Observations relative to the state of the skull and of the brain in congenital chronic hydrocephalus, and to idiocy and paralysis attending it : with cases / by Francis Battersby, M.B.

(4) with the Author's Compts

OBSERVATIONS

RELATIVE TO THE

STATE OF THE SKULL AND OF THE BRAIN

IN

CONGENITAL

CHRONIC HYDROCEPHALUS,

AND TO

IDIOCY AND PARALYSIS ATTENDING IT.

WITH CASES.

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MDCCCLI.

ON THE

STATE OF THE SKULL AND OF THE BRAIN

IN

CONGENITAL CHRONIC HYDROCEPHALUS.

Breschet states that hydrocephalus may co-exist with a head natural in size, or of diminished volume. The first of these conditions he thinks most common; but this is not the case. The second is always congenital. Most frequently children, with a head of diminished size, have, at their birth, the fontanelles closed, and the sutures ossified. The most of these children die as soon as they are born, or perish in convulsions a very short time after birth. They are absolutely deprived of intellectual faculties, and their senses are obliterated. The head of these little ones is constantly pointed at its summit, and depressed laterally towards the ears. The forehead is also flattened, and the head covered with thick hair. The eyes are constantly convulsed; they rotate, and are insensible to the light; the pupil is much dilated, and in some cases the iris has appeared to adhere to the cornea. The face, without any expression, is the image of stupidity. The

* Read to the Dublin Obstetrical Society, February 2, 1850.

voracity of these children is great, yet nutrition is badly performed; liquids are swallowed with difficulty; they lose their breath, and give fears for their suffocation. The stools and urine are discharged involuntarily. The voice is a feeble and hoarse sound. The feet are crossed immovably; the thighs are flexed on the abdomen. These unfortunates can never stand nor walk. Their extremities are cold. They appear to have only a vegetative existence; they never exhibit a speck of reason, and are one of the saddest pictures of humanity.*

A case of this kind has been recorded by Mr Ward.†

An idiot boy died aged eleven months. Its cry was even less expressive than that of a puppy, nor had it the tone of an infant's voice. The child was illegitimate. There was little or no forehead; the frontal bone sloping backwards immediately above the eyes; neither were there any fontanelles. It had convulsions from birth, and its fingers were always clenched over its thumbs. It could hear and see till a short time before death, but it gave no sign of intelligence.

The following state of the parts was found after death.

The skull cap was twice its ordinary thickness. The sutures were all closed. There was one ounce and a half of fluid in the ventricles of the brain; the convolutions were absent. There was no *corpus callosum*. The central portions of the brain were so rudimentary as scarcely to be distinguished. The nerves were all perfect.

The following is a case of the same description.

Case 5. Patrick Moran, aged one year and nine months, brought to the Institution for Diseases of Children, November 28, 1849. This child never made an attempt at speaking. He sees and hears well. His forearms are stiff, hands pronated, and fingers kept closed over his thumbs. He cannot take anything in his hands, nor can he extend his fingers, except partially the index and middle finger. He cannot walk, nor stand, nor sit, unless tied in his chair. The legs are very much wasted, being little else than skin and bone.

His head was quite ossified at birth. It is now very small, being only sixteen inches by nine. It is very rounded, the forehead shelving remarkably backwards, and it is depressed laterally towards the ears, which are too large, and project much from the side of the head. He has a very fine crop of hair. He has convergent strabismus. There is a general bend backwards of the spine.

For six months he is constantly screaming, thus annoying his

* Dict. de Medecine, *art.* Hydroceph. Chronique, p. 533.

† London Medical Gazette, March 27, 1846.

parents constantly. His mouth is ever kept open, and from it protrudes an enlarged tongue. Since his earliest days there is a constant flow of saliva from his mouth, keeping his clothes ever wet. His mother says it is impossible to keep him dry. His bowels are constantly confined. Has had no stool for a fortnight.

March 6th, 1850.—He has nearly all his teeth. Cries less during the day, but at night incessantly, notwithstanding the use of strong opiates. I gave him a mixture containing two drachms of camphorated tincture of opium, directing him to get a teaspoonful three times daily, yet it produced not the least effect in quieting him.

August 17th.—Has got all his teeth, yet still is constantly slavering his clothes. His teeth are decaying. He remains in just the same state as at first. Eats little, but drinks voraciously, and without difficulty. In the morning takes an immense quantity of drink, and screams loudly and incessantly till it is given him. Stools and urine pass involuntarily. His feet are crossed; his legs are generally flexed on the abdomen. He is less cross than formerly; is often induced to smile, opening his large mouth, and looking hideous, but never laughs. Has a great dislike to women with bonnets; used to have the same for men with hats. His face has become tolerably fat, but his limbs are much wasted, and are always cold. His right side is more powerless than the left; when held up he cannot put forward the right foot. He has never uttered an articulate sound. Is the first child of his parents, who are young.

To this form of disease of the brain, with diminished size of the skull, Cruveilhier proposes to apply the denomination of Microcephalus. Of this, Cruveilhier states that there are three forms:—1st, microcephalus, with atrophy of the brain: 2d, with serous effusion into the cavity of the cranium: 3d, at the same time atrophy of the brain and hydrocephalus. In the second form, or that with serous effusion into the cavity of the cranium, death ensues at the moment of birth; whilst in microcephalus from atrophy of the brain the patients survive for a greater or less length of time.*

Of a hydrocephalic head of natural size, we have an example in the following case.

Case 6.—James Healy, aged four years and nine months, September 1850. Is the only child of his parents, who are middle-aged. He never spoke a word; smiles often, however unnaturally; is said to laugh occasionally, and cries very seldom. He appears to hear well. He cannot hold up his head perfectly, nor could he do so at all until two years ago, having been until then constantly lying in bed. He cannot sit unsupported, nor crawl along the

* Anat. Pathol. Livrais, xxxix., Planche iv.

floor; is always seated in a wicker cart, in which he is supported by pillows.

He cannot stand nor walk. He likes to be carried about on his legs, which are then tossed about in a curious way, as if they did not belong to him. During this exercise his arms are kept in the same irregular motion. He makes when thus brought about most hideous faces, the muscles of the face contracting irregularly and without sympathy, and his tongue then often protrudes.

There is no defect in his spine nor any of his limbs. He finds constant amusement in the toys of children, taking them up with half-closed fingers, as these he cannot extend perfectly. He cannot feed himself; is rather tall for his age.

His head is not unusually large, being nineteen and a half by eleven and a quarter inches. There is a depression of the skull at the anterior fontanelle, which is closed but one year. His fæces and urine are discharged involuntarily.

He will touch no food with salt in it. His teeth are all rotten. His clothes are slavered, but this is said to be the case not more than a fortnight.

The third variety, according to Breschet, of hydrocephalus, or that with increased volume of the head, is undoubtedly the most common. It is, Boyer states, a disease peculiar to children; most frequently it is congenital, or they are affected with it before birth, but they may be attacked by it after birth.*

In it the walls of the cranium recede from its centre, and the head augments in volume according as the quantity of fluid becomes considerable. The bones of the face neither participate in nor contribute anything to this enlargement. They preserve their natural volume and form. The bones of the cranium conspiring to its enlargement are the frontal, parietal, the superior part of the occipital, and a small part of the squamous portion of the temporal bones. These bones become expanded, thinned, and membranous. The frontal expands, is elevated, and advances forwards over the eyes and the face, which looks narrower and shorter. The angle which the superior part of the frontal, now enlarged, forms with its orbital portion, diminishes and is effaced almost entirely, so that the eye is driven down and concealed by the lower lid, which ascends to the level of the centre of the pupil. Camper remarks, that this disposition would alone suffice to recognise chronic hydrocephalus, even although all the rest of the head were covered. The bones forming the vault of the cranium are separated, and the intervals, more or less large, separating them, are occupied by a fine membrane, through which fluctuation of the water inside can be felt distinctly. This sepa-

* Loc. cit., p. 534

ration is very great between the parietal bones, and especially at the fontanelles. The membrane filling these spaces is sometimes distended to such a degree as to form a very visible longitudinal tumour. On pressing strongly the fingers upon these parts of the head, no depression is left, and the intervals of the bones yield to this compression like a bladder full of water. On gently striking one of these intervals the liquid can be felt at the opposite side. Resistance is felt everywhere else, that is, in the parts naturally ossified.*

In many hydrocephalic heads Breschet found the bones of the skull and of the face almost as fine as a sheet of paper, transparent, and yielding under the finger, as if they had been deprived of their saline parts, and reduced to their organic elements. Buttner, Wrisberg, Marcorel, and Meckel have made similar remarks. They say the cranial bones of their hydrocephalic patients were from one to three lines in thickness, and that they were tender and flexible. This softness pertains either to the entire extent of the bones of the skull, or to a part only. In the frontal, orbital, parietal, and occipital regions are occasionally places where the bone is very fine, transparent, and of an elasticity like that of cartilage. I may here mention that in three cases, two of them aged nine months, and one one year and one month, the skull was so very soft as to be easily divided by a pair of dressing-case scissors. In the fourth, aged one year, it was more solid.

