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DIPHTHERIAL

NERVE-AFFECTIONS.

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EDINBURGH: OLIVER AND BOYD, TWEEDDALE COURT.

MDCCCLXIII.

REPRINTED FROM THE EDINBURGH MEDICAL JOURNAL, AUGUST 1863.

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The epidemic sore throat which, under the name of diphtheria, has engaged so much attention in this country during the last six years, is well known to be followed by nervous phenomena of a peculiar kind. These consist chiefly of impaired, perverted, or excessive sensibility, together with more or less complete paralysis of the muscles of the fauces, pharynx, tongue, lips, extremities, trunk, and neck: the frequency of the occurrence of these symptoms in the several sets of muscles being nearly in accordance with the order in which I have named them,—those of the fauces being the most, and those of the neck the least frequently affected.

During the last few months I have had the opportunity of carefully watching the course of some of these nerve-affections consequent on diphtheria, in the cases of several patients who have been under treatment in the Middlesex Hospital. These cases constitute a group of great practical interest, and form the basis of the present communication; but in order to avoid interrupting the thread of the general remarks I shall found on them, I have placed the cases at the end of the paper.

It should be clearly understood that I do not mean to infer that every attack of diphtheria is followed by one or more of these nervous disorders, nor to assert that their frequency or intensity is invariably proportional to the severity of the primary disease; for, on the one hand, patients sometimes recover perfectly from even severe attacks of diphtheria without experiencing any of these subsequent ailments, and, on the other hand, these nerve-affections sometimes follow where the previous sore throat has been comparatively mild. Notwithstanding these necessary qualifications, there is, however, no doubt that, as a general rule, the more severe cases of diphtheria are followed by one or more of these nerve-affections, and that, other things being equal, their intensity is generally found to be greater or less in proportion to that of the primary disease.

A brief period of convalescence usually intervenes between the disappearance of the primary, and the appearance of these secondary, symptoms of diphtheria. If the case have been treated in an hospital, the patient may even, during this intervening period, have been discharged as well; and several cases have fallen under my notice in private practice, in which patients who had apparently recovered, and had been sent from home for change of air, have subsequently fallen into a helpless condition from the accession of diphtherial paralysis. In Case 4 (Wiseman), the patient had returned to his work before the manifestation of the impairment of sight, which, as will be seen in the report of his case, was the beginning of his nervous disorders. The duration of this intervening period of apparent convalescence is uncertain; it does not generally exceed a few days, but it may occasionally, as in Case 5 (Hawker), extend to several weeks. The fact of the frequent occurrence of this interval between the subsidence of the primary disease and the accession of the secondary nerve-affections is the more important, because it shows that the latter can by no means be entirely attributable to debility or anæmia, seeing that patients have often during this interval begun in some degree to regain flesh and strength, and yet have not escaped the subsequent accession of paralytic symptoms. Neither can these nerve-affections be considered as attributable to the albuminuria which so often accompanies the acute stage of diphtheria, seeing that this symptom has also for the most part either disappeared, or at least greatly diminished, previous to their accession. Thus, in Case 1 (Mufford), there was a copious deposit of albumen in the urine during the last days of January, but it had nearly disappeared on the 11th of February, when the patient's voice became of a nasal character, and a mere trace of it was found on 16th February, when the tip of the tongue and the fingers began to be paralyzed. In Case 3 (Davis), the urine contained much albumen at the time he first came under observation, but the quantity had much diminished by 24th March, and it had entirely disappeared before 14th April, although the nervous symptoms, from which he suffered so severely, did not reach their greatest intensity till 12th May. In Case 2 (Bunkall), albuminuria was likewise found on the admission of the patient into the hospital, 17th December, and the presence of much albumen in the urine was noted on 28th December; but it had diminished to a mere trace by the 10th January, and then disappeared, although the nervous disorder did not subside until nearly a month later.

These nerve-affections do not at once attain their maximum of intensity, but are progressive, although their progress even in the same sets of muscles is seldom quite uniform. For example, the grasping power of the hands will vary somewhat from day to day, as in Case 5 (Hawker), or the power of using the lower limbs will vary, so that a patient who could scarcely walk at a certain date may be much better able to do so a few days later, and yet retro-

grade to the former, or even a worse condition, at a subsequent period.

If several of the sets of muscles which I have enumerated should be attacked in the same case they do not become affected all at once, but in succession,—the faucial or pharyngeal muscles being almost invariably the first to suffer, next the sight becomes impaired, and, subsequently, the muscles of the tongue, of the lips, and of the upper and lower extremities become affected in the order in which I have named them, though it by no means follows that all of them should be affected in the same individual. Thus, in Case 3 (Davis), paralysis of pharyngeal muscles set in on 22d March; a few days later the sight became seriously impaired; but it was not until 23d April that the patient's speech became so inarticulate that he could scarcely make himself understood, and the paralysis of the lower extremities did not attain its maximum of intensity until 12th May. Again, in Case 2 (Bunkall), unequivocal symptoms of paralysis of the faucial muscles were noted on 4th January. Two days later the patient became unable to read even large type, but it was not till towards the end of the month that the paralysis of the lower extremities reached its climax. In Case 4 (Wiseman), the patient was able to walk up stairs on his admission to the hospital, 18th March, his sight having become affected early in February, and his tongue shortly afterwards; and it was not until a week later, March 25, that he lost all power of locomotion.

