valves, an early stage in the process of valvular disorganization, or of dilatation of the aorta without valvular disease. It is, therefore, of much value as an aid to precise diagnosis, and in determining the probable duration of life."[1] It will be of great value to us as practitioners if we can discover the diseased condition previously to the more complete disorganization when the fatal regurgitation commences; and still more important if, when discovering it, we can suggest any means of arresting the danger.

ARTICLE IV.—*Cases of Intra-Cranial Tumour.* By BYROM BRAMWELL, M.D., Physician and Pathologist to the Newcastle-on-Tyne Infirmary, Joint Lecturer on Clinical Medicine and Pathology in the University of Durham College of Medicine, Newcastle-on-Tyne.

(*Continued from p.* 605.)

CASE VIII.—*Female, æt.* 20. *Headache; Vomiting; Double Optic Neuritis, with Perfect Vision; Relief under Iodide of Potassium and Chloral; Convulsion; Death; Large Tumour pressing upon and causing Extensive Atrophy of the Ascending Frontal, Ascending Parietal, Inferior and Middle Frontal Convolutions, and of the Island of Reil, on the Right Side.*

M. D., æt. 20, single, shop girl, was admitted to the Newcastle-on-Tyne Infirmary on 5th January 1877, complaining of headache, vomiting, and giddiness.

Previous History.—When nine years of age she fell and hurt her head; the injury was a severe one, and was followed by vomiting. With this exception she has never been laid up until the present attack. It commenced three years ago with headache. Eight months ago the headache got worse, and she vomited occasionally. Two months ago she had to leave her situation. She says she has never had a fit, but has more than once tumbled off her chair when sitting, in consequence, she thinks, of giddiness. She has only menstruated once, and that was two years ago. She knows no cause for her illness. There is no suspicion of syphilis.

The family history is good.

Present Condition.—She is a well-developed and well-nourished girl, and, with the exception of a slightly coated tongue, is, as regards the circulatory, respiratory, alimentary, and urinary systems, perfectly healthy.

She seems intelligent, but her friends say that she is very much quieter than she used to be. The face at times has a somewhat dusky, congested hue. The eyes are unusually prominent, but have always been so. The headache is severe, and is worse at

[1] *Diseases of Heart and Aorta*, p. 238.

night; the pain is referred to the forehead and to the vertex. There is no tender spot on the surface of the cranium.

Special Senses: Sight. — The pupils are equal and moderately dilated. Vision is so perfect that she can read with ease the smallest type, and yet the ophthalmoscope shows marked double optic neuritis. *Hearing*—The skull sounds are not heard in the right ear. *Smell* is imperfect in both nostrils. (This was probably only temporary, the result of iodism.) *Taste* is perfect.

Speech is natural. *There is no trace of paralysis.* The temperature is normal.

Diagnosis.—An intra-cranial tumour. This opinion was based on the headache, vomiting, and above all the optic neuritis. There were no localizing symptoms; the seat of the tumour, therefore, could not be defined.

Treatment.—Full doses of iodide of potassium, and anodynes for the headache.

Progress of the Case.—On 18th and 19th January she frequently vomited, and the headache was intense. Croton chloral, 10 grains three times daily, was prescribed.

On 28th January she was very much easier; indeed, she felt so well that she expressed a wish to go home.

On 5th February there was some return of the headache, but she said it was nothing; and that she felt quite able to go home the next day as she had arranged.

On 6th February.—At 1.30 A.M. my clinical clerk, Mr Tait, was suddenly called to see her. He found that she had just died in a convulsion.

The Autopsy was made eleven hours after death. The head only was examined. The scalp was natural. The lower part of the right parietal bone, the inferior frontal sub-division of the right frontal bone, and the upper part of the squamous portion of the right temporal bone, were reduced to half their normal thickness. The dura was not adherent to the bone, but was firmly attached to the subjacent membranes in the right inferior frontal and inferior parietal areas. On removing the dura a large tumour was seen to be situated in these regions. It seemed to spring from the commencement of the right Sylvian fissure, and had destroyed the posterior half of the inferior frontal convolution, the lower half of the ascending parietal convolution, the lower half of the ascending frontal convolution, and the outer half of island of Reil on the right side. It had also invaded the superficial surface of the posterior half of the middle frontal convolution, the anterior part of the supra-marginal convolution, and the anterior part of the superior sphenoidal convolution.

The tumour measured from before backwards three inches, from above downwards three inches, and from without inwards 1½ inches.

