Notes of a case of hemiplegia / by T. Lauder Brunton.

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NOTES OF A CASE OF HEMIPLEGIA.

BY

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It is only a few years since Ferrier predicted that a knowledge of the localisation of the cerebral functions would render cerebral surgery possible. His prediction has been so amply fulfilled that exact localisation has become of great practical importance, and even a very small contribution to the subject may not be out of place. The brain of man is so different from that of quadrupeds that experiments on them such as those of Fritsch and Hitzig only showed the existence of localised motor centres in the cerebrum, but were of no use in indicating the position of corresponding centres in man. The brains of the quadrumana resemble that of man so much more closely, that Ferrier was able by experimenting on them to indicate approximately the position of similar centres in the human cerebrum. But the brains of all the quadrumana are not alike, and in none of them is the brain so highly developed as in man. Recently Horsley and Beevor have made some experiments on the brain of the orang, which being one of the highest apes, might naturally be regarded as more likely to resemble man in the structure of its brain than would a lower monkey like the macacus.

The following case is interesting inasmuch as it seems to show that this is not the case, and that the distribution of the cortical centres in man resembles that in the macacus or bonnet-monkey rather than that in the orang. In Ferrier's original experiments on the macacus the centre for the shoulder in Fig. I. is seen to be rather farther forward than those for the arm and hand (Fig. I. Nos. 4, 5, 11, *a*, *b*, *c*, *d*); while in Horsley's farther experiments on the same kind of monkey the hip centre (Fig. II.) is seen to be also farther forward than those for the knees, ankles, and toes. From Fig. II. it will be seen that if we draw a line in continuation upwards of the præcentral sulcus (P.C.)

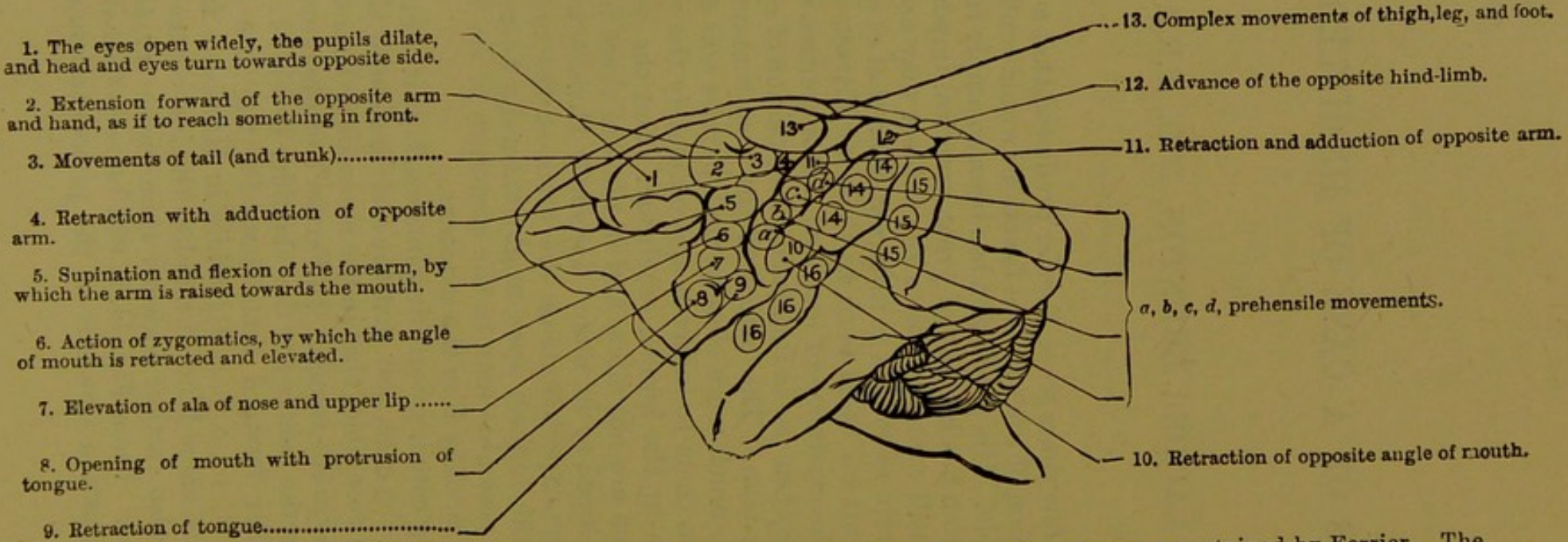


FIG. I.—Brain of Bonnet-Monkey, showing the position of the motor and sensory centres as ascertained by Ferrier. The actions all occur on the side of the body opposite to the part of the brain irritated.

in the bonnet-monkey, the centre for the hip and a great part of the centre for the shoulder will lie in front of it, while the centres for the arm and fingers, knee, ankle, and toes lie behind it.