The muscles of the fauces are by far the most frequent, as well as the earliest, seat of nerve-disorder after diphtheria. I have seen them attacked in a great many cases in which the rest of the muscular system either entirely escaped or was so slightly affected that the paralytic symptoms were attributed to mere debility. Paralysis generally affects the muscles on both sides of the fauces, but not always in the same degree; and sometimes the muscles on one side have quite regained their power while those on the other side remain motionless. On looking into the throat in cases of paralysis of the fauces after diphtheria, the velum pendulum palati is seen to hang relaxed and motionless. If the patient be desired to take a forcible inspiration, or to articulate the word "Ah!" it still remains immovable, and is not excited to action even by the passage of food, which, consequently, often, if it be of a liquid nature, passes upwards through the nostrils, instead of taking its natural course downwards through the pharynx. Anæsthesia has co-existed with the paralytic affection of the fauces in all the cases that have come under my observation: these organs, naturally so sensitive, become altogether insensible and callous even to repeated and forcible pricks with the nib of a pen. A snuffling and more or less imperfect articulation accompanies this affection of the fauces. In rare instances, as in Case 3 (Davis), the speech becomes so inarticulate as to be almost unintelligible. This affection of the speech and regurgitation of liquids through the nostrils, in consequence of

paralysis of the faucial muscles, must be discriminated from the hoarseness of voice and the return of fluids through the nostrils which often occur during the acute stage of diphtheria, and arise, as in ordinary quinsy, from the swollen and painful state of the fauces impeding the natural action of the parts. It is worthy of note, that the paralysis and anæsthesia are sometimes more complete on that side of the fauces which was most severely affected in the early stage of the disease. This was well exemplified in Cases 2 and 3 (Bunkall and Davis), in both of whom the right side of the throat suffered more severely than the left from the diphtheria and also from the subsequent nerve-affection. The same relation between the two stages of the disease was observed as regards the tongue in Case 1 (Mufford), in whom the right tonsil and right side of the uvula were covered with a dense membranous exudation, while the left remained comparatively free, and in whom the right side of the tongue was subsequently less sensitive than the left. Sometimes the muscles of the pharynx are also paralyzed, and there is then more or less difficulty in swallowing. I have several times seen this to an alarming extent; but in the present group of cases there was only slight dysphagia in Case 2 (Bunkall), who was compelled at one period of his illness to wash solid food down his throat with liquids; and in Case 5 (Hawker), who complained of difficulty in swallowing, obliging him to endeavour to jerk, or, as he termed it, "to bolt" the food down his throat.

Next to the affection of the fauces, impairment of vision, probably due to paralysis of the ciliary muscle, is perhaps the most frequent of the nerve-affections consequent on diphtheria. It sometimes comes on very suddenly, as in Case 2 (Bunkall), where the patient could distinctly read ordinary newspaper type on Saturday 4th January, and two days later was unable to read a word of the largest print found in the ward. The same account of the suddenness of his loss of sight was given by Wiseman (Case 4), who, on returning to work after his illness, was able to follow his occupation for two days, but was compelled to discontinue it on account of failing sight on the third day. But although patients suffering from this affection are often unable to read, they have, in all the cases which have come under my notice, been able to see distant objects with more or less accuracy. Thus, at the very time when Bunkall (Case 2) could not with unassisted sight read a book held at the ordinary distance from the eyes, he was able to distinguish perfectly a painted inscription on the wall at the further end of the ward, and could even, with the help of convex spectacles, read small print with tolerable facility. I have verified the same fact in a great many other cases during the last four years, and of late I have further observed that the pupil of the eye is dilated and acts sluggishly for a day or two before the sight becomes sensibly impaired; and in Case 2 (Bunkall), the pupils were for a day or two almost immovable under the stimulus of bright daylight. The dilatation

of the pupils also continues for some days, and often for a longer time after the sight has been regained. It is evident from the above details that the impairment of vision in these cases is not caused by any permanent change of structure in the eye, but is due to a temporary want of that adjusting power which enables the eye to accommodate itself to the discernment of near objects.[1]

The tongue and lips are also, as I have already stated, very frequently the seat of nerve-disorder after diphtheria; there is formication of the tongue, or of the lips and tongue,—this abnormal sensation in the latter organ being sometimes described by patients as a sense of scalding, accompanied by numbness, coldness, and impaired power of movement. These symptoms begin for the most part simultaneously in the lips and tip of the tongue, and gradually extend upwards towards the dorsum and root of the latter organ; this was well seen in Case 2 (Bunkall). In Case 4 (Wiseman), the tongue was cold, and there was inability to move it; and in Case 1 (Mufford), the sense of taste was lost during the existence of the paralysis and anæsthesia of the tongue. In Case 2 (Bunkall), the muscles of the cheeks were likewise paralyzed, so as to disable him from whistling or blowing out a candle.