Malacarne† speaks of a hydrocephalic patient with the right frontal bone for many inches fibrous and membranous like the *dura mater*. Bordenave has described a fœtal head of seven months, in which all the bones only offered a small number of disseminated osseous radii. The shape of the bones, the radiated disposition of the osseous fibres, the situation of the most solid parts, and of those which are soft, indicate that this is less a retrograde changing of tissue than imperfection of the osseous formation.

Thinning of the cranium is not constant in hydrocephalus. In a sufficiently large number of cases the bones have been found thicker than natural. Ecmark, Malacarne, and Hartell have found them of a thickness proportional to their surface, or to the volume of the head. Riedlin says he met them twice as thick as natural in a hydrocephalic case of seventeen years. Loder speaks of a child two years old in whom all the bones of the vertex had a thickness of nine or ten lines. The cranium described by Molineux was so thick that that physician took the head of the patient for that of a giant. Albinus had doubts on that point, and Sandifort demonstrated that the bones of this subject had increased in thickness according as the diameters of the head had

* Boyer, Maladies Chirurgicales, T. v., p. 211.

† Meckel, Pathol. Anat., T. i., p. 270.

become larger and larger by the accumulation of the fluid. Breschet met with a case of hydrocephalus, aged twenty-eight years, in which the bones of the skull had the thickness natural to a well-formed adult, and which were united by solid suture.*

The first lineaments of the Wormian bones are observed in hydrocephalic subjects of a very tender age. Breschet remarked little osseous needles in the membranes, by which the edges are most generally united. These needles are very remarkable in the skull of a hydrocephalic fœtus, preserved in the museum of the Rotundo Lying-in Hospital.

The sutures may remain long unclosed. In one of Dr Conquest's cases (Foster), at five years of age, the bones in the course of the coronal suture, on either side of the median line, were two inches apart. In a case by Dr Monro,† the sagittal and coronal sutures were not ossified in a boy aged nine years. In Howship's case at twenty-five years, the vertex was diaphanous, while in the celebrated case of Cardinal the anterior fontanelle was not ossified till his twenty-seventh year.

Dr Baillie has given a case in which the sutures of the skull are said to have opened in a boy aged seven years, who died of hydrocephalus.‡ This separation of the bones is denied entirely by Dr Craigie, who says, "upon the whole, I conceive it may be justly inferred that there is, strictly speaking, no opening of the sutures in chronic hydrocephalus; that the bones, indeed, are separated, and the regular process of ossification is disturbed and suspended, and that in its place the *pericranium* and *dura mater* assume an ossific action, and in this manner deposit between them, points of osseous matter, which eventually unite the bones and close the skull, but do not form genuine sutures."§ In this opinion I coincide with Dr Craigie, and it would seem to be proved by the short description given of the bones of Dr Baillie's patient:—"The edges of the frontal and parietal bones were thinner than is usual at the same period of life; and in examining the edges of the two parietals at the sagittal suture, the processes of union appeared to be more simple in their form and fewer in number than is usual in children of the same age."

Dr Craigie denies the separation or disunion of the sutures in chronic hydrocephalus, for the reason that no sutures exist at its commencement. He gives several instances of a complete or partial consolidation of the cranial bones, which is effected in hydrocephalus chiefly by ossification of the membranes; and this may be established from several isolated points forming in this way an assemblage of Wormian bones.

* Loco citat., pp. 516, 517. † Annals of Med., Vol. iii. section ii., p. 364.
‡ Transactions of the College of Physicians, Vol. iv., p. 1.
§ Edinburgh Medical and Surgical Journal, Vol. xxxviii., p. 43.

May not one, says Breschet, in this confusion of the osseous pieces, see an analogy with the conformation of the cetacea, fishes, and birds, where the bones of the cranium are formed very early, and present but a continuous whole, without lines of demarcation between separate and distinct pieces ? *

" It must be remarked, nevertheless," says Dr Craigie, " that not every instance of disease and obliteration of the cranial suture is to be ascribed to the previous existence of hydrocephalus, and the membranous ossification of the skull. It is only when it takes place in skulls of unusual size, in some manner deformed, and at a period of life unusually early, that the closure can be regarded as originating from the cause I mention."†

I have now before me a beautiful preparation of a skull belonging to the museum of the Royal College of Surgeons, which very well exhibits the union of the bones by *ossa Wormiana*. The child to which it belonged is stated to have been aged at death thirteen months, but would appear, from the existence of all the teeth, to have been older. All the account I have been able to procure of the patient is, that the head was observed to grow large upon his being eight months old, that he never had convulsions or fits of any kind, and was carried off by an attack of diarrhœa.

In circumference the head measures twenty-nine inches; from ear to ear twenty-one inches. The milk teeth are all present, and are quite sound. (I may mention that in one of the children, whose case has been already given, there were no teeth at one year; in another at thirteen months there were but two.) The skull is very light and diaphanous. The bones are solid, without any vascular holes. It is of an ivory texture. At the edges of the bones, fibres diverge from the centre of each towards its commissure ; they are particularly remarkable at the anterior parts of the parietals, which meet together. The orbital processes of the frontal bone are not depressed, but form an obtuse angle with the superior parts of the bone. The orbits are greatly increased from below upwards ; the supercilium is carried much upwards and forwards beyond the lower part of the orbit, and the frontal bone projects much over the face. The frontal bone is in one piece.

A large membranous expansion, two and a-half by nine inches, exists between the frontal and parietal bones, the interval is occupied by two large *ossa Wormiana*, in the angle between the parietals, and by several smaller ones.

The parietal bones at their anterior part meet for the space of two inches, while for five inches posteriorly they are joined by membranes two inches and a half in breadth. The lower part of this division is closed by *ossa Wormiana*, which are in apposition with an innumerable number of the same bones, filling the lambdoid

* Loc cit., . 518. † Loc cit., p. 40.

suture, which is two inches in breadth. A few of these bones also exist between the squamous portion of the temporal and parietal bones.

Examined on the inside, all trace of suture between the frontal and parietal bones, sufficiently distinct on the outside of the skull, has disappeared. Even the Wormian bones in the lambdoid suture scarcely present a trace of suture in the inside, though on the outside they are distinct enough. This gives a confirmation of the views of Craigie and Breschet with respect to the consolidation of the bones in chronic hydrocephalus.

That this case was not, however, one of congenital hydrocephalus, would appear from the orbital plates of the frontal bone remaining undepressed. In the congenital form, these plates, as in the skulls preserved in the Rotundo, form a continuous curve with the superior part of the frontal bone.

The size of the head has been observed very great. Meckel states that he had seen a fœtus of seven months, the transverse diameter of whose head was sixteen inches. The head of another fœtus, come to its full time, was, at birth, fifteen inches in circumference, and five inches in height. Another, by Willan, at twenty months, was twenty-eight inches in circumference, and nineteen from ear to ear;[1] by Friend,[2] at two years, it was twenty-nine inches. A head, in the museum of the Rotundo, Dublin, is stated to have been twenty-two inches in circumference when the mother was delivered by the crotchet. Wrisberg delivered a Jewess with the crotchet, and the child's head was ten inches long, and thirty and a-half in circumference. Dr Monro's, at nine years, was thirty-six and a-half inches.[3] The head in Bartholin's case was forty-eight;[4] in Cruickshank's, at sixteen months, fifty-two inches in circumference. This is the largest head I have met a description of, with the exception of Marcorel's case, in which the head, according to Meckel,[5] was, however incredible, twenty-eight feet round! Meckel's words are—"Der von Marcorel beschriebene Schädel, der von acht und zwanzig Fuss in umfange hatte, war weich und sehr dünn."