In the orang-outang (Fig. III.) this is not the case, for the centres for the hip and shoulder are placed between, and indeed one might say appear to be almost surrounded by, the centres for the toes, ankle, knee, elbow, wrist, and thumb.

In the bonnet-monkey one can easily see how an embolism which plugs the artery supplying the convolutions on each side of the fissure of Rolando may destroy the functions of the centres for the hand and foot, arm and leg, while those for the shoulder and hip may retain their activity in consequence of their vascular supply being obtained from another artery. In the orang-outang it is difficult to see how this could be the case, as the shoulder and hip centres lie between the other centres, instead of to one side, as in the bonnet-monkey.

The following case affords an instance of a patient suffering from heart-disease who quickly lost speech and became paralysed in the left side. After a short time speech returned,[1] the shoulder and hip recovered power, but the hand, arm, toes, ankle, and knee remained paralysed.

She had been suffering from cardiac disease for six years before the attack of paralysis came on. Whilst in Hospital she had sudden enlargement of the spleen, with much pain and tenderness in the organ, and a sudden rise of temperature up to 102°. These symptoms probably indicate an embolic infarction of the spleen, and the previous paralysis was also probably due to embolism.

The symptoms are, I think, most easily explained by supposing that an infarct nearly occluded the middle cerebral artery where it sends off the branch to the third frontal convolution (Fig. IV. 1), just before dividing into the branches which supply the motor areas (Fig. IV. 2 and 3) and part of the sensory centres. By slight fibrinous accretion the infarct became in a few minutes large enough to occlude the vessel completely, and thus the loss of speech and paralysis both became complete. In a day or two the infarct began to contract, so that the branch to the third frontal convolution (Fig. IV. 1) became free, and speech began to return, but the branches to the motor areas (Fig. IV. 2 and 3) still remained occluded, and thus paralysis continued.

The improvement in walking and in the movement of the paralysed arm, due to the partial recovery of the muscles about the hip and shoulder joints, in such cases as the present, is usually

[1] Although it is stated in the notes that speech returned after a fortnight, yet on asking the patient about it, my impression is that she said speech began to return within forty-eight hours.