The limbs not unfrequently suffer from nerve-affection after diphtheria; they did so more or less in all the five cases which form the basis of this paper, and in all of them the disorder either began first in the upper, or at the same time in both the upper and lower extremities. The affection of the limbs comprises more or less complete paralysis and anæsthesia, besides tenderness and abnormal sensations, such as formication and a perception of tightness in the fleshy parts. In Case 5 (Hawker), there were also convulsive movements, resembling chorea, when the patient attempted to use the limbs. Just as the sense of scalding and numbness already described always begin in the tip of the tongue, and subsequently spread upwards along the organ, so also these affections of the limbs are at their commencement peripheral. Tingling is experienced in the tips of the fingers, accompanied by numbness rendering the patient unable to pick up small objects; presently these symptoms extend to the wrists and upwards to the elbows, and even to the shoulders, being especially felt, however, on the palmar surface of the hands. The ailment runs a like course in the lower extremities, but also frequently extends to the muscles of the lower part of the back and of the abdomen as high as the umbilicus. The limbs affected at first feel heavy and feeble, and a sensation of coldness often exists in them throughout the duration of the paralysis. As the ailment progresses, the anæs-

[1] Since writing the above, I have seen a case in which the adjusting power was for a time more impaired in one eye than in the other. Objects were very indistinctly seen by the patient at a distance of from 8 to 10 inches from the eyes; at a further distance they were seen double, and at a still greater distance single, and with comparative distinctness.

thesia renders the sense of touch so imperfect, that, both in endeavouring to walk and to use the hands, the patient is compelled to direct his movements by the eye. The sense of numbness is pretty constantly present in these cases, but the formication is chiefly, perhaps only, felt when efforts are made to move the affected limbs. If the paralysis continue for any length of time, the muscles concerned become flabby and sometimes very much emaciated, and their strength becomes so much impaired that patients who can move the affected limbs freely in bed often walk with much difficulty, or are even unable to stand, their limbs bending under them in the effort, so that, unless supported, they fall to the ground. Very often this loss of power and numbness are accompanied by increased sensibility of particular parts of the affected limbs. There is tenderness of the soles of the feet, of the calves of the legs, or of the fleshy parts of the arms; besides this general tenderness, pressure of the instep between the finger and thumb often causes acute pain, with convulsive starting of the leg and foot; and pressure along the large nerves of the arm and thigh, especially the sciatic and median nerves, is attended by pain or acute tenderness, as shown in Case 3 (Davis). In Case 4 (Wiseman), there was very considerable pain on percussion over the dorsal and lumbar vertebræ, and also tenderness on pressure by the sides of the vertebræ, from the lower dorsal region downwards. In the severest cases of diphtherial paralysis and anæsthesia, a sense of tightness is often experienced as if the parts were firmly bandaged. This does not usually occur till the patient is beginning to mend, and is then often very troublesome, affecting sometimes only one set of limbs, but extending in other cases to the arms, legs, and abdomen, as will be seen by reference to Cases 3, 4, and 5. Patients occasionally speak of their limbs as swollen, but this is an error arising from the sense of constriction above described, as is proved by the fact that the feeling of swelling is often worst where the limbs, in consequence of emaciation, are much smaller than in health. The paralysis in some cases assumes a more or less hemiplegic character, as in Case 5 (Hawker), but I have seen no instance in which one side being paralyzed the other remained entirely unaffected.

Nerve-affections of a graver character than any of those exemplified in the present group of cases, sometimes, though not frequently, follow diphtheria, and several even fatal cases have fallen under my notice in private practice. In three of these latter, death was caused by failure of the action of the heart; in one of them it was sudden, apparently from syncope; in the others, more gradual, the pulse becoming slower and slower, until, in one instance, it fell below thirty beats in the minute. I have also seen one case in which, when the patient appeared to be convalescent, vomiting supervened, and proved fatal in a few days from exhaustion. Fortunately, however, such cases are rare, and the great majority of

sufferers from diphtherial nerve-affections, under good management, ultimately recover their former health and strength, like those whose cases are related in this paper.

