ON
ATROPHY OF THE BRAIN,
WITH
CASES IN WHICH THERE WERE REMARKABLE INEQUALITIES
OF THE CEREBRAL HEMISPHERES,
ATTENDED WITH
HEMIPLEGIA AND CONTRACTION OF THE LIMBS ON THE SIDE
OPPOSITE THE ATROPHIED HEMISPHERE.
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THE occasional occurrence of atrophy of the brain was known to the ancients. *Liebanti*¹ supposed it to happen from old age. *Morgagni*¹ refers to cases in which the side opposite to that injured by wounds or blows was paralysed, and convulsive motions occurred in either one or the other side, and sometimes in both. *Valsalva*² found paralysis on the side of the body opposite to the injury of the brain. *Daniel Hoffman*³ observed, in a boy who had suffered concussion of the brain on the left side, with “a

¹ ‘Morgagni,’ let. li, art. 10.

² art. 45.

³ art. 48.

considerable loss of substance, a very violent convulsive agitation of the left foot, and paralysis of the right side, which made it altogether immovable." *Meckel*¹ states that atrophy of the nervous system may be primitive, as in "tabes dorsalis," or consecutive, as in wasting of the optic nerve, when the eyesight is destroyed: he further states, that children of successive births are subjected to similar malformations, and instances three brothers and sisters with deficiency of brain. From *Otto*² we learn that not only in many idiots is the whole brain remarkably small, but that it is generally, though more frequently only locally, very much diminished by external pressure. *Greding* observes, that not unfrequently in the insane the two halves of the brain are formed unsymmetrically³. Atrophy of a portion of the brain is almost always accompanied by imperfect volition, the person being partly deprived of the use of a limb on one side of the body. Many have, in a greater or less degree, muscular contraction of the paralysed limbs. In general the cerebral lesion is on the opposite side to that paralysed, and the individuals are infirm; many are epileptics, and the paralysed limbs are wasted and shortened. *Cazanvieuilh* found, in all the cases which he investigated, except one, the atrophy of brain and paralysis of limbs were on opposite sides, and in the only exceptional case there was a tumour on the contrary side to that wasted. He also observed that the bones of the paralysed limbs were, in general, shortened,—nine times out of eleven in the legs, and ten out of eleven in the arms, the muscles being also wasted; where the limb was large it was from œdema.

The causes of atrophy of the brain are little known; in some cases the affection is congenital, in others it is preceded by convulsions in infancy. Congenital paralysis depends on an arrest of development, or atrophy of some portion of the encephalon. Atrophy may also be the result of

¹ 'General Anatomy,' Eng. Trans., London, 1837, p. 230.

² *Otto*, translated by South, page 389, et seq.

³ 'Dictionnaire de Médecine,' tome xi, p. 589.

an apoplectic clot, which has produced considerable ravages, and terminated in absorption and cicatrization; and also from the pressure of tumours, or from abscess or softening. In old cases of paralysis, with extravasation after absorption of the coagulum, serous cysts are often found in the brain.

Examples of these several sources and forms of the disease are recorded by *Cruveilhier*, *Andral*, and different authors.

When atrophy takes place before the complete development of the skull, and when the deficiency of brain is not replaced by liquid, the skull is proportionably flattened; on the contrary, if the loss of brain be supplied by serum, the skull may be natural, or even larger than natural, as in some cases of congenital hydrocephalus, where the brain is in a great degree wanting. In some cases the internal table of the skull is unusually thin, and the diploe of great thickness.

Atrophy of the convolutions may be a mere diminution in volume, or a shrivelling of the same, presenting an unequal and granular appearance; this last is often accompanied by different shades of colour, from former effusion of blood.¹ In other cases the irregularities are filled with fluid contained in the subarachnoidal cellular tissue, when circumscribed, in the form of a cyst.

In a paper of mine, published in the 'Edinburgh Medical and Surgical Journal,'² there is an account of 22 cases of cerebral dropsy, which occurred in adults. Of these cases atrophy of the brain was found in 3 males and 4 females; in No. 735 with contracted limbs, bed-sores on hips, ankle, &c.; atrophy of optic nerve in Nos. 746 and 753. In the same journal will be found notes of 17 cases of softening of the brain; paralysis occurred in 10 of these, with contraction of the limbs in 4; in No. 772 there was loss of substance in one cerebral hemisphere, and gangrene of cerebellum, and, in 776, atrophy of the brain, attended with gangrenous sores of the character described by *Cruveilhier*.

