SECTION OF SURGERY.

REMOVAL OF TUMOUR OF BRAIN.

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THE difficulties of localising and removing neoplasms situated within the cranial cavity are such, I think, as to warrant me in occupying some of the time of the Academy with notes of the following case. I think, too, that all cases of brain surgery, possessing, as they do, much interest for the surgeon, should in the present state of our knowledge of it be recorded.

In the early part of the year 1891 I exhibited here the portions of the bone and tumour which I removed in this case, and I then invited members of the Academy to come and examine the patient for themselves. Some had seen and noted his condition prior to the operation, and many visited him subsequently, so that the facts in connection with the case are within the knowledge of several gentlemen now present.

CASE.—R. M'R., aged 28, on the 10th August, 1891, presented himself for treatment at Mercer's Hospital, suffering from a sebaceous cyst situated over the right parietal eminence, and which had suppurated. This was laid open, and at the bottom of it was found a portion of bone devoid of periosteum. On the 28th of the following September the man left hospital before the wound was fully healed. He lived in one of the northern suburbs and walked into town to his work. On his way he frequently lost himself in the city, forgetting where he was to go. He was a plumber by

trade, and noticed that when driving a nail he often missed it and struck his hand or fingers. In the latter end of the year 1891 he again presented himself, complaining of giddiness, impaired vision, and defective memory. He had then also some slowness of speech.

On the 9th January, 1892, he was again admitted to hospital complaining of severe pain in the head running round the forehead and down the back of the neck. This pain was occasionally intermittent with paroxysmal exacerbations so severe as to cause him to scream loudly during both day and night. The pain was increased by coughing.

On the 12th January, 1892, it was noticed that he was manifesting convulsive movements of the left leg and toes. There was flexion of the hip and ankle with extension of the knee. The movements were at first limited and vague, coming on in paroxysms and lasting short periods. Muscular movements subsequently commenced in the arm. There was flexion of the forearm and fingers, with supination of the hand. Sensation was impaired, especially in the extremity of the lower limb. If the affected hand was moved actively or passively the patient was unconscious of the position in which it rested. Two days later obvious muscular weakness was noticed in the left leg and arm, with slight subsidence of the convulsive phenomena. Reflexes at first were exaggerated, knee-jerk and ankle clonus being readily developed. Paralysis of the leg subsequently became complete, and though voluntary movement of the arm was abolished, the muscles continued in a state of tonic rigidity. There was no loss of power over the bladder and rectum. Retraction of the head and neck, rigidity of the spinal muscles, and photophobia were well marked; the pupils were irregular and sluggish. There was a history of syphilis of old standing for which he was treated with 3i doses of iodide of potassium and mercurial inunctions, but without effect upon the head symptoms. There was no evidence of kidney disease or lead poisoning, nor was the patient in a marked degree anæmic.

The symptoms when grouped pointed to combined compression and irritation of the brain, and the fact that they had developed with considerable rapidity, and that there had been antecedent suppuration of the scalp, with exposure of the bone, led to the diagnosis of intra-cranial suppuration.

Compression of the brain having been diagnosed, the next step was to ascertain the seat of it.

The fact that the muscular spasms, beginning in the leg, after-

wards involved the arm, and that the paralysis was at a later stage more marked in the leg than in the arm, pointed to the leg centre as being the seat of the primary lesion.

This opinion was strengthened by the fact that there was no aphasia, no mind blindness, and no implication of any of the cranial nerves.

After careful deliberation and analysis of these symptoms the diagnosis arrived at was that the seat of the lesion was primarily in the motor centre of the lower extremity, and that the arm phenomena were due to extension of the disease, or to radiation of the irritation.

It was accordingly resolved to open the cranial cavity at a point corresponding to the anterior extremity of the superior parietal lobule just behind the upper extremity of the fissure of Rolando.

On Sunday morning, 17th January, the patient was semi-unconscious; if spoken to loudly he answered slowly and took a considerable time to put out his tongue. When the operation was proposed, however, his friends refused consent on the ground that he was dying, and that interference would be useless.

Mr. J. B. Story, consulting ophthalmic surgeon, had been sent for, and finding the visual centre implicated, double optic neuritis, and well-marked left hemianopsia, concurred in the diagnosis, and joined in urging operative interference as giving the patient the only chance of life. His relations were, however, unable to make up their minds during the day, and it was not until ten o'clock at night that they ultimately consented.

In addition to my colleagues, Mr. Ward and Dr. Auchinleck, I sought the advice and co-operation of Mr. Wheeler and Mr. Myles, surgeons of well-known skill and eminence, upon whose judgment and courage I felt that I could implicitly rely. To them, as well as to Mr. Story and the other gentlemen who kindly came with him at this unseasonable hour in harsh inclement weather, I shall always feel deeply grateful.

The symptoms which the patient exhibited in the morning were now still more pronounced, and it was manifest to all who saw him that unless some relief was promptly afforded him he must die rapidly.