These ailments are best managed on general principles, and require no special mode of treatment; but I have found rest in bed, until convalescence had become thoroughly established, a most important aid towards a quick recovery even in the slighter cases. Generous diet and a liberal allowance of wine or malt liquor, or occasionally even of brandy, are always necessary,—the quantities being, of course, in each case regulated according to the state of the patient. Tonics, especially steel and quinine, or the mineral acids, are almost always required from the first appearance of the nerve-symptoms; and nux vomica or strychnia have in my hands proved most valuable remedies; but I have in no case found them to be of use until after the complete development of the paralytic affection. When this had taken place, I have usually combined them with the other tonics, which they need not supersede. In cases attended by obstinate constipation, I have found a combination of compound extract of colocynth with extract of nux vomica, —in the proportion of two or three grains of the former with one-third of a grain of the latter,—and about two grains of the extract of conium, the most effective aperient. The daily application of dry-cupping glasses along the back, on either side of the spine, appeared to be of essential benefit in Case 4 (Wiseman).

The five following cases, arranged in the order of their admission into the hospital, are those on which the foregoing remarks are chiefly founded. The first of them I had not the opportunity of seeing, and the report is taken from notes supplied to me by Mr Spurgin, one of the clinical assistants; the other four are abridged from my own notes of almost daily observation, supplemented, as regards Cases 2, 3, and 4, from the clinical case books, which were kindly placed at my disposal for that purpose, by my colleagues Drs Stewart and Thompson, who had those patients under their care.

Case 1.—Job Mufford, aged 20, shoemaker, was admitted into the Middlesex Hospital, under the care of Dr Thompson, on 17th January 1861. Is of spare habit, small muscular development, dusky complexion, and somewhat below middle height. Has never been robust, but, excepting several attacks of ague in childhood and occasional epistaxis, has not suffered from any particular illness until the present time. About a week previous to admission, he had a feverish attack, attended with sore throat and considerable difficulty in deglutition. On the fourth day of his illness, violent epistaxis supervened, and continued at intervals until the morning of his admission, when he was found to be suffering from severe faucial diphtheria, the uvula and right tonsil being covered with a dense membranous exudation; pulse 80, soft, small, and very compressible; urine, sp. gr. 1025, free from albumen. Two days later (19th January), there was likewise a slight filmy coating over the left tonsil. On the 22d, this coating had almost disappeared from the left tonsil, the uvula was now also quite free from exudation, and the false membrane on the right tonsil was clearing away. This day, for the first time, urine found to be albuminous,

sp. gr. 1020. On the 26th, the exudation had disappeared, all but a few small patches on the right tonsil; the pulse was 68, small and weak, and the quantity of albumen in the urine had largely increased. On the 29th, albuminuria still continued, and the patient now complained of weakness in the left arm, and of pain extending from the elbow to the shoulder joint; these symptoms were, however, of very short duration. From this time he made slow progress until 11th February, when the albumen in the urine had diminished to a very small quantity; his voice, however, about this date, began to assume a nasal character. On 16th February, he complained of numbness and insensibility at the tips of the fingers, and also in the lips and tongue, the sense of taste being so much impaired as to prevent his distinguishing different kinds of food. The tongue was covered with a whitish fur anteriorly; posteriorly, but chiefly on the right side, with a rusty grey coloured coating; pulse, 104, weak; appetite good; voice still intensely nasal; urine, sp. gr. 1014, contained now only a trace of albumen. 18*th February*. Sensibility of lips and fingers improving; right side of mouth and tongue less sensitive than left; right side of tongue still coated; voice less nasal. 2*d March*. The patient complained of a sense of tingling and numbness in the feet and hands; tongue still furred, but chiefly on the right side. 5*th March*. Discharged to the Convalescent Hospital at Walton-on-Thames.

Case 2.—Joseph Bunkall, aged 18, butcher, was admitted into Founder Ward, under the care of Dr Thompson, on 17th December 1861. Had been taken ill on the 11th, and was found on admission to be suffering from well-marked diphtheria. There was an herpetic eruption around the mouth, and the fauces and tonsils were swollen, and, excepting the parts covered with exudation, were of a dusky red colour. The right half of the soft palate, the corresponding tonsil, and the greater part of the uvula, were covered with a dense mass of membranous exudation, loose and well-defined at its anterior and superior margin, but firmly attached to the subjacent textures at its lower and posterior border. This exudation was continuous, at the middle of the fauces, with a whiter, closely-adherent membrane, which reached, but did not cover, the left tonsil. There was slight sanious discharge from the nostrils, the voice was raucous, the glands beneath and at the angles of the lower jaw were greatly enlarged, and there was also considerable swelling of the neck, especially at the right side. The urine contained a large excess of phosphates and a trace of albumen. On the day following the admission of the patient, the large loose patch of exudation had separated and come away, and the case ran through the ordinary course of diphtheria, varying slightly from day to day, but on the whole progressing towards recovery. The patient was able to take nourishment freely, and no untoward symptoms supervened; but the albumen in the urine, at first a mere trace, increased in quantity until the 28th of December, when it was found in great excess. It varied in quantity from day to day, and at different periods of the twenty-four hours, but the amount did not begin steadily to decrease until about the 4th January, was still considerable on the 11th January, and it was not until the 16th January that it was again reduced to a trace, from which date it entirely disappeared. On the 24th of December, liquids began to regurgitate through the nostrils, and, on the 29th, a scanty papular eruption appeared on the face, especially on the right cheek. 4*th January*. Sitting up; gait unsteady, and could not walk well without support; voice, which had become more natural, was now again affected, and had rather a snuffling than a raucous character; sight perfect, enabling the patient to read ordinary newspaper type with facility; pupils dilated and sluggish. 6*th January*. The albumen in the urine greatly diminished; pulse 80, of moderate volume, but very compressible; the patient unable to distinguish the type which he read with ease on the 4th inst., but able to see distant objects clearly; pupils dilated, and almost insensible to light. 7*th*. He complained of numbness, and a sensation of scalding or tingling in the tip of his tongue; liquids still regurgitated through the nostrils. 8*th*. Pupils still dilated and sluggish, but less insensible to light than on the 6th inst.; the patient still