The continuation of the paper published in No. 172 of

¹ 'Edinb. Med. and Surg. Journal,' No. 156, p. 159.

² *Ib.*, No. 171, p. 466.

the same journal, Case 787, is an instance of hemiplegia of six years' standing, caused by a tumour on the opposite side. Case 815 affords a similar example.

In 13 cases of paralysis, recorded in the same journal, there was atrophy of the brain in 6, and in 4 the atrophy was observed principally in one cerebral hemisphere.

In 31 cases subsequently examined by me (16 from thirty to sixty, and the remainder upwards of sixty years of age), the brain was below the average size in three fourths of the number, and was unsymmetrical in the remainder. There was cerebral softening in 11 cases ; in an acute case, of one week's duration, the softened hemisphere was 3 oz. heavier, and, in another, $1\frac{3}{4}$ oz. heavier than the other hemisphere ; in one, there was a loss of $2\frac{1}{4}$ oz., and, in a fourth, the difference was only 1 oz. ; there were convulsions in 2 ; general paralysis in 1 ; paraplegia and contraction of the lower limbs in 2 ; hemiplegia of right side, and contracted wrist, in 2, softening being in the left hemispheres ; hemiplegia of the left side in 2, and the cerebral softening on the right side ; paraplegia and contracted lower limbs in 1, with softening of each "corpus striatum," and sloughing bed-sores. In one, loss of substance in left cerebral hemisphere, and hemiplegia of right side. Apoplexy existed in 2 cases ; in one of left corpus striatum and optic thalamus, with hemiplegia on same side ; the other a rusty colour, and wasting of cerebral convolutions of left hemisphere, and hemiplegia of right side. In 1, tumours, and considerable atrophy of the brain, which weighed only $27\frac{1}{2}$ oz. ; the lower limbs were contracted. Fluid was found in the ventricles, or on the surface of the brain, in 11 cases ; in 1 there was a difference between the cerebral hemispheres of 2 oz. ; in 8, paralysis, with more or less wasting ; in 2 there was stupor, with no paralysis ; and bed-sores in 3. Atrophy of the brain in 5, wasting of the "pons varolii ;" in 1 there was paraplegia of the lower limbs, and the right cerebral hemisphere was 1 oz. heavier than the left ; wasting of the right optic thalamus, and a soporific state, in 1 ; wasting of the optic nerves, in cases of blindness, in 3 ; one of these, a female, aged 85, was blind of the left eye, and

had atrophy of the left optic nerve; her eyes were dissected by the late Mr. Dalrymple, who found "the sclerotic and choroid perfectly healthy, but the retina was extremely thin and translucent, and, compared with the right eye, had not half its substance; in fact, the granular or external layer appeared nearly absent. The iris had been inflamed, and the pupil was closed upon an opaque capsule, to which it was universally adherent; the lens behind was opaque, the vitreous body healthy. The case had probably been one of iritis originally, which had gone on to closed pupil and spurious cataract in the left eye, but it is singular to find this resulting in atrophy of the retina and optic nerve." There was fluid on the surface of the brain, and atrophy of the cerebral convolutions; there was also $1\frac{1}{2}$ oz. of fluid in the lateral auricles; weight of brain, $36\frac{1}{2}$ oz. Old pulmonary tubercles degenerated into earthy and hardened matter in the apices of both lungs. Heart natural. Abdominal organs small.

There may be considerable loss of substance of the surface of the hemispheres, without hemiplegia, as the following case demonstrates: A female, æt. 55, died of dropsy; enlarged heart ($16\frac{3}{4}$ oz.), left cerebral hemisphere ($3\frac{1}{4}$ oz.) smaller than the right, the convolutions of a yellow colour, and softened to the depth of one fourth of an inch; there was no paralysis, but there was a deficiency of intelligence. Weight of brain, $41\frac{1}{4}$ oz.

A case in which there was a remarkable inequality of the cerebral hemispheres in an intelligent man, attended with hemiplegia and contraction of the limbs on the side opposite the atrophied hemisphere, which was only half the size of the other, was published in a contribution of mine to the 'Edinburgh Med. and Surg. Journal,' No. 172, Case 823. The cerebral convolutions were wanting on the left side, and their place was occupied by cellular membrane, filled with transparent fluid; the medullary portion of hemisphere was unusually firm. The weight of brain was $33\frac{1}{4}$ oz.; the thoracic and abdominal organs were natural; death occurred from convulsions, and was sudden. This case would seem to

be favorable to the hypothesis of the late Dr. Wigan on "the duality of the mind," as it appeared, from the evidence of his sister, that this man possessed a more than ordinary amount of ability, being a good accountant.