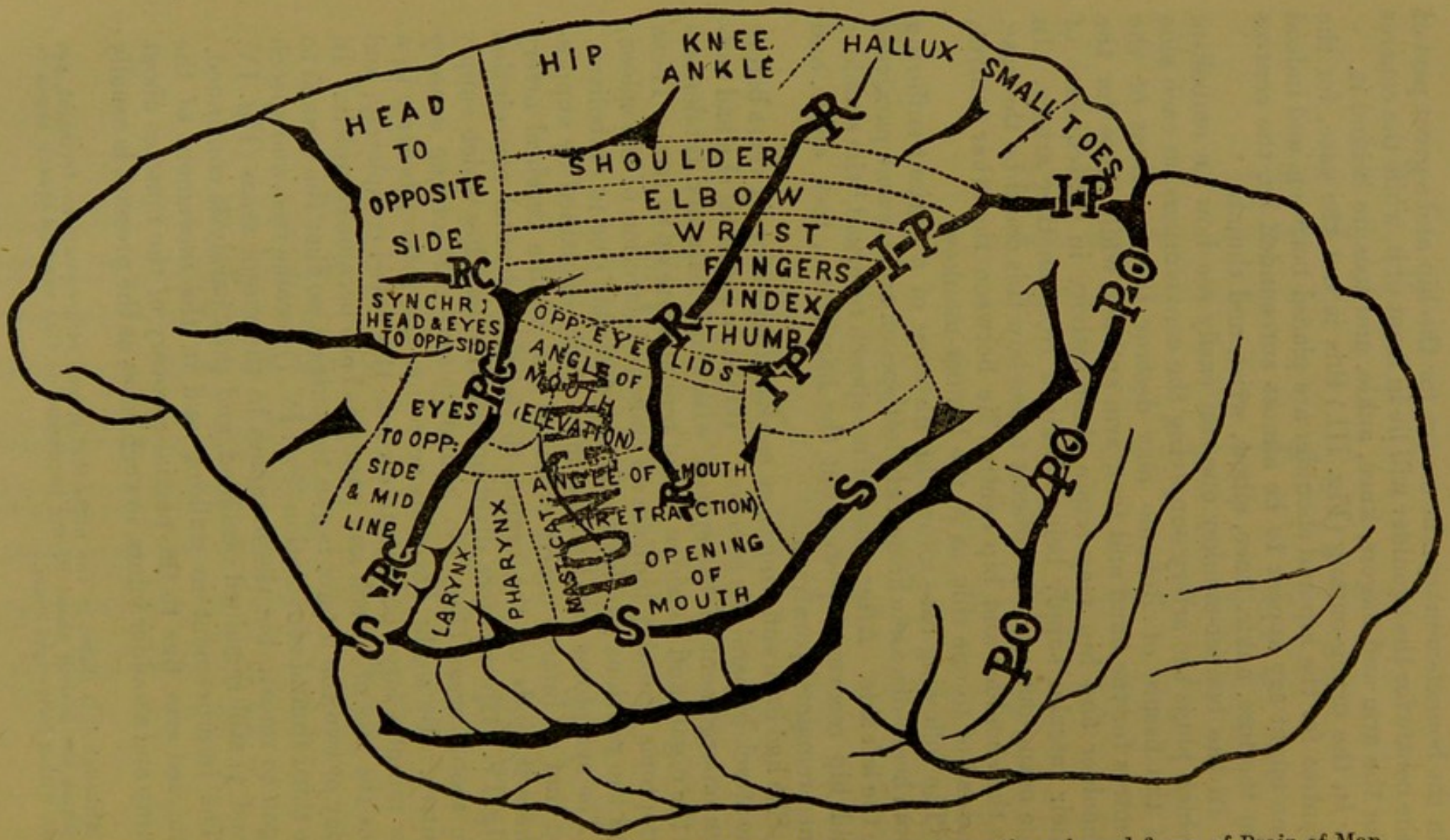


FIG. II. (after Horsley).—Brain of Bonnet-Monkey, enlarged to about the same size as the enlarged figure of Brain of Man and showing the Localisation of the Motor Centres.

