possible, the supinator, triceps, and patellar reflexes were in each instance tested by the aid of a percussion hammer.

In some few instances the examination was precluded by stiffness and painfulness of the neighbouring joint, but usually no such obstacle was met with, and I do not think that, except where it is so stated, the state of the joints interfered in any way with the results obtained, since in cases where there was considerable enlargement present the reflexes were often found to be markedly increased. On glancing over this table it is at once apparent that there is little uniformity in the results obtained. In

apparently similar cases the jerks may be markedly increased in one, normal or diminished in another.

Nor are the results more uniform in individual instances. Patients who have all their limbs affected, apparently to a like degree, may have all the reflexes normal or diminished, with the exception of one or two, which are found to be greatly increased. In thirty-two out of the fifty cases there was definite increase of one or more of the reflexes.

Since it is difficult to appreciate the slighter degrees of muscular atrophy, especially when there is no opportunity of comparing the diseased with a sound limb, I have divided the cases into those in which the atrophy was sufficiently advanced to be noticeable on inspection and those in which it was not so.

Of twenty-three cases in which there was marked atrophy there were eighteen in which there was increase of some of the reflexes, whilst of twenty-seven in which the atrophy was not marked, there was increase of reflexes in fourteen only.

The amount of muscular atrophy varies very greatly, being hardly appreciable in some cases in which the joints are very seriously affected, whilst it is conspicuous in some of the early cases, in which the enlargement and deformity of the joints is comparatively slight.

When the cases are arranged in the order of their duration no definite results are arrived at, and this is not surprising when we call to mind the very different rates at which the disease advances in different patients. There are, however, a few observations which seem to show that when one limb is attacked before the corresponding one of the other side, the reflexes are greater on the side more recently affected.

One point, however, comes out clearly, namely, that as in other instances of arthritic muscular atrophy, the increased myotatic irritability is not confined to the affected limb. In cases in which one hip-joint only is diseased, both knee jerks and even the supinator and triceps jerks as well may be increased. In some

instances the increase of the reflexes was very remarkable.

Thus in a man, *æt.* 32, who dated his disease from a prolonged immersion in the Orange River, in South Africa, two years previously, all the reflexes were greatly exaggerated. The joints affected were those of the hands and feet, the elbows, shoulders, ankles, and knees. A tap upon either of the supinator tendons caused contraction of the triceps, and a slight clonic spasm, and in the same way, when the triceps tendon was struck, clonus was observed, and all the arm and scapular muscles contracted. The patellar reflexes were also greatly increased and slight ankle-clonus was obtained on the left side. There was considerable deformity of the affected joints, and great wasting of muscles of all the limbs.

The notes of a still more remarkable case have been published by Dr. Mader,¹ of Vienna.

The patient was a woman, *æt.* 43, who had suffered from rheumatoid arthritis for fifteen years. The nerve-trunks of the upper extremities were tender on pressure. A tap on the patellar or triceps tendon not only elicited a greatly exaggerated reflex but also caused contraction of the trunk-muscles.

The left arm was always jerked when the right was tapped, and the same result could be produced by a slight blow upon the right tibia, or over the sternum. Such experiments always started a clonic spasm of the whole of the body, lasting several minutes.

How are we to explain the want of uniformity in the results obtained from the examination of the fifty cases?

Probably in some instances the deficiency of the jerks is due to the advanced changes which have taken place in the substance of the muscles.

Is it possible that the changes in the peripheral nerves may act as a disturbing factor in some instances, neutralizing the tendency to increase of the reflexes?

¹ 'Berichte der k. k. Krankenanstalt, Rudolph Stiftung in Wien,' 1881, p. 266.

Perhaps we may look upon the tingling and numbness in the affected limbs, phenomena which are not infrequently met with in course of rheumatoid arthritis, as symptoms of the same nerve changes.

These symptoms have received but little attention from those who have written upon the subject. They are noted in some of the published cases, but I am only acquainted with the two following distinct references to their occurrence.

Dr Homolle, in his article in the '*Dictionnaire de Médecine et de Chirurgie Pratique*,' says:—"Anomalous sensations of numbness and formication, and vague pains in the limbs, are usually the first symptoms of which the patients complain," and he compares them to similar sensations met with in connection with certain spinal diseases.

Dr. Howard again, in '*Pepper's System of Medicine*,' writes as follows:—"For weeks or months the patient may experience numbness or tingling and rheumatic pains in the limbs, perhaps with a sense of stiffness in the joints, especially felt after rest, or the day after unusual fatigue."

