A CASE
OF
NEOPLASM CYST OF THE BRAIN
TREATED BY OPERATION

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R. W—, a boy *æt.* 11 years, was admitted into the National Hospital for the Paralysed and Epileptic, Queen Square, on October 6th, 1890, under Dr. Gowers.

History of present illness.—Ten months ago he fell off a high railing, and struck the back of his head. He is said to have been stunned for some little time, but in a few days appeared to be quite well again, except that he was more easily put out of temper. In April, 1890, he had his first fit. By the middle of June five fits had occurred, but there has not been one since. Each fit commenced with twitching of the angle of the mouth (on one occasion he was able to get home from two doors off before the fit developed any further); he then became

unconscious, and had a general epileptic attack. The friends principally noticed the convulsion in the left arm ; the eyes were turned strongly upwards ; the tongue was not bitten, neither did he pass water. The fits are said to have lasted twenty minutes. In June, 1890, when the fits ceased, some weakness of the right side of the face was noted, and, moreover, speech became affected ; the lower jaw was noticed to drop as if weak, and the mouth was not closed properly. Six weeks ago the right arm and leg became weak ; this weakness has gradually become more marked, and coincidently with this speech has improved, and the dropping of the lower jaw is less. For between two and three months there has been frontal headache and occasional vomiting, the latter symptom being more marked during the last few weeks.

Previous history.—Measles when quite young ; no other illness. Has always been thin and pale.

Family history.—Maternal grandfather died of phthisis ; no other fact of importance elicited.

Present condition.—A pale, weakly-looking boy, very thin. Head : no tender spot and no scar on scalp discovered. Head and trunk movements normal. Face : lower part of right side does not move as well as left. Slight difference in action of corrugators. Eyes shut equally. Weakness of right side marked in smiling or in showing teeth. Tongue protruded straight. Palate : right side does not move as well as left. Eyes : movements good ; no nystagmus ; pupils equal, and act normally to light and accommodation. Ophthalmic examination : right, some blurring of margins of disc, especially at inner side ; left disc swollen, edge invisible. There is considerable myopia. Speech : no appreciable defect. Arms : right colder than left, and of a bluish colour. Dynamometer : R. = 0, L. = 25. Much weakness of movements of right arm at shoulder, and complete loss of power of movement at elbow, wrist, fingers, and thumb-joints. No rigidity : muscles small and flabby. No

localised atrophy. *Left arm*, no loss of power. Wrist-jerk active, no marked difference on the two sides.

Lower extremities.—Movements of right hip- and knee-joints feeble. Movements of right ankle and toes absent. Right limb colder than left. Muscles flabby; no rigidity. Knee-jerks active; right more brisk than left, and with slight patellar clonus. No ankle-clonus. Plantar, cremasteric, and abdominal reflexes not elicited. Left lower limb normal. Gait: drags right leg much in walking. Sensation: no affection or disturbance of sensation. Micturition not affected; urine normal. Defæcation normal. Heart, lungs, and abdominal organs normal.

Electrical examination.—Muscles react normally to faradic and galvanic currents.

Aural examination.—R. M.T. opaque, retracted somewhat; cone of light interrupted. L. M.T. not so opaque, retracted anteriorly and below handle of malleus. (These signs point to old catarrhal mischief in both ears.) Bone conduction normal.

Progress.—October 13th, 1890.—Complains occasionally of attacks of sharp pain across frontal region. Vomited yesterday, the first time since admission. The vomiting was purposeless, but did not occur during an attack of pain.

28th.—Since last note many attacks of vomiting have taken place. Optic neuritis in both eyes more advanced.

November 7th.—Severe headache and vomiting. Optic neuritis more intense. The head was shaved and cleansed to-day; the position of the median line and left sulcus of Rolando marked on the scalp, and an antiseptic dressing applied.

8th. *Operation*.—Chloroform was administered. A Horsley's Ω -shaped flap (see Fig. 1) was cut and thrown downwards with the periosteum. After the bleeding was arrested the flap was wrapped in warm and wet antiseptic gauze. The trephine was then applied to the parietal bone over the lower part of the motor cortex, and a disc of bone one inch in diameter removed. The pin of the tre-

FIG. 1.

FIG. 1.—Sketch of operation done on November 8th, 1890. (Half natural size.) (Death occurred on September 28th, 1893.) The curved line shows the line of incision of the scalp.

t = site of trephine opening, through which a cavity in a subcortical malignant tumour was drained with complete relief from the following symptoms:—Headache, vomiting, Jacksonian fits, hemiplegia, optic neuritis, &c.

The dotted lines crossing the trephine opening show the position of sulci seen after reflection of the dura mater.