unable to read ordinary type with the unassisted sight, but able to do so with the aid of convex spectacles, and even without them able to see distant objects perfectly well. He complained of vertigo, of pain at the epigastrium, and of dyspnœa. 9*th*. Fluids continued to regurgitate, and he was now unable to swallow solid food without drinking. Could read ordinary type when the book was held two feet from the eyes. Soft palate, nearly motionless in respiration and in articulating the word, "Ah!" and also quite insensible to the touch. 15*th*. Swallowing easier, but still occasional return of fluids through the nostrils. Vision still much impaired as regards near objects unless aided by spectacles, tolerably good for distant objects. Voice still snuffling; soft palate insensible and nearly motionless; tingling and numbness of the tongue had extended nearly midway up the dorsum, and there was now also tingling of the lips and inability to inflate the cheeks with air. 17*th*. Voice as before, but swallowing much improved. Pupils dilated and sluggish, and large print could only be read at a distance of four feet from the eye. Tingling of the anterior half of tongue and of the lips still continued; there was now also tingling and numbness in the fingers of both hands from the tips upwards to the second joint. 21*st*. Up to this date, the throat had never been quite free from exudation, which was renewed from time to time, at first in a pellicular form, and latterly in that of a mere transparent glazing of the surface. This day the patient complained of stiffness about the articulation of the lower jaw. Solid food still appeared at times to stick in its passage downwards, till washed down with drink, and fluids still occasionally regurgitated through the nostrils. Pupils large, but more sensitive to light; sight for near objects still much impaired; voice as before; soft palate still insensible and nearly motionless, especially on the right side. Tingling of the tongue and lips nearly gone, but that of the fingers had now extended upwards to the wrists, accompanied by numbness and impaired sense of touch. Walk unsteady. 24*th*. Sight, voice, power of deglutition, insensibility, and imperfect mobility of soft palate remained as on the 21st. Anæsthesia and tingling of the upper extremities had extended, especially on the right side, and having likewise commenced in the toes a day or two previously, they had now spread half-way along the feet. 30*th*. No material change, but the patient had suffered occasionally from headache and vertigo. Deglutition easier, and regurgitation of fluids through the nostrils diminished. Vision still much impaired, but the patient could read distinctly with the aid of spectacles. Walk still unsteady, and the tingling and impaired sensibility of the lower extremities now reached as high as the knees. 3*d February*. Deglutition and vision much improved, but the eyes easily fatigued, so that after a short trial of reading, the type became indistinct. Paralytic symptoms subsiding in the upper, but not as yet in the lower extremities, the patient still complaining much of tingling and aching in the calves. 9*th*. In all respects much improved, but the right side of the soft palate still remained less movable than the left, and there was still unsteadiness of gait and tingling and anæsthesia of the lower limbs. 11*th*. The patient was discharged to the Walton Convalescent Asylum. On his leaving that institution a month later, he attended at the hospital for some time as an out-patient under my care, and did not regain the perfect use and sensibility of the soft palate, or entirely recover his former health and strength until the middle of May.

Case 3.—Frederick Davis, aged 16, shoemaker, was admitted under the care of Dr Thompson, March 17, 1862. Was said to have been always weakly, but had never suffered from sore throat until the present illness. Had been ill a week previous to his admission, when he was found to be suffering from severe diphtheria. His voice was raucous, and there was much albumen in the urine. On the 22d, his voice, which had been less hoarse the two previous days, began to assume a snuffling character, and for the first time liquids regurgitated through the nostrils. On the 24th, the quantity of albumen in the urine was already diminished. On the 25th, the pupils had become dilated, the voice continued nasal, and there was occasional regurgitation of fluids through the nostrils, the albuminuria still diminishing. On the 29th, there