I have come across several cases of this kind lately, and it certainly appears that, as these authors remark, these symptoms occasionally precede the joint lesions, and have the appearance of being primary symptoms of rheumatoid arthritis.

Thus a married woman, *æt.* 52, had had a sensation of pins and needles in the hands and arms for two years, accompanied by gnawing pains in the bones, yet the joints of the fingers had only been affected for one year.

Another female patient volunteered the information that the disease came on with tingling in the fingers, like pins and needles, and when these symptoms first appeared she had violent pains in both arms, lasting for three or four hours, and followed by sweating.

In other cases the tingling and numbness appear

simultaneously with the joint affection, and in others again they come on at a later period of the disease.

Tingling and numbness are prominent symptoms of peripheral neuritis, and it is curious to note that in no case in which a history of such symptoms was obtained did I find any increase of the tendon reflexes. The jerks were not, however, abolished, but were simply normal or diminished.

In considering any sensory disturbances met with in the course of rheumatoid arthritis, one source of fallacy must always be borne in mind. This disease not infrequently affects the joints of the vertebral column, causing that stiffness of the neck of which the patients so often complain. As Leyden and others have pointed out, this spondylitis may lead to pressure upon the nerve-roots, and so to radiating pains, and even to loss of power in the limbs. The following case, for the opportunity of seeing which I am indebted to Dr. Andrew, under whose care the patient was, appears to me to be one of this kind.

A young woman, æt., 24, was attacked in October 1885, with rheumatoid arthritis of the right wrist-joint. The disease soon involved the right foot, the knees, hands, shoulders, and temporo-maxillary joints. One night, in April, 1886, she was seized with severe burning pain in the right arm, extending from the shoulder to the fingers. This lasted about ten hours, and ceased as suddenly as it had commenced. The following morning she found that she had lost the use of the arm, and she had no feeling in it. Power and sensation returned in about a fortnight. During the same night her neck became stiff, and she began to suffer from pain along the vertebral column, and especially between the shoulders. At the time when I saw her there was well-marked grating felt when she rotated her neck.

Such causes will not, however, account for all the sensory symptoms met with in cases of rheumatoid arthritis.

The muscular atrophy of rheumatoid arthritis resembles

the other forms of arthritic muscular atrophy in other respects beside the increase of myotatic irritability. Its distribution is similar, the muscles which extend the affected joints suffering most. The hands of the patient have a peculiar appearance, owing to the wasting of the interossei, especially the abductor indicis, and this peculiarity is often increased by the enlargement of the knuckle-joints.

The electrical reactions resemble those of ordinary arthritic atrophy, the reaction of degeneration being rarely present, and when found being as a rule limited to one or two of the muscles which are most seriously affected.

Associated with the wasting there is also a spasmodic condition of the muscles, which manifests itself in the form of severe cramp-like pains to which these patients are peculiarly liable, and which cause the most acute suffering which they endure, and gives rise at a later period to those distortions which constitute the most serious deformity met with in rheumatoid arthritis.

Moreover, the muscular atrophy follows the appearance of the joint disease after a greater or lesser interval. In ordinary cases of rheumatoid arthritis we do not find the extension of the disease to a fresh joint heralded by the atrophy of the muscular structures which move that joint.

Dr. Ord is of opinion that these non-articular troubles do sometimes precede the appearance of the joint lesions, and it is certain that articular changes, clinically identical with rheumatoid arthritis, are sometimes to be met with coming on as a later affection, in cases in which other dystrophic phenomena have been present for some time previously. The question is, whether such cases can be regarded as examples of ordinary rheumatoid arthritis, or whether they are not rather arthropathies of nervous origin, in the more limited sense of the term, lending powerful support to the nervous theory of rheumatoid arthritis by bridging over the interval separating that disease from the arthritis associated with spinal injuries and definite spinal diseases.

The following case may perhaps be regarded as one of this character.

The patient was a man, æt. 55, who had formerly been a sailor, but who had left the sea, and was engaged in the manufacture of rigging. He complained of pain in the region of the right clavicle, and down the right arm, from which he had suffered for some three or four months.

The right shoulder appeared somewhat flattened, and the muscles of the upper arm were peculiarly flabby. When requested to extend the elbow he did not bring the long head of the triceps into action at all, but the muscle acted well when extension was resisted. No difference could be detected in the measurements of the circumference of the two arms.

The patient complained of tingling and numbness of the right arm, with some loss of power, and the grip of the right hand was weaker than that of the left. The supinator reflex was increased in the affected arm, but the triceps reflex was not obtained. Fibrillary twitchings were noticed in the muscles of both arms, but were most marked in the right.