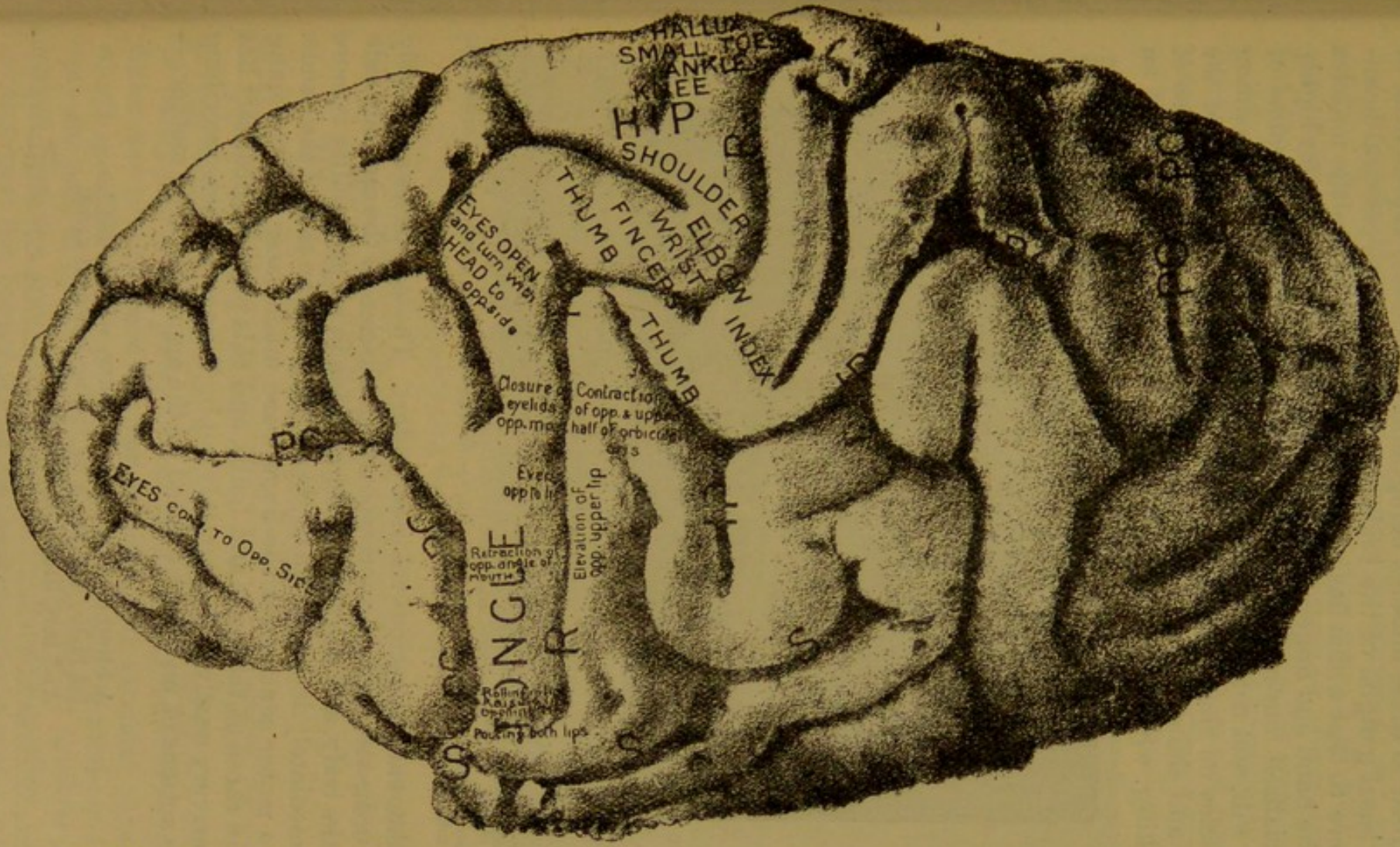


FIG. III. (after Horsley and Buist).—Photograph, enlarged nearly twice, of the Outer Surface of the Left Half of the Brain of an Orang-Outang.

ascribed to these muscles being more completely represented in the basal ganglia of the brain, or in the opposite cerebral hemisphere to that which has undergone injury, than are the muscles of the hand and fingers. The latter are used especially for highly specialised movements, which are directly under the control of the will, and act in complete independence of the corresponding muscles on the other side of the body, while the muscles of the hip and shoulder are more used in such movements as those of walking, which, though originating voluntarily, are carried on

FIG. IV. (after Ross).—Diagram showing the Distribution of the Middle Cerebral Artery.

S. Sylvian or middle cerebral artery. *P.* Perforating branches. 1. Inferior frontal branch. 2. Ascending frontal branch. 3. Ascending parietal branch. 4 and 5. Parieto-sphenoidal branches. *A.* Ascending frontal convolution. *B.* Ascending parietal convolution. F_1, F_2, F_3. First, second, and third frontal convolutions. P_1, P_2, P_3. First, second, and third parietal convolutions. T_1, T_2, T_3. First, second, and third tempero-sphenoidal convolutions. *OL.* Occipital lobe.

without any conscious voluntary effort. These muscles are closely co-ordinated with the corresponding muscles on the opposite side of the body, and their motor innervation in all probability is more immediately derived from the basal ganglia than that of the hands. The motor centres for the fingers are much later in developing than those of the body and limbs, and this physiological fact has been very neatly and accurately put by Tennyson when describing the actions of an infant excited by the approach of its mother:—

> "Spied its mother, and began
> A blind and babbling laughter, and to dance
> Its body, and reach its fatling innocent arms
> And lazy lingering fingers."[1]

[1] "The Princess," Part vi.

In all probability the ordinary view is true to a great extent, but it seems to me doubtful whether it represents the whole truth. For if it did, we should hardly expect to find one muscle of the shoulder singled out for retention of movement, like the deltoid in this case, while the other muscles were paralysed. Such an exemption as this seems rather to point to the possibility of a part of the cortical centre for the shoulder having retained its functional activity on account of its getting a supply of blood from another vessel than those which have become com-

