ON SOME POINTS IN THE DIAGNOSIS AND TREATMENT OF BRAIN DISEASE.

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While therefore our knowledge of the clinical features of thalamus opticus lesions is as yet very fragmentary, we possess a large body of evidence with regard to the distinctive characters of disease in the neighbouring ganglionic mass of the corpus striatum, the several portions of which were first clinically differentiated by the observations of Tuerck, Meynert and Charcot, as they had long before been anatomically unravelled by Burdach in his great work on the structure of the brain. The prominence given, and the great interest attaching to the affections of the different portions of the corpus striatum, which are more frequent and practically important than any other localised brain-lesions, have caused the terms of lenticular and caudate nucleus, and external and internal capsule, to become household words in neurological literature.

The term "corpus striatum" is now used in a somewhat different sense by various writers. Most pathologists comprehend by it (a) the grey caudate nucleus, Schwanzkern, or intraventricular portion of the ganglion, which comes in sight on laying bare the lateral ventricle; (b) the lenticular nucleus, Linsenkern, or extraventricular portion, which is imbedded in the cerebral substance, and therefore not visible from the ven-

1 Singularly enough, the terms "external and internal capsule" are nowhere to be found in the last edition of 'Quain's Anatomy,' by Sharpey, Allen Thomson and Schäfer. (1878)
tricle; and (c) the white internal capsule, which is situated between the two nuclei, and forms the connecting link between the crus cerebri on the one hand, and the corona radiata and the cortex, of the brain on the other hand. Prof. Dalton,¹ of New York, and others have recently restricted the term corpus striatum to the caudate nucleus or intraventricular portion of the ganglion; while in the following remarks, for the sake of clinical convenience, both nuclei, the internal and external capsule, and the claustrum, will be comprehended under the name of corpus striatum. The claustrum (Vormauer, avant-mur) is that thin layer of grey matter which separates the lenticular nucleus from the convolutions of the island of Reil, the external capsule being a correspondingly thin layer of white fibres on the inner side of the claustrum.

(a) External Capsule and Claustrum.—It has long been known that haemorrhage to a very large amount is apt to occur between the external capsule and the external surface of the lenticular nucleus; and Charcot says that the artery here in fault—one of the lenticula—striated arteries arising from the middle cerebral—is so frequently affected by sclerosis leading to the formation of miliary aneurisms, with subsequent rupture and haemorrhage, that it almost seems to deserve the name of "cerebral-haemorrhage-artery." More than forty years ago Gendrin had already called attention to the fact of haemorrhage occurring more outside than inside the grey nuclei of the corpus striatum; and his observations have since then been extended chiefly by Bouchard, Bourneville, and Duret, and in this country by Dr. Broadbent,² who has shown that the effused blood in its further course through the brain-substance performs a kind of natural dissection in the direction of the least resistance. Dr. Broadbent's cases, however valuable in themselves, cannot by any means be taken to afford any information concerning the special functions of the external capsule and claustrum, as has been assumed, for in none of them was the lesion limited to these structures; on the contrary, it was always found to extend to distant parts, generally ploughing

¹ "Brain," Part X. p. 147.
up the hemisphere more or less, and bursting into the lateral ventricle. This great extent of the haemorrhage quite unfits these cases for being utilised for localisation, strictly so called, as for that only limited lesions are suitable. An additional reason for our not making such use of these cases is that all the patients died shortly after the attack. One of them, indeed, survived for three weeks and a half, but the others were carried off within some hours, or, at most, a few days after the seizure. Now recent cases, more especially of haemorrhage, are most deceptive if employed for the purpose of localisation, inasmuch as at an early period of the disease the symptoms are not exclusively owing to destruction of tissue, but also very greatly to pressure of the clot on neighbouring parts, whereby the circulation in them is altered, and function inhibited. As the clot contracts, these latter symptoms gradually disappear; and about six or eight weeks after the attack those which remain are probably mainly owing to destruction, and then fit for diagnostic purposes. Dr. Broadbent has, in the paper just referred to (p. 358), called special attention to the circumstance that he found hemianæsthesia accompanying the paralysis, not only where the thalamus or the posterior portion of the internal capsule was damaged, but where the haemorrhage was too far forward for either occurrence. This has led him to think that the French school has referred hemianæsthesia too exclusively to a lesion of the posterior part of the internal capsule, and that that symptom may also be induced by lesion elsewhere. It will be seen from the above considerations, however, that this conclusion as to the causation of hemianæsthesia is not justified by the cases on which Dr. Broadbent has relied for his argument. Had his patients survived the lesion a little longer, the hemianæsthesia might have gradually disappeared, as is not uncommonly seen in similar cases, showing that that symptom was owing not to destruction, but to temporary inhibition merely.

