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A THIRD CONTRIBUTION
TO THE STUDY OF
Localized Cerebral Lesions.

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Physicians and Surgeons, New York; Corresponding Member of
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A THIRD CONTRIBUTION TO THE STUDY OF LOCALIZED CEREBRAL LESIONS.¹

I OFFER the two subjoined cases as additional evidence of a localization of motor functions in limited areas, cortical and subcortical, of the cerebrum. The first case more especially demonstrates the results of a superficial irritating lesion of the cortex.

While separately considered, these cases may not be of very great value, yet, taken together with the evidence already accumulated, they seem worthy of record.

CASE I.—Relating to the face-centre. In collaboration with Dr. J. L. Hicks.

Summary: Right hemiparesis, most marked in the right cheek; clonic convulsions in right cheek; slight fever; no aphasia or choked disk. Recovery after prolonged use of iodide of potassium. Sixteen months later, death after symptoms of acute meningitis. Autopsy shows a patch of simple adhesive meningitis over a part of left motor area, and recent acute tubercular meningitis.

A boy aged 7 years, named Harold, very intelligent and healthy, seen at Flushing in consultation with Dr. J. L. Hicks, Jan. 13th, 1885.

For about two weeks before this date, it was noticed that the child was not as well as usual—even before Christmas his right hand felt numb at times, and an examination of his copy-books revealed a change in his handwriting; less steady writing, an inequality between different words, in contrast to previous remarkable uniformity of the script. An attack of measles appeared Dec. 23d (1884), and ran a very mild course. During this week of illness, the patient several times complained of his right hand "going asleep," and feeling "queer."

¹ Read at the second annual meeting of the Association of American Physicians, June 3d, 1887. For first and second contributions, *vide* Seguin, "Opera Minora," p. 202 and p. 495, New York, 1884.

On Jan. 2d, after slight fever on the preceding day, it was observed that he spoke thickly, that saliva dribbled from the right buccal angle, and that the right cheek and arm were decidedly paretic; the leg slightly so (?). There was neither headache nor aphasia; the mouth temperature ranged from 98.5° to 100°. After cutting the gums over some molar teeth, improvement appeared.

On Jan. 9th, one hour after a very mild faradic application to the weak muscles on the right side, there occurred clonic convulsive movements in the right cheek, with suspension of speech and turning of eyeballs to the right. No spasm in other parts; patient fully conscious. This *facial monospasm* lasted for more than two hours. No return of convulsive movements since; the temperature has ranged from 98.5° to 99.5° (in mouth); the right face (upper lip near median line especially) and the right hand have occasionally felt numb and "queer." Speech has been thick at times, and a few times he has used the wrong word. No gastric disturbance, but constipation has been present.

Inquiry into possible causes reveals no serious injury to the head, although a "slight" (?) fall on knees, arm, and forehead from a velocipede occurred about three months ago. No pulmonary, renal, or aural disease.

Examination.—Mind clear, speech normal (it was thick a little while ago); no headache or cranial tenderness to percussion. Only lesion in eyes is great myopia, with posterior staphyloma and large veins. Right cheek is paretic, the tongue deviates to the right; the right hand is weak, and in walking there is a slight drooping of body to right. The knee-jerk is low on both sides, but more marked on the right. No anesthesia. Heart normal. Mouth temperature 100°; pulse 90, regular.

The *diagnosis* was uncertain as between a tumor in the left central gyrus (its lower third and adjacent part of second frontal gyrus) or a localized meningitis over the same part. The idea that such very localized ("Jacksonian") symptoms could be reflex from irritation about the gums I could not entertain.

Treatment.—Fluid extract of ergot in doses of 5 drops, and saturated solution of iodide of potassium, 10 drops every three hours. Absolute rest and plenty of liquid food. The iodide to be rapidly increased.

Jan. 27th. The iodide has been given in doses of 75 drops (about 5 grams) three times a day. Great improvement has occurred; occasional numbness of right cheek and hand. Iodide to be reduced.

Feb. 16th. Paresis of right cheek is constant, though the arm is stronger and well used, and no spasm has occurred. No disturbance from the iodide, now used in doses of 30 drops *ter die*.

