

The Geneva Convention of 1864 and the International Red Cross Association, to which it gave origin, have brought unspeakable amelioration to the horrors of war.

The extraordinarily extended literature of our profession, which in every language makes known the researches of medical men throughout the world, has found expression in Hirsch's great work on the geographical distribution of disease. The International Congresses which have brought men together from every clime to compare their experience have proved how cosmopolitan is our science, though to us the words of Scripture may be fitly applied, that we are "ever learning, and yet never able to come to a full knowledge of the truth." The remarkable subdivision of subjects which has been necessitated by the expansion of every department; the substitution of laboratory for systematic teaching; the use of statistics for generalising experience, are all striking features in modern medical education.

Every collateral science has been made subservient to our purposes. Even the beautiful art of photography, which has been created since the Queen ascended the throne, has been employed, with remarkable advantages, for the record of our labours.

The General Council of Medical Education has been created to govern and direct our organisation, and its influence is already felt and valued. But I must make an end.

Gentlemen,—I have thus, in the limited time at my disposal, and to the best of my power, noted the changes and improvements in surgical theory and practice which have emerged during the last half century. The task I set myself has proved longer and more difficult than I anticipated, as the harvest has been extraordinarily abundant. I am conscious of having omitted much from want of time and knowledge; but I trust I have succeeded in showing that in every branch of the surgical art there has been a wondrous advance, and that the profession to which we belong marches in the very van of the great army, recruited in all climes, whose aim it is to enlarge human knowledge. Such a retrospect as I have attempted make us reverence a profession whose hope and ambition it has ever been to abate suffering without distinction of race or creed. We see how an abiding and ever increasing purpose has run through these long ages, and that while we now rejoice at being no longer bound by the authority and crude doctrines which shackled our forefathers, we can yet honour the traditions of the past, and appreciate the efforts of that great host of devoted men who have, by their unselfish labours built up the famous temple of our art.

AN ADDRESS

ON

THE SURGERY OF THE BRAIN AND SPINAL CORD.

Delivered at the Annual Meeting of the British Medical Association, held in Glasgow, August 9th, 1888.

By WILLIAM MACEWEN, M.D.,

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MR. PRESIDENT AND GENTLEMEN,—Allow me to thank you for the exceptional honour you have conferred upon me, by inviting me to address the British Medical Association on my "recent investigations in Surgery." It would have been more in harmony with my own feelings to bring before such a meeting the work of others, but this the form of invitation explicitly precludes. From among the various subjects which have engaged my attention, it would have been difficult for me to single out one as especially worthy of notice. Fortunately, I was so far relieved from that decision by receiving a very direct hint from one whose position in the Association demands respect. In obedience to that expressed wish, I now venture to address you on the Surgery of the Brain and Spinal Cord—a subject which has been of much interest to me, and which I hope may not prove uninteresting to you. In doing so it is necessary to premise, in the briefest possible form, the history of the evolution of cerebral surgery.

THE SURGERY OF THE HEAD IN THE PAST.

Lesions of the head have at all times held a prominent place in the annals of surgery: much has been done by surgeons before our

day to advance the healing art as applied to this particular region. Their efforts were, however, chiefly directed to the superficial parts, the skull and its membranes, and were exclusively confined to the results of injury. Their operations were simple, undertaken for the most part upon the primitive evidence of direct visual and tactile observation. There is no reference made by them to cerebral surgery, as it is now known. The brain, whose function was at that time little understood, inspired fear; it was intimately associated with the seat of life; it was the "mysterious dome of thought;" it gave lodgment in its recesses to the soul; and was surrounded by all the mysticism which a highly speculative philosophy inculcated. Although surgeons did not share the popular belief that to touch the brain was to induce certain death, yet they had just grounds for concluding that to them it was practically inviolable. It was no want of boldness or lack of manipulative dexterity, in which, indeed, they greatly excelled, that determined this reluctance in dealing with brain lesions. *Post-mortem* examination revealed the fact that many cerebral lesions could have been easily reached, had the surgeon only known during life at what particular part they had been situated. There were two formidable barriers to the advance of surgery in this region: first, the fact that the majority of intra-cranial operations were attended by inflammatory action, which so often proved fatal as to cause surgeons to shun active interference; and, secondly, the brain was a dark continent, in which they could descry neither path nor guide capable of leading them to a particular diseased area, and, did they attempt to reach it, it could only be by groping in the dark. Therefore, they were constrained to confine their efforts to traumatic lesions, and of these to such as afforded external indications of their presence, and which called out clamantly for relief. From the days of Pott to our own, there seemed to be a growing conviction, not only of the impotence, but of the positive harmfulness, of active interference; so that the trephine was regarded as an almost obsolete instrument. Yet, surgery was fully abreast of the physiology of the day. Such was the state of cranial surgery till 1870.

TWO FACTORS NECESSARY FOR THE INTRODUCTION OF CEREBRAL SURGERY, AND HOW THEY WERE OBTAINED.

However wishful one might be to extend the sphere of surgery to the brain, it was necessary first to adopt means whereby immunity from the inflammation which so constantly attended brain lesions could be secured, and secondly, to endeavour to gain a better physiological knowledge, in the hope that light might be shed upon the localisation of cerebral lesions.

In the wards of the Glasgow Royal Infirmary, Lister had formulated the theory, and wrought out the practice of the antiseptic treatment of wounds, and already much had been done to dissipate the fears of surgeons regarding operations practised on other parts of the body. Experience gained by me showed, that not only compound fractures of the skull, but large osseous defects in the cranial vault, accompanied by extensive loss of cerebral substance, were quite amenable to treatment, exhibiting no tendency to inflammatory action, as long as the tissues were preserved aseptic. When this held true of the rough and often septic lesions produced by machinery accidents, how much surer would well planned and carefully executed operations be? This conclusion was subsequently amply confirmed by the results of operations undertaken by me for the relief of injury, in which the brain had to be exposed, and from which detached portions of it had to be removed. In such instances no inflammatory phenomena interrupted the even course of healing. A striking feature of these wounds of, and operations upon, the brain, was the absence of false hernia cerebri, which had hitherto formed such a conspicuous complication of brain lesions in man, and which had so often marred the success of physiological experiments, by extending the zone of irritation, and by the fatal results which ensued. It was thus manifest that inflammation arising from exposure of, and operations upon, the cerebrum, could be obviated under aseptic conditions.

