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Posterior Part of the External Capsule.

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A CASE OF CEREBRAL ABSCESS SITUATED AT THE POSTERIOR PART OF THE EXTERNAL CAPSULE (INVOLVING THE MEDULLARY SUBSTANCE OF THE FIRST TEMPORAL CONVOLUTION AND PART OF THE SECOND, ALSO THE POSTERIOR PART OF THE LENTICULAR NUCLEUS), WITH SOME CONSIDERATIONS IN REGARD TO THE CONSTITUTION OF THE EXTERNAL BUNDLE OF FIBRES IN THE CEREBRAL PEDUNCLE.^{1*}

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C. H., 48 years old, a baker, was admitted to the Philadelphia Hospital to the service of Dr. Mills, January 30, 1896, and died February 26, 1896.

The patient had always had fair health. His mother had never heard him complain of earache. During the entire summer of 1895 he suffered constantly from severe headache.

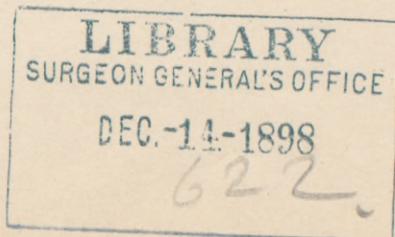
On December 20, 1895, while in the bake room mixing dough, he became unconscious and had three general convulsions which resembled those of epilepsy. He was unconscious for two days, and when he regained consciousness it was noticed that he was partially paralyzed on the right side, and that he not could not talk properly.

January 29, 1896, he had another attack of unconsciousness without convulsions, but with aphasia and decided paralysis. He was brought to the hospital the next day.

On admission he was in a condition of stupor; he did

¹ The microscopic sections were made in the Pepper Laboratory.

* Read at the Twenty-second Annual Meeting of the American Neurological Association.



not speak when addressed and had almost total right sided paralysis, incontinence of urine and feces, and entire loss of pain and touch sense over the paralyzed side. It was impossible to employ the perimeter on account of his stupor, but by testing him with small pieces of bread brought towards his mouth from the right and left it was noticed that he opened his mouth to receive the food only when it was brought from the left side. Likewise, when a pointed instrument was brought near either eyeball from the side, as if to touch it, it was observed that he winked only when the motion was made in front of the left half of each eyeball. From these tests, to which he responded repeatedly in the same manner, it was evident that right homonymous hemianopsia was present.

He was found to have double papillitis, most marked in the left eye. The patient's general condition gradually became worse. He occasionally complained of headache, which he did not localize. Bed-sores did not form.

February 25, 1896, he became unconscious, breathing was stertorous, the face dark red in color. The coma gradually increased until he died, twenty hours after the beginning of this attack.

There was no evidence at any time of middle ear disease.

During the entire time that he was in the hospital, until just before death, respiration, pulse and temperature presented no indications of the purulent process within the brain.

From the report of the autopsy by Dr. Jameson we extract the following:

A horizontal section just above the level of the callosum revealed an abscess on the left side in the centrum ovale, and antero-posteriorly corresponding with the position of the thalamus, internal capsule and part of the lenticular body. Both tympanic membranes were normal. No evidences of suppuration or perforation were present. The pleura, pericardium, heart, spleen and kidneys were normal.

Microscopic examination of the pus from the cerebral abscess showed only the ordinary *staphylococcus pyogenes aureus*. There were about two ounces of pus in the cavity and left ventricle. Both eyes were removed and examined by Dr. Charles A. Oliver, who reported that careful examination of the posterior halves of the eyeballs showed well marked choked discs, more decided

on the left side; the swelling and inflammation of the nerve head and surrounding retina being extensive and covered at places with minute capillary hemorrhages.

The occurrence of epileptiform convulsions at the time of his first attack of unconsciousness, probably due to irritation of the motor fibres within the internal capsule, is worthy of note as an instance of the difficulty in diagnosing cortical lesions. It is not known in what portion of the body these convulsions began. On account of the right-sided hemiplegia and right homonymous hemianopsia, the diagnosis was made of some morbid process located at the posterior part of the internal capsule involving the optic radiations and causing pressure. Notwithstanding the history of previous epileptiform convulsions, the lesion was not believed to be cortical. A tumor, softening, or hemorrhage involving the cortex which would cause this combination of symptoms must be large enough to destroy the motor area or to act on it by pressure, and to extend backwards and inwards far enough to cut the optic radiations or involve the inner side of the occipital lobe. For the diagnosis of cortical thrombosis or embolism it would be necessary to assume a closure of both the middle and the posterior cerebral arteries in order to include the motor and visual areas.