The surface of the tumour, where it was unadherent to the

dura, was of a reddish colour, and had a striated, granular appearance. It seemed to be made up of delicate fibre bundles. The margins of the tumour were very thin, and seemed to be gradually applying themselves to, and invading adjacent convolutions. The section of the tumour was of a dark purple colour, granular in appearance, and very soft and friable. After hardening in spirit it was readily separated from the subjacent brain tissue, and was found to be surrounded by a delicate fibrous capsule. Several large vessels passed into and out of the tumour. On *microscopical examination* it was found to be a sarcoma. The fibre cells were large and were arranged in bundles. In addition to cells, the tumour contained numerous large oval nuclei and granular protoplasmic material.

There were no signs of hæmorrhage about the tumour.

The convolutions of the left hemisphere were much flattened, and the sulci effaced. There had been evidently great squeezing of brain tissue. With this exception, however, the other parts of the brain were quite normal.

Remarks.—This tumour was of great size, and had caused extensive destruction of nerve tissue in regions which are now acknowledged to be motor, and yet there was no paralysis. In this respect the case contrasts remarkably with cases I. and VII. previously related, in which limited lesions of the same parts of the cerebral cortex gave rise to marked motor symptoms, *i.e.*, convulsions.

This radical difference can only be explained by supposing that the pathological changes induced in the nervous tissue by the foreign body, *i.e.*, the tumour, were different in the two cases. In Case VIII. there was slow and gradual destruction. In Cases I. and VII. irritation of the nervous elements. In fact, in Case VIII. there was a "destroying," and in Cases I. and VII. a "discharging" lesion.

Now, as Dr Hughlings-Jackson has pointed out, a discharging lesion of necessity gives rise to symptoms—convulsions, in the base of a motor centre—but a destroying lesion may be unattended by paralysis *provided that the destruction is a slow and gradual process.*

The absence of paralysis in these cases is explained by supposing that other motor centres carry on the functions of those which are destroyed. It is generally supposed that these "substitution" centres are situated in the same hemisphere, and such, probably, is the rule. This case, however, in which the destruction was so extensive, and the remarkable case which I shall next relate, in which the left corpus striatum was destroyed, and in which there was no paralysis, seem to show that the "substitution" centres must, sometimes, be situated on the opposite side of the brain.

Destruction of a large part of the right hemisphere is more likely to be compensated than destruction of the left, for the latter is the more active or "driving" side.

The age of the patient is also of importance. In young subjects

the processes of repair and compensation are much more efficiently carried out than in the fully formed being. In young subjects, too, movements are much more automatic, much less highly specialized, than in the adult. These facts may help to explain, in accordance with the substitution theory, the absence of paralysis in Case IX.

The absence of obvious paralysis, when a motor centre is destroyed, gives a clue to the mode in which muscular movements are represented in the motor centres, as the following quotation from Dr Hughlings-Jackson's *Clinical and Physiological Researches on the Nervous System* shows :—

"Then it may be said that one convolution will represent only the *movements* of the arm, another only those of speech, another only those of the leg, and so on. The facts above stated show that this is not the plan of the structure of the nervous system. Thus, to take an illustration, the external parts x, y, and z, are each represented by units of the corpus striatum. But the plan of representation is not that some units contain x largely only, as x^3, others y largely only, as y^3, but that *each* unit contains, x, y, and z,—some, let us say, as x^3, y^2, z, others as x^2, y^3, z, etc. When we come to the still higher evolution of the cerebrum, we can easily understand that, if the same plan be carried out, a square inch of convolution *may be wanting*, without palsy of the face, arm, and leg, as x, y, and z are represented in other convolutions; and we can also easily understand that *discharge* of a square inch of convolution must put in excessive movement the *whole* region (face, arm, and leg), for it contains processes representing x, y, and z, with gray matter in exact proportion to the degree of complexity."—(Page xv.)

Again, "A region of the body is not permanently paralyzed when a part of the brain representing it is destroyed, because the neighbouring parts also represent the very same region. This is what we should expect on the Principle of Evolution; for the higher the centre, the greater the number of *different* movements and impressions represented in it. This implies a greater number both of nerve fibres and cells. Now, of course, the more fibres in the centre, the less loss of movement will result from the destruction of part of it; and, of course, the more ganglion cells the more over-movement from discharge of an unstable part of it."—(Page xvii.)

The circumstance that the skull sounds were not heard in the right ear is a point to which I wish briefly to refer. Nothing in the auditory nerve nor in the internal ear was found to account for this condition. It will be observed that the bone over the tumour was very thin. The question arises whether this abnormal condition of the bone could in any way account for the non-conduction of the skull sounds. The point is, I think, worth noting, for in other cases of intra-cranial tumour in which there has been no post-mortem, I have remarked the same fact, namely, that the patient professed not to hear the skull sounds. It is just possible that we may have in this a localizing symptom of some importance.