Haemorrhage localised in the external capsule and claustrum is very rare; and softening limited to these parts does not occur. Temporary crossed hemiplegia would appear to be the symptom corresponding to the above lesion; yet there may be no morbid sign whatever from the commencement, and
it therefore seems impossible to diagnose disease of these structures.

(b) *Linsenkern, lenticular nucleus.*—Small areas of softening in this region may remain latent during life; but if the larger part of the nucleus be affected, opposite hemiplegia is the result, which is generally incomplete in character, and transitory in appearance. The recovery of function which appears to be the rule in such cases, is probably owing to compensation being effected by means of the uninjured portions of the linsenkern itself, or of the caudate nucleus. In some of these cases nothing but paralysis of the lower branches of the portio dura has been observed. Haemorrhage seems never to be strictly limited to the linsenkern, but always to involve portions at least of the internal capsule at the same time; while tumours have been found involving symmetrically the nuclei of both sides, and yet had been totally unsuspected during life (Rondot, Fürstner).

(c) *Schwanzkern, caudate nucleus.*—Lesions affecting this ganglion in its entire extent, without encroaching upon other neighbouring structures, have not yet been observed, which is no doubt owing to the peculiar distribution of blood-vessels in this part. Its head alone has occasionally been found softened where there had been no symptoms during life, exciting suspicion of such an occurrence. Where portions of the internal capsule have suffered in company with the schwanzkern, crossed incomplete and transitory hemiplegia has been the result. From all this it appears that we are unable to distinguish during life a lesion in one grey nucleus from a similar one in the other; and that, where hemiplegia remains permanent after an apoplectic seizure, the lesion cannot be limited to either of the grey nuclei of the corpus striatum.

(d) *Internal Capsule.*—It has been stated that haemorrhage into, or softening of, the white medullary matter of the internal capsule always causes permanent and incurable crossed hemiplegia; but such is not the case. Here, as elsewhere, the extent of the area of disease is of the greatest consequence, for small lesions may exist even in this important locality without leading to striking symptoms during life. Nevertheless it is a fact that, in the vast majority of cases, somewhat extensive
destruction of this part is followed by crossed hemiplegia of the portio dura and the extremities. The conducting paths for the portio dura and the extremities are probably quite distinct within the internal capsule, as cases are on record where the extremities suffered exclusively, and others where the lower branches of the portio dura suffered exclusively, from disease in this region. The hypoglossus is not so commonly involved as the portio dura; indeed, the tongue appears sometimes quite straight, even in the commencement, and there may be no difficulty of articulation. In other cases the tip of the tongue deviates, and there is dysarthria or anarthria, such as we see it in medullary or pontine lesions. These symptoms, however, frequently vanish in the further progress of the case, from which it may be concluded that they were owing not to destruction, but to inhibition of the function of the cortical or subcortical centres of the hypoglossus, by pressure of the clot. As this latter contracts, the pressure is relieved, and function resumed to a proportionate extent.

That hemiplegia should be more or less permanent from disease of the internal capsule, and temporary from affection of the grey nuclei, is explained by considering the fibres of this capsule as centrifugal in their action, intended to transmit to the extremities and the portio dura the motor influence generated in the cineritious substance of the hemispheres as well as in the caudate and lenticular nucleus. While, therefore, lesion of the lenticular nucleus, for instance, will not prevent transmission of power from the caudate nucleus and the cortex of the brain, destruction of the internal capsule puts an impediment in the way of conduction of any motor power, from whatever source generated. It would therefore follow that only regeneration of nervous fibres in the capsule could, by re-establishing conduction between the centre and the periphery, lead to disappearance of the paralysis in such cases; and this appears, unfortunately, to be a very rare occurrence.

