

ART. III.—CASE OF UNILATERAL CEREBELLAR ABSCESS AND TUMORS WITHOUT PERSISTENCE OF SYMPTOMS. REMARKS ON UNILATERAL DISEASE OF THE CEREBELLUM.
OTHER CASES CITED.

BY C. H. HUGHES, M. D., LATE SUPT. AND PHYSICIAN MISSOURI
STATE LUNATIC ASYLUM.

Read before the Association of Superintendents of American Asylums for the Insane, at St. Louis, May 31st, 1877.

A SIDE from the comparative rarity of abscess of the cerebellum, an especial interest attaches to this case because of the remarkable improvement which took place in the patient's symptoms, and the light which a careful study of its history in connection with the *post mortem* examination helps to throw upon the still conjectural functions of the cerebellum.

During the paroxysms of most severe suffering, there was inability, without external aid, to entirely control the muscular movements essential to the maintenance of equilibrium. He could walk when supported at the elbow by a friend, and minister to his wants in any way in which the arms or hands serve us, though he was sometimes tremulous in attempting to convey food to his mouth. He could feed himself, wash his face and hands, robe and disrobe, etc. It was the balancing power, which failed him.

His gait was not shuffling, nor had he at any time in his history the slightest sign of motor paralysis.

After he had been a short time under treatment he went, unaccompanied by any one, about the city, sometimes walking considerable distances, and getting on and off the street cars without help.

When we first saw him he had headache, stagger-

ing and vertiginous sensations, some hesitancy in comprehension and speech, a slow, full, regular pulse, and drowsiness, but only the exaggeration of the occipital pain and the pulsation served to locate the trouble in the cerebellum. Clearing the bowels twice daily and restoring the depressed brain circulation by proper medication, dispelled all the symptoms. To such an extent did he improve that he went, free from all pain or other head-symptom, to his home in Bloomfield, Ill., to vote for President, whence he returned, after two days absence, only to die of the extensive and not recently formed abscess and tumors shown in the diagram and brain before you. On the night following the last presidential election, he went down town in the cars to see the returns as they were announced by the different city newspapers, and was much interested but not at all abnormally excited. He had a history of malarial poisoning which led to the administration of ten grains of quinia, and a fortieth of a grain of arsenious acid each morning.

The history thus far given, and as follows, tends to confirm the view that the whole cerebellum is not necessary to perfect voluntary muscular co-ordination, and to excite the reasonable suspicion that the hemispheres, and parts of a single hemisphere may, under certain circumstances, perform a vicarious function. And why, in the wonderful economy of nature, always conservative of vital function and power as we know nature to be, should it not be the case here as it is in the lungs and kidneys, the eyes and ears, and in the hemispheres and probably some of the convolutions of the cerebrum.

Jacob Schoene, in September and October of eighteen hundred and seventy-two, first came under the treatment of Dr. J. H. Hewitt, a reputable and skillful physician of Summerfield, Ills. He then had malarial fever and obtained prompt relief, requiring no further treatment until February 22d, 1873, when the doctor treated him for *neuralgia cerebri* of malarial origin. Schoene suffered more or less from pain until the seventeenth of the following March. He was prescribed for twice in the succeeding April, and on the first, fourth, eighth and tenth of May and the thirteenth and fifteenth

of June, for the same trouble. The last prescriptions made by Dr. Hewitt were on September 7th, for an attack of remittent fever, and September 22d for pain in the head. He had been treated also by a homeopathist of this city. He came under my observation October 31st, 1876, and remained with me, except the two days he was gone to vote, until he died, on the thirteenth of the following November.

The following is what we recorded from observation and his wife's statement of his history at the time we began to treat him.

He has a sense of fullness in the head, headaches daily, with intensified pain and throbbing in the occipital region, especially severe in the morning after breakfast. He has a ravenous appetite; vomits often, especially after eating, and has dizzy spells.

His wife thinks he is somewhat different from what he used to be. She says: "He talks childish a good deal," and he is obstinately constipated.

Before the headaches came on he would sometimes sleep twenty-four hours without waking. His pulse is now sixty beats a minute, regular and full. When attempting to walk, he often staggers as though he were drunk.

He sometimes hesitates for words to express his ideas, but not enough to be called aphasic.

Three weeks before coming under my treatment, he was much out of his head. He became wild and delirious, and engaged in an imaginary fight with his wife and boy, taking down his gun from over the door to shoot them, saying he must defend himself. He had but a confused remembrance of the fact afterwards. He complains of a sound as of hissing steam in his ears.