The quantity of fluid found in hydrocephalic heads is also very considerable. Willan, in a child aged twenty months, found four quarts; Ecmark, eight pounds,[6] and Duncan,[7] eight pounds, eight ounces; Wrisberg,[8] in the Jewess's child, nine pounds; Buttner, twenty pounds; Stegman, twenty-four pounds;[9] Cruikshank,

1 Breschet, l. c., p. 514 2 Phil. Trans., No. 256.
3 Annals of Medicine, Vol. iii., section ii., p. 365.
4 Medical and Physical Journal, Vol. lvi., p. 87.
5 Patholog. Anatomie, T. i. p. 285.
6 Sandifort Thesaur. Dissertat., T. ii., p. 327. Rotterd, 1669.
7 Transact. Medico-Chir. Society, Edinb., Vol. i. p. 205.
8 Satz. Zeit., 1805. Bd. i. S. 89. 9 Miscell. Cur. Dec. iii., An. i.

twenty-seven pounds; Esquirol, thirty-six pounds;[1] and Lechel, fifty pounds.[2]

Forestus, J. P. Frank, Stoerck, Girtanner, Plenck, Sprengel, Feiler, Goelis, Rudolphi, and others, haverecognised the existence of hydrocephalus in the embryo, and in new-born children. Richter says, "this disease can only form in children, and the small number of adults in whom it is observed have been affected with it from their earliest age."[3] Boehmer and Wigand assume that children are born disposed to this disease, and it is often developed, according to Rosenstein, Struve, and Loder, a few days or months after birth.[4]

Hydrocephalus generally proves fatal soon after birth, but it does not always carry with it the idea of the near death of the individual.

Dr West says, "on examining the date of the commencement of the disease in fifty cases (fourteen of which came under my own observation, and the remaining thirty-six are recorded by various writers), that some symptoms of it were observed in forty-six cases before the child was six months old, that in twelve of them the malady was congenital, and that in nineteen more it came before the completion of the third month."[5] I have notes of thirty cases aged from six to seventy-nine years. Hartell and Malacarne give one each, aged seventeen years; Loder, twenty-two; Buttner, thirty-one; Schneider, forty-three; Ecmark, forty-five; Schomberg, forty-eight; Gall, fifty-four; and two by Goelis, aged seventy-one and seventy-nine years.

Chronic hydrocephalus is not constantly a fatal disorder. Cardinal died of fever and diarrhœa at twenty-nine years of age; Dr Fourçade's[6] patient, of pneumonia; Dr Lee's,[7] of cholera; one of Conquest's cases, of pertussis; Dr Banks',[8] of phthisis, at the age of thirty years; and Dr Dickinson's, of bronchitis,[9] &c.

Dr Monro states, "I have endeavoured to prove that there is not only a mere extension of the brain in chronic hydrocephalus, but also an absorption of part of its substance."[10] Against this Dr West says, "it was long supposed there was a real destruction of cerebral substance in these cases, and that the brain had actually melted down, as it were, beneath the encroachments of the fluid. This opinion was the more readily entertained, from the circumstance, that the attenuated brain often gave way under examina-

[1] Gaz. Medicale, Janvier 24, 1835.
[2] Meckel, loc. cit., T. i., p. 272.
[3] Bibliotheque Germanique, T. viii., p. 375.
[4] Breschet, loc. cit., p. 510.
[5] Diseases of Children, p. 84.
[6] Lancette Fran., Vol. iv. p. 188.
[7] Stewart on Diseases of Children, p. 353.
[8] Dublin Medical Journal, N. S., Vol. i., p. 514.
[9] Mr Dickinson, in a private note, informs me that the age of his patient was thirteen months, and not years, as printed in the Lancet.
[10] On Hydrocephalus, p. 134.

tion, and the relation which the different parts had actually borne to each other was thus involved in hopeless confusion. It has been ascertained, however, that this was a mistaken notion, that the cerebral substance is simply unfolded, not destroyed."[1] Whether this be correct or not, it is difficult to say, but it would appear to me not improbable that in cases in which the brain is found to be undeveloped, as in the four cases I have given, a deficiency of the amount of brain would be detected. Meckel remarks, "the substance of the brain in hydrocephalus appears to be remarkably smaller than natural."[2] At all events, I cannot agree with Billard that an hypertrophy of the brain is ever found to exist in chronic hydrocephalus.[3]

Dr West also says, that even when the walls of the ventricles are not above two or three lines in thickness, the two layers of white and grey matter are still distinctly perceptible; and this is also Klein's opinion. Breschet, however, states he never saw them distinct. "I can, on the contrary," says he, "affirm, that in most hydrocephalic subjects examined by me, the cerebral substance had a uniform colour, and that there was not either a distinct medullary, nor cortical or grey substance to be seen."[4] In the four cases examined by me there was distinctly a medullary and cineritious layer observable.

What, then, is the cause of congenital chronic hydrocephalus? The imagination of the mother has been assigned as a cause, as well as her chagrins, frights, and passions,—her diseases,—her debility, —the age of the father,—an hereditary disposition. J. P. Frank attended a woman in her confinement seven times, and each time she produced a hydrocephalic child. Goelis gives a similar case. Drunkenness of the parents, the compression produced by stays, and the means for concealing pregnancy, are also said to produce it. This is certain, that hydrocephalus and other faults of conformation are much more common in the children of unmarried girls than in those of married women.

It will, I think, appear that congenital chronic hydrocephalus is always dependent on faults of conformation of the brain.

Chronic hydrocephalus, says Meckel,[5] appears to me to be in most, if not in all cases, the result of an arrest of development of the skull and of the brain. The state of the brain, the condition of the bones, and the form of the head, in general, indicate the most prominent grounds for this opinion. But it is besides countenanced by the circumstance that this disease appears always to be congenital, that it presents itself under conditions which appear to favour arrests of organic development; and, finally, its common union with other analogous vices of formation. Morbid

[1] On Hydrocephalus. p. 87. [2] Path. Anat., T. i., p. 271.
[3] Maladies des Enfans, p. 592. Paris, 1828. [4] Loc. cit., p. 519.
[5] Loc. cit., p. 262.

alterations, depending on a change from the normal to the unnatural, are in the fœtus of so rare an occurrence, that in one hundred fœtuses opened by Meckel, in not a single one did he find anything of a like disorganization. Hydrocephalus, therefore, made so much a more striking exception, inasmuch as other dropsies are much more infrequent.

But hydrocephalus appears in fact to be always congenital. The period of its origin is always the earliest time of life; and when it is occasionally developed some years after birth, this circumstance does not prove that notwithstanding the brain was originally formed natural, inasmuch as Monro has remarked that children in whom the disease appeared two years after birth had yet the bones of the head separated far asunder before that period, and during their entire life.

In effect all observers agree in this, that in ventricular hydrocephalus the brain represents a thin membranous bladder filled with fluid whose quantity varies according to the stage of the disease, and which, by its form and structure, appears to indicate at one time a more early, at another time a later, period of its development.

There is a circumstance, says Breschet,[1] to which I shall direct the attention of physicians, and which appears to explain the frequency of serous intracranial effusions in general, and especially of congenital hydrocephalus. The fine researches of M. Magendie on the cerebro-spinal fluid leave no doubt of the existence of this liquid at all periods of life, intra-uterine and extra-uterine, and its abundance as well as its constancy appear to demonstrate that this liquid performs important functions. Here, then, is a natural hydrocephalus, or one which is united with the regular performance of the functions of the brain and spinal cord. The study of organic evolutions has caused this liquid to be recognised as more abundant at the first period of the formation of the cerebro-spinal nervous centres than at any other epoch of life. From the existence of this liquid, from its more considerable quantity, during the first phases of life, to the existence of hydrocephalus there is but a degree. Hydrocephalus must happen more easily and more frequently than hydrothorax, hydropericardia, &c., because in these cavities liquid is not found in the normal state, as in the cranial cavity. In confirmation of these views, I may mention that it is stated by Dr Todd,[2] that "where an arrest of development of any portion of the cerebro-spinal axis has taken place, the space which ought to be occupied by the organ of imperfect growth is filled with liquid." This statement, however, is not universally true, as Mr Paget[3] and Mr Mitchell Henry[4] have each given a case, in neither of which is any mention made of water in the

[1] Loc. cit., p. 511. [2] Cyclop. Anat. and Physiol., Part xxv., p. 642.
[3] Med.-Chir. Transac., Vol. xxix., p. 55. [4] Ibid., Vol. xxxi., p. 239.

brain, yet there was in both a great deficiency of the *corpus callosum*, *fornix*, and *septum lucidum*.