The localisation of the conducting paths for motion and sensation in the different portions of the internal capsule constitutes one of the most brilliant discoveries in this chapter of pathology. According to Charcot and Flechsig, lesions of the internal capsule alone, without any participation of the grey nuclei,
will cause permanent hemiplegia with late rigidity, without permanent affection of sensibility, if limited to the two anterior thirds of the capsule, where this separates the anterior end of the linsenkern from the head of the schwanzkern; while, on the other hand, destruction of the posterior third of the posterior segment of the internal capsule, where this lies between the thalamus opticus and the posterior end of the linsenkern, will cause crossed hemianæsthesia without motor paralysis.

Hemianæsthesia from disease of the internal capsule may be complete and permanent. It then affects not only the entire skin of one half of the body from vertex to toe, but also the mucous membranes of the eye, nose, mouth and tongue, the external auditory meatus, one half of the anus, glans penis, or vagina, as well as the special senses of sight (with negative ophthalmoscopic appearances), of hearing, smell and taste. In other cases it is incomplete, affecting only the skin, and leaving the mucous membranes and special senses intact; or slight in degree, so that sensation is only impaired, but not lost. Where it is complete, the muscular sense and electro-muscular sensibility are likewise absent, so that, while the nerves and muscles respond well to faradisation and galvanisation, no sensation is excited by the electro-muscular contraction; while tendon-reflex excitability is unaffected. In some cases hemianæsthesia disappears after a time, showing that it was not owing to destruction, but to inhibition of function; and similarly in a case where there were at first both hemiplegia and hemianæsthesia, the latter may remain and the former gradually disappear, showing that there was an inhibitory lesion in the anterior, and a destructive one in the posterior part of the capsule.

It is perhaps well to remark that hemianæsthesia of the skin may also occur in lesions of the mesocephale (pons, crus cerebri) and of the corona radiata, so that it cannot be considered as strictly characteristic of internal capsule disease.

Lesions of the centrum ovale are as yet little studied, and their symptoms are so manifold in character that in most instances in which they occur, an accurate diagnosis cannot be made during life. Comparatively large portions of this connecting link between the central ganglia and the cortex
may be destroyed by softening or haemorrhage, without giving rise to any symptoms at all. This appears to be more particularly the case where the occipital, parietal, sphenoidal, and anterior and middle frontal portions are affected. On the other hand, disease in the posterior frontal and posterior central part causes the typical symptoms of corpus striatum paralysis, i.e. opposite hemiplegia with paralysis of the lower branches of the portio dura, and sometimes of the hypoglossus.

Where the left hemisphere is the seat of it there may also be aphasia, which we are at present unable to distinguish from aphasia owing to destruction of Broca's convolution; and dysarthria which resembles the same symptom from disease of the pons Varolii, medulla, &c. The lesion of aphasia is in the posterior frontal part, close by the third left frontal convolution, and is probably owing to disruption of what Meynert has called the "system of association." Where a small area is affected, there may be only monoplegia. Early and late rigidity in the paralysed muscles is also sometimes found. Tumours invading the centrum ovale may give rise to the general symptoms of increased intracranial pressure, such as vomiting, optic neuritis, headache and epileptiform seizures, without the presence of any regional phenomena enabling us to localise the seat of the disease. It is also worthy of note that destruction of the occipital portion of the centrum ovale has been found associated with acute bedsores on the opposite side.

By lesions of the cortical substance of the hemispheres we understand not only those which affect the cineritious substance itself, but also the white medullary matter immediately underlying the same. Of all cerebral convolutions the third left frontal has, since Broca's observations, received the largest share of attention; and a number of typical cases in which there was limited destruction of the same, have rendered its intimate relation to the production of intelligent language absolutely certain. Yet a number of questions connected with this point still await solution. Is this the only centre for language, or are there other portions of the brain which have a close and constant relation to that faculty? What is the part played by the island of Reil and the first left temporal
convolution? How are we to explain some undoubted cases of destructive lesions, not only in the left, but in both third frontal convolutions, in which there was no aphasia? Have the parietal lobes any relation to the faculty of intelligent language, &c.?