The leg centre having been mapped out by careful measurements, a V-shaped incision was made directly over it, and a small trephine was applied. The bone was found to be extremely thick, without diploe, and of almost ivory hardness, so that a consider-

able time was occupied in opening the cranial cavity. On removing the small disc of bone, instead of an abscess a hard cartilaginous substance was struck, dipping deeply into the brain and running forward across the fissure of Rolando. A larger trephine was applied, and the diseased mass further exposed and removed. A portion of it ran inwards towards the falx cerebri, and was closely attached to the outer wall of the superior longitudinal sinus, from which it was necessary to remove it piecemeal by means of a Volkmann's scoop.

The neoplasm, *in situ*, measured 2 inches antero-posteriorly by $1\frac{1}{2}$ inches transversely. It was half an inch in thickness. Its upper surface was flat; I exhibited it here in its recent state. The opinion formed by those who saw it so far as they could judge from its macroscopic appearance was, that it was of syphilitic origin, and that it was associated with pachymeningitis.

It was, I regret to say, mislaid in the museum, so that I am unable to submit sections of it to-night as I intended.

Directly the pressure was removed from the brain a marked improvement was noticed in the pulse. When the effects of the anæsthetic passed off the patient was found to be quite conscious and free from pain in the head, which had previously been so intense.

On the following morning his temperature was normal, and his pulse 110. He recognised and spoke to his friends. He was able to move his arm and leg slightly. He noticed that there were spots of blood on my shirt sleeves. He asked me why I had changed my shirt studs, and observed that they were now black. I noted his remarks as indicating a considerable amount of mental activity, in marked contrast to his condition on the previous day.

It would be unprofitable and unjustifiable on my part to trespass further upon the time of the Section by a day-to-day report of the case. It is sufficient to say that the most prominent symptoms noted were severe spasms of the muscles of the arm and leg (reported by the nurses as "rigors"), and which were, no doubt, produced by irritation of the motor area, caused by the separation of the deep attachments of the tumour; retention of urine, which passed off after two days; pain referred to the region of the umbilicus, with diarrhœa; hiccough on the 22nd, and slight delirium, with loss of control over the rectum on the 23rd; subsidence of these symptoms, with the development of a hernia cerebri.

Report on January 29th.—Patient quite conscious; free from

pain in head and neck; can see hands of a watch and tell the time by it; has moved both arms and legs; has recovered power over bladder and rectum; temperature normal.

Mr. Story subsequently visited the patient, but seeing him so well, and, believing that he would soon be able to be up and about, he deferred any detailed examination of him on that occasion.

February 20th.—More than a month after the operation. His condition is noted as follows:—He is quite conscious; is able to sing and repeat the verses of a song; recognises old patients, and can tell what they are suffering from, and also what was done for them when he was in hospital more than a year ago. He has frequently drawn up his left leg, but objects to his left arm being moved, as he says it gives him pain.

February 22nd.—Early this morning the acting resident surgeon was summoned, and found the patient suffering from venous hæmorrhage from a small point on the surface of the hernia cerebri. He removed the dressings and applied Ruspini's styptic to the bleeding point, and reapplied them. When I saw the patient some hours afterwards he was comatose, and died at 11 a.m.

The friends refused permission for a *post-mortem* examination, so that I am unable to say what was the exact cause of death.

Of the various methods devised to enable the surgeon to map out on the surface of the shaven scalp the important parts within the cranial cavity (such as leg and arm centres) which he desires to reach with safety and accuracy, there are three to which I will allude as bearing more directly upon the case under consideration. They are those of Professors Reid, Thane, and Fraser, and in so doing I may say that I am not unmindful of the sterling work of Professors Cunningham and Birmingham in this direction, which is in every respect worthy of the high reputation which these gentlemen enjoy as scientific anatomists.

Professor Thane's Method.—To find the upper extremity of the fissure of Rolando, the following plan is laid down:—Measure along the middle line from the root of the nose to the occipital protuberance, half an inch behind the centre of

this line is the upper extremity of the fissure. This fissure makes with the middle line an angle of 67° .

Professor Reid's Rules.—A base line is drawn from the lower margin of the orbit through the middle of the auditory meatus. One perpendicular from the base line is carried up through the depression in front of the auditory meatus, and a second from the posterior border of the mastoid process to the sagittal suture. The fissure of Rolando is the diagonal of the upper half of the parallelogram running from above and behind downwards and forwards.

Professor Fraser's Method.—The principle underlying Professor Fraser's method may be briefly described as follows:—First, a standard skull is taken. This standard skull has been obtained by most careful measurements and observations of a great number of subjects, carried out by Professor Fraser with an amount of care, patience, and technical skill which do him infinite credit. On this standard skull tapes are laid in various positions. For simplicity of description only three of these tapes may be considered. The first passes horizontally round the cranium from the glabellum in front to the highest point of the occipital bone behind (the maximum occipital point, or point of maximum convexity), which Prof. Fraser found to be invariably one inch exactly above the occipital protuberance, which can be readily felt in all skulls. The second passes over the vertex from the glabellum in front to the same point behind. The third passes from the middle of the horizontal tape directly over the vertex to a corresponding point on the opposite side. These tapes are divided into inches or centimetres. A standard adult skull will show the following measurements:—The horizontal tape measures, say, 20 inches, the antero-posterior, or what may be called the sagittal tape, 12 inches, and the tape passing transversely, and what may be styled the coronal, measures 11 inches.