The dotted circle is placed on the spot on the bulging convolution, which was pierced in order to evacuate the fluid in the subcortical "cyst."

phine was placed over the sulcus of Rolando about three inches from the middle line measured along the guiding mark traced on the scalp. At this point a needle had been thrust through the scalp and pressed on the bone, and when the scalp was turned down the needle mark was easily found. The dura bulged greatly into the trephine opening, and was divided by a crucial incision. The cortex, then evidently under much tension, bulged through the opening. A large vein and sulcus were observed running downwards and forwards across the exposed cortex. The colour of the cortex was normal, and nothing abnormal was discovered on palpation. The needle of a large exploring syringe was thrust through the middle of the exposed cortex in a direction forwards and inwards, and was soon felt to enter a cavity. Some thin, clear straw-coloured fluid was drawn off. This was alkaline, and coagulated in the test-tube. After withdrawing the syringe the fluid continued to escape through the aperture in the cortex. The previously bulging cortex collapsed. The puncture was gently enlarged with forceps. The cavity was found to extend forwards under the cortex for about one inch; it had no true boundary or cyst-wall; it appeared to be surrounded by normal cerebral substance. The dura was then sutured in place by two or three fine silk threads. The bone was not replaced. The scalp flap was brought into position with many horsehair stitches, and a carbolic gauze and sal-alembroth wool dressing was applied.

9th.—General condition good. Dressing has had to be renewed every four hours. The fluid which soaks into the dressing is not blood-stained to-day.

10th.—Patient much better to-day. No sickness or headache. Face: still well-marked facial weakness on right side, of cerebral type, but not nearly so marked as before operation. Tongue protruded straight. Right arm: movements at shoulder and elbow fairly good; movement of wrist not so free as movements of shoulder and elbow. No movement of fingers or thumb. Right

leg : fair movement of all joints—hip, knee, ankle, and toes, but not so strong as on opposite side. Sensation : no sensory impairment noted on right side. Optic neuritis well marked in both eyes.

11th.—Dressing changed once. Arm moves more freely ; slight movement of flexion of fingers. Ophthalmoscopic examination (Dr. Gowers) : vessels are small ; a good deal more œdema than formerly, so that the whole appearance is paler, and discs are not so easily seen. *Right disc* : distinct sharp edge towards apparent temporal side, mottled ; arteries and veins singularly narrow. *Left disc* : swelling much greater ; edge of disc not visible, though its position can be dimly seen. Some small striated hæmorrhages upon its margin, and white spots on its surface. The difference in the intensity of the neuritis in the two eyes is very marked.

12th.—Movement of right hand and fingers more free. Feels very well. Appetite good. No headache or sickness.

13th.—Movement of right fingers more vigorous. Also movement of right thumb. Extension and flexion at right wrist and elbow strong. Slight perceptible weakness on right side of face. Tongue straight. Some fluid pent up under scalp, so three stitches were removed at posterior extremity of scalp wound, and the fluid was let out.

15th.—Considerable amount of discharge of pale yellow albuminous fluid into dressing. Gentle elastic pressure applied over scalp flap.

16th.—Rubber tube inserted under scalp at posterior angle of wound. General condition good. Face : very little sign of weakness of right side.

19th.—Eight stitches removed. Tube left out. Wound healed except at point corresponding to track of tube.

20th.—No escape of fluid into dressing. No bulging of scalp. Hemiplegia practically cleared up. Right hand can be used for writing and drawing (the boy draws well). Neuritis, though well marked, is less than it was.

30th.—Wound healed for some days. Yesterday had a feeling which he described as “like clockwork about the right eye.” No fit followed this sensation.

December 3rd.—Quite well till to-day, when he had a fit at 1.20. It commenced with a curious feeling about the right eye; no twitching observed. Right arm first affected (it is uncertain if the thumb moved first) with clonic spasm. The head and eyes turned to the right, consciousness was lost, urine passed. After the first movement of the right arm the head and eyes turned to the left, and the convulsion became general. No weakness observed after the fit. At 4.20 slight attack without loss of consciousness; nurse observed twitching of the cheek on the right side of the nose.

8th.—This morning patient felt as if he was going to have a fit. There was a sensation of twitching of the index and middle fingers of the right hand, and some twitching of the extensor tendons of those two fingers was observed. 1.30, another slight attack, with twitching of the right eyebrow and right index finger. 3.30, another attack; twitching of right index and middle fingers. No loss of consciousness in these attacks: the twitching lasted only a few moments. Optic neuritis distinctly less.

22nd.—Ophthalmoscopic examination (Dr. Gowers). *Right eye*: inner and upper margin clear; outer and lower slightly blurred; physiological cup well reproduced. *Left eye*: blurring above, below and on outer side; physiological cup small. Arteries and veins smaller than normal.

February 9th, 1891.—The hemiplegia has gradually returned, accompanied by marked bulging of the flap. There has been no further fit, and the loss of power has been relieved on two occasions by drawing off the fluid by means of a sterilised needle and syringe. It was decided therefore to operate again, with the view of establishing permanent drainage.

Operation.—An incision was made along the line of the old scar and the flap turned down as before, exposing a

cystic swelling with a thin membranous covering. The membrane was incised, when the swelling collapsed and a considerable quantity of albuminous straw-coloured clear fluid escaped, similar to that which was evacuated at the former operation. The subcortical cavity seemed larger, and to extend further forwards. A platinised silver tracheotomy tube was inserted with the concavity forwards through the cortex into the cyst, and brought out through a hole which had been made for it in the scalp flap. The scalp was sutured and dressed in the ordinary way.