had been steady and rapid improvement in the general health, but voice and deglutition remained as before. 3*d April*. Patient complained of slight headache, and was unable to read for more than a few minutes at a time, the pupils being dilated and sluggish. 5*th*. Sight more impaired. 10*th*. Tingling and numbness over the whole palmar aspect of both hands. Urine now quite free from albumen. 15*th*. No material change in the symptoms. 19*th*. Voice more nasal, and the tingling and numbness of the hands had now extended above the wrists. 23*d*. The fauces were insensible to the tickling of a feather, and there was scarcely any movement of the velum in respiration or in the articulation of the word, "Ah!" Voice so snuffling and inarticulate as to render the patient almost unintelligible. Formication and numbness of the feet, and likewise numbness and a sense of tightness in the lower part of the abdomen had supervened since the last report, and the limbs were so weak that the patient could scarcely stand, even when supporting himself with his hands on the bedstead and a chair. 26*th*. Patient could read half a column of ordinary newspaper type held at a distance of twelve inches from the eyes; his sight then became dim and confused, and he was compelled to rest the eyes; pupils of normal size, and acted freely under the influence of light. 1*st May*. Formication and numbness of the lower limbs had extended upwards, especially on the right side, on which the hip was now affected. 7*th*. Sensibility and motor power of the soft palate improved, but chiefly on the left side, as was well seen on the patient's attempting to speak, when the right side of the velum remained nearly motionless, while on the left there was considerable action; articulation still very imperfect. Patient could not grasp firmly, the muscles of the fore-arms being almost powerless; he got out of bed with great difficulty, but could neither stand upright nor get into bed again without assistance, his limbs giving way under him in the attempt. Muscles of the hands, arms, and legs much emaciated. Numbness and tingling of the hands and feet still continued, but the numbness and sense of tightness in the lower part of the abdomen quite gone. Tenderness was found on pressure over the sciatic nerves, and along the course of the posterior tibial and median nerves, and more diffusedly over the fleshy parts of the fore-arms. 12*th*. Sensibility and motor power of the soft palate still imperfect, especially on the right side, but speech and general aspect greatly improved; pulse 76, of fair volume; slight increase of grasping power, but still much tingling in the hands. Patient quite unable to stand or use his legs, being worse in this respect than on the 7th. Tenderness along the course of the nerves as before, and pain was now also caused by squeezing the foot at the instep between the finger and thumb. 17*th*. Further slight increase of grasping power; the patient could now stand upright, but was unable to walk. Formication was felt in the hands and feet but only on occasion of movement, and it then extended in the lower limbs upwards to both hips; there was now also a sense of constriction in both arms, as if they were tightly bandaged. 26*th*. Sensibility of fauces much increased, but neither this nor motor power of the velum yet quite perfect. Further improvement in the grasping power of the hands, but the patient complained of a sense of roughness in the fingers when he touched anything; he was still powerless as regards walking, but able to move the limbs freely when in bed. The muscles of the extremities still much emaciated. Tenderness on pressure over the sciatic and median nerves continued. There was great tenderness with forcible starting of the limb on squeezing the instep near the junction of the first and second bones of the metatarsus with the tarsus, and the same sense of constriction and tightness in the feet as was complained of in the arms on the 17th inst. 3*d June*. Grasping power slightly increased, but the muscles of the fore-arm even now were scarcely seen to contract with the effort. Patient still unable to walk, and still complained of the sense of tightness in the feet. Tenderness on pressure over the sciatic nerves continued; much tenderness on pressure of the calves and of the fleshy parts of the fore-arms, and an extreme degree of tenderness along the course of the median nerve in the right arm downwards towards the elbow. 11*th*. Patient decidedly improving;

could walk round the table, though unsteadily, with the help of a stick in the other hand. 17*th*. General aspect greatly improved; patient could now stand and walk across the ward with no support but a stick. Muscles of hands, arms, and legs had gained both in volume and power. Sensation of roughness in the fingers on touching anything still continued. Numbness of lower limbs had disappeared, but acute pain was felt on pressure over the sciatic nerves, and tenderness as before on pressure of the calves. 21*st June* Patient in almost all respects improved; the pain on pressure over the sciatic nerves alone rather increased than diminished. 26*th*. Patient rapidly improving, though he still walked a little unsteadily. All sense of formication, numbness, and tightness in the extremities had ceased; the tenderness in the calves was entirely gone, and the pain on pressure over the sciatic nerves very greatly diminished. The sensibility and motor power of the soft palate had been entirely regained, the sight had for some time been perfect, and the muscles of the limbs were gaining in bulk and firmness. Discharged to the Convalescent Asylum at Walton.