April 29th. Except paresis of right cheek, has been remarkably well until yesterday, when the following occurred: a numbness began in right forefinger, extended into the arm, to the right side of face, right half of tongue, and right heel (not toes!). There

was no spasm. The right upper lip was decidedly swollen, and there was drawing from right corner of mouth. No aphasia, headache, or fever. To-day, the cheek is paretic, but not more than before the attack, and there is still some prickling in the right hand. Otherwise well; advise rapid increase of iodide to 45 drops *ter die*.

May 28th. Except right facial paresis, has been well until 18th inst., when an attack, like the one above described, occurred (similar except that there was no numbness in the leg). There was another attack on the 19th. Excitable. On 22d, had attack of severe transverse frontal headache of short duration. Is taking 65 drops of iodide *ter die*; and this was subsequently increased to 100 drops *ter die* (about 20 grams per day) without unpleasant effects.

Examined again June 13th. Distinct right hemiparesis, most

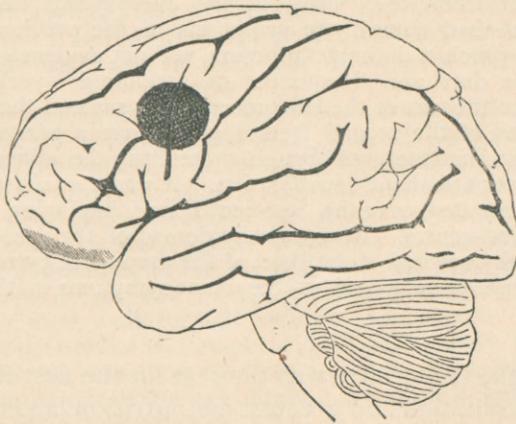


FIG. 1.—Patch of localized adhesive meningitis over the second frontal and precentral gyri of the left hemisphere in case 1.

marked in the face; no anæsthesia; speech and optic nerves normal. General condition good, except pallor. Advised stop medicine; patient to be gradually allowed more liberty and watched carefully.

Oct. 3d. Has been very well. On June 17th, a slight attack of numbness occurred. The paresis has passed away, except that, when tired, the right cheek droops somewhat. It is to be observed that, although numbness appeared first in the hand in some of the attacks, the cheek was the seat of the greatest and most persistent paresis, and that the clonic convulsions occurred only in the facial muscles (the lower set); so that it might reasonably be concluded that the lesion of the left hemisphere was chiefly in or upon the cortical face-centre.

The next year early in April, 1886, the lad developed unmis-

takable symptoms of acute general meningitis: headache, photophobia, vomiting, slow and irregular pulse, temperature of 101° and 102° . May 1st, delirium set in with higher temperature, and death occurred the next day. In this attack, there were no convulsive or paralytic phenomena. The ophthalmoscope was not used.

The *autopsy*, on May 4th, revealed the ordinary recent lesions of tubercular meningitis. This was intense over the pre-pontic base of the brain, over the apices of the temporal lobes, and well up into both fissures of Sylvius. There was much gelatinous effusion about the chiasm. The rest of the brain showed no evident meningitis. The ventricles were largely dilated and filled with clear fluid. The cerebral substance, especially its cortex, was pale. Microscopic examination showed abundant cellular infiltration of the pia, and many globular and muff-like tubercular masses along the blood-vessels.

The most interesting result of the autopsy was finding the lesion which had caused the symptoms of the previous illness. This was a patch of intimate adhesion, without evident exudation, between the dura and the pia (or its arachnoid layer), situated over the ventral part of the left precentral gyrus and the adjacent (caudal) end of the second frontal gyrus, over a space one inch (25 mm.) in diameter. Although quite firm, the adhesion gave way to traction without decortication. It was a *localized adhesive meningitis* situated over the face-centre, and impinging upon the arm- or hand-centre. It was wholly dorsad of the speech-centre, and decidedly ventrad of that part of the precentral gyrus in which lesions cause primary and predominant symptoms in the fingers and hand.¹

While the face-centre was the seat (in the first illness) of the chief irritation and greatest malnutrition (anæmia), it is evident from the symptoms that there was more or less extension of irritation (very much as in electrical experiments in animals) to the rest of the motor area of the same side.