13th.—After the operation there was a rapid recovery of power on the right side. Fluid draining through tube freely, requiring frequent dressing.

March 11th.—Progress has been uninterrupted. Wound quite healed except where tube passes through scalp. Very little discharge. No bulging of the scalp. Uses right arm well, walks well. General condition much improved. Optic neuritis almost gone. Drainage-tube is retained, as fluid dribbles out still.

20th.—Has been very well till this morning, when slight twitching of right index and middle fingers was noticed.

April 3rd.—Several similar attacks have been observed since last note. Ordered Potass. Bromid. bis die. Has been kept in bed during the last week. Very little drainage of fluid. Wound dressed every other day. No bulging of flap.

June 9th.—No fit since April 3rd. Patient otherwise remains in same condition. Movement of right arm, hand, and leg very good. No bulging of flap. Four days ago tube was removed.

July 4th, 1891.—Left the hospital; wound healed. Hemiplegia very slight but definite.

May 26th, 1892.—Patient readmitted on this date with an increase in the hemiplegic symptoms, and bulging through the trephine opening was an apparently fluid collection.

Notes on readmission.—The right hand and forearm

are practically useless ; he cannot extend the fingers, and can only slightly flex them. The wrist is dropped. Extension and flexion of elbow and all movements of right shoulder are very weak. All movements can be carried out with the joints of the right lower limb, but they are markedly weaker than those of the left limb. Speech slow ; words pronounced distinctly ; is occasionally at a loss for a word, but he never uses wrong words. No affection of sensation, but he complains of a subjective feeling of numbness in the right hand and arm. Slight right facial palsy, but no affection of any other cranial nerve. Fundi are healthy except for some myopic changes (Mr. Gunn). Right knee-jerk increased ; no ankle-clonus. Wrist- and elbow-jerks are increased on the right side. Gait : can walk well, dragging very slightly right foot.

June 17th.—Considerable improvement in hemiplegia. Movements of the right upper extremity markedly better, but extension of wrist and fingers cannot be performed.

July 6th.—Since admission no headache, vomiting, or fit. The power of the right arm has decidedly improved, and he can walk well. At 10 a.m. vomiting occurred ; no other symptoms. At 1.45 p.m. patient had a fit, after where there was no complaint of headache and no increase in the hemiplegia. The fit commenced with a gurgling sound in the throat, and then both sides were convulsed (the actual commencement was not seen but almost immediately after the cry he was seen to be convulsed on both sides). The head and eyes turned to the left. Left arm rigidly extended ; very slight convulsive movements. Right arm flexed at elbow, and rapid clonic movements in the fingers and hand seen. Both legs very rigid, but in right limb some distinct clonic movements were observed. The clonic movements only ceased in right arm after all the other limbs were relaxed. Duration twenty seconds.

9th.—Boy complained of a sensation as if the right arm was moving, but no movements were seen.

14th. *Operation.*—Chloroform was administered. The

old flap was turned down and dissected carefully from the cyst. The cyst was tapped, and about one ounce of clear straw-coloured liquid evacuated. Rubber drainage-tube inserted through an opening in the scalp. Scalp brought together by horsehair. Dressed with cyanide gauze.

15th.—No shock from the operation. Fluid draining freely into dressing.

24th.—Wound healed. Fluid has not been coming away well during the last few days. It clots in the tube and blocks it. Dressing changed daily and tube cleaned. On removal of tube some fluid escapes. Hemiplegia decidedly less ; patient comfortable ; no fits.

August 10th.—Had a fit to-day which commenced in the right hand, and then became of much the same character as the last.

20th.—Had about twenty fits. Ordered Potass. Bromid. After the fits much more weakness of the right side was noticed, the hemiplegia previously having practically cleared up.

September 30th.—Patient going on fairly well. Is taking Pot. Bromid., and has only occasional fits. The long silver tube is acting better than the india-rubber one, and drainage seems effectual ; the paralytic symptoms have cleared up.

October 30th.—No fits since last report. Still taking bromide. Some clear fluid coming from "cyst." There does not seem to be any tendency of the cyst to close.

November 30th.—Boy up and about all day. No fit. Up to this date has been dressed daily, but as discharge is less it has been determined to change the dressing less frequently.

December 15th.—Patient dressed once a week. Less discharge. No bulging of scalp. No tendency to close is evidenced by the cavity within the skull, for almost the whole length of an ordinary silver probe (curved) can be passed into a large cavity lying anterior to the original trephine opening.

23rd.—Silver tube shortened to-day.

January 4th, 1893.—Some bulging of flap since shorter tube put in. Two days ago long silver tube replaced and ten drachms of blood-stained clear fluid withdrawn. In the hope, still faintly entertained, that the disease might be a non-malignant cyst, it was determined to make a counter opening so as to obtain more perfect drainage.

Operation.—The scalp was carefully shaved and aseptised. A small $\cap$ -shaped flap was made so as to expose the skull about three inches in front of the original trephine opening, for a probe passed through the latter passed easily forwards for fully that distance. A disc of bone was removed at this spot, the dura opened, and the brain cortex, which appeared normal, was punctured until the cavity was reached in which the probe was passed from the other trephine opening. A drainage-tube was carried from one opening to the other. The scalp wound was closed by horsehair. Cyanide dressing as usual was employed.