Meanwhile many workers had been sedulously endeavouring to unravel the intricate and complex questions relating to the structure and functions of the brain. Previously the cerebrum was supposed to perform its function as a whole, in the same way as the liver, heart, and kidneys performed theirs, there being no differentiation of function. Broca, in 1861, from observation on human pathology, isolated a particular limited area, as the seat of the faculty of articulate language. This very important in-

vestigation foreshadowed the localisation of function in other cortical centres, for if the existence of a definite function confined to an isolated area were admitted, then the question arose, how many other centres with specialised functions might there be? Broca's discovery was thoroughly iconoclastic, it shook the notion entertained regarding the unity of brain function to its foundation, it awakened thought, and made men explore anew with critical eyes, fields which previous investigators were supposed to have exhausted. Dr. Alexander Robertson, of Glasgow, suggested, in 1866,¹ that there were separate sets of fibres for the conveyance of special motor impulses from the cortex. Hughlings Jackson, in 1869, stated that there were many limited areas on the brain connected with separate and distinctive functions, founding his opinion not on speculative deductions, but on clinical experience, and on the direct observation of pathological facts. The inception of the idea that there was a portion of the brain whose function was related to motion, was treated with extreme scepticism, and the suggestion was likely to have long remained a speculative question, had it not been for the advent of another and more direct mode of examination. This new departure consisted in the performance of experiments upon the lower animals, by Fritsch and Hitzig, who in 1870 published an account of their observations. They demonstrated the existence of a series of circumscribed areas on the surface of certain of the cerebral convolutions, the electrical stimulation of which caused, on the opposite side of the body, co-ordinated movement, in distinct groups of muscles. These were momentous facts, destined to revolutionise former ideas of cerebral function. But their full force and significance were not recognised, in this country at least, until Ferrier's observations on the brains of animals, undertaken to put to an experimental proof the views entertained by Hughlings Jackson, were published in 1873. Then the mind of the physiological world was fairly awakened. The suggestions of Hughlings Jackson on the motor cortex became crystallised. Another link in the unity of plan of creation was manifest, as even in the higher and more complex brain of man, parts existed whose function found homologous expression in that of the lower animals.

Abundant proof has been gathered from human pathology, such as that afforded by the elaborate observations of Charcot and Pitres, to put beyond cavil the broad fact that there are points in the human cortex cerebri intimately related to the motor and sensory functions of certain parts of the body. The apportionment of definite areas and their precise delimitation is still the subject of investigation.

Many interpretations have been put on these facts; some hold that the central convolutions are distinctly motor in function; some that they are sensory; others that they are both motor and sensory; and still others believe that the excitable regions of the cortex are but points of departure and not foci of production of motor reactions. These views, interesting in themselves, cannot be discussed here; it is enough for our present purpose to recognise that there are certain regions of the brain in intimate relation with the movement and the sensation of certain parts of the body, and which, in the presence of either irritative or destructive lesions, give rise to phenomena which are of the greatest diagnostic value.

THE INITIAL HISTORY OF CEREBRAL SURGERY.

This extended physiological knowledge enabled cerebral lesions to be more accurately localised, while my experience showed that, by preserving aseptic the parts operated on, surgical interference with the brain could be robbed of its chief danger.

1. *Case in which the Symptoms of Focal Cerebral Disease led to Diagnosis of Lesion in Broca's Lobe: 1876.*—While in possession of this knowledge a case of cerebral abscess presented itself to me in July, 1876. The general symptoms of this affection were clearly manifest. A cicatrix on the forehead marked the site of an injury under which the skull was bare. Had this cicatrix been taken as a guide to the localisation of the abscess, and an operation performed there, no abscess would have been found. But other phenomena were exhibited which enabled its seat to be definitely recognised. A convulsion, accompanied by loss of consciousness, commenced on the right side, and gradually involved the whole body. On its cessation absolute hemiplegia of the right side was present, and remained for two hours, during which the patient was aphasic. Both these phenomena became much less marked at the end of this period. From these symptoms the

abscess was diagnosed to be situated in the immediate vicinity of Broca's lobe. It was evident that the whole of the base of the left third frontal was not involved in a destructive lesion, otherwise the aphasia would have persisted for a much longer period, and it was probable that Broca's area had become involved in the inflammatory zone surrounding the abscess. Trusting to these localising symptoms, it was proposed to open the abscess aseptically by exposing Broca's lobe. Unfortunately, the result of a consultation was decidedly to negative this proposal. The parents then refused consent, notwithstanding the assumption by myself of the sole responsibility of advising and performing the operation. Thirty-six hours afterwards the convulsions returned and persisted until a fatal issue ensued. After death the friends acquiesced in the proposal to have the operation performed just as it would have been had permission to do so been granted during life. The skull was trephined, the brain exposed, and an instrument was introduced through the third frontal convolution for half an inch, when pus flowed through the incision, proving the accuracy of the diagnosis and giving poignancy to the regret that the operation had not been permitted during life. The abscess, about the size of a pigeon's egg, was situated in the white matter of the basis of the second and third frontal convolutions.

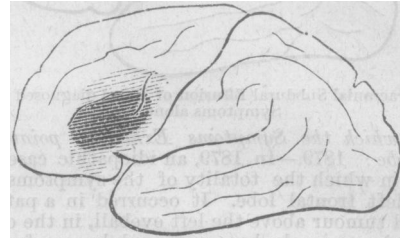


Fig. 1.—Abscess in vicinity of Broca's lobe diagnosed from symptoms exhibited.

The blade of the bistoury which had been left *in situ* after insertion through the trephine opening, was found to have penetrated its outer wall. The congested zone in the periphery of the abscess extended from the anterior horn of the lateral ventricle to the cortex of the base of the second, but especially that of the third left frontal convolution.

Here the precise spot in the brain which the abscess occupied was accurately determined from the localising phenomena induced by the focal lesion, which were trusted as indicating its position, though pointing to a different part of the brain from that which would have been selected had the seat of injury been accepted as a guide. The operation showed how easily the pus could have been evacuated, though the unfortunate refusal to allow it to take place during life leaves uncertain the ultimate issue, but judging from my subsequent experience, worse cases have recovered after operation.

2. *Case in which Motor Phenomena were the sole Guides to the Cerebral Lesion: 1879.*—In 1879, a case with definitely localising motor symptoms was seen by me, occurring in a boy who had had a fall six days previously, which occasioned some slight bruising about the face and head, accompanied by a shade of mental obscurance. At the termination of forty-eight hours he was so well that his parents could with difficulty be dissuaded from allowing him to rise from bed. On the sixth day he had a series of convulsions, the twitchings beginning in the left side of the face, gradually involving the left arm and subsequently the left leg, during which consciousness was preserved. Paresis of these parts remained, though sensation was unimpaired. On the following day there was a renewal of the convulsions, the parts being affected in the same order, but the convulsions persisted and finally became general, with loss of consciousness. Those motor phenomena indicated a lesion on the right side of the brain, pronounced at the middle and lower portion of the ascending convolutions, as the face and arm centres were the first to show evidence of stimulation. The lesion was evidently of an irritative nature, such as might be occasioned by a spiculum of bone driven into the brain or by a degree of pressure exercised on its surface. It was clearly not destructive, such as might be occasioned by severe cerebral contusion. Dr. Alex. Robertson was asked to see the case, and agreed with me that the motor symptoms presented a sufficiently clear guide to the localisation of the lesion in the lower part of

¹ *Journal Mental Science*, January, 1867; *Glasgow Medical Journal*, February, 1871, Observations on Aphasia.

the fissure of Rolando. It was therefore resolved to expose that portion of the brain. As a preliminary, the head was shaven, when a scarcely perceptible irregularity was detected in the cranial vault near the coronal suture. When the skull was exposed a fissure was discovered running across the coronal suture. Trephining was performed at a point slightly behind the auriculo-bregmatic line, and midway between the external auditory meatus and the vertex. This point happened to correspond to the posterior extremity of the fissured fracture. There was no blood between the dura mater and the skull, but the dura had a very dark colour. This membrane was opened and gave vent to two ounces of fluid and coagulated blood contained in the subdural cavity. The operation was conducted aseptically and the patient made an uninterrupted, typical, afebrile recovery. There was no recurrence of the fits; paralysis of the left arm soon disappeared, and he is living now and in perfect health.