A case somewhat similar to the foregoing, but of the history of which fewer particulars could be obtained, occurred in a messenger, æt. 30 years, who died of pulmonary phthisis. He had hemiplegia and contraction of left wrist and ankle for twenty-eight years. The dura mater was quite flaccid over the right cerebral hemisphere, which was not half the size of the left; the convolutions were firm, but much shrivelled; the pia mater in an oedematous state; 1 oz. of fluid in lateral ventricles; the right cerebral hemisphere weighed 9, the left $19\frac{1}{4}$ oz.; weight of brain, $33\frac{3}{4}$ oz.

An epileptic male, aged 18, suffered from epilepsy since his fifth year. He was found dead in bed. Hemiplegia of the right side; right wrist and ankle firmly contracted; right lower extremity one inch shorter than the left; right thigh two inches less in circumference, and calf of right leg two inches and a half less in circumference than the left. The circumference of right arm and forearm two inches less than left. There was an extensive loss of substance laterally of the anterior lobe of the left cerebral hemisphere; the space filled by fluid contained in a reticular membrane; the cerebral structure beneath the membrane smooth, unusually firm, and of a brown colour.

Of the cases now referred to 33 were males, and 31 females. One male only was below 30 years of age; and of the other males, one half were between 30 and 60 years, and the remainder above that age, the oldest being 84. The youngest female was 32; 12 were under 60, 18 above that age, and the oldest 98.

The average weight of the brain in the males was $43\frac{1}{2}$, in the females $39\frac{3}{4}$ oz. The smallest brain in the males was $30\frac{1}{2}$, in the females $27\frac{1}{2}$; the largest in the males was $52\frac{1}{2}$, and in the females $50\frac{1}{4}$ oz. No account has been here taken of any case where the difference in weight between the cerebral hemispheres was less than one ounce.

As regards the relative frequency of atrophy of the brain (with inequality), it was found in about $4\frac{1}{2}$ per cent. of the adult cases examined by me at the St. Marylebone Infirmary. According to my experience subsequently, it is at least twice as frequent in the insane, and males of this class are very much more subject to it than females; and it is also very common in epileptics.

In 31 cases in the insane (21 males and 10 females), a difference of one ounce between the cerebral hemispheres was found in 7 males and 4 females. Of these 2 males and 1 female had general paralysis; and in 1 female, æt. 61, who always sat bent forward, and tottered in walking, there were several semicartilaginous specks of various sizes, from that of a split pea to a silver fourpenny piece, on the arachnoid of the spinal cord, the largest over the "cauda equina." The specks are indicated in the drawing sent with this paper. There was also a mass of hydatids on the under surface of the right lobe of the liver. In 1 male the difference was $1\frac{1}{2}$ oz., and the case one of general paralysis; the brain unusually small, 39 oz. In 5 males and 4 females the difference was $1\frac{1}{2}$ oz.; in 3 of the males and in 1 female there was general paralysis, and in 2 females cerebral softening. In 2 males and 1 female the difference was $1\frac{1}{2}$ oz.; in both males there was general paralysis, and in the female epilepsy. In 1 male the difference was 2 oz., and in this case there was general paralysis. In 1 male, a case of epilepsy, a difference of $2\frac{1}{4}$ oz. In 1 male and 1 female the difference was $2\frac{1}{2}$ oz.; the man died in convulsions, and the woman had epilepsy. In 1 male the difference was 3 oz., a case of epilepsy. In another male epileptic case, the difference was 4 oz. In 1 male the difference was 6 oz.; there was hemiplegia and contraction of the joints upon the opposite side; the right cerebral hemisphere was destroyed to the depth of an inch, and three inches and a half in the antero-posterior, and two inches and a half in the lateral diameter; skull natural. The symptoms were those of mania, combined with epilepsy. In one male the cerebral hemispheres were equal in weight; there was blindness of

left eye for twenty-two years (caused by an accident from lime), and the left optic nerve was only half the size of the other; this was a case of congenital idiocy.

The average weight of the brain in the 21 insane males was $45\frac{1}{2}$, and in the 10 insane females $41\frac{1}{2}$ oz. In 10 males and 4 females the atrophy was of the right cerebral hemisphere; and in 9 males and 5 females of the left. In one male and one female the atrophy was general; and in one male local, being confined to the optic nerve.