10th.—Boy very well. Discharge into dressing free.

16th.—Boy had a fit this morning of the usual character, commencing in the right hand.

20th.—Boy very drowsy ; a good deal of bulging from both trephine openings.

22nd.—Temperature for the first time 99° F. Much headache. Two attacks of vomiting.

24th.—Still very drowsy ; more bulging of flaps ; this is evidently due to herniæ cerebri. Fomentations of cyanide gauze wrung out in hot 1 in 20 carbolic lotion applied every six hours.

28th.—More drowsy. More vomiting. Dressings as before. Herniæ larger.

30th.—Boy very drowsy. Herniæ increasing. The bulging has made it difficult to replace after cleaning the silver tubes which pass through the two trephine openings. There is now paralysis of the lower part of the right side of the face, also of the right wrist and fingers, though slight flexion of the fingers is possible : the wrist is in the typical "dropped" position. Flexion

and extension of right elbow feeble. Movements of right shoulder fairly good. Movements of right leg weaker than those of opposite side. Boy too drowsy to be carefully examined as to sensation. No optic neuritis. Complains of intense pain in the back of the head and neck, also of frontal and vertex headache. Dressings as before.

31st.—Patient nearly comatose and apparently dying.

Operation (9 p.m.).—Dr. Buxton gave chloroform. The scalp having been carefully shaved and cleansed, a large $\cap$ -shaped flap about five to six inches in diameter was thrown down so as to include in the bone exposed both trephine holes. The scalp was carefully peeled off from the masses protruding through the openings in the skull. It was soon apparent that the mass coming through the posterior or original trephine opening was a soft tumour, not brain tissue. A dura mater elevator having been passed from one trephine opening to the other, the bone between was removed, and an opening in the skull was obtained about $3\frac{1}{2}$ inches by 2 inches. The dura was now incised, and what appeared at first sight to be normal compressed cortex was exposed. The anterior hernia was now ligatured with silk and removed carefully. The posterior hernia was evidently a part of a tumour, and on beginning to separate it posteriorly from the cortex it was found that all the part exposed by the removal of bone between the trephine openings (which was previously taken to be compressed cortex, and which it exactly resembled in colour, and in apparently having convolutions and a pia with vessels—see Fig. 2) consisted of tumour substance, and that it could easily be separated from the brain beneath by the finger; this was accordingly done. The tumour removed is shown in Figs. 3 and 4. One piece of the tumour extended down on to the orbital plate of the frontal bone lying between the dura and what was apparently the third frontal convolution. This piece was very diffuent and difficult to manage with the fingers, so Dr. Head kindly boiled a silver egg-spoon, and with this instrument its removal was easily effected. On

removal of the tumour the external much-compressed surface of the cortex was seen to be fully one inch from the inner surface of the dura, so much had the intra-dural tumour pressed the brain towards the middle line. At one point on the cortex was a hole; this was just behind the sulcus of Rolando at the lower part, and was evidently

FIG. 2.—This drawing represents the tumour that was removed on January 31st, 1893. (Natural size.) Weight 3 oz. It was made the following day. The dark shading is intended to represent the cystic character of the growth. The tumour was placed between the dura mater and the cortex, and had forced the convolutions inwards. The original subcortical tumour fungated through the small opening in the cortex made by the silver drainage-tube, and in this way a large tumour arose between the dura and the brain.

The small drawing to the left shows a piece of the membrane (with vessels like those of the pia) which covered the tumour.

the opening which had been occupied by the silver tube for drainage. From it some fluid was observed to escape. The general oozing, which was rather free during the removal of the tumour, was easily controlled by gentle pressure made by mops of cotton wool wrung out in hot perchloride of mercury solution.

When it seemed that every particle of tumour had been removed the scalp was sutured with horsehair. The drainage openings in the scalp through which the

FIG. 3.

FIG. 4.

(Natural size.) Cystic tumour removed January 31st, 1893. These figures show the appearance of the tumour after hardening in spirit.

herniæ had protruded were freshened and left open. No tubes were inserted. The strictest antiseptic precautions were used throughout. Dressings of double cyanide

gauze wrung out in 1 in 40 carbolic lotion were applied, and covered with cyanide wool and perchloride wood-wool tissue.

February 1st.—Patient stood the operation well. No collapse. No vomiting. Cried a good deal. Temperature normal. Pulse 140. Well-marked paralysis of right arm to-day.

Report by Mr. Gunn.—Left disc paler than right. Edge well seen. Veins rather full. No other changes made out. Right disc redder than left. Slight want of definition, principally above. Veins full. No hæmorrhages or signs of gross neuritis.

2nd.—Dressing changed to-day. The brain has risen to the proper level as seen through the holes in the flap. Movements of right wrist and fingers absent except feeble flexion of fingers. Movements at right elbow and right shoulder very feeble. Paralysis lower part of right face.