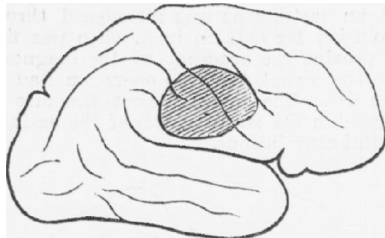


Fig. 2.—Intracranial Subdural Effusion of Blood diagnosed from Motor Symptoms alone.

3. *Case in which the Symptoms Exhibited pointed to Lesion in Frontal Lobe: 1879.*—In 1879, an idiopathic case came under observation, in which the totality of the symptoms indicated a lesion in the left frontal lobe. It occurred in a patient the subject of a small tumour above the left eyeball, in the orbital cavity. A tumour had previously been removed by me from that position, and had now recurred. Other symptoms had, however, meanwhile presented themselves. The left pupil was in a state of stable myosis; there was obscuration of intelligence, slowness of comprehension, want of mental vigour, and pain in the head. These pointed to the probability of a lesion in the left frontal lobe, but were not sufficient to permit a diagnosis to be made. The patient was, therefore, placed under the observation of an educated skilled nurse. Some weeks later a series of convulsions occurred, the initial stages of which were carefully recorded by the nurse, without which the key to the brain lesion as indicated by the convulsions would have been lost, as, when seen by me, they had become general, and threatened speedy dissolution. The convulsions were at the outset strictly limited to the right side, commencing in the face and arm, and confined to these two parts during the initial attacks. The leg on the same side was affected during the third seizure, and ultimately the convulsions became general, with complete loss of consciousness. These phenomena were construed as indicating extension of the irritation to the lower and middle portions of the ascending convolutions; and, when this was considered along with the former evidence, it was concluded that an irritative lesion existed in the left frontal lobe. On these grounds it was resolved to trephine midway between the centre of the ascending convolutions and the anterior aspect of the cranium. At this point a minute nodule, the size of a barley grain, was detected on the outside of the skull. A large trephine was applied, a disc of bone removed, and a tumour of the dura mater which was exercising pressure on the brain was exposed. It was half-an-inch in thickness at this point, gradually becoming much thinner, and spreading all over the anterior two-thirds of the frontal lobe. The tumour was, after a prolonged operation, carefully dissected out along with the brain membranes, where they were involved in the neoplasm. The patient rapidly recovered, was restored to perfect health, and subsequently was able to gain her own livelihood. She lived for eight years afterwards, ultimately becoming affected with chronic Bright's disease, from which she died. The skull and brain were examined, and there was no trace of further tumour growth. This case was published in 1879. A paper by me, illustrating some points in the localisation of cerebral affections and the advantages of antiseptic trephining, published in 1881, concludes:—"When the skull can be opened, the cerebral coverings incised, and the brain exposed without fear of inflammatory mischief, trephining ought to be employed when the localisation of the lesion is established. And,

further, besides operating in traumatic cases, trephining is justifiable in idiopathic cases."

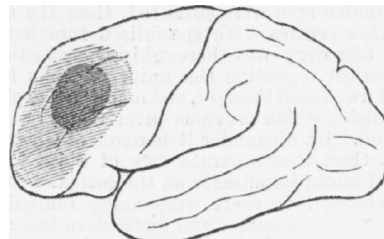


Fig. 3.—Tumour of Dura Mater pressing on Frontal Lobe.

4. *Cerebral Abscess in Temporo-sphenoidal Lobe: Involvement of Motor Area: 1881.*—In 1881, a very large cerebral abscess, located in the temporo-sphenoidal lobe, but involving the basis of the third frontal and ascending convolutions, came under notice, but at such a late period of the disease, that before arrangements could be made for the operation, the patient suddenly exhibited all the phenomena of the abscess having burst into the lateral ventricles. Prior to this, aphasia could be discerned through the clouded state of patient's intelligence; there was paralysis of the left third nerve, and of the brachial and facial muscles on the right side. From these the extent and localisation of the disease was determined. Notwithstanding the fact that the patient was *in extremis*, the operation was performed. The membranes were congested, and the abscess was reached on penetrating a quarter of an inch of the cerebral surface. After several ounces of pus had been evacuated, something like a tennis ball was seen floating in a sea of pus, which still remained in the interior of the brain. This proved to be an old encysted abscess, in the periphery of which an acute abscess had developed, which had destroyed the whole of the temporo-sphenoidal lobe. The patient, though greatly relieved, died from exhaustion. It was seen *post mortem* that the whole temporo-sphenoidal lobe had disappeared, and the basis of the second and third frontal, as well as the basis of the two ascending convolutions, were the seat of acute encephalitis.

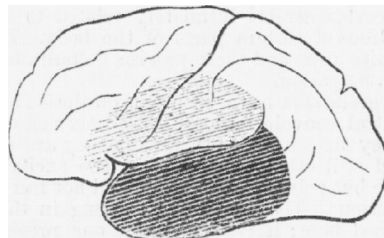


Fig. 4.—Destructive Lesion (with motor symptoms) obstructing Temporo-sphenoidal Lobe.

5. *Intracranial Effusion of Blood diagnosed from Motor Symptoms alone: 1883.*—There are three cases which occurred in 1883, to which brief reference may be made, two of them having already been published. In May of that year, a traumatic intracranial effusion of blood was correctly diagnosed from the motor symptoms exhibited, as being located over the base of the ascending convolutions. There were no external marks of injury, and the motor symptoms alone were the guides to the position of the lesion. The patient is now alive, in robust health, and regularly at work.

6. *Syphilitic Tumour in Paracentral Lobule Diagnosed from Motor Symptoms alone: 1883.*—In the following month, a case of brachio-crural monoplegia, without loss of sensation, was relieved by the removal of a syphilitic tumour from the paracentral lobule and a plastic effusion from the centre of the ascending convolutions. Within a week the patient had recovered the power of the lower limb, and within a month was able to walk and perform her household duties. She has continued since in fair health, and can walk long distances, though with a slight hemiplegic gait, a certain amount of structural contraction having occurred prior to the operation.²

7. *Focal Lesion in Ascending Convolution Recognised by Motor Symptoms alone: 1883.*—A few months later, a brachial monoplegia

² Case shown Path. Soc., Glasgow, Jan. 24th, 1884, and published in *Glas. Med. Journal*.

was correctly diagnosed, a focal lesion being found in the white substance of the motor cortex of the middle portion of the ascending convolution. The lesion was an extravasation of blood into the brain, around which encephalitis had occurred, inducing irritation and compression of this area. The relief given was immediate and complete. The patient has since been in perfect health and regularly at work.

With the relation of these seven cases, all of which occurred prior to the end of 1883, the initial history of the movement ceases to be solely personal as regards myself. In December, 1884, Dr. Bennet and Mr. Godlee, assisted by Dr. Ferrier, had the first case operated on in London in which a tumour was removed by Mr. Godlee from the brain.