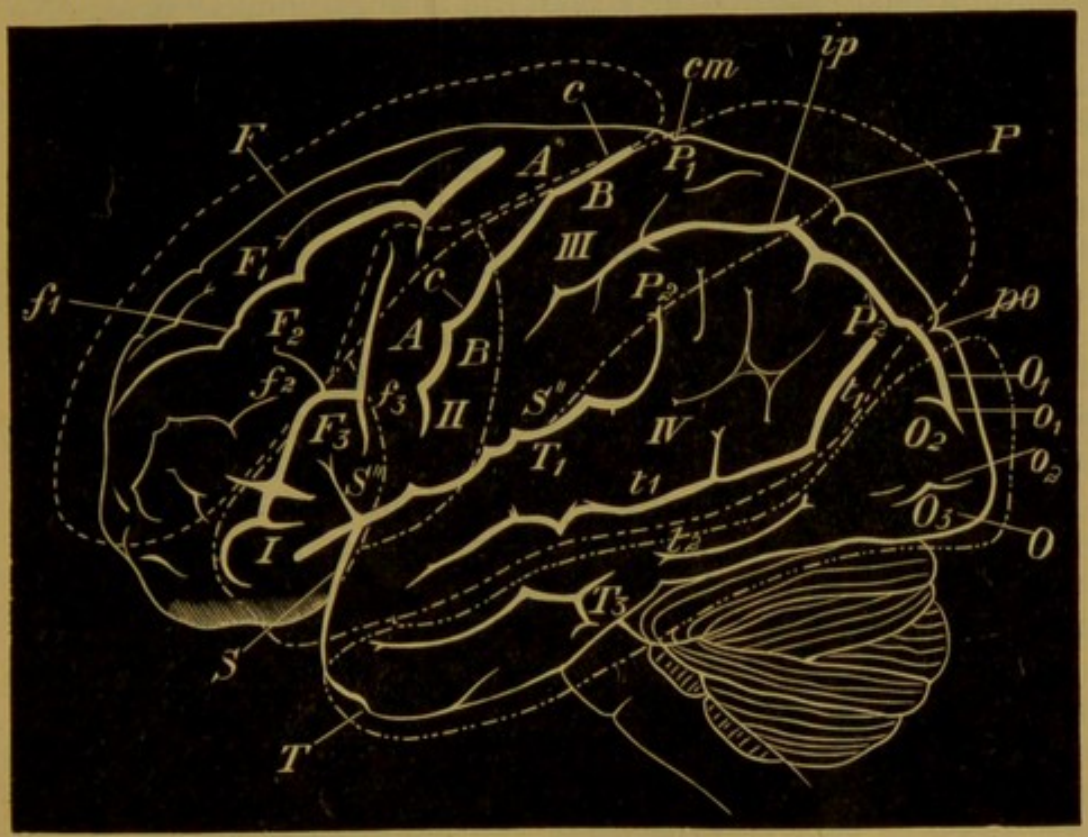


FIG. V. (from Ross after Seller and Duret).—Diagram of Outer Surface of the Left Hemisphere, showing Distribution of the Vessels.

The region bounded by the line (- - - - -) represents the territory over which the branches of the ANTERIOR CEREBRAL ARTERY are distributed.

The Anterior Regions, bounded by the line (— · — · — · —), represent the territories over which branches of the MIDDLE CEREBRAL ARTERY are distributed.

I. Is the region of the *External and Inferior Frontal Artery.*
II. ,, ,, ,, *Anterior Parietal Artery.*
III. ,, ,, ,, *Posterior Parietal Artery.*
IV. ,, ,, ,, *Parieto-Sphenoidal Artery.*

The posterior and inferior region bounded by the line (— · · — · · — · · —) represents the territory over which branches of the POSTERIOR CEREBRAL ARTERY are distributed.

pletely paralysed. The improvement in walking may, I think, be partly due to the patient's having gradually learned to make fuller use of those centres for the hip and shoulder muscles which remained unparalysed. I have already pointed out that only one part of the shoulder centre lies in front of the line prolonged from the præcentral sulcus in the bonnet-monkey, while another part lies behind it; and it is interesting to notice in this

case that the patient retained power only over the deltoid, the other muscles of the shoulder being paralysed.

If the inferences I have drawn from the facts of this case be correct, it would show that the arrangement of the cortical centres in man resembles that in the bonnet-monkey more than that in the orang-outang, and one must look for the centres for the hip and shoulder in the human brain farther forward than in the brain of the orang-outang.

We are usually accustomed to look on the orang-outang as resembling man more nearly than the bonnet-monkey does. No doubt this is the case as far as outward appearance, size, and absence of tail is concerned, but the intelligence of the orang is probably below that of the bonnet-monkey, and in this respect it is less like man than the smaller animal. The chimpanzee is perhaps more like man in all respects than either of the other animals, and experiments upon it may perhaps settle questions which at present must be left undetermined.

For the notes of the following case I am indebted to the clinical clerk, Mr. Horne, as well as to Dr. Fletcher, house-physician, and to Dr. Lewis Jones for the electrical examination.

History of present condition.—Elizabeth S., æt. 22, a married woman, was admitted to Faith Ward on 1st September 1891, under the care of Dr. Brunton, with dyspnœa and cough, suffering from morbus cordis, and paralysed in the right arm and leg.

Fourteen months ago patient went through her first confinement. The labour was easy and straightforward, excepting that she considers the loss of blood was excessive. No history of any previous uterine event, and none since; not even catamenia seen since. Two months after the confinement—that would be approximately one year previous to admission—when apparently enjoying good health, attending to her housework and managing a confectioner's business of a somewhat unprofitable kind, she suddenly became indistinct in her speech, and within twenty minutes speechless. The face was noticed by her friends to be drawn to the (right) side. She was able to walk upstairs, but on reaching her room, the right arm and leg were powerless. This all occurred within half-an-hour.