After making macroscopic and microscopic sections of the left hemisphere at different levels, it was found that the abscess occupied the posterior part of the external capsule, a portion of the lenticular nucleus, especially the putamen, and extended downwards into the upper part of the second temporal gyrus, but had not cut the fibres of the optic radiations nor those of the internal capsule. At one place it is possible that a few motor fibres may have been destroyed, but if so, not enough to cause descending degeneration. The loss of function of the motor and visual tracts was probably due to pressure from the pus in the abscess cavity. The white matter of the first temporal gyrus was almost entirely destroyed, and fibres from the upper anterior part of the second temporal were also cut. As the cavity was very near the periphery of the first temporal convolution, it would not have been difficult for the surgeon to have emptied it.

No loss of the sense of hearing for ordinary sounds had been noticed. As the first temporal gyrus of the left hemisphere including the posterior third was destroyed, the question of word-deafness is of considerable importance. Questions were repeatedly put to the patient by

Dr. Mills, but neither by word, gesture, nor pantomime, on the part of the patient was it evident that he understood. His stupor was not great enough to prevent him from taking food when offered, or from turning in bed on his sound side. The resident physician, Dr. Hetrick, and the nurses, never heard him utter more than two or three words. When his name was called he made no response, but it was probable that he was not deaf to sound heard as sound from the fact that once when a patient fell out of bed he raised his head and looked to see from what source the noise came, and it is stated positively that his attention was not aroused through the sense of sight. Vibration might, however, have to be taken into account.

In view of the frequency of cerebral abscess after suppurative processes in the lungs, it may be added that neither during life nor at the autopsy was any such process found, with the exception of spots of catarrhal pneumonia in both lungs, nor was any suppuration found elsewhere in the body. As the lesion had lasted for at least sixty-eight days and possibly longer, judging from the history of previous severe headache during several months, it was considered an excellent case for the method of Marchi.

No descending degeneration has been found in the peduncle, oblongata or cord, showing that the motor fibres were not injured to any extent, for there is hardly a doubt that if such had been the case the method employed would have revealed it.

At all parts a good half inch of sound tissue is found corresponding to the location of the optic radiations at their entrance into the pulvinar. It is through this portion that the fasciculus of Türk (which forms the lateral bundle of the peduncle) joins the posterior part of the internal capsule in the subthalamic region, according to Dejerine. These fibres, therefore, are not cut. As this statement of Dejerine may not be well known in this country, we have translated the paragraph in which it occurs.

"The posterior segment of the internal capsule, situated in front of the external geniculate body, from which it is separated by the prolongation of the reticulated zone, presents a characteristic appearance. The fibres are not cut perpendicularly to their length, as in the anterior six-sevenths, but have an oblique, almost horizontal course. It is a system of fibres with a course quite analogous to that we have described for the knee of the