The patient was born Feb. 6th, 1835. He had been twice married, and by his first wife had several healthy sons.

His sexual appetite was neither absent nor inordinate, so far as we could discover. His mind was clear up to the hour of his death, and a few hours before that event he walked, though somewhat clumsily, about his room. A few minutes before he died he sat up in bed, clasping his hands to his head and crying out with intense pain. Until the last agony, we had

always relieved him with applications of sulphuric ether to the top and back part of the head. He became comatose without convulsive or other premonition, and fell back on his pillow and in a few moments expired.

The superficial wall of the abscess had probably suddenly given way. On removing the cerebellum, pus and serum escaped through a small opening in the membrane not caused by laceration or scalpel puncture.



A, Abscess. B, Cyst containing serum. C, Organized apoplectic clot.

The abscess, as you see, occupies the lower half of the left hemisphere of the cerebellum, extending forwards and upwards, so as to obliterate all traces of the corpus dentatum, and backward and downward, so as to communicate with an apoplectic cell, about the size of a hazel-nut, filled with serum.

This cell extended from the surface through the arbor vitæ arrangement, and opened into the abscess.

The cavity of the abscess was immediately above and contiguous to the organized apoplectic cyst, located just beneath the arachnoid membrane, and occupying the striated structure at the extreme posterior inferior part of the left cerebellar hemisphere, and just within the median line.

This organized blood-clot, though now a little shrunken

from long immersion in alcohol, was about the size and shape of a butter-bean.

The apoplectic products did not invade the right hemisphere. The abscess did not implicate any part nearer the middle of the tuber annulare than one and a quarter inches, and of course did implicate the crus cerebelli.

The cavity of the abscess was large enough to envelop a large sized almond, and was filled with pus.

A careful examination revealed no lesion of the cerebrum.

The weight of the brain, including the pons varolii, medulla oblongata and membranes, was forty-eight ounces and a half. The weight of the cerebellum, medulla and pons, after evacuating the abscess and cell of their pus and serum, was four and one half ounces.

The opposite cerebellar hemisphere appeared neither congested nor in any other manner diseased.

In the ninety-three cases of disease of the cerebellum collected by Andral, occur nine examples of morbid implication of a single hemisphere, in which no disturbance of motion was noted.

Of these nine cases, one was an *apoplectic clot in the right lobe, with a history of apoplexy two years before death, but without any lack of co-ordination or paralysis.*

Another consisted of five small tubercles in one hemisphere.

Another was a *tuberculous mass, the size of a hazel-nut; another was that of a cyst of similar size.*

Referring to these cases, Dr. Austin Flint, Jr., says :¹

“They do not present sufficient destruction of the cerebellar substance to lead us to expect any disorder of the movements.”

Discussing the remaining five cases,² among which was an *abscess involving one of the lateral lobes*, the same writer notes the fact, that *in animals recovery of co-ordinating power takes place when half of the cerebellum has been removed*; and by way of explanation, makes a statement quite *apropos* to our case; viz., “the abscesses were probably of slow development, and if they did not destroy a sufficiently large propor-

1. Human Phys. Ed. 1873, p. 714.

2. Op. Cit.

tion of the cerebellum to influence the co-ordinating power permanently, it is not probable that the functions of this organ would be at all affected, *as there would be no shock, such as occurs in the sudden removal of substance by an operation;*"¹ and he might have added there would not be so great circulatory disturbance throughout the cerebellum in consequence of a slowly forming abscess. There certainly could not have been in the case we present.

Dr. Flint also cites a case from Bonvier, in which there was an extensive cavity in the two outer thirds of the left lobe of the cerebellum, containing several tablespoonfuls of pus, though during the patient's life no symptoms led to the suspicion of its existence.

This extensive lesion, in Dr. Flint's opinion, was not sufficient to necessarily disturb co-ordination, and referring to two of Larrey's cases, one being an abscess pervading the whole substance of the right hemisphere, he thinks "there was *not enough* injury, judging from the results of experiments on animals, to necessarily influence the power of co-ordination."²

In the case of Schoene it can not be maintained that the course of treatment pursued had any possible restorative influence on the cyst, the organized clot or the abscess. The symptoms were plainly attributable to the disturbed cerebral and cerebellar circulation, for its restoration dissipated for a time all evidences of disease.