CASE IX.—*Boy, æt. 5. Headache; Vomiting; Optic Neuritis, with Good Vision; Voracious Appetite; Phosphaturea, with Puffy Face and Eyelids; General Nutrition Good; No Paralysis. Complete Temporary Relief under Iodide and Bromide of Potassium. Gradual and Increasing Mental Apathy; Excessive Sleepiness; Attack of Right Internal Strabismus; General Convulsion; Failure of Vision, due to Optic Atrophy; Severe General Convulsion, followed by Left-Sided Hemiplegia, Coma and Death. Six Scrofulous Tumours in various parts of the Cerebral Hemispheres: Left Corpus Striatum destroyed.*

J. W., æt. 5, was admitted on Feb. 27th, 1877.

Previous History.—His parents stated that his illness commenced three months ago with headache and vomiting. The vomiting was slight, and only occurred once or twice. The headache was generally worse at night. For the past week it has been so bad that he has cried for the greater part of the night. His parents know no cause for his illness. Eighteen months ago he had a severe attack of scarlet fever; he had, however, quite recovered from it months before his present complaints commenced. Two years ago he fell down stairs and injured his head severely, but has not suffered from headaches until the present attack. There are no signs of congenital syphilis.

The family history is good, the parents and all the other children being healthy.

Condition on Admission.—He is a sharp, intelligent, and lively boy, very active, and well nourished. The face is pale and somewhat puffy about the eyelids, but the urine is free from albumen; it is, however, loaded with phosphates.

The exterior of the skull is natural, and there are no tender spots on percussion. The headache is frontal, and, as a rule, only comes on at night. The pupils are equal and dilated. Sight is good, but marked optic neuritis is seen in both eyes. The other special senses are normal. There is no trace of paralysis. The gait is natural. He has never had a fit. His appetite is voracious, in fact, he bolts everything that comes before him.

The left wrist joint is swollen and evidently in a state of scrofulous degeneration. He does not complain of it, and it is only slightly tender on pressure. The sensibility of the skin both to touch and pain seems lessened. This loss of sensibility is general, and apparently is not complete at any part. His parents say that the wrist has been in its present state for several weeks.

The *pulse* and *temperature* are normal. The *digestive*, *circulatory*, and *integumentary systems* are normal. The *respiratory system* is normal. (This statement needs qualification. There never were any subjective signs of lung disease, nor was any physical change detected during life, owing, probably, to the fact that the bases of

the lungs were not examined; otherwise the lesion found post-mortem must have been detected. The apices were carefully examined, as I suspected the intra-cranial disease to be tubercular.)

The *diagnosis* was an intra-cranial tumour. The position of the tumour could not be ascertained as there were no localizing symptoms. From the associated condition of the wrist joint, and from the age of the patient, it was thought to be scrofulous.

Treatment.—A mixture containing iodide and bromide of potassium was prescribed. Tincture of iodine was painted over the swollen wrist, and it was supported by a splint.

Subsequent progress of the case.—On *March 10th* it was noted:—He is apparently quite well. There has been no headache for several nights. Indeed, so well did he seem that the nurse repeatedly asked me why I did not send him home. He continued well until March 20th, when an internal squint in the right eye was noticed; the eyeball was turned inwards and upwards, and the squint was increased by looking at distant objects. The dose of iodide was increased to 10 grains.

On March 26th it was noted:—For some days past he has been dull and heavy, and has slept a great deal. The left wrist joint was to-day opened under antiseptic precautions; a quantity of thick cheesy pus was evacuated.

On April 5th he had a series of severe general convulsions; both sides of the body were affected, the left more powerfully than the right. The convulsions continued more or less for three hours.

On April 6th he looked pale, but seemed otherwise much as usual. The squint was less marked, and on April 20th it had disappeared. For the next two months he remained in a passive state, making no complaint, eating voraciously, and sleeping too constantly. He gradually became more dull and stupid. His eyesight failed, and the ophthalmoscope showed the steady progress of optic atrophy. All this time the body continued to be well nourished, *and there was not now, nor at any subsequent period, until after the final convulsion, the slightest trace of paralysis.*

On 30th June an herpetic eruption appeared underneath the left eyelid.

On 4th August he vomited several times without any obvious cause.

On 17th August he was seized with convulsions; the spasms again chiefly affected the left side. After the attack the left arm and leg were found to be paralyzed.