4th.—General condition improved. A little pain at back of neck complained of. The dressing was changed. The flap was slightly bulging; this was relieved by introducing dressing forceps under the scalp; about 3ij of grumous-looking fluid escaped. All movements of right leg good.

6th.—Boy much better. Some bulging at posterior part of flap over site of original trephine opening.

14th.—A large hernia has appeared since last note at posterior opening. It was removed to-day during the dressing with the fingers and the handle of a knife. No pain or other sensation was complained of.

18th.—The hernia has not regrown. General condition good. Still a good deal of local bulging. Paralysis as before.

March 13th.—Hernia again large through posterior opening. General condition fairly satisfactory.

16th.—Hernia increasing. It was thought that there had been a regrowth of tumour between the dura and the cortex, and it was determined to again attempt its removal.

Operation.—The same flap was turned down as before, and as much as possible of the growth removed. It was, however, less easy to separate it from the cortex than on the previous occasion, and it was thought that a complete removal was not effected; moreover the hæmorrhage was so free, and the child became so collapsed, that the operation had to be completed hurriedly.

February 17th.—The boy rallied from the shock of the operation fairly quickly. Condition to-day satisfactory.

18th.—Head dressed. Slight bulging of flap. Pain in back of neck.

20th.—This morning boy cried for half an hour with severe pain in the back of the neck and on the vertex. The dressing then suddenly became soaked with fluid, and the pain was almost entirely relieved. At 11 a.m. the temperature rose to 102° F. At 6 p.m. he had a fit commencing in the left hand. It then became general, but was much more violent on the left than the right side. It lasted longer also on the left side. There was conjugate deviation of the eyes to the right. Loss of consciousness lasting over twenty-five minutes.

March 28th.—No further fits have occurred, and patient has quite recovered from the operation of February 16th. Some bulging of flap and a considerable hernia again at the old spot. The hernia was scarcely pulsating at all, so a pair of sinus forceps was passed through it and some fluid escaped. Pulsation then became more evident in the hernia, which was also not so prominent. After this the boy was drowsy, sleeping all the afternoon.

April 4th.—No bulging of flap. Hernia less prominent. Anterior opening in scalp (which corresponded to the anterior trephine opening) shows a tendency to close.

8th.—Anterior scalp opening nearly healed. No bulging of flap. Hernia on level with scalp. There has been gradual improvement in the paralysis of the arm; all movements can now be formed, but extension of the wrist is the feeblest. After the operation on January 31st

there was aphasia for several days, and for two months subsequently the words used were spoken very slowly and deliberately. Speech is now perfect, and the boy is bright and jolly, and about the ward all day.

14th.—Concavity now of flap. Anterior opening healed. Posterior opening, which was the site of hernia, nearly healed. Boy quite himself again.

May 28th.—Patient has been going on well. Flap concave, scalp quite healed (see Fig. 5). It is noteworthy that since the operation on January 31st a moral change has taken place. During the five months preceding the operation the child was detected on many

FIG. 5.

From a photograph. Appearance of patient in May, 1893. Scalp flap concave.

occasions stealing from other patients in the ward with much cunning. Since the operation this moral deterioration seems to have quite disappeared.

June 23rd.—Patient discharged feeling quite well. There is still slight weakness of the movements of the lower half of the face, and of the joints of the arm and

leg (slight right hemiplegia). This does not interfere with his getting about very well, and with an apparent attainment of almost complete recovery. The flap is concave, and the hair has grown long over it.

Readmitted September 18th, 1893. The boy had been quite well up to about three weeks ago, when the father noticed that the scalp over the aperture in the skull, which had up till then remained concave, began to be convex and to bulge.

There were no other symptoms, no pain, no vomiting. He would, however, frequently cry out in his sleep and talk in his sleep a great deal, which he previously had not been accustomed to do.

One evening ten days ago he became very drowsy and emotional, and said he was going to have a fit. He did not have a fit, nor has he had any up to the time of his admission.

The scalp flap, however, gradually bulged more and more; the slight weakness to the right side, however, did not appear to increase.

Condition on admission.—General condition fair. Complexion decidedly anæmic. *Nervous system.*—Mental condition dull. No delusions or hallucinations. Sleeps fairly well. No headache. *Motion: arm.*—All movements of left arm and leg good. Movements of right shoulder and elbow good, but weaker than on left side: complete wrist-drop. Flexion of fingers fairly good. No power of extension. Little or no rigidity of arm. No wasting. *Leg.*—Movements of the right hip and knee are fairly good. Movements of the right ankle and right toes are practically lost. No wasting or rigidity. *Sensation.*—There is marked impairment of the sense of touch over the whole of the right side of the body. This is most marked on the right arm. Localisation of tactile sensations on right side is most inaccurate. Painful sensations on the right side are not appreciated as they are on the left. *Reflexes.*—Right knee-jerk + . Ankle-clonus right side. Right plantar brisker than left.

Abdominal present. *Cranial nerves*.—Marked paralysis of lower half of right side of face. No affection of any other nerve. Tongue comes out straight. Speech slow.

Ophthalmoscopic examination.—Discs and fundi in same condition as last note. No optic neuritis.