This and the other recorded examples of unilateral cerebellar disease, without corresponding physiological disturbance persisting, compel us to concede to the opposite sides of the cerebellum, and perhaps to other portions within the same hemisphere, under gradually invading disease, the probability of vicarious power.

The treatment adopted being unknown twenty years ago, suggests the reasonable presumption that the results in some of Andral's cases might have been different had the power of the bromides and other agents in regulating and controlling intra-cerebral capillary states, been then as well understood as now.

1. Op. Cit. p. 714.

2. Op. cit., pp. 717 and 718.

One of Flint's cases¹ taken from Vulpian was somewhat similar to ours, though not so extensive.

There was softening the size of a hazel-nut in one of the cerebellar hemispheres, and the corpus dentatum was entirely destroyed. "The woman walked well, but vacillated slightly, without, however, a tendency to fall." A slightly drunken person might do the same. Restore the cerebral circulation and all unsteadiness departs.

A case no less interesting than the one we present, "involving no disturbance of motion or locomotion, except such as would come from debility," occurred some years since in the practice of Prof. Jno. T. Hodgen, who kindly permits me to here produce it.

The case is given as transcribed from the doctor's case book by his associate, Dr. Henry T. Madd.

The patient, a physician of good constitution, robust form, aged forty-one years, was, on 4th of February, 1873, attacked with pain in the left side of head and temple; also, in back and limbs. He was sick at his stomach and thought he had small-pox. February 6th and 7th he was out attending to business. On the eighth of February he suffered with severe pain in left temple and mastoid region. About the 1st of March dulness of hearing was apparent in the left ear, and paralysis of portiodura of left side supervened. During latter part of February he had pleuro-pneumonia, first on one side and then on the other—the attack extending into latter part of March. During this time he suffered severely with pain in his chest; pain worse in afternoon.

Patient had also periosteal inflammation of the left leg, followed by nodes on the tibia; rheumatic pains in his shoulder also; took iodide of potash, and nodes disappeared and paralysis improved.

In May patient was able to be about the city—went to country for his health, improved rapidly, and returned to the city, but losing strength, he again went to the country on June 30th, 1873, at which time he was suffering from sick stomach, feebleness, lack of appetite and was jaundiced.

Pain again returned in his temple; deafness recurred and he

1. Op. cit.

was seized with persistent vomiting; double vision, more marked when the rod was held obliquely before him, was present. He could not lie for an instant on his left side without vomiting, but if kept on his right side could retain some food. He was nourished by injections, but rapidly emaciated. Intellect remained clear, except occasional delirium a few days before death, which occurred August 7th, 1873. Six hours before death the skin became very red and hot.

No history of any prior disease. The patient had suffered slightly from indigestion, and had had hæmorrhoids.

P. M. August 10th, 1873. Brain healthy, except pneumogastric lobule of left side of cerebellum, which was occupied by abscess, holding about $1\frac{1}{2}$ drachms of green tenacious pus. There was partial thickening of the basilar artery.

Up to those memorable days in March and April of 1822, when the then young experimental observer, M. Flourens, of whom and from whom the physiological and medical world have since heard so much, submitted to the Royal Academy of France his celebrated memoir "On the Determination of the Properties of the Nervous System, or Physical Researches on Irritability and Sensibility," no one had yet supposed, said the most eminent men of that day,¹ "that the cerebellum was in any manner the balancer, the regulator of the locomotive movements of the animal," though Rolando, as early as 1809, had timidly ventured the conjecture, based upon experiments in some respects resembling those of Flourens, that the cerebellum is in some way connected with the power of locomotion.

Notwithstanding the various explanations which the phenomena, observed by Flourens, have elicited from Foville, who reasoned that the cerebellum is the central point of convergence of the sensations, and Sir Charles Bell, who sought to harmonize all the facts with his doctrine of a muscular sense, to the more recent conclusions of M. Onimus, that the cerebellum serves more for preserving the equilibrium, than for the co-ordination of movements, and to the undoubtedly accurate experiments in physiology which give to the semi-

1. Report of Portal, the Count Bertollet, Dumeril, Pinel and the Baron Cuvier on the Memoir, to the Academy, July 22d, 1822.

circular canals of the internal ear and to the anterior white columns of the spinal cord, at least, an auxiliary function in maintaining equilibrium, the observations of Flourens have been verified by all succeeding physiologists; though Flourens was undoubtedly in error, as one of his contemporaries¹ believed, in regarding the cerebellum as the co-ordinator of *all* the movements called voluntary.