As at the present day any opposition to the main features of Broca’s theory proceeds only from those who are wilfully blind or disingenuous, the least that the adherents of that doctrine have a right to ask for from their opponents is a thoroughly complete description of the cases brought forward, with the view of disproving the same. Thus it is indispensable to know whether the subjects have been right or left-handed during life; for it is an established fact that, where there is congenital or acquired deficiency of the left hemisphere, the right side of the brain will be trained during infancy for speech, and for the more complex movements of the upper extremity. The omission of this particular renders such cases as those of Simpson, Christison and others, entirely devoid of value. Then, again, it is now well understood that part of the third convolution may be destroyed, and yet its function not be seriously interfered with, if only that portion of it in contact with the operculum—which is situated at the junction of the two branches of the fissure of Sylvius, and covers the convolution of the insula—has remained intact. It is therefore an important reservation to state that language is, in general, bound to the opercular portion of the third frontal convolution.

For other cases which are apparently contradictory, the bilateral function of the parts in question offers a ready solution. With all these reservations, however, a few cases remain which would seem to show that the function which is in the immense majority of cases bound to the third left frontal may occasionally be undertaken by the insula of Reil, either alone, or in connection with the first left temporal convolution and perhaps the gyrus angularis. A somewhat constant relation of the first left temporal to Kussmaul’s “verbal deafness” seems to have been established. Patients of this kind appear either deaf or insane, although they are neither, because they are unable to realise the meaning of spoken words; and this affection is in some instances combined with aphasia, agraphia,
and alexia. It is an interesting fact that in one of Kussmaul's cases verbal deafness was associated with disease in the right first temporal in a man who had been left-handed during life, and in whom therefore congenital deficiency of the left hemisphere could be assumed.

Next in importance to the questions connected with the third frontal and the first temporal is the occurrence of motor paralysis from disease of the convolutions bordering the fissure of Rolando, viz. the anterior and posterior central, and the paracentral lobule. Lussana and Lemoigne have entirely failed to shake the large array of facts which prove such a connection; yet numerous points in this matter are not as yet cleared up. If we accept, for instance, the topography of centres for the tongue, portio dura, and extremities, as given by Charcot and Pitres, it is difficult to explain the occurrence of cases of hemiplegia resembling that which is caused by internal capsule haemorrhage, and coming on without disease involving the entire region of Rolando, the lesion being limited to a comparatively small area in it. Again, the dissociated or piecemeal appearance of paralysis is not absolutely distinctive for cortical lesions, for occasionally loss of motor power may come on suddenly together with loss of consciousness, in disease of the central convolutions; while it may appear piecemeal, and without affecting the sensorium, in lesions of the pons Varolii, the crus, and the centrum ovale.

The occurrence of signs of motor irritation which is generally believed to be characteristic of lesions in Rolando's region, likewise raises questions which have not as yet been satisfactorily answered. Leaving out of view the presence of late rigidity owing to secondary sclerosis in the pyramidal strands, which may follow cortical lesions just as well as corresponding affections in the centrum ovale, the internal capsule, &c., we are confronted with localised clonic or tonic spasms, and with cortical or Jacksonian epilepsy. Why do these symptoms occur in one set of cases, and not in another apparently exactly similar one? How are they produced? And what is the reason that neither the kind of disease—whether tumour, softening or haemorrhage—nor its seat in one or the other of the three convolutions in question, nor its invasion of the
cineritious, or the underlying medullary matter, seem to have any influence in the production of these phenomena. That their presence or absence follows a definite law cannot be doubted; but much careful clinical as well as pathological work will have to be done before this law can be formulated.