There is great bulging of the scalp over the opening in the skull (see Fig. 6). The bulging mass fluctuates and pulsates. The scars of the old operation wounds are healthy, but look red and more vascular than usual. In the scalp, over and around the tumour, numerous veins are visible.

FIG. 6.

From a photograph. Appearance of patient in September, 1893.
Scalp flap bulging.

It was thought that a tumour had again grown between the dura and cortex, and it was determined that an attempt should be made to remove it.

September 28th.—*Operation*.—Chloroform was administered at 9 a.m. The old scar was incised and the flap turned down in the usual way. There was free hæmorrhage from the scalp, and the bone bled very freely.

The bone was noticed to be of a pink colour, and on it minute pink lines indicating the course of vessels could on close inspection be observed. The bulging mass was found to be part of a large tumour, and it was then determined to enlarge the opening in the skull, and try if possible to remove it. On commencing to remove the bone with cutting forceps the bleeding which ensued was persistent and uncontrollable; the bone surface literally wept blood, and the operation was promptly abandoned. Nevertheless the hæmorrhage had evidently had a considerable effect on the patient, and he suffered much from shock. The scalp flap was stitched rapidly with horsehair in place, the dressing applied, and warmth and restoratives used. The temperature was 95° F., and the pulse 140. The boy, however, did not rally; he was exceedingly restless, and towards evening the respiration became sighing, and the pulse at the wrist could only just be felt. Temperature 96° F., pulse 144. At 9 p.m., the condition remaining the same, it was determined to infuse him with warm normal saline solution. This was done, but without effect, and death took place at 10 p.m.

(N.B.—During nearly the whole period of the illness the temperature of the right or paralysed side was slightly higher than the temperature of the left. For some three or four months after the first operation the reverse was [speaking generally] the case. After the first operation, when pressure was relieved the pulse was not slow. It was seldom more or less than eighty beats per minute.)

Post-mortem examination by Dr. Colman (September 29th, 1893).—Body fairly nourished. Recent operation wound on left side of head. The tumour which had been so prominent during life (see Fig. 7) had now sunk, and was level with the surface. The skull-cap has a large aperture on the left side, which has been recently enlarged; it came away easily from the dura mater.

The dura mater was not adherent to the convolutions

except close to the site of the tumour. The tumour was partly superficial and partly subcortical, as shown in Figs. 8 and 9. Where it was subcortical the convolutions were broadened out and pale. Where it involved the surface the outline was uneven, and its substance was very soft to the touch.

FIG. 7.

View of brain at autopsy. (Half natural size.)

Dotted line shows roughly extent of subcortical tumour. Within the dotted line the white surface shows the flattened convolutions; the grey shading represents adherent dura mater.

R = sulcus of Rolando.

a, b, shows line of section represented in Fig. 9.

c, d, shows line of section represented in Fig. 8.

On separating the hemispheres a cyst or cavity in the tumour was found bulging into the lateral ventricles (see Fig. 9), its wall being formed merely by thickened ependyma. There was no communication with the ventricle. On cutting into the cyst a thin brownish fluid escaped. The "cyst" was found to correspond pretty well with the tumour on the surface of the brain, and was bounded by a soft sarcomatous mass, which was thickest at the posterior part of the cyst. The tumour and "cyst"

appeared to involve all the white matter of the centrum ovale as far down as the basal ganglia.

Longitudinal section at *c, d*, in Fig. 7. (Half natural size.)
 Shaded area = tumour.
 Black centre = cavity in tumour.

Transverse vertical section at *a, b* in Fig. 7. (Half natural size.)
 Shaded area = tumour.
 Black centre = cavity in tumour which does not communicate with lateral ventricle.
a = cortex destroyed by tumour.
b = cortex compressed by tumour.
c = adherent dura mater.
 This drawing shows the destruction of the corona radiata by the tumour.

The rest of the brain was quite natural.

Spinal cord.—No naked-eye change in fresh condition.

Microscopical examination.—Sections showed degeneration of the crossed pyramidal tract on the right side, and to a slight extent on the left. The direct pyramidal tracts were not affected at all.

No new growth was found in any of the body organs, which were quite healthy.

The tumour was an angiosarcoma. In places it was almost entirely cellular, in others almost completely vascular, and in other places there were vessels of considerable size, with thin walls separated by sarcomatous tissue.

REMARKS.

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1. ABSTRACT OF THE NOTES.

The story of the case may be briefly summed up as follows :—In December, 1889, the boy was stunned by a blow on the head, and between this date and his admission into the hospital, in October, 1890, he suffered successively from the following symptoms :

1. Irritable temper.
2. Fits commencing with twitching of the right angle

of the mouth, and followed by paralysis of the lower part of the right side of the face.

3. The gradual extension of the paralysis to the right upper and lower extremities.

4. Slow speech.

5. Severe frontal headache.

6. Purposeless vomiting.

7. On admission double optic neuritis was observed.

The symptoms increasing in severity after a month's residence in the hospital, the lower part of the left motor cortex was exposed by operation (November, 1890), and a subcortical "cyst" tapped, the result being that the symptoms practically disappeared.