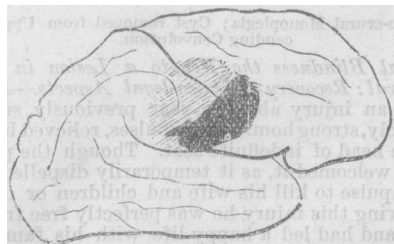


Fig. 5.—Lesion in Ascending Convolution diagnosed from Motor Symptoms alone.

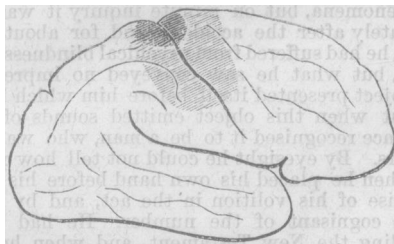


Fig. 6.—Syphilitic Tumour in Paracentral Lobule. Lighter shading indicates effusion on surface of upper part of central convolution.

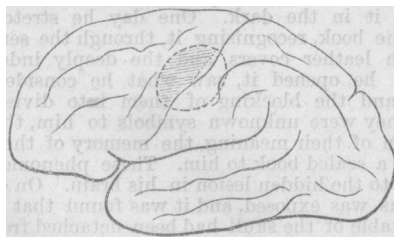


Fig. 7.—Focal Lesion in Ascending Convolution diagnosed from Motor and Sensory Symptoms.

A FEW POINTS REGARDING THE PRESENT ASPECT OF CEREBRAL SURGERY.

Reference may now be made to a few points regarding the present aspects of cerebral surgery. First, are the localising motor phenomena reliable guides to the diagnosis of cerebral lesions situated in the motor cortex? My answer is unhesitatingly affirmative. Each case, however, requires to be studied on its own merits, the whole phenomena presented, the *unobtrusive* as well as the prominent features must be carefully searched for, the degree in which each is present must be accurately measured, and the whole weighed and compared with former experience before drawing a conclusion. The various points upon which reliance is to be placed should be tested wherever possible by instruments of precision, instead of the rough impressions conveyed by the hand being trusted. In testing the power of the muscles in brachial paresis, the dynamometer will impart much more accurate information than that which can be gained through the sense of touch, and occasionally shades of difference may be determined by it, which otherwise would remain undetected. In many cases the evidences of focal lesions are so distinct that a diagnosis is easy; in others they are so intricate that a prolonged and minute investigation is necessary to decipher them; while there are still others in which the signs are so perplexing that at best an approxi-

mation only can be arrived at. To lay bare a certain known convolution on a cerebral surface and observe the results of its stimulation, is an easier task than to take what appears to be a tangled skein of nerve phenomena, such as is presented by many lesions of the complex brain of man, and to relegate each to its true source and infer from a study of the whole what particular parts of the brain are affected.

8. *Epilepsy (Jacksonian) induced by Focal Facio-Lingual Lesion: Removal of Cyst from Brain: Cured.*—In support of the foregoing the following instances are adduced, and a case is first presented in which the symptoms were so definite and precise that the diagnosis was easy, and permitted me to perform the operation on first seeing the patient. He was 22 years of age, and suffered from epileptiform convulsions, each lasting from two to three minutes, and as these occurred on an average every five minutes, he consequently had over 100 in twenty-four hours. The convulsions were limited to the tongue, the right facial muscles, and the platysma on the same side. When they subsided the parts remained paralysed. Consciousness was retained throughout. Eight years previously he had received an injury to the head, after which his right arm became weak, the weakness persisting, though he was quite able to work. It was clear that an irritating focal lesion existed, confined to the base of the ascending convolutions, causing a Jacksonian epilepsy. The only question was, whether the base of the ascending parietal was involved as well as that of the ascending frontal. The contraction of the platysma on the opposite side has been asserted to be

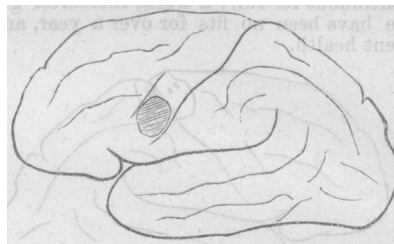


Fig. 8.—Epilepsy (Jacksonian) Focal Lesion in the Facio-lingual Centre. Cyst removed.

induced by stimulation of the base of the ascending parietal. Dr. Whitelocke reminded me, however, that the platysma is often supplied by a branch of the facial, so that a single lesion in the base of the ascending frontal would be sufficient to account for the whole phenomena. The operation was at once undertaken, when in the lower part of the ascending frontal, a cyst about the size of a filbert was found situated partly in the cortical and partly in the white substance of the brain, and was surrounded by a narrow zone of encephalitis. In manipulating the medullary substance, in process of removal of the cyst, the patient, while under chloroform, had a convulsion confined to the same group of muscles as were affected in his fits prior to the operation. The convulsion ceased with the removal of the cyst, and he has never had another. The wound healed firmly under one dressing, the paralysis of the facial muscle soon disappeared, and he has since been constantly at work. The power of the right arm has also been increased. Possibly the cyst might have caused indirectly slight pressure on, or had set up an inhibitory action of, the middle portion of the ascending frontal. This case affords important evidence of the position occupied by the facio-lingual centre in man, and on the whole corroborates that assigned to it by experiments on the lower animals. It was also interesting to note when this part of the brain was exposed and irritated that it gave rise to the same kind of convulsion.

9. *Protopspasm of the Hallux preceded by Sensory Impressions, and followed by Paralysis.*—In another instance, a very definite protospasm, accompanied by a sensory impression, gave the key to the localisation. It occurred in a girl aged seven, the subject of frequently recurring attacks of severe epileptiform seizures, followed by paralysis of the affected parts. At the onset of these attacks, patient first experienced in the great toe of the right foot a painful sensation of such severity as to cause her to scream out. Shortly after, that toe was firmly extended in tonic spasm, which lasted about five minutes. Sometimes this ended the attack. More frequently it was followed by clonic contractions of the muscles of the right foot, leg, and thigh, where the convulsions often terminated. Occasionally they extended to the muscles of

the trunk, then to those of the right side of the face and right arm, the contractions ceasing in the order of accession. Rarely did they involve the opposite side, and when they did, patient lost consciousness. Though there was motor paralysis in the affected parts, the cutaneous sensibility remained unimpaired. From the great number of fits which patient had, following each other in rapid succession, occurring in parts affected with paresis, the result of former attacks, while the cutaneous sensibility remained unimpaired, and from the limited area affected, it was concluded that the lesion was cortical. The sensory impression in the hallux, followed by tonic and then clonic contractions of the same parts, extending to the lower limb, pointed to the upper region of the ascending convolutions as the area of irritation. From the general condition of the patient and her family history, the lesion was probably tubercular, and if so, might be multiple. During operation the upper portion of the ascending convolutions was exposed, and with the exception of a few tubercular nodules, the size of barley grains, adhering to the vessels over the upper part of the ascending frontal, there was nothing visible on the surface. On careful palpation of the ascending convolutions, there was found in the upper part of the ascending parietal, a circumscribed nodule buried in the cerebral substance, which on exposure by cutting through the grey matter, was seen to be a tubercular tumour, about the size of a hazel nut, which was easily shelled out. As an immediate result, there was prolonged trepidations of an erratic kind, affecting the muscles of the right side of the body, but especially those of the arm and the leg. These were continuous for fully a week, thereafter gradually subsiding. There have been no fits for over a year, and the girl is now in excellent health.