I can affirm, says Breschet, in consequence of the many bodies examined by me at the Hôpital des Enfans Trouvés, that in the fœtus, in children come to their time, and in those aged from six months to one year, a true hydrocephalus of the anterior and median, or ventricle of the *septum lucidum*, is met with. This ventricular cavity, so well described by the brothers Wenzel and Tiedemann, is so much larger as it is examined at a period near the formation of the brain, and it always contains serosity. A constant anatomical structure should not be considered a disease, but only as it may more or less dispose to a pathological state. This proposition, deduced from anatomy and pathological physiology, is countenanced by many well proved facts.[1]

Shall we place the accumulation of liquid in the ventricle of the *septum lucidum* amongst chronic hydrocephali? Certainly not, since it is a constant state, belonging to the development of the organ. But when this serosity becomes more abundant than in the generality of cases, then may we consider this liquor as forming a new species of hydrocephalus? It is a point as yet but little known and to which I invite the attention of anatomists and practitioners.[2]

The middle parts of the brain being formed later than the lateral parts, the walls of the *septum lucidum* are very much separated, and between them is still found much serosity when all that of the lateral cavities has been absorbed, and when the ventricles of the cerebral hemispheres have their walls already contiguous.[3]

Breschet has given the results of his dissection of several cases, from which he concludes that internal hydrocephalus must always depend on some defect of original conformation. He remarks that in the first periods of fœtal life, the lateral ventricles are veritable cavities filled with liquid, and it is only by the absorption of this liquid, and by the secretion of cerebral substance between the two layers of the arachnoid, that the ventricles become cavities with contiguous walls. It also appears, that in all the cases he examined the parts were so much more imperfect in their development as one advanced from the posterior to the anterior parts of the brain. The organs placed laterally almost all existed, although imperfectly, whilst those in the median line were absent altogether, or scarcely traced out (*à peine ebauchées*). The commissures were not visible, which appears to confirm the proposition that the parts of the brain proceeding from the divergent fibres have a more precocious development than those belonging to the convergent fibres or the system of commissures.[4]

[1] Loc. cit., p. 510. [2] Ibid, p. 528.
[3] Breschet, loc. cit., p. 529. [4] Loc. cit., p. 524.

Dr Duncan, Jun.,* has given a description of a very interesting case of bifid or cleft brain. The infant, a female, was born hydrocephalic; it lived seven months, and was seen by many other practitioners. When Dr Duncan first saw her she was aged five months. The countenance and other parts of the body were emaciated. All her functions appeared natural. She took no food but the breast milk, but this with the usual avidity. On account of the weight of the head she could never sit up, yet she was sometimes lively, and evidently received pleasure from being played with. The external senses appeared entire. In a fortnight after, the circumference of the head was twenty-nine and a-half inches; from the tip of one ear to the tip of the other, sixteen and three quarter inches. Her head was translucent.

On dissection, the *dura mater* was natural, but the falciform process was greatly larger. The cranium held eight pounds eight ounces of fluid. Those surfaces of the two hemispheres of the brain which are usually applied to the falx were separated from each other about four inches, except within an inch of their anterior extremities, where they remained united in the natural manner. The *corpus callosum* was wholly wanting except two white bands which stretched across between the anterior horns of the ventricles, nearly parallel to each other; they were about a quarter of an inch apart, and each of them was from an eighth to a quarter of an inch broad. There was no fornix, nor *septum lucidum*, nor the least appearance of the anterior commissure of the brain. Neither was there a choroid plexus. All the nerves were entire. There was no absorption of the substance of the brain. The enlarged ventricles formed one common cavity with the parieties of the cranium.

One of the most interesting circumstances, says Dr Duncan, regarding the progressive formation of the fœtus, and which has a great share in explaining the malformations commonly observed, and, if I mistake not, explains the case which has led to these observations, is the formation of the fœtus in two lateral halves, which at first are quite unconnected. When the development of the organisation is regularly progressive, these distinct halves soon unite perfectly; but when their union is partially interrupted, a variety of malformations is generated, which are often manifested by the exposure of organs that ought to have been covered.

As examples may be quoted all fissures of the anterior and posterior surfaces of the body, the exposure of the organs of the chest or abdomen, of the spinal marrow or brain, hare-lip, fissure of the palate, exposure and fissure of the urinary bladder, separation of the *ossa pubis*, double uterus, vagina, &c. A detail of these

* Trans. Med.-Chir. Society, Edinburgh, Vol. i., p. 205.

would fully establish Meckel's opinion, but it is necessary to confine these observations to the illustration of the present case, and to those circumstances which bear upon it.

In an early stage of the growth of the fœtus the ventricles of the brain are not closed, and they resemble, remarkably, the state of the hemispheres in the head of the present case. It is impossible not to be struck with the resemblance to this case of the state of the parts described by Tiedemann in his account of the brain of an embryo of the twelfth week. He says, "The hemispheres of the brain are uncommonly small in proportion to the parts already described (*i. e.* the cerebellum, and especially the *corpora quadrigemina*), for they are only four lines long, five broad, and three high. Properly speaking, only their anterior lobes are as yet formed, for the middle and posterior lobes present only two very short appendices, rounded posteriorly, and lying before and to the side of the *crura cerebri*. From this scanty formation of the hemispheres it will be understood how parts which, in the adult brain, are covered by the brain, lie here exposed and uncovered,—such as the *corpora quadrigemina* and cerebellum. The surface of the hemispheres is everywhere smooth, and shows no sulci nor convolutions. The two hemispheres are on the upper side deeply divided longitudinally, and into the fissure the falciform process of the *dura mater* enters, which as yet is tender and projects but little. When the two hemispheres are separated laterally from each other, we observe at once the thalami of the optic nerves and the *corpora striata*, for as yet there is no *corpus callosum*, and no fornix formed. The two hemispheres are connected only anteriorly, constituting the commencement of the *corpus callosum*. The hemispheres are evidently two hollow membranous sacs, whose parietes are scarcely one quarter of a line thick. If we continue cautiously their separation, we can turn them entirely sidewards and unfold them into a membrane, so that the cavities of the ventricles and the eminences in them are exposed."*

After describing the progress in the formation of the hemispheres until the maturity of the infant, Tiedemann thus concludes: "From all this it appears, that the formation of the hemispheres proceeds from the sides and from before; that they were originally a thin medullary membrane, turned inwards and backwards; that they gradually increase in size and thickness; and that in the same proportion they stretch from before backwards over the *corpora striata*, the thalami, the *corpora quadrigemina*, and, lastly, over the cerebellum, and cover these parts."†

The *corpus callosum* does not exist in the brain of the human

* Anat. &c., des Gehirns im Fœtus. P. 20. Nurnberg, 1816.

† Ibid., p. 143.

embryo during the first months after conception. It is towards the end of the third month that the two membranous hemispheres are first connected anteriorly by a small, narrow, almost perpendicular commissure, while, in the middle and posteriorly, they are so entirely distinct from each other that the thalami and third ventricle are seen when they are drawn aside. In the fourth and fifth month it is still very thin, and has an almost perpendicular situation. In the sixth month, the hemispheres have extended considerably backwards, and assumed a horizontal position, and covered the anterior part of the thalami. In the seventh month it lies perfectly horizontal, and covers the thalami and the third ventricle. In the eighth it not only covers the thalami perfectly, but stretches to the *corpora quadrigemina.*

Enough has been adduced to show that the state of the malformed parts, in this singular case, corresponds very exactly with their natural state in a fœtus of the third month,—whether a hydropic action of the serous membranes of the brain was the cause of the arrested progress of its development, or whether the unnatural arrangement was the cause of the increased serous effusion, cannot be easily decided; but after the dropsy became considerable, in such a state of the parts the effect would naturally be to expand and distend the skull and the membranes lining it; while the hemispheres, attached by nerves and vessels to the basis of the skull, and to the cerebellum and *medulla oblongata*, would be confined to the lower part, and be thrown outwards along with the temporal bones, which by distension were rendered almost horizontal, so as to give the appearance represented by Tiedemann, when the hemispherical membranes of the early fœtus were artificially separated.

Dr Remmett* has given a similar case, which he punctured several times. The whole cavity of the cranium was full of a clear pellucid fluid, of which there were two quarts. The *dura mater*, with its processes, were entire, but he could not at first discover any appearance of brain. After the most minute examination, he could only trace the *medulla oblongata* descending into the spine, and behind the orbits of the eyes a very small quantity of medullary substance indistinctly resembling that of the brain. Similar cases, which were also repeatedly punctured, are recorded by Glover, Whitemore, Sym, Armstrong, Kilgour, Loftie, and Dickinson.

Whatever, then, may be its remote cause, we may, I think, conclude with Meckel, Breschet, and Duncan, that congenital chronic hydrocephalus depends on an arrest of development of the brain, or, according to Mr Anderson and Dr Carte, of the proper brainy material.

* Edin. Med. Commentaries, Vol. vi., Part i., p. 422.

In the forty unsuccessful cases of tapping, given by Dr West, along with Lizars' case, making forty-one in all, the brain was so disorganized that no account could be given of it in six cases. In seventeen there was no account of its state, and a very imperfect one in three cases, while in fifteen it was decidedly defective.

