ON BULBAR PARALYSIS FOLLOWED BY
PROGRESSIVE MUSCULAR ATROPHY.TREATED BY A NEW METHOD OF IONIC MEDICATION
(STATIC IONIZATION).

BY

J. FLETCHER LITTLE, and T. J. BOKENHAM,
M.B.CANTAB., M.R.C.P.LOND. L.R.C.P., M.R.C.S.

BULBAR paralysis, whether uncomplicated or associated with lesions of the spinal cord, is happily one of the least frequently occurring affections of the nervous system. It is also one in which remedial measures have proved hitherto of so little avail in arresting the slow but steady advance of the symptoms and their ultimately fatal ending that there has been a strong tendency for the physician to take refuge in general advice as to the careful observance of hygienic rules and the avoidance of anything calculated to hasten the end.

It is this apparent hopelessness of ordinary measures, together with the pathetic circumstance that the patient's higher faculties remain quite intact, which has seemed to demand a departure from an attitude of hopeless inactivity and a search for possible help in the less familiar and partly experimental regions of physio-therapeutics. In the case about to be described, although there could be little hope of cure, owing to its advanced stage, we believe that the results obtained may warrant an expectation of more striking success when similar measures may be applied in the earlier period of bulbar palsy.

R. C. H., aged 34½, height 5ft. 11½ in., normal weight 11 st. 8 lb., had, until four years ago, enjoyed excellent health. By profession an electrical engineer, he held a post of great responsibility. In 1900 he undertook the duties of erecting, organizing, and afterwards of managing, a borough electric generating station and distribution system. For the first year or two the constant strain must have been very heavy, but he noticed no untoward effects on his health until about four years ago, when he became aware of a slight difficulty in whistling. This difficulty became during the month or two following progressively greater, until at last he was unable to make the necessary muscular movements. From this time the classical symptoms of bulbar palsy gradually developed until in June, 1906, when he consulted Dr. James Taylor, he had some wasting of his lips and tongue, with a trace of trouble in swallowing, and a suspicion of difficulty in articulation. There seems then to have been no general wasting of muscles, but he describes the ball of his left thumb as having become somewhat flattened, and adds that he was, particularly when tired, liable to involuntary fibrillary twitchings of certain muscles.

By June, 1907, the disease had made marked advance, speech and deglutition being then difficult, and general wasting and loss of strength being distinctly marked.

The patient was first seen by one of us (J. F. L.) on February 3rd, 1908, in consultation with Dr. Glinn, of Camden Square; also on March 3rd, 11th, and 30th. At the consultation on March 11th Sir Victor Horsley was also present. Later on that day the patient was also shown at a meeting of the Neurological Section of the Royal Society of Medicine.

On March 30th his weight was 8 st. 13½ lb., dressed—8 st. 2 lb. net—a loss of 9 lb. since six months previously. Walking was less easy and quickly caused fatigue. Meat was taken with difficulty, but milk and milk puddings were taken freely. He slept well at night, and also for an hour after luncheon. He dressed himself, but could not always manage to fasten his collar. The power of articulation had been practically lost, and respiratory difficulties gave frequent trouble and anxiety. The patient had been compelled to give up his professional work in August, 1907.

Condition at Commencement of Treatment.

On April 8th, 1908, he was seen by us both, in consultation with Dr. Glinn, and the following note recorded:

General Appearance.—Tall. Shoulders much rounded, and cervical spine presents pronounced anterior curve, with great backward prominence of lower cervical spinous processes. General muscular wasting very pronounced.

Facies.—Expression of upper part of face practically normal, but from orbits downwards the face is expressionless and emaciated. Mouth open, lips wasted and bluish, the flow of saliva being abundant and beyond control. Cannot whistle or protrude tongue. Has lost all power of producing articulate sounds.

Tongue lies helpless on floor of mouth, its substance greatly shrunken, its surface being rugose and lumpy, thickly coated with white fur. The edges bear marks of indentations by the teeth.

Palate practically immobile, uvula large, and hanging low and inert.

Eyes.—Pupils normal in appearance and reactions. Vision in no way impaired. Fundus normal.

Muscular System.—Pronounced general wasting, with marked fibrillary movements continually going on. Left hand is typi-

cally wasted, presenting the characteristic appearance of the "main en griffe." Right hand shows only a trace of wasting, and can be used without difficulty for writing and all ordinary purposes. Superficial reflexes generally lessened, but not to any marked degree. Deep reflexes show a general exaggeration. Control over bladder and sphincters unimpaired.

Circulatory System.—Pulse normal in character and volume, average frequency 70 to 75. Blood pressure measured at brachial artery, 145 mm.