Case 4.—Arthur Wiseman, aged 28, married, shoemaker, admitted under the care of Dr Stewart, 18th March 1862. Had been healthy previous to his present illness, which began on the 8th January, with catarrhal symptoms. On the following day his throat was sore, and he had much difficulty in swallowing. The first medical man who saw him called his complaint diphtheria, but a second who saw him a little later said it was ulcerated sore-throat. There can, however, be no doubt that the disease had been really diphtheria. In about a fortnight from the commencement of his illness, the throat began rapidly to amend, and in about a month the patient was able to return to work. He did not feel strong, but worked very well for two days, being able to see distinctly both to work and read. On the third day his sight became indistinct, as though from a mist floating before his eyes, and he was unable to read. The impairment of sight lasted three weeks, during which time, however, he discovered that he could read with the help of spectacles. His power of vision returned almost as suddenly as it had departed. About the same time that his sight became impaired, the patient had felt numbness in the tip of the tongue, which also felt cold, and he was unable to move it freely in the mouth. Besides this numbness and coldness, there was a sense of scalding or tingling in the tongue, which gradually extended upwards from the tip towards the dorsum. This affection of the tongue was before long accompanied by a sensation of choking in the throat, and by difficulty of speech. The duration of these symptoms is uncertain, as the patient could supply no accurate data by which it could be estimated. Next commenced numbness and formication in the tips of the fingers, which gradually, but slowly, crept upwards to the shoulders, and was attended by almost complete loss of power in the arms. About the same time, or very shortly afterwards, numbness, but unattended with tingling, commenced in the toes, and gradually crept up to the hips and to the lower part of the abdomen, causing his gait to be feeble and unsteady. Throughout the course of his illness, previous to the day of his admission into the hospital, he had never been confined to bed, and on that day, the 18th March, he walked up stairs to the ward, though with difficulty. On admission, he was pale and somewhat emaciated; countenance anxious; skin soft and warm; tongue flabby, indented by the teeth, and covered on the dorsum with a thin white fur. Pulse from 68 to 80, very excitable, sometimes irregular, and frequently intermitting. Pupils of equal size, dilated and sluggish under the influence of light. Occasional tinnitus aurium, swallowing difficult, and attended with a choking sensation. There was a feeling of constriction around the lower part of the abdomen, and the cutaneous sensibility was much impaired from the umbilicus downwards; there was also pain on percussion over the spine, and tenderness on pressure by the sides of the vertebræ, from the lower dorsal region downwards. The velum pendulum palati and the adjoining parts of the fauces were insensible to touch, and the velum hung relaxed and almost motionless in respiration, and in the attempt to articulate the word.

"Ah!" The urine was free from albumen. 26*th*. The patient had lost all power of walking, and could not even stand by the bedside, the left leg being manifestly still weaker than the right. No material change in the other symptoms. 12*th April*. Sensation and motor power of the soft palate still imperfect. Sight perfect, so that the patient could read ordinary type both at the normal distance and also at a distance of three feet from the eyes. Power of grasping with the hands much impaired; numbness and formication of the arms and numbness and loss of power in the legs have receded from the shoulders and hips downwards to the elbows and knees, but the numbness of the feet has rather increased. Patient unable to stand, but could lift his feet from the ground when seated. The right leg was now worse than the left; the right arm had throughout been more affected than the left. Muscles of the hands, arms, and legs much shrunken and emaciated. Sense of constriction round the abdomen diminished; tenderness in the vertebral region nearly gone. On moderate pressure of the feet between the finger and thumb, near the junction of the first and second metatarsal bones with the tarsus, there was tenderness and spasmodic retraction of the legs, especially of the left. There was also considerable tenderness on pressure over the sciatic nerves. 25*th*. Patient's appearance much improved; had gained flesh; had acquired considerable command of the left hand and arm, and somewhat increased power in the right hand and forearm; there was also some return of sensation in the fauces, and of motor power in the soft palate. Numbness of legs and feet, and hyperæsthesia and jerking of the limbs, on pressure of the instep between the finger and thumb, continued. 6*th May*. Patient had gained strength in both arms, could stand with great difficulty, but was unable to walk. The sense of constriction round the abdomen was nearly though not quite gone, but there was now the same feeling in the arms from the shoulders downwards to the wrists. 12*th*. Patient could now grasp firmly with both hands, the left being still the strongest, and could likewise raise himself from his chair, and stand without assistance. The lower limbs were free from formication while at rest, but when they were moved it was felt from the feet upwards to the hips. There was still tenderness on pressure over the sciatic nerves, but none in the vertebral region. 16*th*. Sensibility of the fauces appeared to be perfectly restored, but the motor power of the velum in articulation was still imperfect, especially on the right side. The sense of tightness in the arms remained, but in a less degree, and the patient had for the last two days experienced the same sensation in both legs from the knees downwards anteriorly to the toes and posteriorly to the heels. Formication of lower extremities on movement still considerable. 20*th*. Patient much improved in colour and general appearance, and was this day for the first time able to walk across the ward. 26*th*. Decided improvement in all respects, but patient still complained of the sense of constriction in both arms and legs as though they were bandaged. He could now walk, but unsteadily, and while doing so, required to look to his feet in order to direct their movements by the eye. 4*th June*. Had walked a mile and a quarter this day, but his limbs were still feeble, and his gait unsteady. Was gaining flesh, the muscles of the hands and arms especially having become stouter and firmer. The sense of constriction in the arms and of constriction and numbness in the legs greatly diminished during the last ten days. The tenderness on pressure over the sciatic nerves and the hyperæsthesia of the feet quite gone. Discharged to the Convalescent Asylum at Walton.