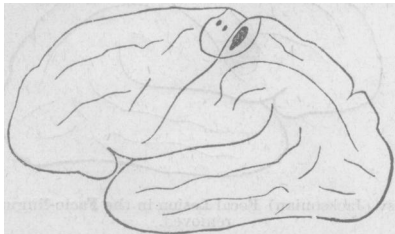


Fig. 9.—Epilepsy (Jacksonian)—Protospasm of Hallux—Focal Lesion in Upper Part of Ascending Parietal. Tumour removed.

The marked sensory impression which this lesion produced supports Dr. Gowers's opinion that the parts in the so-called motor area subserve a sensory as well as a motor function. The localisation of the movements of the hallux in the upper part of the ascending frontal has not been borne out by this case (unless the minute barley-grain tubercular nodules attached to the vessels in the pia mater could account for the stimulation), the tumour being found in the upper part of the ascending parietal, but the whole lesion could be included in the ring which Beever and Horsley place on the upper portion of the ascending convolutions.

Other Instances.—A brachial monoparesis, accompanied by sensory impressions confined to the same parts, has already been alluded to, in which, though the centre of both ascending convolutions was involved, yet the chief lesion was confined to the ascending parietal, and implicated both its medullary and cortical substance.

10. *Brachio-cruval Monoplegia: Cyst removed from Brain.*—In another, occurring in a boy of three years, a brachio-cruval monoplegia, with late rigidity, was present, the result of a traumatism received eight months previously. In it a large thick-walled subdural cyst, containing clear fluid, was found pressing upon the motor convolutions, and a spiculum of bone, detached from the inner table of the skull, was seen to have penetrated the brain. These were removed, and the bone was placed in proper position. The patient made an uninterrupted recovery. The paralysis, with the contractions of the muscles, passed off to a great extent. He could neither walk nor stand before the operation; now he can run about and use his hand well, though there is still paresis in both.

With these data from my own experience, as well as from cases reported by Mr. Godlee, Mr. Horsley, and many others, it is clear that the motor and sensory phenomena form reliable guides to localisation of lesions in the central convolutions.

The Diagnosis of Cerebral Lesions in Non-motor Regions may be made from Sensory Phenomena.—The following instance shows

this, and is also an example of the difficulty of finding the exact clue to the lesion and how easily it may be overlooked.

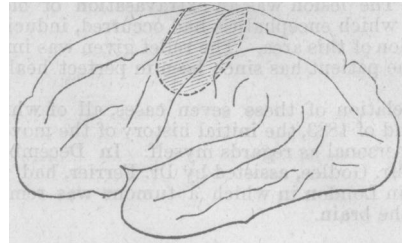


Fig. 10.—Brachio-cruval Monoplegia; Cyst removed from Upper Part of ascending Convolution.

11. *Psychical Blindness the Key to a Lesion in the Angular Gyrus: Removal: Recovery: Medico-legal Aspects.*—A man who had received an injury about a year previously, suffered from deep melancholy, strong homicidal impulses, relieved by paroxysms of pain in the head of indefinite seat. Though the pain was excruciating he welcomed it, as it temporarily dispelled the almost irresistible impulse to kill his wife and children or other people. Prior to receiving this injury he was perfectly free from impulses of this kind, and had led a happy life with his family. Behind the angular process of the frontal there was a slight osseous depression, which could not account for his symptoms. There were no motor phenomena, but on minute inquiry it was discovered that immediately after the accident, and for about two weeks subsequently, he had suffered from psychical blindness. Physically he could see, but what he saw conveyed no impression to his mind. An object presented itself before him which he could not make out, but when this object emitted sounds of the human voice, he at once recognised it to be a man, who was one of his fellow-workers. By eyesight he could not tell how many fingers he held up when he placed his own hand before his face, though by the exercise of his volition in the act, and by other sensations he was cognisant of the number. He had been in the habit of reading the New Testament, and when he had so far recovered from his injury, he wished to resume his reading. He knew where the book lay near his bed and could put his hand on it in the dark. One day he stretched out his hand, took the book, recognising it, through the sense of touch, by its smooth leather covers, and the deeply indented letters on its back; he opened it, saw what he considered must be the letters, and the blocking of them into divisions for the words, but they were unknown symbols to him, they conveyed no impression of their meaning, the memory of their signs was gone, it was a sealed book to him. These phenomena, however, gave the key to the hidden lesion in his brain. On operation the angular gyrus was exposed, and it was found that a portion of the internal table of the skull had been detached from the outer, and had exercised pressure on the posterior portion of the supra-marginal convolution, while a corner of it had penetrated and lay imbedded in the anterior portion of the angular gyrus. The bone was removed from the brain and re-implanted in proper position, after which he became greatly relieved in his mental state, though still excitable. He has made no further allusion to his homicidal tendencies—which previously were obtrusive—and is now at work.

Such cases of complete mind-blindness are rare, and the definite localisation in this case will assist in indicating in man what

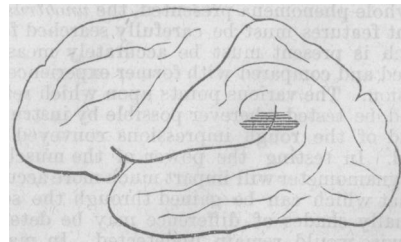


Fig. 11.—Psychical Blindness: Lesion in Posterior Part of Supra-marginal Convolution in Anterior Part of Angular Gyrus.

function the anterior portion of the angular gyrus and the posterior portion of the supra-marginal convolution subserve.

Other cases have been related above; one where a combination of symptoms pointed to a lesion in the frontal lobe, and guided by these, a tumour was found pressing upon that area of the brain from which it was successfully removed; in the other, a lesion was definitely recognised from the localising symptoms, as seated in the immediate vicinity of Broca's lobe. But even in such areas as the temporo-sphenoidal lobe, where destructive lesions may exist without localising symptoms, one may occasionally by a process of exclusion, definitely localise the lesion as seated in that part.