Two months later (February, 1891) the symptoms are noted to have gradually returned, hence a tube was passed into the "cyst" in order to effect permanent drainage. In June, 1891, the tube was removed, and the following month the boy left the hospital apparently quite well, except for a very slight right hemiplegia.

In May, 1892, he was readmitted with marked right hemiplegia, and in July a drainage-tube was again passed into the "cyst," but without causing the same complete relief from symptoms as on the previous occasion.

The boy remained in hospital during the succeeding six months, his condition varying much, and being better or worse according as the intra-cranial "cyst" drained freely or not through the drainage-tube.

In January, 1893, the state of the patient became more critical, and at an operation which was then performed a tumour three ounces in weight was removed from between the dura and the motor cortex of the left cerebral hemisphere.

In June, 1893, the child left the hospital with the scalp flap healed and concave, and in fair general health. There was still slight right hemiplegia.

In September, 1893, he was again readmitted with a recurrence of the symptoms, and with the scalp flap bulg-

ing. An operation was attempted, but death occurred from uncontrollable bleeding from the bone.

There are many points of interest in the diagnosis, symptoms, pathology, and treatment of this case, to which reference may be made.

2. DIAGNOSIS.

The history of the case clearly pointed to a diagnosis of brain tumour; and the symptoms showed that the tumour occupied a definite position, and involved the cortex or corona radiata immediately beneath the cortex.

It was hoped at first, notwithstanding the extreme rarity of subcortical traumatic cysts, that the "cyst" might be hæmorrhagic in origin, but the gradual progress of the case in the direction away from recovery, and, indeed, the absence of cyst-wall and the nature of the fluid (really plasma) removed, negated the hopeful view, and made for the diagnosis of malignant growth. The notes say when the boy was first admitted to the hospital that "there is no affection or derangement of sensation," but this statement is not so satisfactory as a positive assertion that "there is no defect in the localisation of tactile sensations, and no loss of muscular sense on the paralysed side." I do not remember whether this was so or not, but seeing that the cortex was involved (by pressure at least) it is not improbable that these signs were present. The absence of marked sensory disturbance on the paralysed side would suggest that a tumour occupying the corona radiata was nearer the cortex than the internal capsule.

3. BRAIN TUMOUR AND TRAUMA.

A history of injury to the head may sometimes be obtained in cases of tumour of the brain. In one case of glioma of the occipital lobe on which I operated, a healed fracture of the skull three inches long was exposed on

turning down the scalp flap, and this fracture was over the site of the tumour. There was no scar on the scalp, and no history of injury had been given by the patient or his friends.¹

4. INTERMISSION OF SYMPTOMS.

This occurrence is by no means uncommon in the early stages of brain tumour. In this case in June, 1890, there was weakness of the right side of the face with jaw-drop and slow speech. In July, 1890, weakness of the right arm and leg became a marked sign, and coincidently there was a return to normal in the power of speech, and recovery from jaw-drop.

5. TWITCHING OF THE INDEX FINGER.

A movement of the index finger, alone or in conjunction with a movement of the thumb, can be produced by stimulation of the cortex both in *Macacus rhesus* and *Macacus sinicus*. During the autumn of 1890 the boy had movement of the index finger at the commencement of a fit, so that it is clearly true to affirm that there is an area on the human motor cortex (as in monkeys)², where the movement of the index is more highly represented than any other movement. "Jaw-drop" (depression of the lower jaw) can also easily be elicited by cortical stimulation in monkeys.

¹ In Dr. Hadden's case (referred to later on in a note) there was a history of trauma; in Dudley's case ('Brain,' vol. xi) a cerebral tumour was apparently the direct result of a cranial injury.

² "Experimental Observations of the Brain of the Monkey," Hadden and Ballance, 'St. Thomas's Hospital Reports,' vol. xix. See also the classical papers by Bevor and Horsley, "A Further Minute Analysis of the Motor Region of the Cortex Cerebri of the Monkey," 'Phil. Trans.,' 1888, vol. clxxxix, p. 232, "Centre," 85; "Analysis of the Motor Cortex of the Orang-outang," 'Phil. Trans.,' 1890, vol. clxxxi (2), p. 140. These experimenters locate the "centre" for the movements of the index immediately above the area on the ascending parietal gyrus where the movements of the thumb are most highly represented.

6. MORAL DEGRADATION.

Previous to the removal of the large intra-dural tumour the patient became addicted to stealing in a most artful and cunning manner. Dr. Jackson,¹ in the discussion on "imperative ideas," said, "The degree of mental degradation will, I think, be helpful in gauging the patient's condition, especially with regard to the degree of raised intra-cranial pressure from the tumour." It may be stated that in this case, with an opening in the skull and dura, the general intra-cranial pressure could not have been much raised. Would it have been right, then, to diagnose considerable local pressure (which was actually present) from the signs of moral degradation?