In eleven cases unnoticed by Dr West, given by Jeffrey, Dickinson, Loftie, Dendy, Bellingham, Woodroffe, Fergusson, Watson, and Taylor, there was either no *post mortem* account of the brain, or a very imperfect one in seven of them, while in four it was decidedly defective.

For other authors who have described cases in which the brain was defective, I shall refer to Kerkringius,[1] Morgagni,[2] Baster,[3] Duncan, Bright, Craigie, Paré,[1] A. Duncan, Jun., Klein,[4] Breschet,[5] Cruveilhier,[6] Allan Burns,[7] Wepfer,[8] Bonetus,[9] Béclard,[10] Duverney, Tauffer, Carlisle, Bianchi, Reed,[11] Jeffrey,[12] Howship, Chatto, Solly, Reil, Baron, Miller, Ecmark, Wrisberg, &c.

My own dissections fully confirm this view of the state of the brain in chronic hydrocephalus, notwithstanding it is opposed to Dr West's assertion that "congenital hydrocephalus is usually, though by no means invariably, associated with malformation of the brain."[13] It should be remembered that malformation of the brain existed in all the cases given in my former paper, while in case No. 4 the fluid was quite unconnected with the ventricles of the brain.

It is difficult not to feel one's self guilty of presumption in differing from Cruveilhier,[14] who says, "hydrocephalus exists with a perfect integrity of the brain. There are even circumstances in which the serous fluxion, directed upon the ventricular membrane, is accompanied with hypertrophy, more or less considerable, of the substance of the brain." The question of the perfect integrity of the brain has been already settled; as to hypertrophy of it, first promulgated by Billard, I have been unable to discover a single case of it in connection with hydrocephalus.

The history of the development of the brain, thanks to Carus, Tiedemann, and Döllinger, is at present sufficiently advanced to enable us to look on those with a single hemisphere as the effect of the destruction of the *septum lucidum*, and of the malformation of

[1] Boneti Opera, Vol. iv. p. 309. Geneva, 1679.
[2] De Caus. et Sed. Morbor., Epist. xii. [3] Philos. Trans., Vol. ix., p. 235.
[4] Dissert. de Rachit. Congen. Strasbourg, 1763. [5] Loc. cit., p. 525.
[6] Anat. Pathol., Livrais. xxxix. 1836. Liv. xv. Planche iv.
[7] Monro on Hydrocephalus, p. 31. [8] Opera, p. 49, &c.
[9] Sepulchret. T. i. p. 394. [10] Breschet, loc. cit., p. 525.
[11] Edinburgh Medical and Surgical Journal, Vol. xi. p. 453.
[12] London Medical Repository, 1822.
[13] On Diseases of Children, p. 83. [14] Anat. Pathologique, Livr. .

the cerebral commissure. The organic disposition of which Bianchi and Carlisle have spoken, are to be attributed to a deformity produced by the presence of liquid in the lateral and third ventricles. The former found in a child, seven years old, a single cerebral cavity, in which were to be seen confounded the *corpora striata* and optic thalami. The conarium and choroid plexus were wanting, as well as a part of the *medulla oblongata*. The *tubercula quadrigemina* and cerebellum were natural. The brain was formed of cineritious substance only, the medullary being generally wanting. There was no trace of *septum lucidum* nor of the *corpus callosum*. In a woman, aged twenty years, Carlisle found the brain unilocular, and the *corpus callosum* scarcely apparent. In this subject the intellectual faculties offered nothing particular, whilst in Bianchi's case there was perfect idiotcy.*

I shall now proceed to show the manner in which external hydrocephalus was produced in the cases recorded of it in the writings of British practitioners. Dr Monro says, "An anatomist, reasoning *a priori*, would be apt to suppose that the water in *hydrocephalus internus* should be as often found immediately within the *dura mater*, between it and the outer surface of the brain, cerebellum, and spinal marrow, as within the ventricles of the brain. Experience, however, proves that it is generally collected within the ventricles; and as I have not met with a single instance in which the water was entirely on the outer side of the brain (although I am far from doubting the possibility of the fact), I cannot help suspecting that this happens much more rarely than is supposed by authors, and that in many cases, supposed to have been of this kind, the brain had been lacerated in opening the cranium, and the water by that means had become effused on the surface of the brain."† In not one of the recorded cases was the fluid originally external, except in La Motte's‡ case, in which it does not appear whether there was or not a *post mortem* examination.

Dr Craigie's remarks on this subject are very deserving attention.§ He considers the inner surface of the ventricles to be the original situation of the fluid in chronic cerebral dropsy, and states that there are two cases in which it may get out of that situation, and insinuate itself between the outer surface of the brain and the *dura mater*.

The first is where the process of serous effusion commences at a period so early in fœtal existence that it precedes the full development of the brain, suddenly arrests the process of development while the *pia mater* and choroid plexus communicate freely,

* Breschet, loc. cit., p. 529.
† On the Brain, the Eye, and the Ear, p. 33. 1797.
‡ Traité complet de Chirurg. T, i. Obs. 115. § Loc. cit., p. 22.

and prevents at some point of the mesial plane cerebral matter from being deposited. He refers to the development of the brain of the fœtus as detailed by Tiedemann, and says, "if, therefore, by any cause, the process of serous effusion should commence at this period, it is manifest that whatever fluid was poured forth within the ventricles would easily find its way to the exterior surface, and that, as its presence arrests the further growth of the hemispheres, their internal or mesial margins would remain apart till the death of the individual, and in this state would be found on inspection." Dr Craigie gives no examples to illustrate these views; but they are confirmed by the cases, just mentioned, of Glover, Whitmore, Sym, Armstrong, Kilgour, Loftie, and Dickinson, as well as those by Howship, Chatto, Reil, Ecmark, Solly,* and Wrisberg.†

Mr Howship's‡ case is that of a man twenty-five years of age, with an immense enlargement of the head, being twenty-five by fourteen inches. His appearance and manners were those of an idiot, but his faculties were, notwithstanding, in some respects, by no means deficient. The hydrocephalus was congenital. At two years of age he fell down stairs, and from that time had been subject occasionally to fits of slight epileptic convulsions. He was conscious of having water in his head; a peculiar rotatory motion of the head, stooping it forwards and turning his face alternately from side to side, prevented, as he said, the water from giving him pain. The poor fellow had generally the power of giving a rational answer, and when asked how he did, would sometimes complain of pain in his head. His sight was generally perfect; his hearing and appetite good. In disposition he was vindictive and spiteful on the least occasion. For several years (during which he had been an inmate of a workhouse) he had been allowed the care of a large hand-bell, that was rung morning and evening every day. His constant and strong attachment to this bell frequently proved the source of much amusement to his companions.

At the *post mortem* examination the cranium was found remarkably thick, but towards the vertex diaphanous. A thin vesicle or bladder, like a very large hydatid, was pressed up from between the hemispheres of the brain, and exactly over the usual position of the *corpus callosum*. This vesicle being cut, a very large quantity of serosity flowed off. The remainder of the fluid in the ventricles amounted to three pints and a half. The coat of the vesicle proved to be the extenuated substance, and was all that remained of the *corpus callosum*. The fornix and *septum lucidum* were deficient.

Mr Chatto's§ case died aged one year. In all its life it mani-

* Medical Obs. and Enquiries, Vol. v., p. 121. † Saltz. Zeit., 1805, p. 89.
‡ Practical Observ. on Surgery, p. 79. London, 1816.
§ Medical Gazette, January 10, 1845.

fested no sign whatever of recognising persons or objects. Upon division of the membranes a considerable quantity of fluid escaped. The source of this was not at first obvious, but as the incision into the *dura mater* was made near the point where the two hemispheres come in contact, "I doubt not," says Mr Chatto, "it followed this separation; in fact, upon stretching these asunder, we looked at once into the cavities of the ventricles,—the *corpus callosum*, fornix, and *septum lucidum* being absent, except two small slips of the first, lying between the anterior portion of each ventricle."

In the case recorded by Mr Solly,* the patient was aged seventeen years. He died seven days after a fall, in which the base of his skull was fractured. His mother never considered him right from his birth. He sometimes talked pretty rationally, but generally, to use his mother's expression, he was *boobified*. He was childish in his amusements, very good-hearted, and willing to do all that was required of him. It had always appeared difficult to him to maintain the erect posture, and he used to tumble and roll about. He had been from infancy unable to hold up his head, and generally appeared drowsy.