12. *A Lesion Localised Definitely as Existing in the Temporo-Sphenoidal Lobe.*—A patient exhibiting symptoms of cerebral abscess, had on the left side ptosis, stabile mydriasis, paresis of all the ocular muscles, with the exception of the external rectus, without external squint. On the right side paralysis of the facial muscles, which retained power of emotional expression to a slight degree and the patient power to close the right eyelid by an effort of will, though it remained partially opened during sleep. He had also paresis of the right arm, which during the few hours he was under observation before operation had amounted to distinct paralysis. The leg remained normal. There was no diminution of cutaneous sensibility. From these symptoms it was concluded that a single lesion must be large which could affect at once the third nerve in its course, and the lower half of the ascending convolutions. Second, it was clear that it was not a destructive lesion of large size in the motor area, or the crural centre would probably have been involved, thus causing absolute hemiplegia. The same observation applies with greater force to the crus cerebri, which must be excluded, as the effects of pressure would probably have led to more extensive involvement. Had the pressure even indirectly affected that area from without inwards it would have implicated the parts in the reverse order—the leg first, the face last. The tentorium cerebelli would prevent pressure downwards on the pons. Third, the internal capsule could not be the seat of a large lesion, otherwise hemiplegia with destruction of "Charcot's cross-way" would have resulted. Fourth, though the whole trunk of the third nerve was involved, paresis was alone produced, probably resulting from a degree of pressure. Fifth, the lesion was gradually implicating the motor area from below upwards, and was probably occasioned by pressure and its consequences. The only place where a lesion could be situated, producing all these phenomena just to that precise degree, was the temporo-sphenoidal

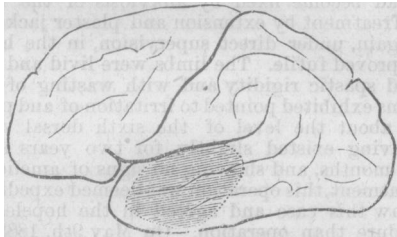


Fig. 12.—Lesion in the Temporo-sphenoidal Lobe.

lobe. It was cut down upon, and in the medullary substance of the temporo-sphenoidal lobe an abscess, containing three ounces of pus, was found, which was evacuated, when the whole of the above symptoms vanished. Three weeks afterwards, the wound was looked at for the first time and found healed.

Can the Motor Area be Removed in Large Pieces with Immunity from Serious Consequences?—If this region be of such psychical importance to movement, and destructive cortical lesions in it are followed by secondary degeneration of the motor tracts, then excision of these areas will necessarily induce permanent paralysis, late rigidity, and ultimate structural contracture. The removal of large wedges from the brain, especially in the motor centres, will induce serious effects upon the brain as a whole, causing, during cicatrization, a dragging and displacement of the neighbouring parts, with final anchoring of the cerebrum to the cicatrix. In an acute ulcerative process rapidly advancing, such as an abscess, none can hesitate to evacuate the pus; it is not the living brain-substance which is removed, but the peccant matter alone. Epilepsy presents quite another aspect. In the presence of a stationary cicatrix, or of a slow-growing neoplasm in the motor area, occasionally producing fits, few would attempt the removal of such a large wedge of the motor region as to induce permanent hemiplegia. Even when the fits are much more numerous and aggravated, it is serious to contemplate the production of hemiplegia while attempting the cure of the fits. No doubt these epilepsies,

when long continued, especially in early life, are apt to lead to great and extensive instability of the motor cortex, so as to warp the whole cerebral function, and ultimately involve life itself. Still, how much better is the cure by the removal of a large wedge, involving the greater part of the motor area? How many people would submit to have their upper and lower limbs, on the same side of the body, amputated by disarticulation at their proximal joints—for this is what the hemiplegia amounts to—in the process of cure of their fits? Numerous epileptics have been asked the question by me, but none have expressed their willingness to undergo such a cure. Even had they done so, the circumstances would require to have been exceptional to have induced one to hazard the life of the patient for so poor a result. It is true that corresponding wedges have been removed from the brain of monkeys, and these animals have survived for months thereafter. In men also they have been removed by others; in one instance reported to me the patient remained completely hemiplegic until his death some months after. Nor is the removal of very large tumours and large wedges of brain free from immediate peril to life. In several instances operated on elsewhere, death has ensued—one while the tumour was being removed from the brain, and one immediately after the completion of the operation.

In cerebral surgery, not only does one require to localise the lesion, and to select suitable cases, but also, after exposing the brain and its lesion, to judge when to advance and when to hold the hand. In a case rightly localised from the motor symptoms, a tumour was exposed in the leg and arm centres, on the left side of the brain; but its dimensions were such as to cause me, after carefully contemplating them, to refrain from removing it, as it would have led to a hemiplegia of a much more pronounced character than was present. Instead, the vessels which supplied it with nutriment and which ran into its substance, from the surface, were all ligatured, in the hope that this would effect a restraining influence on its growth. The patient recovered and is considerably improved. Though the fits are not quite cured, they are not so severe as formerly, and are somewhat altered in character.

Anchoring of the Brain and some of its Consequences.—When injury has been inflicted on the surface of the cerebrum, followed by plastic effusion and cicatricial formation, the superficial substance is apt to become soldered to the membranes when these remain intact, which in turn may be soldered to the skull, or in the event of their detachment, the brain may become directly adherent to the bone by means of cicatricial adhesion. Thus, the surface of the brain becomes anchored or soldered to its rigid walls. It has no longer the free play within its water bed to expand and contract according to the varying states of the circulation. Each variation produces a dragging of the brain at this spot, and through it the whole hemisphere at least is affected. Any sudden physical effort pulls on the brain, producing a slight shock, a momentary disturbance, just as if the cerebrum had received a blow. Vertigo results. People affected in this way cannot rise up quickly, or perform any sudden movement of the body or head, without experiencing a sensation of giddiness, which sometimes causes them to drop. Consequently, they are often incapacitated from pursuing their usual avocations.

Following upon this, the grey matter of the cortex, immediately surrounding the cicatrix, by the incessant movement is apt to become unstable and to produce fits. Some cases of traumatic epilepsy are thus caused. Further, if the cortical irritation be continued, encephalitis is occasionally produced, often appearing in a chronic form and long remaining so, though susceptible of being lit up into an acute affection. If the temperature remains high, active interference is apt to induce an extension of the encephalitis. Operation in such cases should be, when possible, postponed. The disregard of this advice has, to my knowledge in one instance, hastened the fatal issue, encephalitis becoming rapidly general.

False Hernia Cerebri.—It is true that, round many neoplasms, there is a zone of encephalitis, and, should this be extensive and of the nature of red softening, false hernia cerebri is prone to form. It was supposed that false hernia cerebri was entirely due to decomposition, many recent writers averring that it cannot occur unless when operations are conducted non-antiseptically, basing their belief on experimental investigations conducted on brains in a physiological state. Had they concluded that the formation of false hernia cerebri, after operations, was principally caused by decomposition, and always so when it occurred after operations on a physiological cerebrum, they would have been right. The consistence of false hernia cerebri is identical with red softening of the

brain, occurring in idiopathic affections in which there had been no operation. In one instance, in which trephining was performed for the relief of pressure causing total hemiplegia, and where the symptoms indicated either acute encephalitis or abscess, or both, the moment the dura mater was opened a large mass of red encephalitis protruded through the membranes, forming a false hernia cerebri on the surface of the scalp. This encephalitis was not occasioned by septic matter introduced through a wound, as it occurred the moment the wound was made. Around neoplasms red softening sometimes exists, and interference might possibly occasion an extension of the affection, though, were the operation conducted with strict antiseptic precautions, the possibility of its formation would be reduced to a minimum. With this exception, there has been no false hernia cerebri after any of my operations.