It seems to me that, taken together with other recorded cases, this case goes to support the view that in the human brain the cortical centre for the face is in the caudal end of the second frontal gyrus, where it is continuous with the precentral gyrus.

¹ Compare Case IV, of first contribution for intermittent aphasia caused by localized meningitis over Broca's speech-centre; and Case I. of second contribution for brachial monospasm and monoplegia caused by a tumor in the middle part (vertically) of the precentral gyrus. "Opera Minora," p. 211 and p. 495.

CASE II.¹—Bearing on the question of the location of the leg-centre.

Summary: Paresis of right leg; clonic spasm in right abdominal muscles; right hemi-epileptic attacks with first spasm in abdominal muscles; then in the leg, last in the arm (none in face). Repeated similar attacks without loss of consciousness; paralysis of the right leg, paresis of right arm; no aphasia or choked disk. Death; sarcomatous tumor in white substance of left hemisphere, subcortical, situated dorso-laterad of the paracentral lobule.

Mr. F. W., aged 49 years; seen Nov. 22d, 1881. Has enjoyed good health, with exception of occasional headaches, which have been less troublesome in the last few years. Denies syphilis and injury to head.

About a year ago had severe left occipital neuralgia; the region midway between morbid process and median line being hyperæsthetic. Pain distinctly worse at night. This lasted one month and has not recurred. Was generally weak and in poor health during the past summer; legs felt heavy, and feet were "sensitive" in the morning. The right foot was weaker and œdematous; there was no numbness; and he was able to keep at work during the autumn.

Some four or five weeks ago, there was marked increase in the difficulty in walking. The right foot was dragged rather stiffly with the heel raised. Was unsteady. About Nov. 1st, after application of an electrical current, he had a first attack of spasm limited to the right abdominal muscles. A day or two later, there was a more severe seizure, spasm beginning in the right abdominal muscles, extending to the leg, and lastly to the arm of same side. No spasm in face, and no loss of consciousness. The right arm and leg were weak for half an hour after attack. Since, he has had numerous similar attacks, always on the right side, and without loss of consciousness; from six to eight seizures a day. Marked paresis of the right limbs. No aphasia, headache, vomiting, or mental disturbance.

Yesterday (Nov. 21st), in an attack, spasm extended to the right face and the left limbs; he lost consciousness (attack witnessed by Dr. Bruce, a relative).

Examination.—Pallor; heart and pulse normal; no aphasia. The right pupil is a little wider than left, both active; optic nerves normal.² There is no facial or lingual deviation, but the right arm and leg are very paretic. In the upper extremity, the paralysis is most marked in the region of shoulder and in upper arm, and he still has a fairly good grasp. When standing, the right foot is held in equino-varus position; and the knee-jerk is raised on this side. No anaesthesia.

¹ I am indebted to Dr. R. W. Amidon for many of the notes in this case and for ophthalmological examinations.

² This was the case throughout the illness, an ophthalmoscopic examination being made shortly before death.

Diagnosis.—Probably a cerebral tumor. It is learned that the grandfather and one aunt of patient (both on paternal side) had "cancer."

Treatment.—Ord. thirty grains (2 grams) of bromide of potassium at bed-time. Iodide of potassium in large doses three times a day. Absolute rest.

Nov. 27th. More hemiplegia of a peculiar type. The leg is completely paralyzed, the upper arm and shoulder more paretic than the forearm and hand (grasp 12° on a stiff dynamometer); right cheek a little flabby. At night, has "cramps" in right leg.

Owing probably to the influence of the bromide of potassium, the convulsions did not recur, but there were frequent attacks of

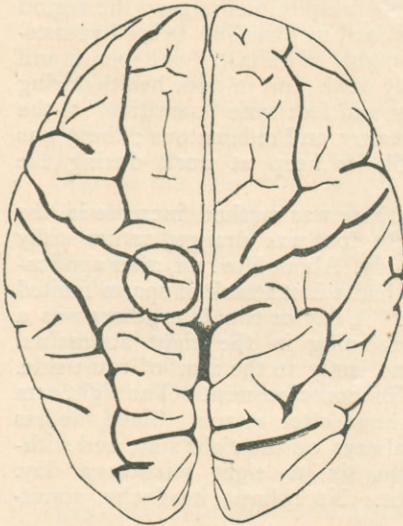


FIG. 2.