There has been at no time any loss of consciousness. Patient took to her bed, and remained there six weeks.

At the end of a fortnight the speech began to return, and within four weeks from the onset of paralysis the speech was as good as previous to losing it. Then the facial expressions became natural, at least the friends observed no want of symmetry. The arm and leg somewhat improved, but not usefully.

In the eighth week of this paralysis she attended at the Queen's Square Hospital as an out-patient for two weeks, and then as an in-patient for five months.

She does not consider that she improved materially, and "had pleurisy in left side" whilst at Queen's Square.

Since leaving Queen's Square she has been attending at St. Bartholomew's Hospital as an out-patient under the care of Dr. Brunton. Has been able to move about in her home by holding on to chairs and tables.

As long as she can remember, she has suffered from shortness of breath, but during the week previous to admission her breathing has become worse, and a cough has developed. There is no expectoration, but on awaking in the morning has noticed blood-stained mucus round the teeth and gums.

Five months ago the legs were first noticed to swell, and have remained about the same since. Last week the right hand became swollen.

At no time has there been incontinence of urine or fæces. On the ninth day after confinement she left her bed and went downstairs, and did some work. She suckled the child for two months, and was then advised by a doctor to wean it.

Past history.—Had rheumatic fever at the age of 15, and again at 16; never scarlet fever. Has suffered from pains in the head, referred to the frontal region, for many years past.

Family history.—Mother alive, aged 49. Suffers from shortness of breath. Father alive and well. Three brothers and three sisters all alive; none suffer from rheumatism nor rheumatic fever. No family history of fits.

Present condition.—Well-nourished woman, below the average build, of a bronzed complexion; dark hair and eyes, and dark ring round eyes; lips pale and anæmic; alæ nasi working slightly.

Eyes semi-circumcorneal zone. Pupil-reflexes present and natural.

Tongue moist, clean, red along edges and at tip.

Bowels open day of admission, and have been daily previously.

Pulse 72, weak, compressible, rather jerky, regular.

Respirations 40, and quiet. Temperature 98.6°.

Chest-movements equal; well covered; mammæ flaccid; skin bronzed. Vocal vibrations in front good on right, but less on left; behind impaired from level of seventh rib downwards.

Percussion note in front good, except at left apex; behind impaired from level of seventh rib downwards.

Breath-sounds harsh over left apex in front, and diminished; behind impaired over both bases; crepitations and moist sounds heard, especially over left base.

Heart.—No thrill. Apex-beat in fifth interspace, and within nipple-line.

Area of præcordial dulness extends half an inch to right of sternum and up to the third rib.

Sounds: at apex, loud systolic murmur and a faint diastolic. The systolic is conducted outwards, and heard in axilla and all over back; at second right intercostal space the murmurs are heard, the diastolic more loudly; this latter is propagated down the right side of sternum, and heard more loudly towards ensiform cartilage. The systolic can be traced upwards, and heard in cervical vessels.

Abdomen.—Wall flaccid, well marked with lineæ argenteæ; skin more deeply bronzed by contrast.

Liver dulness commences at fifth rib, and extends a hand's-breadth below costal arch, and here edge can be felt, but not sharply defined.

Spleen can be felt in left inguinal region; notch felt, and moves on respiration.

Legs.—Considerable œdema of both feet, and some of legs.

The right foot lies in a position of paralytic varus; on patient attempting to lift foot off the bed, the leg is raised from the hip and the foot is drawn inwards. Apparently the peronei, interossei, and extensors of toes on right side are paralysed. The thigh can be flexed and extended.

Patellar reflex diminished on left side; increased on right side, and accompanied by a clonic tremor. Ankle-clonus readily obtained on right side.

Arm.—Attempts made to move any part of the arm culminate in action of deltoid, which muscle alone is brought into use.

Hands.—Grasp good on left side. On right side fingers are flexed, and thumb flexed and turned into palm. Cannot be voluntarily extended, but patient can straighten them out with the left hand.

September 2.—Did not sleep well last night; no pain.

September 3.—Did not sleep much.

September 6.—Condition unchanged; sleeps badly.

September 11.—Bowels open after house physic; is sleeping now.

September 13.—Much pain in splenic region yesterday and last night; slept a little after bromide. Vomited several times yesterday evening and during night; looks much worse. Urine examined for blood, and none found. Blood examined, 3,500,000 red corpuscles; leucocytes 1 in 180.

September 14.—Temperature has risen to 102°. No change in heart murmurs. Slight venous pulsation in neck. Pain in spleen less. Looks rather better.