On examining the brain, there was seen in the place of the *corpus callosum* a pale, semitransparent, membranous cyst, attached to the left hemisphere, forming part of the roof of the left lateral ventricle, and protruding into the space between the hemispheres. The cyst was formed of thin membrane. It measured two inches in length and one in breadth, and contained about an ounce of limpid fluid. The *corpus callosum* was wholly absent; the third ventricle was covered by only a thin membrane, probably the velum; the middle part of the fornix was absent. Both lateral ventricles were very much enlarged, and contained about four ounces of fluid.

A case recorded by Reil† is interesting. A woman, thirty years of age, an idiot, of good constitution, and frequently employed by the inhabitants of her village in trifling commissions, fell suddenly backwards and died. On opening the head, the *corpus callosum* presented a solution of continuity the whole length of its middle portion, or rather this middle portion was altogether wanting, so that the optic chambers were completely exposed, and the two hemispheres solely united by the *commissura mollis*, the anterior commissure, and by the *tubercula quadrigemina*. The *septum lucidum* was also wanting. The ventricles were moderately full of water.

The second case, in which, according to Dr Craigie, the fluid might be found on the outside of the brain as well as the inside,

* The Human Brain, p. 433. London, 1836.

† Reil and Autenreith's Archiv. für die Physiologie, Vol. xx. p. 341.

is when the process of effusion has advanced to such an extreme degree as to lacerate the upper and most attenuated part of the hemispheres. He confesses himself ignorant of any unequivocal case of this mode of termination, of which the following are examples.

It is yet proper to remark that Monro (although not correct in the explanation he has given of it) acknowledged a similar termination of hydrocephalus. He says, the water is found on the exterior of the brain in consequence of the rupture of the ventricles; and assumes that it is there always first found, and is contained in the ventricles, where only two or three pounds of it are secreted; but it is, on the contrary, found between the *dura mater* and the skull whenever its quantity exceeds five pounds.*

Cardinal lived to his twenty-ninth year. His hydrocephalus was congenital. He was unable to walk alone until he was six years old, and then only on a level surface; if he attempted to run or stoop, he fell down. His appetite was ravenous. The bones of his head were not closed until two years before his death; he was not altogether firm on his feet, but sometimes tottered a little and required support; there was something childish and irritable in his manner; his voice was not manly, but feeble and somewhat hoarse. He was fond of being noticed, and especially pleased by the assurance that his head was growing larger.

Six or seven pints of a clear and transparent fluid were found within the *dura mater*, and one pint in the ventricles. "It soon, however, became obvious, that what we saw looking like the flattened superior surface of the two hemispheres was, in fact, the two lateral surfaces, which in health are opposed to each other. These had been separated and thrown back by the pressure of the fluid, which, having first accumulated in the lateral ventricles, had forced a preternatural opening on one side of the *corpus callosum*, which, together with the fornix, had been nearly obliterated."†

Baron's‡ case is similar. A child was affected with congenital hydrocephalus, and died, aged eighteen months. The head was twenty-eight inches in circumference. This child was affected with a swelling at the top of the head, over the posterior fontanelle, which in a week's time acquired the size of a goose's egg. The size of this was affected by a constant dribbling of water from the urinary passage, and the scalp fell in large wrinkles over the child's forehead, so as actually to cover the eyes. At a later period fluid came from the nose, causing a subsidence of the swelling of the head. At the inspection, a little to the right of

* On the Brain, the Eye, and Ear.
† Bright's Reports, Vol. ii., Part i., p. 431.
‡ Medic. Chirurg. Trans., Vol. viii., p. 51.

the falx, the *dura mater* was found ruptured, as was demonstrated by a well-defined circular opening, nearly an inch in diameter, which communicated directly with what was the external tumour and the interior of the brain. Through the opening were evacuated three or four pints of fluid contained in a bag formed by both hemispheres of the brain. The expansion of the brain was so great, that round the margin of the opening it did not exceed the thickness of a shilling, and under the opening it had entirely disappeared, proving that it had given way where the *dura mater* yielded, and allowed the fluid from the internal cavity to escape into the outward swelling. A probe was easily passed through the ethmoid bone into the nose.

Mr Millar's case,* though imperfectly given, as no account is given of the way in which the fluid got out of the brain, appears to be similar. A young man died, aged sixteen years and a half. The circumference of his head was thirty-one inches. He used to sit by the fire in an elbow chair, with a board crossed before him, of sufficient height to support his head. His reasoning was good; the mental faculties perfect. For the last two years of his life, some water, to the amount of one or two ounces daily, used to drop from his nose. The features of his face corresponded to the size of his cranium.

On examination after death, the bones of the skull were found perfectly firm and completely united, although very thin. The ventricles were like large pouches, and contained eight pints and a half of fluid, which was in contact with the skull, the *dura mater* being absorbed and diseased. The body was deformed by rickets. A considerable quantity of bloody serum flowed from the spinal chord on the body being raised. The brain was but three quarters of its natural size, and was diffluent and pulpy. There was a foramen an inch above and to the right side of the *crista galli* process, communicating directly with the nasal cavity, and allowing the passage of four bristles.

A third form of communication between the ventricles and the cavity of the arachnoid is where the deficiency does not exist in the mesial plane, but laterally, as in two cases given by Cruveilhier. In one† of these, both the anterior hemispheres of the brain were deficient and open anteriorly, the right one in addition laterally. In the other,‡ the left middle lobe was absent, by which a communication was effected between the lateral ventricle and the cavity of the arachnoid, which was filled with fluid.

In case No. 4 by me, it may be remembered, at the anterior part of one hemisphere, for the space of one inch square, there was no cerebral substance separating the fluid contained in the

* Med. Chir. Trans. Edinb., Vol. ii., p. 245. † L. c., Livr. viii., p. 6.
‡ L. c., Livr. v., p. 5.

brain from the cavity of the arachnoid, in fact nothing but a layer of this membrane.

A similar occurrence was remarked in several of Mr Smith's cases, but in none of them, he states, was the fluid in the cavity of the arachnoid.

With regard to the intellect of hydrocephalic patients, we find Dr Monro stating, "it is incredible how little the powers of the mind are impaired by this disorder, considering the great enlargement of the ventricles of the brain. I have had opportunities of seeing several examples of this form of hydrocephalus, and have watched the progress of the symptoms for years, yet I have never met with any one instance in which the powers of the mind could be said to be completely deranged."* This opinion, so entirely subversive of phrenological doctrines, is, however, not universally correct. Dr Watson says, "most commonly the mental and voluntary functions are maimed or perverted;" and this we find the case in the cases already quoted from Howship, Solly, Chatto, Reil, and Cardinal's case, as well as those given by Dr Craigie, Ecmark, Schmitt, and Ryan. Dr Donald Monro remarks, there are few cases where the unhappy patients have preserved their faculties entire, when the head has become large.†

The following case is by Dr Craigie.‡ A woman died, aged twenty-one years, with an unusually large hydrocephalic skull. It was of a natural size at birth, and was firmly ossified at twelve years of age. This woman, who was unable to manage her skull, had the free use of her hands, yet never could walk, but moved her legs by raising them one over the other. She was irascible, susceptible of pity, she had a good memory, and distinct ideas of right and wrong.

Ecmark's patient, who died at forty-five years of age, was affected with congenital hydrocephalus. She could never raise her head, nor stand, and was continually in bed. She could not turn nor feed herself. Her face was smiling, her mouth gaping, with saliva flowing from it. Her speech was indistinct, and she continually exhibited a sort of fatuity. She had learned one or two short prayers, but had never learned to read. Her face, neck, and thorax were of a childish form. The *dura mater* adhered so to the skull, that, in dividing the former, a great quantity of fluid escaped. There were no anfractuosities on the brain, which was but a line in thickness.

Michaelis's§ case is interesting. The patient was aged twenty-nine years. His head began to enlarge three weeks after birth. He entirely lost the use of his limbs, a slight motion of the arms

* On Hydrocephalus, p. 138. † Trans. College of Physicians, Vol. ii., p. 358.
‡ Loc. cit., p. 41. § London Med. Communications, Vol. i., p. 404.

alone excepted. He was never able to quit his cradle unless assisted by three or four people. As he never made use of his feet, they remained extremely small, and looked like those of a boy of twelve years, forming an odd contrast with the rest of his body, which was as large as that of a full-grown person. His appetite and hearing were both good. His sight was imperfect, and he squinted. His mental faculties were not contemptible, though he was generally considered an idiot on account of his looking so very stupid. His spirits were always good, and he was glad to see people. His smiles were hideous, and his shrill voice the most disagreeable I ever heard, says Michaelis. The circumference of his head was thirty-two inches. His monstrous head he was unable to move, unless assisted by others. His limbs were neither rickety nor deformed, except his left hand, which had lately become distorted, from its having constantly remained unmoved in a bent position.