Electrical examination showed that faradic contractility was diminished in the right biceps and triceps, but was increased in the muscles of the thenar eminence.

Galvanic irritability was also increased in the thumb-muscles, and greatly increased in the triceps, but K. C. C. was everywhere greater than A. C. C.

There was, moreover, a painless affection of the carpo-metacarpal joint of the right thumb, with excessive mobility of the joint, grating of the articular surface, and enlargement of the heads of the bones.

The question of the nature of the muscular atrophy of rheumatoid arthritis is one of great importance from a theoretical point of view, for if we admit that it is an integral part of the disease, advancing *pari passu* with the joint lesions, we are almost bound to acknowledge the nervous origin of the arthritis, whereas if it be merely a

secondary phenomenon, simply due to the irritant action of the process going on in the joints, it can throw no light on the etiology of that process, and can supply no argument either for or against the nervous origin of the disease. To me, at least, it seems that we have no reason to regard this muscular atrophy as anything but a secondary process, not peculiar to rheumatoid arthritis, and therefore as giving no support to the theory under discussion.

The deformities met with in this disease may be grouped under three heads.

Firstly, there are those produced by osteophytic out-growths around the joint, which are almost peculiar to this disease. I say almost, because similar enlargements are sometimes met with in gouty patients.

Secondly, there is the deflexion of the fingers to the ulnar side of the hand, which is in no way peculiar to rheumatoid arthritis, being a common phenomenon in gout, whilst the most extreme ulnar deflexion that I have ever seen was in a patient who had suffered from several attacks of rheumatic fever but whose joint showed no signs of any permanent change. This deformity I cannot regard as due to muscular action, for it is absent where the true muscular deformities are present, without joint lesions, and I would attribute it rather to the relaxation of the fibrous structures of the metacarpo-phalangeal joints, allowing the digits to fall outwards.

Lastly, there are the true muscular deformities of the hands and feet, which have been so minutely and accurately described and classified by Dr. Charcot. They also are in no way peculiar to rheumatoid arthritis, but may be met with in the course of nervous disorders, where there is no joint affection at all; and may also result from repeated attacks of gout in the hand or foot.

These distortions fall under two main types, which have been called by Dr. Charcot the types of extension or flexion.

The essential character of the type of extension is the hyper-extension of the second row of phalanges upon the

first, which is accompanied by more or less flexion of the other hand-joints ; whereas in the type of flexion the second row of phalanges is flexed upon the first, with hyper-extension of the other joints.

Each main type is capable of modification forming sub-types, and both may be present in different fingers of the same hand. Which type is produced in any particular instance is probably determined by the condition of the interossei, which little muscles are greatly affected by the atrophic process. When they are strong the type of extension results, but when they are overcome by the spasm of the other muscles the hand assumes the type of flexion.

The deformities are never met with in rheumatoid arthritis when the joints of the hands have escaped the disease, and, like the muscular atrophy, they are secondary changes, and no more integral parts of the disease than talipes is a part of infantile paralysis.

Well-marked changes in the skin and nails, with atrophy of the subcutaneous tissues, are much rarer than the muscular atrophy, but when they occur may be developed early in the disease soon after the neighbouring joints have been attacked.

In each of the three cases examined by MM. Pitres and Vaillard such changes were present, associated with peripheral neuritis ; the skin being most affected in the case in which the cutaneous nerves had suffered most. It seems probable therefore that these dystrophies may result from the peripheral neuritis, but whether the neuritis is a primary or secondary phenomenon of rheumatoid arthritis is a question which cannot be answered without further investigation. In other articular diseases peripheral neuritis is met with as a secondary phenomenon, being probably caused by the extension of the morbid processes from the joints to the nerves, but the comparative immunity of the articular nerves in the cases examined is opposed to this explanation.

In the following case the skin change was apparently

due to a mere extension of the inflammatory process to the nerves, since it was confined to the peripheral side of the seats of disease.

A young married woman, æt. 22, who had no family history of articular disease, and who had never suffered previously from any joint affection, was attacked during her second pregnancy with rheumatoid arthritis of the small joints of the carpus of each hand, and, to a much less extent, of the tarsi. When seen the skin of the hands was glossy and atrophied but not pink. This change did not extend at all beyond the seats of the disease. The nails had not undergone any dystrophy. She had felt numbness and tingling in the same areas soon after the joints were attacked, and had noticed the glossiness of the skin since the same period. I could not detect any loss of sensation in the fingers. On the right side the supinator jerk was poor; on the left it was good, but not exaggerated. Both triceps-jerks were well obtained, and the knee-jerks were normal.