The question of treatment of localised brain-lesions has been generally lost sight of by those most eager to investigate their symptoms and pathology; yet this must for all time to come be the chief point of interest for the practical physician. I will in this place not speak of the attempts which have been made to arrive by trephining at the seat of the disease, as I have elsewhere expressed my disbelief in the future of cerebral surgery. A subtler agent than the surgeon's knife or trephine is wanted for this branch of therapeutics. The chief practical points I wish to submit to the attention of neurologists in this place are two, viz. 1st, the expediency of treating tumours of the brain as if they were syphilitic in origin, even where this cannot be demonstrated; and 2nd, utilisation of the catalytic effects of the constant voltaic current, in certain destructive as well as irritative lesions, directed locally to those portions of the brain where we suspect the seat of the mischief, in accordance with the teachings of pathology and with Ferrier's physiological topography of the cerebral cortex.

I will now relate a case in illustration of my first point, viz., the advisability of antisyphilitic treatment for tumours of the brain:

CASE 1. Tumour in the Right Cerebral Hemisphere.—A merchant, aged 32, married and father of two healthy children, consulted me in April 1878. He had always been in good health until about six months ago, when apparently without any particular cause he began to be seized occasionally with attacks of giddiness and vomiting. This was believed to be owing to congestion of the liver, and treated as such. Headache supervened after a time, his sleep became disturbed, and he appeared sometimes delirious at night. The appetite began

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1 'Diseases of the Nervous System,' vol. i. p. 45.
2 A similar case was recently brought before the Medical Society of London, and afterwards published in the 'British Medical Journal,' by Dr. Hughlings-Jackson.
to fail next, and he could not be induced to eat anything sub-
stantial. He generally brought up almost directly what little
he took. When I first saw him, he was so much emaciated that
his friends believed him to be consumptive. He had a sallow
complexion, and a careworn countenance. He complained of
persistent headache, which was generally of a dull aching
character, but sometimes became acute and throbbing, and
"made him feel quite silly;" of attacks of giddiness which
seemed to take him off his feet, so that he felt as if he was
floating in the air; and of greatly impaired memory and
application. He had not been to his office for some weeks
past, as he was incapacitated from fixing his attention on those
subjects which demanded it, and even to look at a column of
figures quite upset him. There was optic neuritis in both
eyes, with slight extravasation of blood, turgid veins and con-
tracted arteries; he could not read No. 2 Jaeger. No
other cranial nerves were affected. He had lost power in the
left side of the body; his left hand was nearly useless, and
showed a grasping power of 25 on the dynamometer, while the
right showed 120. The left leg was very feeble, and the left
foot apt to drag on the ground, so that the patient avoided
walking as much as possible; but there was no reeling gait,
such as is seen in cerebellar disease. There was no atrophy
in the paretic muscles, which responded equally well to fara-
disation and galvanisation as those of the right side. Sensa-
tion was not impaired, the reflex action of the skin and the
mucous membranes normal, that of the tendons appeared
somewhat increased. The urine contained an excess of phos-
phates, but no sugar, albumen, or excess of urea. The action
of the bladder and rectum was normal, and there was no
sign of disease of any of the other viscera.

Tumour in the right cerebral hemisphere was diagnosed,
probably about the ganglionic masses of the corpus striatum
and thalamus opticus. The patient was severely questioned
about any syphilitic antecedents, but denied ever having had
any primary or secondary disease. He had always been ex-
tremely steady in his habits, and had never had connexion
before marriage. His wife had never had any miscarriages,
and she as well as the children appeared perfectly healthy.
I nevertheless instituted an anti-syphilitic treatment, as this appeared to me the only chance of benefiting the patient. One-sixteenth grain of perchloride of mercury was given together with ten grains of iodide of potassium twice a day. The effect of this medication was almost magical. The vomiting ceased after the first dose, and never reappeared at any subsequent time. The appetite began to revive, the headache became less intense, and there was a gradual and steady amelioration in all the symptoms from which the patient had suffered. About a fortnight after commencing the treatment he returned to business, in which he took renewed interest; and rather more than three months afterwards he appeared quite well. No other medicine had been given except cod-liver oil, of which the patient took two tablespoonfuls daily from the third week, and which was continued altogether for six months. The perchloride of mercury had to be occasionally withdrawn for some days on account of affecting the gums too much; but it was always noticed that there was not nearly the same improvement in the more important symptoms when potassic iodide alone was given; and that the patient progressed much more quickly when the perchloride was resumed.