September 15.—Pain less; has not vomited since.

September 21.—Says she feels better, but looks more anæmic. Less pain. Spleen appears smaller. Bowels open three times after a pill; some blood in one stool. No change in heart.

September 22.—*Electrical examination.*.—Right scapular muscles—deltoid, biceps, and triceps—all react to faradism (increased current) and to galvanism—KCC > ACC. Flexors of hand and forearm react to faradism, but much impaired to galvanism—KCC > ACC; small muscles of hand react to faradism and to galvanism—KCC > ACC.

Right lower extremity.—All muscles of leg and thigh react to faradism and to galvanism—KCC > ACC, but increased currents necessary to produce contractions. Faradism of calf-muscles causes ankle-clonus.

September 25.—Has no pain; slept badly last night.

September 28.—Sleeps poorly; takes fairly. No change in heart. Temperature still irregular.

October 6.—During the past week the temperature has been raised and irregular. Looks more anæmic than on admission. Cardiac signs unchanged; pulse 99, and regular.

Lungs.—Both bases resonant on percussion; free entry of air; crepitations no longer heard.

Abdomen.—No change. Liver and spleen as before.

Catamenia not seen since admission.

Limbs.—Right arm: the rigidity of the fingers has increased, and more clawed. Right leg: shooting pains at times in leg and numbness in foot.

Has been taking badly, and vomited on taking food. Perspires at night. Bowels irregular.

October 13.—Patient expresses herself as not feeling so well as a week ago. Cough is more troublesome, but is now sleeping better. Does not take at all well. Feels low-spirited. Bowels open daily; taking conf. sennæ.

Urine, sp. gr. 1016; no albumen; heavy cloud and deposit (urates). Anæmia more marked. Pulse 110, regular; not so strong, and very jerky.

Heart-sounds.—Murmurs the same, but diastolic along sternum, musical. Over second left intercostal space sounds more accentuated. Venous pulsation in neck. Thrill (diastolic) occasionally felt at apex.

Lungs.—No change.

Liver, edge felt below level of umbilicus, tender. Spleen has receded above level of umbilicus.

Temperature continues irregular. Perspires more at night.

Limbs.—Right shoulder painful on pressure; nothing detected

in joint. In right leg ankle-clonus well marked. Knee-jerk increased. Œdema of both feet increased.

October 20.—Has not slept well during past week. Pulse poorer volume. Seems to be losing ground.

October 27.—Takes very badly. Cough very troublesome. Heart murmurs unchanged. Girth 37½ inches (increase ½ inch). Liver and spleen as before. Back resonant. Some crepitations and moist sounds at bases. Considerable lumbar œdema. Œdema of legs and feet more marked. Urine sp. gr. 1022; cloud of albumen; amount varies from 8 to 27 ounces. Hst. scoparii.

November 10.—Cough troublesome last night. Seems sallower to-day. Œdema increased in legs and lumbar region. Heart as before. Some impairment to percussion at both bases, with moist sounds. Girth 40½ inches (increase 1½ inch).

November 14.—Slept badly and coughed much; an extravasation (slight) of blood and blood pigment has appeared just above and to inner side of left ankle over an area of about 4 square inches. This is extremely tender.

November 15.—Patient died to-day.

November 16.—*Post-mortem examination.*—Permission to open the head could not be obtained.

External appearance.—Œdema of legs. Abdomen lax and wrinkled. Some jaundice.

Head.—Examination forbidden.

Spinal cord.—Right posterior-lateral region appeared rather smaller on section than left, but no grey discoloration to be seen with naked eye.

Chest.—Lungs: left nearly normal; right, little inflammatory lymph on surface; some excess of pleural fluid; middle part of lung pneumonic, lower part slightly collapsed. No infarction.

Heart.—Tricuspid valve slightly thickened? Mitral well-marked button-hole character, curtains thickened, a small mass of vegetations on auricular side. Endocardium of auricle itself roughened superficially at one point. Ventricular surface of large flap of mitral showed numerous masses of vegetations, one of them, which was hard and rough, was attached by a sort of peduncle to the base of a papillary muscle. The rest more sessile as to their attachment, rough and comparatively soft, extended up the mitral flap from its edge to the surface of one of the aortic cusps. Aortic cusps thickened, and from them spring similar vegetations, though in much smaller masses. Muscular tissue pale; some dilatation, but not extreme. Weight of heart 15 oz.

Pericardium contained clear fluid in excess.

Aorta and vessels.—At root of aorta was a small patch where the endothelium was rough and irregular.

Abdomen.—Some excess of fluid.

Stomach.—Normal.