Re-implantation of Bone to fill the Hiatus in the Skull left by Injury or made by Operation.—Osseous defects in the cranial wall had hitherto remained permanent, the surgeon making no effort to fill the gap. The brain, in the majority of cases, had thus been exposed, the thin membrane forming an insufficient covering, the patient being doomed for the remainder of his life to wear some kind of plate as a protection from injury. Since 1873, the portions removed by me from the skull have been carefully preserved, rendered aseptic, divided into minute fragments, and reimplanted. Whenever there has been immunity from suppuration these have grown, and the continuity of the osseous wall has been preserved throughout. In a case of injury, nearly one-half of the left anterior portion of the skull was broken into fragments, which lay in a confused mass, mixed with brain substance, shreds of membrane, hairs, *débris* of lime and blood. The portions of bone were all rendered aseptic, divided into fragments, and replaced, quite a mosaic work being thereby formed. On the tenth day, a portion of the damaged scalp having sloughed, exposed four of the reimplanted pieces, two of which, lying side by side, presented a striking contrast, one being suffused with the pinkish blush of life, the other with the pallor of death. With the exception of two fragments which shed, all the others remained, grew, and now form a firm osseous wall, affording complete protection. This case, operated on four years ago, will be shown at the demonstration in the Royal Infirmary, along with many others, where lesser defects have been filled. At the same time, a boy whose humerus has been restored by bone grafting will be presented. He was operated on ten years ago, and the bone has grown in length and thickness since.

The Note Elicited on Percussion of the Skull an Aid to Diagnosis of the Consistence of Intracranial Contents.—When the skull is intact and the ventricles distended with fluid, such as may arise in consequence of tumour in the cerebellum, exercising pressure on the fourth ventricle, the percussion note elicited affords indications of the altered consistence of the intracranial contents. In some instances this note has been found prior to the exhibition of other symptoms indicative of the presence of tumours in the middle lobe of the cerebellum; it, however, became distinct at a later stage. *Post-mortems* have fully borne out the diagnosis. The percussion note, when properly fenced, is, therefore, an aid to the altered consistence of the intracranial contents. It is clear that it will be of most value in early life in the diagnosis of tumours of the cerebellum.

Statistical Résumé.—Of twenty-one cerebral cases (exclusive of fracture of the skull with brain lesions or other immediate effect of injury) in which operations have been performed by me, there have been three deaths and eighteen recoveries. Of those who died, all were *in extremis* when operated on. Two were for abscess of the brain, in one of which the pus had already burst into the lateral ventricles; in the other, suppurative thrombosis of the lateral sinus had previously led to pyæmia and septic pneumonia. The third case was one in which there existed, besides a large subdural cyst over the one hemisphere, extensive softening at the seat of cerebral contusion on the opposite hemisphere, accompanied by œdema of the brain. Of the eighteen who recovered, sixteen are still alive in good health, and most are at work, leaving two who have since died, one eight years after the operation, from Bright's disease, she in the interval being quite well and able to work; the other forty-seven days after the operation, after the abscess was perfectly healed, from an acute attack of tubercular enteritis.

OPERATIONS FOR THE RELIEF OF PARAPLEGIA CAUSED BY PRESSURE ON THE SPINAL CORD.
—*Six Cases in which the Posterior Arches of the Vertebrae have been Removed.*—Turning to another portion of the nervous system,

to which only brief allusion can be made, it is found that certain sensory and motor phenomena, due to lesions within the spinal canal, are amenable to operations, which are attended by a measure of success sufficient to offer a prospect of relief to a distressing, and hitherto regarded, as a hopeless, class of sufferers. The spinal membranes and the cord itself can be exposed, and neoplasms and encroachments upon the lumen of the canal may be removed therefrom without unduly hazarding life. Such interference is unsparingly condemned by writers on the subject, their remarks, however, being applied to injuries, as no such operations have been hitherto contemplated in idiopathic cases. They contend that they are, first, full of danger, being difficult, prolonged, and attended by profuse hæmorrhage; secondly, that the operation could hardly benefit the patient; and, thirdly, that no one had yet been able to present a successful case. Each of those points has now lost its validity.

The first operations of this kind were undertaken by me for the relief of paraplegia due to angular curvature of the spine. In such cases pressure may be exerted on the cord either by connective tissue neoplasms, or by direct displacement of the bodies of the vertebrae, both lessening the lumen of the canal. By lifting the laminae from the affected part, the tumour could be removed, and relief at the same time given to the compressed cord, were the osseous walls in front found to encroach upon the calibre of the canal. This was successfully carried out by me first in 1883. By the making of an incision on the tips of the spinous processes, and severing the tendinous connections, and then shelling the soft parts from the bone with periosteal elevators, the hæmorrhage was so trifling as to be for the most part arrested by sponge pressure, and with suitable instruments the operation, though demanding care, was easy to perform.

Case of Paraplegia with Incontinence of Urine and Fæces, due to Connective Tissue Tumour at Seat of Angular Curvature of Spine, completely Cured by Removal of Tumour and Laminae of Vertebrae.—In 1882 a boy, aged 9, came under observation, suffering from complete sensory and motor paraplegia, with incontinence of urine and fæces, which had existed for two years previously, but had been absolute during the last eighteen months. For three years he had had angular curvature of the spine, most marked between the fifth and seventh dorsal vertebrae, for which he had been treated by extension and plaster jackets. When seen by me the curvature had become fixed by ankylosis of the bodies of the vertebrae. Treatment by extension and plaster jackets was, however, tried again, under direct supervision, in the hope of amelioration. It proved futile. The limbs were livid and cold, affected with marked spastic rigidity and with wasting of the muscles. The symptoms exhibited pointed to irritation of and pressure on the spinal cord about the level of the sixth dorsal vertebra. The paralysis having existed slightly for two years and markedly for eighteen months, and showing no signs of amelioration under ordinary treatment, this operation was deemed expedient. Dr. Alex. Robertson saw this case and agreed in the hopelessness of any other procedure than operation. On May 9th, 1883, the laminae of the fifth, sixth, and seventh dorsal vertebrae were removed. There was no pulsation in the portion of the cord exposed. Between the theca and the bone there was found a fibrous neoplasm of one-eighth of an inch in thickness, which was firmly attached to the theca and covered about two-thirds of its circumference. This was carefully dissected off. The cord was then able to expand backwards, and its pulsations, which up to this period were absent, began to show themselves, especially opposite the fifth dorsal. Twenty-four hours after the removal of the pressure the limbs had lost their livid colour, were distinctly warmer, the spastic rigidity had greatly lessened, the sense of tickling the soles had returned, and that of touch had improved. The first return of movement was observed eight days after. Soon he had perfect control over his sphincters. Six months subsequently he was able to go about without support. Five years afterwards he walked three miles to pay me a visit. He attends school regularly, joins in all the games, including football, and he says he feels quite strong.