I now proceed to give the details of some cases in which localised lesions of certain portions of the brain, other than tumour, were diagnosed, and in which the catalytic effects of the constant current proved of service.

**Case 2. Diabetes insipidus, Galvanisation of the Medulla.**

A gentleman, aged 37, single, consulted me on July 27, 1880. He had spent many years in the tropics, and had suffered from persistent diarrhoea, which nothing would arrest. This ultimately brought on a state of complete cerebral exhaustion and he became quite unable to attend to his occupations. The most troublesome amongst the numerous symptoms from which he suffered, however, was that of polyuria, which was so bad as to exclude him altogether from society. When in company, he could hardly sit still for a quarter of an hour without experiencing a most pressing desire to empty his bladder; and this annoyance had led him to adopt a solitary mode of life. The average quantity of urine which he passed
during the day amounted to ninety ounces, but often much more. It was feebly acid, had a low specific gravity, and contained nothing abnormal. As he had taken gallons of physic without the slightest relief, he wished to ascertain from me whether any mode of applying galvanism might be expected to be of service to him.

I have elsewhere given my reasons for considering diabetes insipidus an affection of the medulla, possibly in connection with the middle lobe of the cerebellum, and for looking upon any ultimate organic lesions in the kidneys as secondary, and owing to the maceration of renal tissue through excessive and long-continued diuresis. Proceeding from this view, I directed the current of fifteen cells of Becker-Muirhead's battery to the back of the head, taking care that the medulla received alternately the influence of the anode and cathode, and regulating the finer degrees of voltaic power by the rheostat. The application lasted altogether six minutes, and was entirely painless. The patient came to see me again a week afterwards, and informed me that the result had been completely successful. The quantity of urine passed during the day had, after the application, fallen to thirty ounces; and while formerly he had often had had incessant calls to pass his water, he had since then only been obliged to pass it three times a day. I regret to say that I had not the opportunity of examining the urine more carefully, either before or after the application of electricity, and that I have since lost sight of the patient, so that I do not know whether the relief has continued. That the change which occurred so suddenly was really owing to the use of the galvanism seems obvious, as no medicine had been given, and the patient had not adopted any alteration in his diet or general regimen. The derangement of the medulla, and possibly of the middle lobe of the cerebellum, which gave rise to the polyuria, must have been slight, and may have been anæmia, or a degree of passive hyperæmia. It was, however, sufficient to render the patient thoroughly miserable, and might perhaps in course of time have developed into more serious organic changes in the organ.

1 'Medical Times and Gazette,' November 27, 1880.
CASE 3. Melancholia; Galvanisation of the Occipital Lobes.—A married woman, aged 28, had her first confinement in July 1877. She had until that time been habitually in the enjoyment of excellent health; and been bright and cheerful in her manner; but soon afterwards a complete change in her disposition was observable. She took a dislike to her husband, seemed to lose all interest in the affairs of her home, and became sullen and morose. She refused to go out, and would sit all day long in a corner of her room, doing nothing. If she conversed at all, it was on religious subjects, in which she had previously shown a very moderate interest only; and the only book she would now read was the Bible. She had a settled conviction that she could not be saved, and was doomed to go to hell. When her friends attempted to reason with her, she became only more rigidly fixed in her ideas, and appeared to resent every interference. I first saw her in March 1878. She had then the expression of a settled frown on her face; the pupils were large; the tongue furred; speech slow and measured. I had much difficulty in inducing her to answer my questions, which she evidently thought impertinent. The appetite was poor, the bowels confined, the catamenia regular. She had never nursed her child. Phosphorus, strychnia, and other nervetonic were given, but did not afford any relief. She had been taken away from her home for a complete change, but this had done no good at all. After two months of ineffectual medical treatment and regimen, I proposed the application of the constant current. This was directed to the occipital lobes, with voltaic alternatives, for five minutes at a time. An improvement soon became manifest, and when the treatment was discontinued after twenty applications, the whole aspect of the case appeared altered. The patient was still more reserved and silent than she had originally been, but she was cheerful, and took more interest in the affairs of daily life. She felt more inclined to take exercise, her appetite had improved, and her ideas on religious subjects had undergone great modifications.