The conclusions are as follows :

1. Although lesions identical with those of rheumatoid arthritis are occasionally met with in cases in which muscular atrophy and other indications of nervous disorder have previously existed, the ordinary muscular atrophy of rheumatoid arthritis is merely an example of reflex arthritic muscular atrophy, with which it agrees in its distribution, and in its association with increased myotatic irritability and muscular spasm.

2. That the remarkable distortions met with in this disease, being due to this muscular spasm, are merely secondary phenomena; and being, like the muscular atrophy, in no way peculiar to rheumatoid arthritis, can supply no argument for or against its nervous origin.

3. That peripheral neuritis, which has been shown to be present, plays an as yet undetermined part in the production of the phenomena of the disease; that it may perhaps be responsible for the irregular results of examination of the tendon reflexes; that it may give rise to

certain sensory phenomenon which are often early, if not primary symptoms; and probably is the cause of the dystrophic condition of the skin and nails occasionally met with.

TENDON REFLEXES IN RHEUMATOID ARTHRITIS.

Cases in which all the Reflexes were Exaggerated.

No.	Sex and age.	Duration of disease.	Joints affected.	Condition of reflexes.	State of muscles, &c.
1	M. 31	4 months	Hands, wrists, ankles, neck, jaw	Supinator much increased; triceps much increased; knee increased	No well-marked atrophy.
2	F. 55	2 years	Hands, wrists, elbows, right shoulder, left hip, knees, sterno-clavicular	Supinator, left increased, right much increased; triceps, left increased, right much increased; knee much increased	Well-marked atrophy, especially in right arm.
3	F. 35	1 year	Hands, wrists, knees	All reflexes increased	Well-marked atrophy, especially in arms.
4	F. 66	12 years	Hands, feet, knees, elbows, hips, ankles, back	All reflexes much increased	No well-marked atrophy.
5	F. 45	1 year	Wrists, hands, feet, ankles, knees	Supinator much increased; triceps increased; knee much increased	Atrophy not well marked; distortion of hands, type of flexion.
6	M. 32	2 years	Hands, elbows, shoulders, feet, left ankle, knees	Enormous exaggeration of all the reflexes; clonic spasm	Much atrophy.
7	M. 45	6 months	Right hip	All reflexes increased	Wasting of muscles around right hip-joint.
8	F. 30	R. wrist 14 years; L. wrist 1 year	Both wrists, right stiff	Supinator, left increased; triceps and knee increased, left triceps more than right	No marked atrophy.
9	F. 34	10 months	Hands, ankles, knees, shoulders	All reflexes increased	Well-marked atrophy.
10	F. 35	5 years	Knuckles, feet, ankles	All reflexes increased; knees slightly	Well-marked atrophy.

Cases in which some Reflexes were Exaggerated.

No.	Sex and age.	Duration of disease.	Joints affected.	Condition of reflexes.	State of muscles, &c.
11	F. 35	7 years	Left hand, right wrist, knees slightly	Supinator and triceps increased; knees normal, or perhaps increased	No marked atrophy.
12	F. 45	5 years	Hands, elbows, shoulders, feet, knees, neck	Supinator increased; triceps and knees poor	Much muscular atrophy; distortion of hands.
13	F. 49	2 months	Knees, left shoulder	Supinator good; triceps, right increased; knee much increased	No marked atrophy.
14	M. 34	2 months	Hands, wrists, elbows, shoulders, hips	All reflexes increased except right triceps	Well-marked atrophy.
15	F. 32	2 years	Hands, wrists, elbows, shoulders, feet, ankles, knees, neck, jaw	Right supinator reflex only, much increased	Fairly marked atrophy.
16	M. 34	3 or 4 years	Left hip, slight in right hip	Triceps and knee reflexes increased; left knee reflex greater than right	Much atrophy of left thigh.
17	M. 53	14 years	Hands, wrists, right elbow, left ankle, knees	Triceps reflexes much increased, especially right; knees could not be tested	Well-marked atrophy.
18	M. 43	6 or 7 months	Right hip	Both knee reflexes increased	Well-marked atrophy of right thigh.
19	F. 52	8 years	Hands, first right, then left; elbows; knees, right, then left; feet	Left supinator and triceps reflexes increased; knee reflexes both increased	Wasting, especially in right arm.
20	F. 35	8 years	Hands, feet, first right, then left	Right knee reflex increased; other reflexes normal or absent	Well-marked atrophy; distortion of hands and feet, type of flexion.