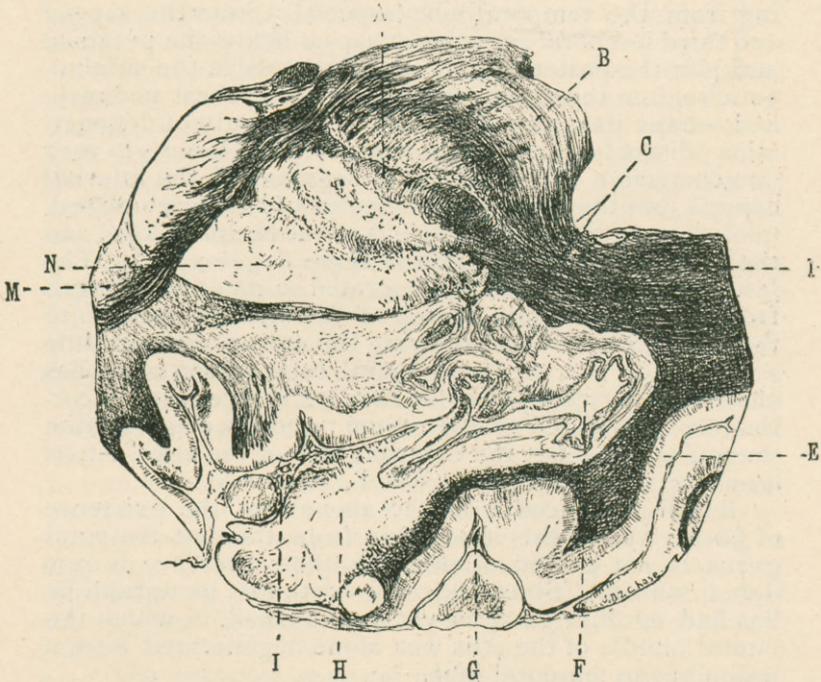
capsule. These horizontal fibres of the posterior part of the posterior segment form the tract of Türck. This tract corresponds approximately to the external fifth of the crus. Its origin has never previously been clearly determined. Many writers, including Meynert, consider the tract of Türck as the continuation in the crus of the fibres from the sagittal layers of the occipital lobe. (Posterior optic radiations. Gratiolet's radiations and inferior longitudinal fasciculus). This interpretation may not longer be accepted. The normal and pathological anatomy are opposed to this view. If the tract of Türck is studied in serial vertico transverse sections from an entire hemisphere, it is clearly demonstrated that this fasciculus is formed of fibres of projection, which, coming from the temporal lobe (especially from the second and third temporal convolutions) pass below the putamen and join the posterior part of the capsule in the subthalamic region, they then pass into the cerebral peduncle and occupy its external portion. The study of degeneration of this fasciculus following cortical lesions is very demonstrative. The posterior segment of the internal capsule and the external fasciculus of the cerebral peduncle remain intact after lesions of the occipital lobe, and the retro-lenticular segment is alone degenerated. The fasciculus of Türck is degenerated in its entire length from the subthalamic region of the internal capsule to the pons, after lesions involving the cortex of the middle and inferior part of the temporal lobe, as one of us has shown by microscopic serial sections in five cases of cortical lesions limited to this region; and the degeneration then occupies about the external fifth of the crus."—(*Anatomie des Centres Nerveux*, Vol. I., page 609).

It will be noticed from the above that the existence of fibres within this fasciculus from the first temporal gyrus is not excluded, although their presence is rendered doubtful. Since Dejerine wrote this paragraph he has had another case, as yet unpublished, in which the lateral bundle of the crus was alone degenerated from a lesion of the temporal lobe.

Kam (*Archiv für Psychiatrie*, XXVII., 1895), has reached conclusions very similar to these of Dejerine. He believes that the lateral bundle ("oval bundle") of the peduncle derives its fibres from the temporal lobe, and that these degenerate downwards when this lobe is destroyed. This "oval bundle," to employ the term used by him, occupies the external fifth of the peduncle.

So far, he expresses the views of Déjerine in every detail, but he does not mention the fact that the second and third temporal gyri are the parts especially connected with the lateral bundle of the peduncle. These statements made by Kam are all the more interesting as they were published apparently in ignorance of the work previously done by Déjerine, and therefore represent conclusions reached independently.

In our case the fibres from the first temporal, as well as those from the upper anterior part of the second temporal convolution, were entirely destroyed, and as no degeneration was found within the lateral bundle of the peduncle by the method of Marchi, and as death oc-



Microscopic section (unmagnified) from the left hemisphere at the level of the parallel fissure. The first temporal gyrus extends to about three-eighths of an inch below the level of this section. The abscess cavity terminates a short distance below this level. A, posterior limb of internal capsule; B, thalamus; C, separated terminations of the abscess cavity; D, optic radiations; E, second temporal gyrus; F, chief portion of abscess cavity; G, parallel (super-temporal) fissure; H, degenerated first temporal gyrus; I, Sylvian fissure; M, anterior limb of internal capsule; N, putamen.

curred sixty-eight days after the first attack and twenty-eight days after the second—certainly a period sufficiently long for this method—we consider that the case demonstrates the fact that *no fibres enter the fasciculus of Türck from the first temporal and the upper anterior part of the second temporal gyrus including a portion of its upper middle segment.*

This, of course, does not render impossible or improbable the origin of such fibres in the lower anterior and the whole of the posterior part of the second temporal and in the whole of the third temporal gyrus. The fibres which enter the first temporal gyrus are probably connected with the sense of hearing, and being sensory, probably do not degenerate downwards, which accounts for the absence of secondary degeneration in the peduncle.

We may state that in another case of hemiplegia in which death occurred three weeks after the beginning of the attack, we are able to show intense degeneration by the method of Marchi.

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