FIG. 3.

FIG. 2.—Diagram of convexity of brain—showing location of the (sub-cortical) tumor

FIG. 3.—Diagram of transection of left hemisphere, showing the exact position of the tumor, and of two minute secondary growths.

painful cramp in the right leg at night (extension of foot and flexion of leg on thigh). The next day paralysis extended to the hand, but the tongue protruded straight; speech slow; no aphasia.

Dec. 4th. More voluntary power in hand and fingers. Marked aphasia and alexia (?); attacks of a syncopal nature occasionally. In one of these the patient died (Dec. 6th), with a low temperature¹ and stertorous breathing.

¹ No figures are given in the original notes, but I am very sure that the temperature was not subnormal; there was simply absence of the hyperpyrexia which usually prevails in the last stage of cerebral tumor.

Autopsy.—Dura normal ; arachnoid shows some opacities, more over the left hemisphere. The convolutions of the left parietal lobe are flattened ; the flattening not extending further frontad than one-half of the frontal lobe, and ventrad not reaching the inferior parietal lobule. The occipital lobe is slightly flattened. The whole hemisphere appears swollen, and larger than the right. Transections reveal a sarcomatous globular tumor ventrad of the top of the pre- and post-central gyri, and dorso-laterad of the paracentral lobule. The growth is mainly in the white substance, but invades the cortex, though it does not appear externally. Two very small nodules of the same new-formation are found further ventrad in the white substance. No other lesions in the brain.

The lesion interrupted fasciculi of fibres connected with the paracentral lobule and with the upper (mesal) ends of the pre- and post-central gyri.

It is very interesting to note the relative immunity of the forearm and hand from symptoms.

From this case we obtain, I think, additional proof that the innervating centre for the leg is in the paracentral lobule, and perhaps also in the mesal ends of the pre- and post-central gyri, in accordance with what has already been established.¹

Another conclusion, of more novel interest, which may be drawn from this case, is that the cortical centre of innervation for the muscles of the shoulder and upper arm is probably in the upper part of the pre- and post-central gyri, between the forearm and leg centres.

We may also infer that the centre for the abdominal muscles is in the same area, but nearer to the leg centre.²

I desire to add, by way of record, summaries of two cases, already published.

¹ Compare Case II. of the second contribution, "Opera Minora," p. 499.

² I have at present under observation, in consultation with Dr. O'Gorman, Jr., of Newark, a most interesting case analogous to the above. The attacks of "Jacksonian" spasm are on the right side and chiefly affect the muscles of the shoulder, upper arm, and side of chest (probably only in the serratus and pectorals, but not in the intercostals). In a few attacks the spasm has extended to the whole of the right side, and one or two general convulsions with loss of consciousness have occurred. No choked disk is present, and there is but little headache. The case is improving under mercury and iodide of potassium, with some bromide of sodium.

CASE III.—Relating to the visual half-centre.

Male, aged 46 years ; seen in 1884. Malignant endocarditis ; sudden attack of left lateral hemianopsia, with (temporary) left hemi-numbness ; no anesthesia or paralysis. Death in May, 1885, from progress of endocarditis ; multiple embolisms, pseudo-intermittent fever, etc. Autopsy showed softening of the right cuneus and fifth temporal gyrus, caused by embolism of the occipital artery (and other visceral lesions). This diagnosis of seat and nature of lesion had been made during the patient's life.

Published in full in this JOURNAL for January, 1886, p. 25.

CASE IV.—Relating also to the visual half-centre.

Male, aged 42 years ; seen in October, 1885. Left lateral hemianopsia ; slight staggering in gait ; temporary paresis of both external recti ; choked disks. Absence of headache, paralysis, and anæsthesia. Operation by Dr. R. F. Weir, March 9th, 1887 ; removal of an enormous sarcomatous tumor situated on the inner aspect of the right occipital lobe, probably connected with the ventral part of the falx cerebri and thus injuring the cuneus early in its development. The diagnosis of tumor of the right cuneus was made by me in November, 1885, sixteen months before the operation.

This case subsequently passed under the care of Dr. W. R. Birdsall, by whom and Dr. Weir it has been very ably reported in the (Philadelphia) *Medical News*, April 16th, 1887.