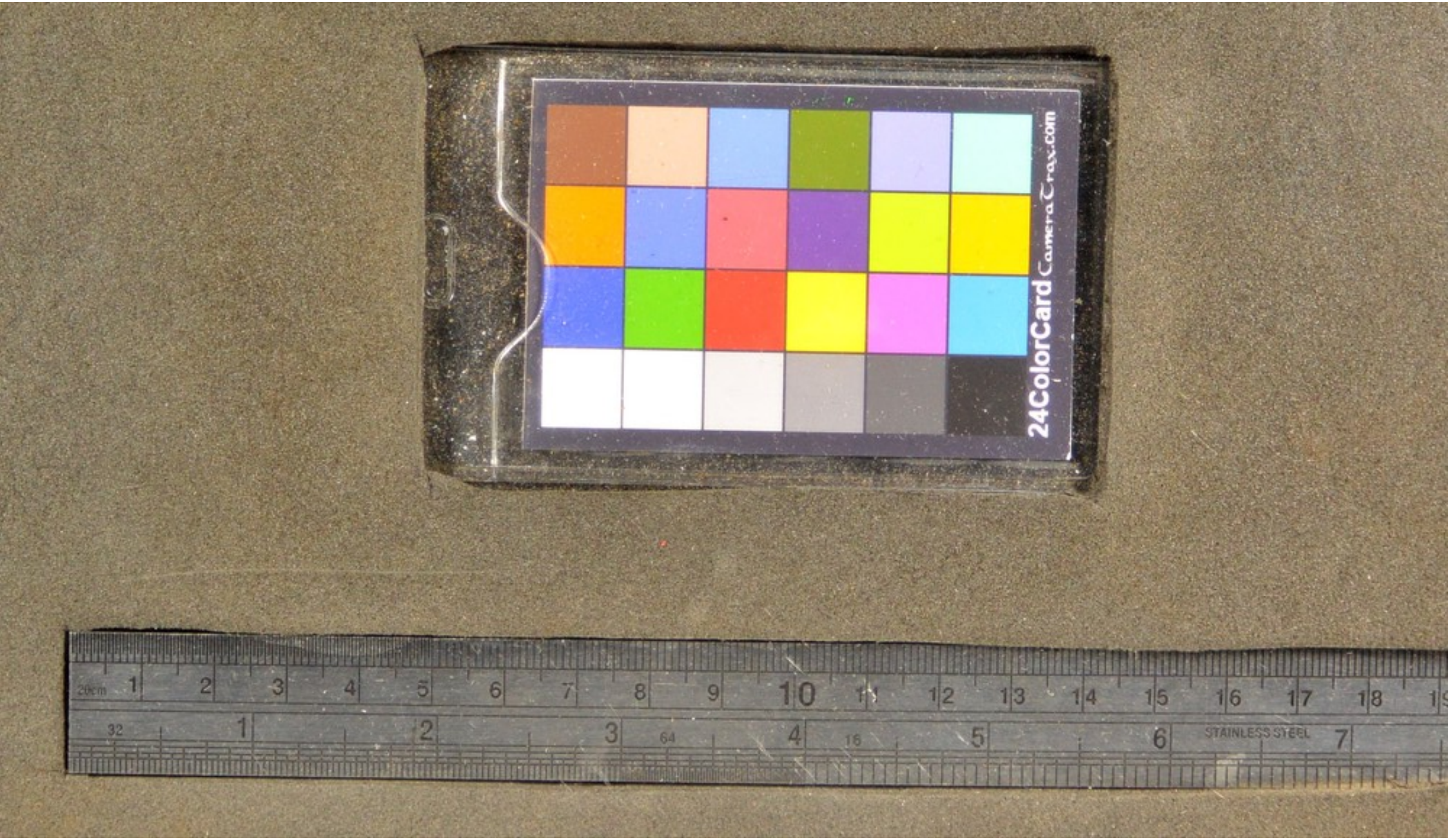
Liver.—Weight 127 oz. Much enlarged, and descending very low into abdomen. Surface and section typically nutmeggy.

Spleen.—Much enlarged; weight 27 oz.; soft on section. Two rather small infarcts—the one decolorised, the other not.

Kidneys.—Rather large. Numerous cysts of a considerable size; pale on section. Cortex in places narrower. Capsule separated easily. Surface mostly smooth, but in places granular.

Ovary.—Portion of left occupied by a cyst size of small egg, tensely filled with clear fluid and a small fibroid mass, apparently the remains of left ovary.[1]

[1] A portion of spinal cord has been set aside for microscopic examination, but (at time of writing these notes) is not ready for section cutting.—W. J. Horne.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