CASE 4. Auditory delusions; Galvanisation of the Temporo-sphenoidal Convolutions.—A gentleman, aged 38, had for some
years past suffered from epileptic seizures, for which he consulted me in February 1879. His memory had become impaired, but his intellect and judgment were good. One morning he came to me in great apparent distress, expressing an apprehension that he was going to become insane, as for some days past he had been subject to delusions, which had come on without any perceptible cause. He constantly heard voices behind his back, calling him names and speaking about his pecuniary affairs and his state of health; and he appeared quite worn out by anxiety on this account. Looking upon this symptom as denoting hyperæsthesia of Ferrier’s auditory centres in the superior temporo-sphenoidal convolutions, I applied the current to those portions of the skull corresponding to these parts, for five minutes consecutively. This gave immediate and thorough relief, as the delusion had completely vanished at the end of the application, and did not return on any future occasion.

Case 5. Corpus Striatum Hæmorrhage.—A widow, aged 60, had an attack of apoplexy on January 30, 1879. The first symptom was giddiness, which passed within half an hour into complete insensibility. There was involuntary evacuation of the urine and feces. The patient remained unconscious for about three hours, after which she gradually came to, and appeared next day to be almost herself again, but that there was hemiplegia of the left side. I first saw her ten days after the attack, and found all the symptoms of recent corpus striatum hæmorrhage. There was paralysis of the lower branches of the portio dura, which became plainly visible on laughing and on attempting to show her teeth; she had difficulty in swallowing solids; the tongue appeared bluish, congested and deviated to the paralyzed side. Articulation was somewhat indistinct, but the patient had no difficulty in expressing herself. There was no headache or giddiness, but some tenderness on percussion over the right hemisphere. There was no conjugate deviation of the head and eyes. The left arm was completely paralyzed, and appeared a piece of inanimate matter, not the slightest voluntary movement being possible in any part of it. The leg, which had at first been as much paralyzed as the arm, had regained a slight degree of
motive power, more especially in the knee-joint and the toes. There was also a degree of paralysis in the muscles of the body, for the patient was unable to shift her position in bed nor could she raise herself from the lying to the sitting posture without assistance. Sensation was normal everywhere; reflex action of the skin and tendons not increased; no ankle-clonus. The faradic excitability of the paralysed muscles was normal. Respiration on both sides of the chest tolerably equal; pulse 90, full, firm; temperature 98.5°; no acute bedsore anywhere. The appetite was tolerably good, and urinary and alvine secretion satisfactory; she slept pretty well, and was in good spirits. I prescribed a phosphorus perle to be taken twice a day, and recommended the application of the continuous current as soon as ankle-clonus should become manifest. This was first noticed on the twenty-seventh day of the disease. The current was now applied to the right hemisphere, the cathode and anode being alternately directed to the crown of the head and occiput, after which the stream was sent transversely through the brain, from one mastoid process to another. Ten cells of Weiss's Leclanché were used, for eight minutes altogether. This was done on alternate days four times, after which the paresis of the muscles of the body had completely disappeared, the patient being able to sit up in bed and change her position without any trouble. The mobility of the leg had also improved, but there was now slight rigidity in the hamstring muscles. The shoulder appeared more movable, but some rigidity in the biceps and flexor communis digitorum was noticed. The galvanic application to the hemisphere was repeated, and a gentle application to the limbs combined with it. After another week of this treatment the patient had almost entirely recovered the use of the leg, and was able not only to walk about in her room, but also to go up and downstairs without assistance. The rigidity in the muscles of the arm had meanwhile become more marked, but there was also greater mobility, not only in the shoulder but also in the elbow and fingers, while the wrist remained quite motionless. The treatment was pursued with some interruptions for four months. The patient was then able to walk three or four miles at a time without the least...
difficulty; indeed all traces of paralysis, as well as rigidity in the lower extremity had disappeared. The arm and hand had not made quite the same progress, but the patient was able to use the hand for dressing and eating; and, although several muscles were still paretic and stiff, she was not nearly so dependent upon others as she had expected to be.