Atrophy of the Brain in Insane Persons.

CASE 1.—A female, H. R—, æt. 24, was brought to this asylum paralysed, and in a very bad state of bodily health; she lived only eight days after admission.

It was stated that she met with an injury to the head thirteen years ago, when she and two other persons were thrown out, and one killed, by the upsetting of a cart coming rapidly down a hill. She was never fit to follow any occupation afterwards.

The head was of the natural size; the skull was unusually thick, the brain much wasted, the dura mater quite flaccid, a gelatinous fluid in the pia mater, the lateral ventricles enlarged and filled with clear fluid, the structure of the brain firm; each cerebral hemisphere weighed only 13, and the entire brain 31 oz. The membranes of the spinal cord were red, and the vessels turgid with blood.

CASE 2.—A German, a teacher of languages, æt. 27, admitted in a state of incoherence, with some symptoms of general paralysis; occasionally very violent; seized with spasm and rigidity of the muscles of the back nine days before death; appetite, which had been excessive, fell off suddenly. Head large; the dura mater, over right cerebral hemisphere, distended; and, when divided, there was nearly 8 oz. of fluid, of a dark colour, mixed with blood, and contained in a smooth, membranous sac, within the cavity of the arachnoid; the surface of that hemisphere was smooth, and much

smaller than the other. The brain, in other respects, appeared natural. The right cerebral hemisphere weighed $12\frac{1}{2}$, and the left 17,—the entire brain 36 oz. There was an unusually large quantity of fluid in the spinal canal, and about one inch of the lower end of the spinal cord was softer than natural; pleuro-pneumonia on both sides of the chest. Although in this case there was a difference of $4\frac{1}{2}$ oz. in the cerebral hemispheres (the loss of substance being from the surface), there was but slight paralysis, and neither convulsions nor epilepsy: duration of insanity, eight or nine months. In another case before mentioned, of twenty-eight years' duration, where the loss of substance in one cerebral hemisphere amounted to 6 oz., there was hemiplegia and contraction of the joints on the side opposite; and also epilepsy, reported to have been caused by an injury to the head. He lived to the age of 47 years.

Atrophy of the Brain in Epileptics.

Amongst 32 male and 33 female epileptics at present in this institution, there are 3 strongly marked cases of hemiplegia and contraction of the limbs; and in 1 there is a manifest depression of the cranium on the side opposite the paralysed one.

CASE 1.—W. M—, a male, æt. 28, when brought to this asylum three years and a half ago, was reported as having, from infancy, been subject to epileptic fits, which were of frequent occurrence. His parents were agriculturists; he had received no education; had no occupation; he is cleanly in his habits; his mental state one *approaching* idiocy; his expression is characteristic of the state of his mind; his disposition cheerful; his bodily health indifferent; his pulse 78, not so frequent as in other epileptics; height, 5 feet $3\frac{1}{2}$ in.: weight, 133 lb. Has hemiplegia of the left side; the elbow and wrist contracted; leg shortened; right arm 2 inches longer, and $1\frac{1}{2}$ inch larger in circumference than the left;

the right leg $1\frac{1}{2}$ inch longer, and three fourths of an inch more in circumference than the left ; the head is small, with a retreating forehead, narrowing at the top ; the circumference $20\frac{1}{4}$ inches, measured round the middle of the forehead and occipital protuberance ; $12\frac{1}{2}$ inches from root of nose to occipital protuberance, the antero-posterior measurement ; and $12\frac{1}{4}$ inches from centre of one external auditory foramen to the other, transverse measurement. In this case there is atrophy of the right cerebral hemisphere, arising probably from arrest of development.

[This patient has, since the paper was read to the Society, died of lumbar abscess not connected with any disease of the spine. He was under medical treatment, and confined to bed for the last ten weeks with diarrhoea and hectic fever, and had an ulcer on the coccyx, and another on the hip ; he became much emaciated, and lost 40 lb. in weight during his illness.