Looking at Professor Fraser's photographs, it will be seen that the upper end of the fissure of Rolando corresponds to Figure 7 on the sagittal tape. A similar tape is now laid on the skull to be operated upon, and let us for the purpose of illustration assume that from the glabellum to the highest point of the occipital bone (the maximum occipital point) is 10 inches, as contrasted with 12 inches in the standard skull. A simple sum in proportion now gives us the position of the fissure of Rolando on the exterior of the skull to be operated upon. Thus as $12 : 10 :: 7$. The result being $5\frac{1}{2}$ ths, or, to put it practically, the upper end of the fissure of Rolando in a skull measuring 10 inches on the sagittal tape would be found at a point less than 6 inches from the glabellum. The lower end of the fissure of Rolando corresponds to a point just in front of the dot marking $3\frac{1}{2}$ inches on the coronal tape, which measures on the standard skull 5 inches; on the skull to be operated on let us assume that the distance instead of being 5 is $4\frac{1}{2}$ inches. The position of the lower end of this fissure can be obtained by a similar sum in proportion—as $5 : 4\frac{1}{2} :: 3 : x$ the point to be operated upon, which would be $3\frac{3}{8}$. For accuracy of measurement I think it would be advisable to adopt the metric system.

I have dealt with only three tapes as illustrations, but it is obvious that further confirmation of these details of localisation can be obtained by utilising the other tapes which Professor Fraser has shown in his standard work. The basis of Professor Frazer's system is that the position of the fissures is relatively constant. By this method every fissure and every convolution can be accurately located on the surface of the skull, and reliable calculations can be made as to the position of the deeper lying central ganglia and other important anatomical details.

Of all the methods suggested in connection with cerebral topography I am clearly of opinion that Professor Fraser's

is by far the most reliable and comprehensive, and of greater practical utility to the surgeon than any of the others.

MR. THORNLEY STOKER inquired whether it was a lesion connected with the dura mater, or whether it was intra-dural; also whether there was any obliteration of the arachnoid space between the dura mater and the growth in the brain.

SIR W. STOKES inquired whether the sebaceous cyst lay over the situation of the tumour which Mr. Nixon had removed. It was interesting for him to learn that the fibrous envelope of bone was stripped off at the situation of the alleged sebaceous cyst. He remembered, a good many years ago, a very animated debate at the then Surgical Society regarding cysts on the scalp. One of the points then discussed was the erosive effect of these cysts on the periosteum. He would be glad to know whether this was really a sebaceous cyst, or whether there was any connection between it and the tumour which was removed.

MR. WHEELER said that, owing to Mr. Nixon's careful diagnosis, there was no difficulty in coming to the situation of the lesion. The operation was one of great difficulty and required a great deal of care in the removal of the tumour. The latter was very adherent, very large, and dipped down deeply into the structure of the brain. The operation was performed most dexterously, and everything looked most satisfactory after it. It was unfortunate that there was no autopsy held to show where the hæmorrhage came from, but there was no reason to believe that there was any vessel injured at the time of the operation.

MR. M'ARDLE thought that the history of *hernia cerebri* was not possibly as well understood as it should be, and in searching out for the cause of death he wished to point out that septic infection would produce death about the time that Mr. Nixon's patient succumbed. He would like to know as to the character of the hæmorrhage, which would aid them as to the cause of death; and, second, the character of the protruded portion of the brain immediately preceding death. He said absolute alcohol had the power of keeping the brain aseptic, and at the same time of causing the greatest amount of pressure to be applied to it—greater than they could apply with safety by any dressing.

MR. MYLES said it was an entirely chronic inflammatory thicken-

ing of the dura mater. He thought this case illustrated graphically the great progress of brain surgery. The different methods of location of the skull contents were very interesting, but Professor Fraser's appeared to him to be the most accurate and complete. By using his charts there would be no difficulty in locating any part of the brain.

MR. NIXON, in reply to the Vice-President, said there was certainly obliteration of the arachnoid spaces, and the membranes were all matted together. With reference to Sir W. Stokes' question, he had no doubt that it was a sebaceous cyst, and it was seated directly over the seat of the disease. There was a good deal of inflammation of the scalp over the roughened surface of bone, but whether there was any connection between the cyst and the tumour he could not say. In reply to Mr. M'Ardle, he said the hæmorrhage was venous, and it came from a spot on the surface of the hernial protrusion. The latter did not appear to be in a healthy condition, because, when he removed a portion of the hernia, it gave him the appearance of a slough separating. The treatment which he adopted was pressure, as he was not aware then of the good effects of absolute alcohol.