Case 5.—James Hawker, aged 40, coachman, admitted under the care of Dr Greenhow, 15th September 1862. A strong healthy man until two years ago, when he had rheumatic fever; since which time he had been less robust and subject to slight rheumatic pains. Three months ago, had an attack of sore throat which lasted in a severe form two weeks, and in a slighter form for several weeks longer. From this illness he had never entirely recovered, though he had been able to return to work, and continue it until within a few days of his admission. About the time that he was attacked with sore throat, his four children had each a slight feverish attack, attended by redness of skin; and about fourteen

days later, he also had a feverish attack, lasting about a week, and attended by slight rash, followed by desquamation of the cuticle. Six weeks before his admission, being therefore about six weeks after the commencement of the sore throat, he experienced tingling and numbness of the fingers, which gradually spread over the whole hand, and were accompanied by great muscular debility. The numbness and loss of power gradually increased, and in two or three weeks after the appearance of these symptoms in the hands, they also began in the feet, and he became unable to walk beyond a short distance. He had also latterly a benumbed feeling over the lower part of the abdomen, a partial loss of power over the bladder, and a sense of constriction of the legs from the knees downwards, as though they were tightly bandaged. The numbness and loss of power in the hands meanwhile continued to increase till he was unable to hold the reins, and was compelled to give up his employment, about a week previous to his admission. 15*th September*. On admission, the patient had numbness and formication in both hands, and also in the feet, extending upwards nearly to the knees. He complained also of a tight and pinched feeling in the lower extremities, which made walking difficult, and rendered his gait irregular and tottering, his limbs jerking about from his inability to direct their movements. The numbness of his feet was so great that he could never feel sure he had planted them on the ground unless he verified the fact by the eye. The power of grasping objects with the hands was very feeble, and when he extended them, the fingers were widely separated, and there were convulsive twitchings of a choreal character. He was unable either to dress himself or to cut up his food. He had a sensation of tightness and numbness over the lower half of the abdomen, and a partial loss of expulsive power over the bladder and rectum. He had also a difficulty in swallowing, which he said caused his food to "bolt down his throat." Was ordered good food, with a liberal allowance of wine and porter. ℞. Tinct. ferri sesquichlor. ♏xx.; acid. hydrochlor. dil. ♏x.; inf. quassiæ, ℥j.; *M*. Ter die sum. ℞. Ext. nuc. vom. gr. ½.; ext. coloc. co. gr. iii.; ext. conii. gr. ii.; *M*. Ft. pil. o. n. sum. 20*th September*. Patient somewhat improved. Tightness of abdomen and difficulty in micturition quite gone. There was also less choreal twitching of the hands, and on extending them he could now bring his fingers close together. Tight feeling in the calves of the legs diminished, and he was able to walk better, though still with a staggering and shuffling gait. ℞. Tinct. ferri sesquichlor. ♏xx.; acid. hydrochl. dil. ♏x.; tinct. nucis vomicæ, ♏viii.; aq. cinnam., ℥i.; *M*. T. d. s. 25*th*. Patient complained of pain in the loins, and had rather less use of his hands than at the date of last report, being again unable to bring his fingers together when the hands were extended. 28*th*. Both legs felt as if tightly bound from the knees downwards. No material change in other symptoms. 2*d October*. Patient not so well; complained of headache and vertigo. Numbness of hands increased. Haust. magnes. co. ℥i. ter die. ℥ii. ol. ricini cras mane. 4*th*. Head symptoms increased; slight hemiplegia of right side; pulse slow (58); speech hesitating. Pil. coloc. c. hyd. chlor. gr. x. statim. Haust. sennæ co. 9*th*. Head symptoms and hemiplegia quite gone, leaving the patient in much the same state as before their accession. ℞. Tinct. nux. vom. ♏x.; inf. chyrett. ℥j. *M*. Ter die sum. 15*th* Power over lower extremities considerably increased, and feeling of tightness diminished. Numbness of hands decreased, so that the patient was now able to button his waistcoat. 22*d*. Decided improvement. 27*th*. Power of locomotion rapidly increasing, but slight return of tingling in hands and fingers. 3*d November*. Much better in all respects. Bowels now act daily without aperients. Muscular power of extremities nearly restored. Sense of tightness in legs almost gone, and very slight formication of the hands remaining. Patient was now quite able to dress and feed himself, and had full control over the movements of his hands and limbs. Discharged to the Walton Convalescent Asylum. At the end of a few weeks he showed himself at the hospital free from all traces of his illness.

PRINTED BY OLIVER AND BOYD, TWEEDDALE COURT, EDINBURGH.