Head—skull thick, unequally so ; the lower surface shows the sinuses dilated, and skull thickest on the right side, being the corresponding side to the small cerebral hemisphere ; the dura mater thickened and flaccid, especially over the anterior portion of the same hemisphere ; the falx imperfect, wanting at the anterior part. The cerebral convolutions smaller on the anterior lobe of the right than of the left hemisphere, and the left hemisphere anteriorly encroached on the right. The brain very small, being only 30 oz. avoirdupois in weight, one pound below the average in the male. Chest—old pleuritic adhesions on the right side, and the lower lobe of right lung in a softened state from low pneumonia, weight 18 oz. ; left lung natural weight, 8 oz. ; heart filled with dark coagula, weight, $8\frac{3}{4}$ oz. Abdomen—stomach large, weight 6 oz. ; liver simply enlarged, but in an excessive degree, weight 74 oz. ; spleen dark coloured, weight $6\frac{3}{4}$ oz. ; pancreas, 3 oz. ; right kidney, 6 oz. ; left kidney, $5\frac{1}{2}$ oz. ; on the left side, beneath the peritoneum, there was putrid pus found to extend from diaphragm to brim of pelvis, and between fibres of psoas muscle ; no sign of the abscess externally. A drawing of the brain in this case is annexed.]

Scale of Inches for the above subject

CASE 2.—A. H—, female, æt. 47, has hemiplegia of left side, left ankle and foot contracted. Is reported to have been healthy as an infant, and no deficiency was observed until she was 7 years of age, and old enough to use her hands; after which the contractions gradually increased, and epileptic fits occurred, which ceased at 10 years of age, but returned in after life, and now occur, with severity, about once a month. Her propensities are to thieve, tell lies, and be abusive, and indecent in her conduct, for which reasons she cannot be kept at home. Her intellect is clear; she can read, and repeat well from memory; no deficiency is observable in the form of the head—circumference $22\frac{1}{2}$ inches, antero-posterior measurement 13, and transverse $13\frac{1}{2}$ inches. Length of right arm $25\frac{1}{2}$, of left arm 24 inches; left hand and forearm shrivelled. The right leg $1\frac{1}{2}$ inch longer, and $\frac{1}{2}$ an inch larger in circumference than the left. In this case the atrophy of the right cerebral hemisphere began in infancy.

CASE 3.—M. A. C—, female, æt. 27, has hemiplegia of right side; wrist, hand, and ankle much contracted and shrivelled; on left side of head there is a manifest lateral indenture, giving proof, in this case, of arrest of development of that side of the brain; she has epileptic fits, and is occasionally very violent and passionate, and will bite even her own flesh. She has a brother who is also an epileptic. Her expression is pleasing and cheerful; there is no great deficiency of intellect, but there is a want of self-control. Circumference of head, 21; antero-posterior measurement, 12; and transverse measurement, 13 inches. Length of right arm 23, left arm $25\frac{1}{2}$ inches; left forearm 1 inch more in circumference than the right.

CASE 4.—E. D—, a female, æt. 19, nearly twelve months in the asylum. Imbecile; disposition cheerful, generally singing; appetite moderate, sleeps well, takes a good deal of exercise. She is subject to fits, which occur night or day, about four or five in a week; they occur without previous

notice, very suddenly, and partake more of the character of eclampsia than epilepsy. Her state appears to depend upon an arrest of development of the right cerebral hemisphere. The limbs on the left side of the body are smaller than the right, and there is a considerable difference between those of the upper and lower extremities, the left being $\frac{1}{8}$ inch shorter than the right, and also $\frac{1}{8}$ inch smaller round the calf of the leg; whilst the left arm is 2 inches shorter than the right, and $\frac{1}{2}$ inch less in circumference. The left wrist is firmly contracted, and the hand wasted, so that it is of very little use.

CASE 5.—J. E—, a female, æt. 29. Mania, combined with hemiplegia, right side, from apoplexy, eight years ago. Right leg and foot each 1 inch shorter than the left, and the calf of the right leg $1\frac{1}{2}$ inch smaller than the left. The right wrist is $\frac{1}{2}$ inch smaller than the left. She is very passionate and violent; not subject to fits. In this case the apoplectic attack would appear to have been destructive to a portion of the left cerebral hemisphere, and have caused the contractions of the limbs on the right side, especially of the lower extremity.

In these five cases the character of the epileptic fits is somewhat similar (the individuals being aware of their approach), and they are neither so frequent nor so prolonged as in ordinary cases of epilepsy. In the first case, 18 fits; in the second, 3; and in the third, 13 have only been observed during four months.

Some amount of atrophy of the brain, and irregularity of the cerebral hemispheres without paralysis, is frequent in epileptics; and, in the foregoing cases of general paralysis amongst the insane, a minor degree of inequality of the cerebral hemispheres from softening was also found. The inequality in cases of general paralysis was mostly produced by inflammation, the softened part being usually on the heavier side; and generally, in such cases, the spinal cord was similarly affected—being likewise softened.