Electrical Reactions.—There is a general lessening of response to direct stimulation of the muscle fibres by either continuous current of low voltage or by coil currents. Those muscles which show advanced atrophy do not respond to either form of stimulus, neither do they contract with the interrupted direct current of Leduc or to low tension condenser discharges as used by Sudnik. Nowhere can it be said that a distinct reaction of degeneration is demonstrable. Stimulation at the motor points by either faradic or battery currents evokes a response, save in the muscles where the atrophic change has become very great.

By employing the form of stimulus known as "the Morton wave" current, derived from a powerful Wimshurst static machine, it was found possible, however, to reduce the number of instances of failure to respond to direct application of the excitator to the muscle, and the reduction was still greater when the motor points were examined.

The special senses are in no way affected, and intellectual powers are quite as good as ever.

Deglutition is very difficult, particularly as regards fluids, which sometimes give great trouble by trickling through the imperfectly-closed glottis.

Speech has dwindled down into nothing more than an unintelligible grunt.

Weight in clothes (no coat) is about 7 st. 11 lb.

The clinical picture afforded by the foregoing observations suggested to our mind the existence of changes not only of the nuclei of the bulb, but, in addition, to lesions in the anterior grey cornua of the spinal cord. The absence of any trace of spastic rigidity or contracture with the limitation of paralysis to the atrophied muscles render it probable that the lateral white columns are not involved.

A few weeks earlier we had read a paper by Dr. Dawson Turner,¹ in which cases of spinal sclerosis were described as having derived great benefit from the ionic introduction of drugs, and it occurred to us that something similar would be at least worth trying in Mr. H.'s case. This we did, after having made it quite clear to all concerned that the treatment was practically experimental, and that no certainty could be promised of beneficial results.

Treatment.

The treatment actually applied may be briefly summarized as follows:

(a) Ionic introduction of sodium, lithium, iodine, or salicylic radical, either by means of large medicated pads applied over the occipital and cervical regions, with the indifferent electrode over the lumbar region, or by means of Schnee local bath cells, with the hands and feet immersed in the solutions. Results practically nil.

(b) Application on alternate days of medicated electrodes as before, with the patient placed on an insulating platform, and the pad being connected with the positive side of a static machine, the negative pole of which was grounded. The discharges were then arranged so as to give a powerful "Morton wave" current. In addition, local application of similar current was made by means of a glass vacuum electrode over the affected muscles and their motor points. On May 1st, after the fourteenth visit, the following note was made: Facial expression greatly improved, the original blank expression has passed off, and the patient possesses quite evident power over his muscles of expression. Lips are of good colour, and more plump in substance. Palate and uvula can be readily raised by voluntary effort. Tongue much cleaner, and surface has lost some of its rugged appearance; it seems less shrunken, and can now be protruded beyond the teeth. Weight increased to 8 st. 11 lb.

Treatment was then interrupted for a fortnight, and resumed on May 18th. On his return it was evident that the muscular atrophy had advanced, and the response to stimuli was less prompt, especially in the muscles of the right hand. Weight, 8 st.

By June 13th his weight had increased to 8 st. 4 lb., and there was no further advance of atrophic changes; the palate was distinctly more under control, and the tongue could be protruded as far as the lips. It was then found necessary to discontinue the iodine ion, as its use increased the salivary trouble, and produced a metallic taste in the mouth.

The foregoing notes were under final revision, and a concluding paragraph had actually been prepared, when news reached us of the quite sudden death of our patient on the evening of July 16th. There had been evidence of increasing fatigue since the morning, but food had been taken with ease and in good amount, and his mother had actually felt comforted at the absence of any special indication of progressing trouble. The end occurred within a few minutes of the patient retiring to bed, and

was entirely free from any evidence of pain or respiratory embarrassment. It was described as a "simple falling asleep."

All that now remains for us to do is to draw attention to the fact that, whereas during the period preceding electrical treatment the symptoms attributable both to the bulbar and spinal lesions were becoming steadily more marked, we think ourselves justified in the belief that as a result of the measures subsequently adopted there occurred, not only an arrest, but an actual improvement as regards the troubles of "bulbar" origin, although we cannot go so far as to claim that the "spinal" complications were similarly influenced.

In conclusion, we hold that the results obtained in this advanced case are so far encouraging as to warrant us in anticipating far more success from the adoption of similar measures during the earlier stages of bulbar palsy. For any such case we would at once recommend the application of intermittent electrical currents at high tension by means of electrodes impregnated with drugs capable of introduction by the plan known as ionic medication.

REFERENCE.

¹ BRITISH MEDICAL JOURNAL, April 4th, 1908, p. 806.

SEVENTY-SIXTH ANNUAL MEETING

OF THE

British Medical Association.

Held at Sheffield on July 24th, 25th, 27th, 28th, 29th,
30th, and 31st.

PROCEEDINGS OF SECTIONS.

SECTION OF ELECTRICITY.