7. SURFACE OF TUMOUR MISTAKEN FOR SURFACE OF CORTEX.

The tumour removed at the operation in January, 1893, when first it came into view, was mistaken by all those present for bulging cortex. The cystic character of the growth gave the false appearance of sulci and convolutions, and its covering of a delicate membrane with vessels, indistinguishable from pia mater, aided in making the distinction between tumour surface and cortical surface impossible until a large opening had been made in the skull. Possibly some of this vascular enclosing membrane was pia, which had been pushed away from the cortex as the fungating tumour grew out through the hole made by the drainage-tube. At the autopsy, nine months after this operation, no sign of tumour growth was found between the dura and the cortex, so that the tumour would seem to have been completely removed.

8. ENORMOUS EXTENT OF TUMOUR;² SYMPTOMS SLIGHT.

The tumour probably commenced in the frontal lobe and grew very gradually backwards, pushing before it the

¹ 'Brain,' part lxx, p. 321.

² Sometimes very large tumours only produce symptoms shortly before

pyramidal fibres of the corona radiata (see position of sulcus of Rolando in Fig. 7). The slow growth of the tumour, the large opening in the skull, and the possible vicarious employment of the other hemisphere are points which offer a possible explanation. The idea that drainage of such a malignant cyst will retard or arrest its growth is probably founded on an erroneous conception of the pathology of malignant tumours.

9. CRANIO-CEREBRAL TOPOGRAPHY.

Only a disc of bone was removed at the first operation, and the place to apply the trephine was previously determined on by marking the scalp by means of one of the many methods of cranio-cerebral topography. In certain cases the methods which depend on scalp markings are no doubt useful. It is to be remembered that these markings are lost as soon as the scalp flap is made. The operator should rely, then, not on scalp markings, but on the known relations of the sutures of the skull to the fissures and convolutions of the brain.

10. PLATINISED SILVER TUBES.

The use of platinised silver tubes for drainage has certain distinct advantages. I learnt their use from my friend Mr. R. H. Clarke, who employed them in the treatment of roaring in horses. Whereas silver tubes become thin by erosion and discoloured, tubes coated with platinum keep their polish and colour, and are indeed quite unaffected by contact with living tissues and

death, *e.g.* the case referred to on page 24 of Gowers' 'Clinical Lectures' became suddenly ill six weeks before death; the brain is in the museum of the National Hospital. A still more remarkable case was published by my friend and colleague, the late Dr. Hadden, in 'Brain,' vol. xi, p. 523. The fatal illness of the patient commenced thirty-six hours before death. He had suffered previously from occasional epileptic seizures. At the autopsy an enormous tumour was found in the right frontal region of the brain.

fluids. Conversely, platinised tubes cause no irritation of the tissues in contact with them. The difference between platinum and silver in this respect can only be appreciated by those who have observed the behaviour of both metals.

11. HÆMORRHAGE FROM BONE.

The patient died in consequence of hæmorrhage from bone at the last operation. It is quite possible that he would have lived some time longer if I had been content merely to pass a trocar through the scalp and withdraw the fluid from the cavity in the tumour. It is important to avoid the tendency of attempting too much. The local condition had much altered since the boy had been in the hospital some months previously. The scalp over the opening in the skull was pierced by new and large veins, and in exposing the bone it was discovered to be of a distinct pink colour for at least one inch all round from the margin of the opening. This vascularity cannot be explained by an appeal to the changes which occur in the healing process, and I believe it was due to an infection of the cut edges of the bone by the intra-dural malignant tumour removed at the operation nine months before. The tumour itself showed on microscopical examination in some places nothing but a network of vessels. Antiseptic wax was useless, and the Liq. Ferri Perchlor. fort. was scarcely more effectual.

12. WAS THE PROPER SURGICAL TREATMENT ADOPTED?

Perhaps the most remarkable fact discovered at the autopsy was that the tumour was discontinuous with the brain substance, and this was still more marked after the brain had been hardened. The question naturally arose, was the treatment by drainage the proper one to adopt when the case was first seen, or could the tumour have been shelled out and removed? At first I was inclined to blame myself for not attempting the radical operation,

but there are several considerations which now seem to support the view that the right treatment was adopted.

1. At the operation the interior of the "cyst" did not show any indication of a cyst-wall; indeed, the interior looked exactly like healthy brain substance, and the cortical surface when collapsed looked normal, and showed no line of junction between healthy and diseased tissue.

2. It is probable that what appears so plain and easy to carry out on the dead and hardened brain may elude surgical observation on the living brain.

3. This year I have operated on a very similar case, and bearing in mind my previous experience I made a strenuous endeavour to discover the presence of tumour tissue surrounding the "cyst," but utterly failed to do so.

4. Any operation undertaken for the removal of the tumour might very possibly have caused permanent aphasia,—a disaster which, in my opinion, should negative in such cases any operation designed to do more than relieve symptoms.

13. SURGERY AND TUMOUR OF THE BRAIN.

The last question is, What did surgery do for the patient? The reply is satisfactory. Life was prolonged for the most part in a happy condition for three years. The sure advent of blindness from the optic neuritis was prevented; and the symptoms—headache, vomiting, fits, palsy, aphasia, and mental and moral degradation—were either completely obviated or markedly mitigated.

(For report of the discussion on this paper, see 'Proceedings of the Royal Medical and Chirurgical Society,' New Series, vol. viii, p. 160.)