No.	Sex and age.	Duration of disease.	Joints affected.	Condition of reflexes.	State of muscles, &c.
21	F. about 40	1 year	End joints of fingers, right worst; right ankle	Right supinator and triceps reflexes increased; both knee reflexes increased	Slight atrophy.
22	F. 9	18 months	Hands, elbows, ankles, knees, neck	Knee reflexes increased	No marked atrophy.
23	M. 21	1 year	Right knee-joint	Left knee reflex increased; right could not be tested	Well-marked atrophy of right thigh.
24	F. 42	7 or 8 months	Carpometacarpal joints of thumbs, especially left	Left supinator reflex increased	No marked atrophy.
25	M. 60	1 year	Hands, right shoulder, right knee, slightly	Left supinator, both triceps, and left knee reflexes increased	No marked atrophy.
26	F. 37	4 months	Hands, shoulders, ankles, neck	Left supinator and both knee reflexes increased	Well-marked atrophy.
27	M. 45	4 months	Left hand and wrist, feet, ankles, knees, right hip	Left supinator reflex increased	No marked atrophy.
28	F. 46	1 year	Hands, knees	Right supinator, both triceps, and knee reflexes increased	No marked atrophy.
29	F. 21	7 years	Hands, wrists, elbows, shoulders, knees, hips, neck, jaw	Triceps and knee reflexes increased	Much muscular atrophy.
30	M. 36	7 years	Hands, feet, ankles, wrists, elbows, knees, hips, jaw	Right triceps reflex increased	Well-marked atrophy; distortion of hands, type of extension.
31	M. 66	7 years	Elbows, hands, wrists, left ankle	Knee reflexes much increased; supinator and triceps not obtained	No marked atrophy.
32	F. 54	2 years	Hands, wrists, knees	All reflexes increased except left knee	No marked wasting.

Cases in which all Reflexes were Normal or Diminished.

No.	Sex and age.	Duration of disease.	Joints affected.	Condition of reflexes.	State of muscles, &c.
33	F. 50	7 years	Fingers, knees, feet, ankles	Supinator and triceps reflexes absent; knee reflexes poor	Wasting not well marked (numbness and tingling).
34	F. 67	10 years	Hands, feet	Supinator and triceps reflexes absent; knee reflexes fairly good	Well-marked atrophy (numbness and tingling).
35	F. 25	20 months	Hands, feet, ankles, knees, elbows, neck, jaw	Supinator and triceps reflexes normal; knees could not be tested	Great muscular wasting.
36	M. 13	5 weeks	Hands, ankles, wrists, shoulders, right knee	Triceps reflexes absent; knee reflexes poor	Wasting not marked (numbness).
37	M. 48	5 or 6 months	Carpometacarpal joints of thumbs	Supinator and knee reflexes very feeble; triceps reflexes absent	No marked wasting.
38	M. 70	30 years	End joints of fingers	All reflexes absent	No marked wasting.
39	F. 31	18 weeks	Hands, knees, shoulders, elbows	All reflexes normal	No marked wasting (numbness and tingling).
40	F. 62	3 years	Hands, knees	Supinator reflexes poor; triceps reflexes absent; knee reflexes very poor	Some atrophy.
41	F. 55	2 years	Heberden's nodes	All reflexes normal	No marked atrophy.
42	M. 34	4 or 5 years	Left hip	All reflexes normal	No marked atrophy.
43	F. 62	17 years	Hands	Supinator reflexes slightly more than normal; triceps reflexes poor; knee reflexes normal, good	Well-marked atrophy (some distortion)
44	F. 67	20 years	Hands	All reflexes diminished	No marked atrophy.

No.	Sex and age.	Duration of disease.	Joints affected.	Condition of reflexes.	State of muscles, &c.
45	F. 52	2 years	Hands	All reflexes normal	No marked atrophy (tingling and numbness).
46	F. 25	14 months	Hands, elbows, feet, knees	All reflexes normal	No marked atrophy.
47	F. 37	5 years	Hands, jaw	All reflexes diminished	No marked atrophy (tingling and numbness).
48	F. 57	5 or 6 years	Right wrist, left elbow, and shoulder	Reflexes of upper extremities feeble; knee reflexes normal	Well-marked atrophy.
49	M. 34	About 3 years	Hands, wrists, shoulders, knees, hips, neck, jaw	Supinator reflexes normal; triceps reflexes obtained; knee reflexes poor	Much atrophy (distortion, type of extension).
50	F. 30	2 months	Hands, ankles	All reflexes normal	No marked atrophy.

(For report of the discussion on this paper, see 'Proceedings of the Royal Medical and Chirurgical Society,' New Series, vol. ii, p. 373.)