E. REGINALD MORTON, M.D. Toronto, F.R.C.S. Edin.,
President.

PRESIDENT'S OPENING ADDRESS.

THE work of the Section was initiated by the President, who read a short paper on The Value of Tele-radiography in Diagnosis. Before reading the paper he welcomed the members and visitors, and said that they as electro-theraputists had good cause for satisfaction in that they had again been granted a separate Section at the Annual Meeting of the British Medical Association. Though this privilege was long denied to them, they had now every reason to feel that they had been accorded a recognized position in the make-up of the programme for this important function.

THE VALUE OF TELE-RADIOGRAPHY IN
DIAGNOSIS.

By E. REGINALD MORTON, M.D. Toronto, F.R.C.S. Edin.,
Medical Officer in Charge of the Electrical Department, London
Hospital;
President of the Section.

THE principle involved in tele-radiography is simplicity itself, and no more than the elementary one that, other things being equal, the further away the source of light, the sharper and less distorted will be the shadow thrown by an opaque object. Probably all of us recognized the truth of this in our nursery days when we amused ourselves by making shadow pictures on the wall.

The practical application of this principle to radiography was not so easy, but, thanks to the suggestions of Groedel of Nauheim, and the technical knowledge and experiment of Mr. Horn—an engineer in the firm of which Mr. Schall

is a member—the whole process has been placed on a practical basis.

For the practical demonstration of this work we require: (1) a supply of continuous current of not less than 100 volts; (2) a suitable switch for breaking the current; (3) a multianode electrolytic break in which all the anodes are tuned to each other and joined in parallel—this being the only way yet discovered that the necessary 70 to 100 amperes can be passed through the coil at a high frequency of interruption.

Any well-designed coil can be used so long as it is of not less than the 12 in. size and is provided with some means of varying the self-induction in the primary coil. This must be adjusted until the amount of inverse current in the secondary is at its minimum. On this account the "heavy discharge" type of coil is not so suitable, as in such a coil the amount of inverse current is usually rather high. With a coil having a high proportion of inverse current it becomes necessary to use at least two valve-tubes, and this places so much resistance in the circuit that the *x*-ray tube does not get a chance to exert its full power in the short time allowed for the exposure. In all large coils the inverse current is such that it has to be reckoned with, but it should not be so great that one good valve-tube cannot deal with it effectually. I might here mention that no form of spark-gap rectifier is of any use. With such a contrivance the discharge between the electrodes partakes of the character of an arc, and an arc does not rectify.

The *x*-ray tube must be one in which the anode consists of a solid block of good heat-conducting metal. Light anodes are quickly used up, and water-cooled anodes are little better, because the water behind the anode becomes almost instantly converted into steam, and so ceases to be of any use as a cooling agent. So far as I have been able to judge, the tube which gives the best results is one specially constructed for this work by Gundelach. It is provided with a palladium osmo regulator, and the vacuum is adjusted so that the penetration reads to "9" on the Wehnelt scale.

Almost any make of *x*-ray plate is suitable, but whatever one is selected it is necessary to use an intensifying screen. While this is a thing to be avoided under ordinary conditions, there can be little objection to using such screens as are now supplied by Mr. Schall. They increase the action on the plate very many times and are quite free from grain. I have negatives in which it would be impossible to say with certainty from an examination of the plate if an intensifying screen had been used or not.

The technique connected with making the exposure requires no special description beyond seeing that the distance from anode to plate is always the same, namely, 2 metres.

With the apparatus arranged substantially as described the exposure is one second for a normal subject. This may be made slightly over or under according to the thickness of the patient. It will be found that even after this short exposure the tube will be appreciably harder, so that a fresh adjustment of the vacuum becomes necessary for every exposure. This alone suggests the intensity of the energy expended in the tube.

As for the current passing through the latter, I have not yet ascertained this. My milliamperemeter reads to 30 only, and I have found it necessary to cut it out when making these exposures. Except as a point of scientific interest I do not know that it matters very much.

This forms a striking instance of the rapidity of change that is continually taking place in a new subject like radiography. Last year in this Section we were much entertained by a demonstration of the orthodiagraph by Drs. Walsham and Halls Dally. We then thought that the last word had been said in the matter of accurate delineation of the heart and great vessels. I think all will agree that tele-radiography achieves the same end equally well as regards accuracy for all practical purposes, and the record obtained on the *x*-ray plate has many advantages over the orthodiagraphic chart.

[At the conclusion of his paper Dr. Morton showed a number of tele-radiographs, in some of which the exposure had been 0.15 of a second at a distance of 80 in. On the opposite two plates of an ordinary chest are shown. The upper one was obtained by the ordinary method; the lower one, showing much greater definition of the heart and other outlines, was taken as described by Dr. Morton.]