A Second but more Aggravated Case.—In 1884 another case was seen of a somewhat similar kind, though much more aggravated, the symptoms being so far advanced as to indicate organic changes in the cord itself, which rendered operation almost hopeless. It was only on the urgent and touching appeal of the girl herself that the operation was undertaken. A dense connective tissue tumour existed between the bone and the theca, which was so firmly adherent to both that in some places the theca was

elevated along with the neoplasm. The portion of the cord thus exposed was shrunken to about half its normal dimensions and lay like an inanimate rod. After the elevation of a sufficient number of laminae to expose a portion of the cord which pulsed, the pulsations were communicated to this rod, pushing it from above downwards, but there were no distensible pulsations in the rod-like part of the cord. From the whole appearances presented at the operation, it was considered that there was no hope of her recovering from her paralytic state. However, ten hours after the operation the limbs had lost their lividity, felt warm to the touch, and the patient said she experienced a sensation "as if she were dreaming that her legs were on and hot water was running through them." From the fourth day after the relief of pressure she had continence of urine and faeces, for which alone she declared she would willingly have undergone the operation. Sensation quickly returned to the limbs, motion very slowly. Six months after she could move her limbs freely. Eight months subsequent to the operation she walked a quarter of a mile, stated she could perform many light duties in the house, besides attending to herself. She has since been very well and able to enjoy life. A third case was also successful, but two others have not been so; one succumbed a week after the operation, the other some months later to an attack of general tuberculosis. In both of these the temperature was high prior to the operation and was subject to exacerbations, indicating an activity in the tubercular disease at some part distant from the ankylosed angular curvature. Since this experience no case has been deemed fit for operation in which the temperature did not run an even, regular, and continuously a febrile course.

Abscess in the Posterior Mediastinum Evacuated successfully.—In connection with these cases an abscess in the posterior mediastinum which was exercising pressure on the heart and bronchi, and threatened life, was evacuated with complete success.

Compression of the Cord from Traumatism.—Another class of cases is that of localised compression of the cord, arising from traumatism. Traumatic lesions are as a rule so gross, and the destruction so complete, that in such operative treatment can be of little service. Still, there are cases in which traumatism has produced localised pressure, primary or secondary, which can be relieved.

Paraplegia from Traumatism, Cured by Elevating Connective Tissue Tumour and Depressed Arch of Twelfth Dorsal Vertebra.—From a coal-pit accident a man, 22 years of age, received a severe injury to the spine, at the level of the lower dorsal vertebrae, which caused absolute motor paralysis with incontinence. There was marked hyperaesthesia of the affected parts, which increased in severity during the first three weeks, so that he could not bear to have the floor shaken or his limbs touched. Between the third and fifth week a rapid change took place. At the termination of that period the muscles of the lower limbs would not respond to electricity, they had become so shrunken and wasted that the contour of the bones stood prominently out, and notwithstanding massage of the limbs, after the cessation of the pain, the flexor muscles had markedly contracted, causing drooping of the feet and toes and fixation of the joints. Later the skin over the bony prominences became red; pressure points and bed-sores formed, irrespective of the most scrupulous attention; the urine became ammoniacal, and his temperature ran up. It was evident that a fatal issue was imminent, unless an attempt to relieve the pressure on the spine were at once made. In February, 1885, this was done. The lower dorsal and the first lumbar vertebrae were exposed. The arch of the twelfth dorsal was found fractured and slightly depressed, and between it and the theca there existed a connective tissue tumour, measuring nearly a quarter of an inch in antero-posterior diameter, and extending from the eleventh dorsal to the second lumbar vertebrae. Both above and below the twelfth dorsal the tumour gradually shaded off to about one half of its thickness at that point. It was confined to the posterior aspects of the canal. This tumour was carefully dissected from the theca. The same night there was a decided improvement in the warmth of the lower limbs. He began to move his toes on the third day. A month afterwards the contracted tendons about the ankle and feet were extensively tenotomised to relieve the structural contractions, after which motor power rapidly increased. He was soon able to walk with support, which a year subsequently he discarded, and now he can move about with ease, but with a paraplegic gait.³

³ These last two cases were shown at Path. and Clin. Soc., Glasg., Dec. 22, 1885, and published in *Glasg. Med. Journal*, besides notes of them appearing in the *JOURNAL*.

Here are, therefore, six cases in which elevation of the posterior laminae of the vertebrae has been performed. Four of these have completely recovered, and two have died, one from extension of tubercular disease, months after the operation, and after the wound had healed, leaving one in which the operation possibly hastened the death of a patient, who was otherwise in a painfully helpless and hopeless condition.

Such operations are now beginning to be practised by others. Mr. Horsley has a few months ago published a successful case, in which a somewhat similar operation had been performed for the removal of a small tumour of the theca, diagnosed by Dr. Gowers.

In conclusion let us remember, that the same phenomena by which we are now able to recognise certain cerebral lesions and locate them in precise areas, were exhibited by patients who came under the eye of our surgical predecessors, some of whom must have had the album of their memory filled with such impressions, yet they saw not their import. They were so hampered by the inculcated physiological dogma of the time, that their true significance never dawned on them. The facts were reflected from their brain as objects from a mirror, and no more. Gentlemen, there are all around us phenomena, each with its hidden truth, obtrusively impressing our senses, and how do we fail to read their riddle?

REVIEWS AND NOTICES.

THE MEDICAL INSTITUTIONS OF GLASGOW: a Handbook prepared for the Annual Meeting of the British Medical Association held in Glasgow, August, 1888. Compiled and Edited at the request of the Local Committee by JAMES CHRISTIE, M.A., M.D., etc. Glasgow: James Maclehoose and Sons, Publishers to the University of Glasgow. 1888.

The handbook giving full information about the medical institutions of Glasgow forms a handsome octavo volume of nearly two hundred pages. Dr. CHRISTIE has been assisted in his editorial duties by Dr. C. Fred. Pollock, and has had the co-operation of a number of contributors who are each entitled to speak with special authority on the subject with which they deal.

The first article on "The University of Glasgow" has been written by Dr. William Snodgrass, Muirhead Demonstrator of Physiology in the University; it is illustrated by a lithograph drawing of the front of the fine new building, designed by Sir Gilbert Scott, which, though it has been in occupation since 1870, has only recently been completed. The article on the Faculty of Physicians and Surgeons is from the pen of Mr. Alexander Duncan, B.A., the Secretary of the Faculty, and contains a short sketch of the history of that corporation since its foundation by King James VI in 1599. Dr. C. Fred Pollock gives an interesting account of Anderson's College Medical School, where David Livingstone obtained the medical training which he subsequently found so useful in the wilds of Africa. The articles on the Royal Infirmary and its School of Medicine are by Dr. M. Thomas, the medical superintendent, who acted as the medical adviser of Mr. James Thomson, the architect of the new buildings of the school. Dr. A. W. Russell, the medical superintendent, has written an account, illustrated by drawings and plans, of the new Western Infirmary, which was opened just seven years ago; the building may be said to stand in the grounds of the University. Dr. James B. Russell, medical officer of health for Glasgow, contributes an interesting description of the City of Glasgow Fever and Small-pox Hospitals; this article is illustrated by a block plan of the fever and small-pox hospitals, with "elevations and sections of a pavilion specially prepared by the Master of Works, and photolithographed at the cost of the local authority."

Dr. Yellowlees has written an account of the Glasgow Royal Asylum, which is illustrated by a drawing of the fine façade of that large building. Articles on the other General Hospitals, on the Special Hospitals, on the Lunatic Asylums, on the Dispensaries, on the Convalescent Homes and Homes for Incurables, on the Institutions for the Blind and the Deaf and Dumb, on Institutions for the Training of Nurses, on the Medical Societies, on the Sanitary and Cleansing Departments of the City, and on the Ambulance Association, have also been written by competent hands.

The volume concludes with short notices of the *Glasgow Medical*