A man used to show himself at fairs, says Van Swieten,* who, from the beginning of life, had laboured under an hydrocephalus, and he was very languid, but, however, was above thirty years old. His head was of a prodigious size, though the rest of his body was not bigger than that of a boy ten years old. He had his senses, but was of dull intellect, nor could he move about much; and indeed the great weight of his head hindered him from sitting upright any long time unless he was supported by pillows placed behind.

Perfect idiocy results from congenital hydrocephalus. Dr Schmitt† says individuals affected by it have been seen to live to the age of forty years and upwards, with a more or less free exercise of their intellectual faculties. Examples of this are nevertheless rare, and they are even cited as objects of curiosity.

He gives an instance of a man, aged twenty-four years, the volume of whose head was enormous, being twenty-five inches in circumference. One could not raise it without being astonished at its weight. The rest of his body was very small in comparison with the head. Its length, with the head, was forty-one inches, and thirty-one not including it. His extremities were extremely feeble and reduced, the upper principally were paralysed and contracted. The hands rested against the external part of the forearm, the consequence, apparently, of convulsions, to which he had been daily subject for years, and the attacks of which continued about a quarter of an hour. His language was very imperfect, it only consisted of some demiarticulated sounds, only intelligible to those constantly with him. His tongue was well formed. His eyes were large and awry, and were fixed upwards. His sight very good. His mouth was of a deformed size. His physiognomy announced idiocy the most profound, and all his manner corresponded to the ex-

* Commentaries, Vol. xii., p. 241. † Biblioth. Germanique, T. vi., p. 234.

pression. Anger and the other passions were unknown to him. He could be made laugh with some ease, but this laugh was only a horrible grimace. His sexual organs sometimes manifested their natural movements without any emission.

The following is a parallel case.

Case 7. John Carroll, aged nineteen years, August 17th, 1849, is the second child of his parents. The first died of hydrocephalus. His head has been unusually large from birth; when in the arms of his mother it was very heavy, and the circumference is now twenty-five inches by fourteen inches and a half. It is square and even, but in front of the parietal protuberance is a rather deep depression from above downwards. When six months old he had convulsions, and has frequently had them since. He now often lies down on the floor and sleeps. Little or nothing has been ever done for him. He cannot endure any one to touch his head; when it is attempted, he puts slowly up his hand, and endeavours to scratch the person meddling with it.

His eyes do not well converge; they move slowly, but he sees well. They are not depressed, but are sunk deeply in his head. He constantly grinds his teeth, which are good, and continually grins, stretching out his hands to his father and mother.

He makes a noise in his throat, but cannot utter an articulate sound, nor stand, nor walk, unless supported, and then very imperfectly. His hearing seems very indistinct. He can sit on the floor or in a high-backed chair, in which he is supported by a strap in front. His feet and hands are of a diminutive size. He cannot feed himself, but takes meat, and whatever is going. His arms are large and fat, as well as his legs, but his feet are small.

He is clad like a woman, but cannot put on his own clothes. Is about five feet high. Is not salacious, nor does he appear to know the sex. He is withal cleanly, and gives notice of requiring to pass water. He sleeps badly at night, and is said to sing in his own way. He never cries, nor seems out of humour, even when hurt. Delights in chewing wood, but does not swallow it. He will not drink buttermilk, nor eat stirabout, and has a great desire for whisky.

Esquirol* says that idiots are often hydrocephalic, even although the cranium be small; when this is opened there are found, almost always, vices of formation of the brain.

Idiots are rickety, scrofulous, epileptic, or paralyzed. The head, too small or too large, is badly formed. Idiots are deaf, half deaf, or hear badly; they are dumb, or articulate with difficulty some monosyllables. Taste and smell are defective. They walk heavily, waddling, and are easily thrown down. Some re-

* Maladies Mentales, T ii., p. 335. Paris, 1838.

main where they are placed, those who walk do so without an aim. Idiots cannot direct their senses; they hear, but do not listen, they see, but do not look. Having no ideas, and not thinking, they desire nothing. They have no need of signs; they do not speak. I must here say, that almost all the idiot children I have been consulted about, sung more or less well, some air, or at least some phrases of music, although deprived of speech. This observation of Esquirol is confirmed by this case, as well as those which will be related.

Sometimes at birth, says Bright,* and sometimes within a few weeks after the sight is lost, though the hearing generally remains acute, and as the months pass on, instead of the intellect gradually unfolding itself, the mind is almost stationary, and often the powers of the body are paralysed. Patients so affected generally lie in bed with the body and legs much bent and contracted, and lose the power of strengthening themselves; and some have entirely lost the power of their legs, and retain a slight power over their arms.

This paralysis of hydrocephalic patients is by no means uncommon. It existed in the four last cases here quoted, as it did in a case by Ryan, and in three of my own cases. I lay more stress upon it, as it is unnoticed in the works of Maunsell and Evanson, Rilliet and Barthez, Barrier, West, and Churchill on Diseases of Children.

Dr Ryan† saw, at Limehouse, a case of a child, aged six years, which was affected with congenital hydrocephalus. It was nearly deprived of the functions of vision, hearing, taste, smell, and touch, and entirely of the power of motion. It was supported in a chair with pillows, and its chin rested on a bar, without which the head could not be kept in the erect position. The eyelids were partially closed, the hearing was very dull, the head very much enlarged, the forehead very prominent, and the fæces and urine were discharged involuntarily. Similar cases have been recorded by Messrs Reed‡ and Jeffrey,§ in which the brain was defective.

Case 8. Mary Carberry, aged eight years, September 1850, was admitted when an infant to the Institution for Diseases of Children. Her head was then very large, and the fontanelles widely open. Her pupils were dilated. She had convulsions almost every day, and was constantly screaming and vomiting. Her head began to be affected when she was a few months old. She became blind in two months, and so remained for four months.

* Reports, Vol. ii. Part i., p. 424.
† London Med. and Surg. Journal, Vol. vii., p. 79.
‡ Edin. Med. and Surg. Journal, Vol. xi., p. 453.
§ London Med. Repository. 1822.

Her head is now twenty-two by twelve and a quarter inches. Its left side is larger than the right, with a raised projection between the frontal and parietal bones of the left side. There is a slight divergent strabismus of the left eye, the pupil of which is more dilated than the right, which is larger than natural. Her teeth are all sound. Has a fine head of hair. Her memory is good, and she sings well.

She has perfect use of her hands, but she cannot stand. When held up she places both feet under her, and then the legs begin to shake. Her legs are deficient in size. She can sit well on a chair, but will not creep along the floor. Her feet are constantly cold, and generally blue. Her spine is quite natural. Can raise, with some difficulty, her head from the pillow.

Case 9. Anne Woodcock, aged nine months, admitted to the Institution for Diseases of Children, 7th February 1844, under the care of Dr Croker. Is a first and only child. Her head was small at birth; it began to enlarge when she was three months old. It now measures twenty-one inches and a half by twelve and three quarters. The anterior fontanelle is largely open. Eyes are straight, unclosed in sleep; oscillation of the right eye. She cannot keep the head erect; legs very stiff and flexed; thumbs turned in; she is always very fretful and irritable; has never had any convulsive fits nor vomiting; sleeps very little in the day time; her bowels are generally confined.

I strapped, at Dr Croker's wish, the entire head with sticking plaster, and afterwards applied a roller over it.

The plaster was renewed in about a month, and was kept on the head for about two months altogether.

January 20, 1849. I was surprised to find this child still alive, and without disease, except that her head is very large, and that she cannot walk nor stand, but moves about by crawling along the floor. The development of the legs is somewhat deficient, and there is a slight curve backwards of the spine. The legs are stiff from a great degree of straitening of the flexor tendons of the hams, and they are never straight; when she is held up and asked to walk, the toes are pointed downwards. Her head measures twenty-four by fourteen inches. The fontanelles were not closed until a year ago. Forehead prominent. Her eyes diverge slightly, and seem lower than natural; the pupils contracted. Her hair is very thin and erect. Her father states, that he considers her rather silly; she talks, but takes delight in singing. Her teeth are rotting. Complains of pain in the head, while she is in the habit of lying on the bed, or floor, constantly during the day. Her feet and hands are constantly cold, but sensation in them is perfect. Her appetite is excessive. Can feed herself, having a perfect use of her hands. She can sit on the floor or a

stool. She has never learned her prayers, although her parents have tried to teach her. She always gives notice whenever she desires to pass stools or urine. When lying down she has much difficulty in raising her head, which yet she always endeavours to effect. Her mother died of phthisis, about five years ago.