M. Onimus, while insisting that the cerebellum alone maintains equilibrium, also contends, as the result of his late very elaborate experiments, that for co-ordinate movements, the conjoined action of the encephalic isthmus and cerebellum is essential.

We are not aware of any physiologist having yet hinted at the probable possession of the power of vicarious function residing in the hemispheres of the cerebellum, in the same manner as has been asserted for the hemispheres of the cerebrum.

A concession, closely approximating such an admission is found in the concession, which facts of physiological and pathological observation have extorted from all observers, that a limited portion of the cerebellum is capable of performing the function of the whole organ. That within the cerebellum reside motor centres capable of having their power gradually increased, so as to perform twice or thrice their usual function.

"After extirpation of even one-half or two-thirds of the cerebellum, the disturbances in co-ordination immediately following the operation may disappear, and the animal may entirely recover, without any regeneration of the extirpated nerve substance."² This is a concession by physiology which medical observation also verifies, of the vicarious function of the hemispheres, though it may yet have to be extended a little up and down the cerebro-spinal axis, in order to harmonize with physiological and pathological revelations.

The fact is, that man's organism is pretty much a dual machine, joined at the median line.

After a careful consideration of Andral's staggering analysis of ninety-three observations and a dozen other more recent

1. M. Bouillaud.

2. Austin Flint's Human Phys. Ed. 1876, p. 711.

cases, Dr. Flint¹ concludes that, "when the disorganization of the nerve tissue is slow and gradual there may never be any disorder of the movements."

The deduction of the physiologist from the facts furnished by pathology are correct, but how are we to explain other cases which, from time to time, obtrude upon our attention?

Take the celebrated case noted by Delamere, and quoted by Andral from Lallemand, where the patient, M. Gneren, forty years of age, though for a year he had vertigo and vomiting with staggering, and was often near falling forward, had, at death, really no cerebellum at all. "It had become entirely transformed into a sac filled with pns," and that of Alexandra Labross, reported in 1831 by Combette, who, though she walked in an uncertain manner, had neither cerebellum nor pons Varolii. Petiet's patient, reported in 1826, though he rose with difficulty from his seat, walking at first with lateral movements, and finally, from before, backwards, and could only walk in this way to an adjoining room in the ward, a distance of about six feet, "was found to have his cerebellum entirely destroyed, its tissue being broken down into a sort of *bouillie*."

These exceptional cases appear to overthrow the views here maintained, but the presumption is that the lesion was not so extensive when progression and equilibration were possible, or in explanation we may assume that other parts of the cerebro-spinal axis may, under the gradual demand made upon them, have come to take on, to a limited extent, the co-ordinating power of the cerebellum.

The anatomical connections of the cerebellum would seem to point to community of action with portions of the cerebrum and cord, and while acting in their truly physiological condition they have special and defined functions, it would not be strange if, under circumstances of disability, their functions might be extended. The neighboring parts doing gradually the work of the whole, just as three fingers after a time learn to do the work of four and, to some extent, the dexterity of the fingers may, under certain circumstances, be acquired by the toes.

1. Op. cit. p. 711.

In estimating functional capability, the conservatism of nature, under stress of disease in vital parts, should not be overlooked.

There are obvious difficulties in the way of precisely determining function by physiological experiment, chief among them being the circulatory disturbances throughout the whole organ, and sympathetically in the contiguous cord and cerebrum.

The slicing process of Flourens appeared to demonstrate "that the integrity of the cerebellum is necessary to the regularity of the locomotive movements," while pathological observations have so modified this conclusion as to establish the absolute necessity for a very little, if any, of the organ as at all times an indispensable essential to regular movements.

Notwithstanding all we have learned since the beginning of the present century from Rolando, Flourens, Magendie and their contemporaries, down to Onimus and Brown-Séquard, and not omitting the investigations of Ferrier, Hitzig and others on the functions of the cerebral convolutions which indirectly, we think, throw some light on the subject, yet something remains to be discovered concerning the cerebellum, and a part of that something consists in a satisfactory explanation of the facts set forth in this paper.

The facts thus far collected may not be deemed sufficient to sustain the view that the cerebellar hemispheres are capable of a dual action, and under certain circumstances of vicarious function, but all the facts harmonize with the conjecture, and they are equally as numerous as those which support a similar view respecting the hemispheres of the cerebrum.