Improvement may follow the systematic use of the voltaic current to the suffering hemisphere even years after the occurrence of the stroke, and when we should expect that secondary sclerosis of the parts below the lesion would render all therapeutical efforts futile. This is shown by the following case:—

Case 6. Softening of the Left Hemisphere from Embolism of the Middle Cerebral Artery.—A single lady, aged 40, had had a stroke which took away her speech and the use of the right side of the body, in summer 1868. I first saw her in July 1878, that is, ten years after the occurrence of the attack. The early history of the case could not be very fully ascertained, but there was little doubt from the symptoms present that she had suffered from embolism of the left Sylvian artery, with consecutive necro-biotic softening in the sphere of that vessel. There was now distinct aphasia, the patient being only able to say "yes," "no," and a few other words, such as "doctor," "my hand," &c.; yet she understood everything that was said to her, could read the paper, and express her wants by pantomime. She behaved quite rationally, and her intellect seemed to be good. There was slight affection of the lower facial muscles; the tongue was thin, and could only be protruded a very little way, but was not deviated. The whole right arm was in a state of paralytic rigidity, and utterly useless. The wrist could neither be raised nor pronated nor supinated, and the fingers were so powerfully flexed that the nails touched the skin. The hamstring muscles of the thigh were likewise contracted, and the patient, although able to walk, was very lame. There was no wasting of muscles, which responded well to faradisation. Ankle-clonus was well marked. The general health of the patient was good, except that she had three years ago lost the catamenia, since when she suffered from periodical headaches.

A similar treatment was resorted to in this case as in the
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above, and continued for six months. At the end of that time the rigidity of the leg had almost entirely disappeared, and the patient walked with great ease. There was considerable amelioration in the use of the right hand, which could be used for dressing, eating, needlework, embroidery, etc., but not for writing, which the patient had learnt to do with the left hand. The most satisfactory feature, however, was the improvement in her language. The patient had regained the command of a large number of words which she had lost before; she was able to read aloud and to converse, and on many occasions pronounced long sentences with tolerable fluency. She was however easily flurried, more especially in the presence of strangers, and then would begin to stammer and to lose the thread of the conversation; she would, however, recover herself after a few minutes, and then speak comparatively well again. The catamenia reappeared after the galvanic treatment had been followed for some weeks; and, although they did not again become thoroughly regular, they continued at intervals varying from six to ten weeks; and she lost the periodical headaches to which she had been subject before.

The precise mode of action of the constant current in destructive brain-lesions will probably not be understood until a number of cases which have been treated in a similar manner have been thoroughly investigated post-mortem. Is there true regeneration of nerve-fibres in the internal capsule under such circumstances, and can secondary sclerosis below the lesion be repaired when the conduction between the cortex and the periphery becomes, at least to some extent, re-established? That repair of destroyed nerve-fibres may occur has been shown not only by experiments on animals, but also by cases of neurectomy for trigeminal neuralgia, in which anaesthesia owing to loss of nerve-substance (amounting in some cases to as much as three-quarters of an inch) was recovered from, and the paroxysmal pain, which had disappeared after the operation, returned in the same sphere after a time. This points in the most unmistakable manner to re-established conduction. Can part of the internal capsule be repaired in a similar manner? Or are the therapeutical results of galvanic applications owing to a more complete removal of the causes
of inhibition, and to the induction of vicarious function on the part of neighbouring structures? These questions have a great theoretical as well as practical interest, and demand the serious attention of neurologists. In the meantime not too much stress can be laid upon the importance of treating such lesions at an early stage, and before secondary sclerosis has been fully established. With regard to this point the occurrence of ankle-clonus after an apoplectic or paralytic seizure should be carefully watched for, as it is a diagnostic sign of considerable value leading us to predict the probably speedy appearance of late rigidity in the paralysed muscles; and as soon as this symptom has made its appearance, no time should be lost in resorting to the use of electricity.