Case 10. Michael Morland, aged ten months, admitted to the Institution for Diseases of Children, August 8, 1842. His head is eighteen inches and a half in circumference. It began to enlarge at the age of three months, with fits, vomiting, and diarrhœa, and screeching. Has had no fit during four months. For six months the head is very large; it is much broader proportionally behind than before. The left side appears largest. Fontanelle widely open. The head is kept stiffly backwards, and cannot be held erect, it must be always supported. Is always very sleepy; expression of eyes vacant, yet he sees; thumbs always turned in; toes cramped; yawns perpetually; is wasted.

February 9, 1849. This child, who escaped my observation until now, is large and stout in his body. His legs and hands are small. The thumbs are turned in. He cannot hold a noggin or cup in either hand, but can feed himself with a crust held in his left hand. Can extend only the fore-finger of right hand. His left elbow is said to have been injured by a fall, and it is stiff, yet he uses the left hand in preference to the right. He cannot draw out either thumb from the fingers, and cannot extend the fingers properly. His legs, which, like Woodcock's, are endowed with perfect sensation, are also like them much wasted; the tendons of the hams being contracted. He cannot stand, nor even sit if unsupported, but in bed can kick about the bed-clothes. If placed on the floor in a sitting posture he would fall, he is therefore seated in a high-backed arm chair, upon the back of which his head can rest, and he is kept from falling forwards by a strap in front. He cannot even crawl along the floor. There is a bend backwards of the spine.

The fontanelle was unclosed for five years. His head is square, not immoderately large, being twenty-two inches by thirteen. Compared to its size, his face is not diminutive. The eyes have a curious expression, they are not full, and are deeply covered by the forehead. The pupils are dilated, and sluggish in their movements. His hair is thin and very coarse. Teeth all rotten. Some have entirely fallen out. Is never low spirited, is always talking, and saying something lively and amusing, grinning hideously the while. He is an excellent singer, and is said to have a fine memory. He is not sleepy, awakes in the morning before the others, and corrects the other children in speaking English. The other children, older and younger, are all healthy.

He cries when he is hurt, and cannot then restrain his passion,

thus exemplifying a remark of Breschet's, that such children *rient avec extase, ou crient avec vehemence.* He is at all other times in excellent humour. He laughs immoderately on saying anything, about which he always seems to reflect previously. Is very pallid, being ever in the house. He lies frequently in bed in the day time, but does not then sleep. Can repeat his prayers well, but it is difficult to hear them. He always gives notice on occasion of desiring to pass stools or urine; when lying down, he cannot himself raise his head. He is about three feet high.

The sensibility of the legs in these cases is by no means impaired. Constipation was common to them all.

On these cases some light is thrown by the cases recorded by Cruveilhier and Smith, of atrophy or deficiency of a portion of the brain.

Cruveilhier gives a case* of idiocy, with permanent semiflexion and rigidity of the thoracic and abdominal limbs, and immobility of them, from the anterior lobes of the brain being transformed into transparent cysts with very thin walls, and containing a limpid serosity. Also another case,† in which idiocy to its greatest extent existed. It was necessary to dress and feed this unhappy patient. She could not co-ordinate her movements for walking; it was necessary to carry her from one place to another. The cavity of her head was not completely filled by brain. The anterior lobes were completely absent. A limpid serosity, contained in the cavity of the arachnoid, occupied the interval separating the exterior extremity of the brain from the frontal region of the *dura mater.* The right hemisphere was nearly the half of the size of the left. Both hemispheres were open anteriorly, and the right in addition laterally, communicating thus with the cavity of the arachnoid. He also gives cases of idiocy from atrophy of nearly the entire right hemisphere of the brain, with the transformation of this hemisphere into a cellular structure, in the tissue of which was placed a large quantity of serosity. The atrophied half of the brain of this case was in weight and volume the tenth part of the sound half. He likewise gives a case of idiocy from atrophy of the brain, and complete idiocy from absence of the left middle lobe, with a communication between the lateral ventricles and the cavity of the arachnoid.‡

Mr (now Professor) R. W. Smith has examined nearly twenty bodies of individuals affected from birth with a congenital deficiency, or atrophy of portions of the brain,—an alteration he has been always able to predict from the contracted state of the upper and lower extremities opposite the affected side of the brain.

* L. c., Livr. xvii., P. i.

† L. c., Livr. viii., P. vi.

‡ L. c., Livr. v., P. iv., v.

With one exception the patients were all lunatics. The following is his description of that case.

A woman, an inmate of the House of Industry, died of bronchitis and pneumonia. She had incomplete paralysis and atrophy of the left arm from her infancy, with a permanently flexed condition of the arm, and of the hand on the forearm. The fingers were also flexed on the hand. Her head was small, though well formed. The left upper and lower extremities were wasted. She was endowed with ordinary intelligence, and all her senses were perfect.

Upon removing the *dura mater* the right hemisphere of the brain was found to be atrophied; the convolutions of the anterior and posterior lobes alone existed, and these were remarkably firm and hard, and exceedingly small. The convolutions of the middle lobe were for the most part deficient, and their place was supplied by the arachnoid membrane, which thus formed a great portion of the outer wall of the lateral ventricle. This cavity was considerably dilated, and filled with serum. The right was not more than one fifth of the size of the left hemisphere. The optic thalamus was not larger than a small nut, and extremely hard. Its inner edge presented a puckered appearance. The *corpus striatum*, *crus cerebri*, and *corpus mamillare* of the right side were also atrophied.*

The specimens of the other cases are all similar. The spinal cord in all of them was healthy, and in most of them nothing but a fold of arachnoid membrane intervened between the fluid in the ventricle and the cavity of the arachnoid.

Cruveilhier gives a case† similar to this. The right side was incompletely paralysed, the patient was endowed with ordinary intellect. The left hemisphere of the brain was atrophied, without any organic lesion. How, says Cruveilhier, is this fact to be reconciled with other facts of daily occurrence, which exhibit small effusions, small tumours in the brain, producing complete hemiplegy of sensation and of motion? The cause perhaps exists in the difference existing partly between atrophy of the brain by compression, and atrophy without compression, and partly between this atrophy, no matter what its cause, and solution of continuity, or the interruption of the cerebral fibres. In atrophy the instrument of our sensation and volition is doubtless imperfect; but it exists with all its constituent parts, which fulfil well or ill the functions they are called on to perform. In solution of continuity, on the contrary, a certain number of the *medullary fasciculi* of the brain are incapable of transmitting the orders of the will and external impressions;—there is a hiatus, an interval that nothing can surmount. In this case there was a deficiency of nutrition of the brain, which, he states, was as developed as possible. In

* Dublin Medical Journal, Vol. xvii., p. 341. † L. c., Livr. viii., Planche v.

Smith's case there was absence of a portion of the brain, yet both patients were endowed with ordinary intelligence.

There are many cases of hydrocephalus in which there existed no paralysis of the limbs, and in which the intellect was not much affected; yet it does not therefore follow there was in them no deficiency of any portion of the brain. In the cases given by Mr Paget and Mr M. Henry, although the *corpus callosum*, *septum lucidum*, and the fornix were defective, there was no absolute want of any function of the brain. "It is worthy of remark," says Mr Henry,* "that my patient in several particulars exhibited a complete antithesis to the girl who fell under Mr Paget's notice. Neither of them can be said to have been of healthy mind, and yet the mental deficiency was of an opposite character in each. In the girl the peculiarity was 'vivacity and a want of caution, showing themselves in an habitual rapidity of action and want of forethought, deliberation, and attention;' whilst in the boy it was a disproportionate degree of caution and want of vivacity, showing themselves in an extreme slowness, amounting almost to stupidity."

Having now shown that hydrocephalic patients will survive for years without the operation of tapping the head being employed with them, but if they do they continue a burden to themselves and their friends, I may add I know of no remedy for so unfortunate a condition. Portal's remarks on this subject are very apposite. "What remedy," says he, "would be efficacious for curing dropsies of the brain, when, independently of the water inundating this viscus, it is disorganised in its substance, and to such a degree that it often forms nothing but a soft mass like *bouillie*, in which it is impossible to make out a difference between the cortical and medullary structures? The cautery, which has been employed for opening the cranium of a hydrocephalic child, has not had more fortunate success than the operation of tapping, and how could it? The sole sinking in by its own weight of the medullary structure (even were it quite sound) upon itself, would it not produce death? The evacuation of the water procured by the operation, would it destroy the causes which produced it, and which will again produce it?"†

Dublin, 31 *Kildare Street.*

* Med.-Chir. Trans., Vol. xxxi., p. 239.
† Anatomie Medicale, T. iv., p. 76.