The patient remained in a semi-comatose condition until 21st August, when he died at 11.30 P.M.

The *post-mortem* was made nineteen hours after death. The body was well nourished. There was nothing noteworthy in the external appearances.

Head.—The scalp, bones, and membranes were natural. There was evidence of great intra-cranial tension, the convolutions being

very much flattened, and the sulci effaced. The brain weighed 2 lbs. 14½ oz. On cutting into the cerebral substance, nodules of new growth were found in the following situations:—

1*st*, A pyriform nodule, size ¾ inch by ½ inch, in the extremity of the first left frontal convolution, where it turns over to become the supra-marginal convolution.

2*d*, An irregular-shaped nodule, measuring 1¼ inch in length by ⅜ of an inch in breadth, in the left gyrus fornicatus, at the junction of its middle with its posterior third.

3*d*, An irregular nodule slightly larger than the preceding nodule in the corresponding part of the right gyrus fornicatus. This nodule extended upwards through the gyrus fornicatus and the supra-marginal convolution to within a quarter of an inch of the vertex of the hemisphere.

Nodules two and three were joined by a connecting band of new growth, which rested upon the posterior part of the corpus callosum.

4*th*, An oval nodule, ¾ of an inch in length by ½ an inch in breadth, in the tip of the left occipital lobe.

5*th*, An irregular nodule, ⅝ of an inch in length by ⅝ of an inch in breadth at its broadest part, in the angular gyrus of the right side.

6*th*, A large round nodule, 1¼ inch in diameter, in the position of the left corpus striatum, which was almost entirely destroyed by it.

All the nodules of new growth presented the same character. They were of a yellowish colour, very firm in consistence; none of them presented any trace of softening. They were separated from the surrounding healthy brain tissue by a narrow line of softened material. After some days' immersion in spirit all the nodules could be easily separated from the surrounding brain tissue. On microscopical examination they were found to present the usual characters of the tubercular brain tumour. The line of softening between the nodules and the brain tissue proper contained numerous bloodvessels. The fibrous element in the nodules was greater than is usually seen in this form of growth.

The vascularity of the brain seemed normal. The ventricles were normal. No nodules were found in the cerebellum. The upper portion of the spinal cord was placed in hardening solution, but unfortunately was mislaid; a circumstance which I much regret, for one of the most interesting points in the case would have been the course of the degenerated fibres in the cord.

In the lower lobe of the left lung there was a large dry caseous mass. Some gray tubercles were scattered throughout the rest of the left lung. A few were also situated in the apex of the right.

The peritoneum, intestines, and other organs of the body were normal.

The left wrist joint was in a state of scrofulous degeneration.

Remarks.—The great point of interest in this case is the fact that nearly the whole of the left corpus striatum was destroyed without any resulting paralysis. I have already commented on it in my remarks on the previous case.

The other nodules of new growth were situated in regions which experimental investigations have shown to be non-motor.

According to Ferrier, a lesion of the anterior part of the frontal lobe would be attended with mental apathy, dulness, and a tendency to sleep,—an opinion which is confirmed to a great extent by clinical observations in the human subject. In this case the lesion in the frontal lobe was small, and it would be exceedingly rash, I think, considering the number and extent of the other lesions, to attribute the mental lethargy and tendency to sleep, which were marked features of the latter stages, to it alone. That Ferrier's conclusions as to the frontal lobes are correct I believe, and they are confirmed, I think, by cases already reported in this series.

According to Ferrier the angular gyrus is the centre for vision of the opposite side. In this case, in which there was a lesion in the right angular gyrus, vision was considerably affected towards the end. The loss of vision was, however, clearly due to the local changes in the fundus. The case, therefore, neither proves nor disproves Ferrier's most interesting observations on this point.

Other interesting points in the case are—

1*st*, The voracious appetite. I have already referred to the opinions of Drs Lawson and Bevan Lewis, and stated that they believe a voracious appetite to be an early symptom of cerebral tumour. Their opinion seems to me to be corroborated by this case. It is the only one, however, in which I have noted this symptom.

2*d*, The general good condition of the patient, associated as it was with the presence of tubercles in the lungs, and with the extensive cerebral lesions. The absence of wasting was probably due to—

(*a*) The absence of fever.

(*b*) The voracious appetite, and healthy condition of the digestive organs.

(*c*) The apathetic condition of the patient. The fact that there was little or no pain in the wrist-joint is probably to be explained in the same way.

3*d*, The fact that the cerebellum, which is the most frequent seat of intra-cranial tubercles, was healthy.

4*th*, The absence of any softening in the cerebral lesions.

(*To be continued.*)