

# A CASE OF CEREBRAL AND CEREBELLAR TUMOURS WITH WELL-DEFINED TRACT DEGENERATIONS.

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A. B., aged 6 years, was admitted into University College Hospital on April 19, 1900, under Mr. Horsley.

(a) *History on admission.*—The patient was sent by Dr. Wohrnitz with the following history:—

On March 17, five weeks previous, the boy fell out of a mail-cart on to the raised edge of a stone from which some railings sprung, *i.e.*, a sort of kerb stone, striking the occipital region. The child cried and a swelling formed on the back of the head as a result of the contusion. Nothing was noticed till the following Sunday, March 19, when the patient became sick and “rigid as if in a fit.” He was thereupon sick on and off until admission.

On Easter Monday, April 16, the patient seemed to have a fit, a right-sided paralytic stroke affecting the entire right side, arm and leg. This passed off.

A fortnight ago, *i.e.*, about April 5, the child commenced to lose sight in both eyes and for the last week he was completely blind in both eyes: prior to the accident he had been able to see quite normally. There was no difficulty in swallowing, &c.

When he had been sitting quietly for a few minutes the mother noticed his eyes to be in a condition of marked convergent strabismus.

*Present state.*—The patient is a well-nourished child in rather a stuporous condition. When he sits or stands the head is held in an oblique direction so that the face is directed towards the left front, the right ear being slightly approximated to the right shoulder.

He stands steadily, but walks with the legs separated and with a cerebellar gait.

*Head.*—Both a subjective sensation of pain and local tenderness exist in the occipital region. The head appears rather large.

*Cranial nerves.*—(I.) Not tested. (II.) Double optic neuritis. Rather more marked (observation by Mr. Percy Flemming) on the right side than the left. There were no hæmorrhages, but on both sides numerous brilliant white spots. (III., IV., and VI.) (1) Extra ocular movements. Though there was no true nystagmus both eyes tended to swing towards the left. (2) Intraocular movements. At rest the pupils were equal and dilated. They varied from time to time, but the contraction was feebly marked. Remaining cranial nerves normal.

All movements of the limbs and trunk could be performed though feebly.

*Reflexes.*—*Superficial.*—There was strong plantar flexion of the great toe. *Deep.*—Knee-jerks: right very feeble, left present. Examined on another occasion by Dr. Risien Russell they were found to be about equally active. Triceps-jerks present and equal.

It was decided to open the dura mater over the cerebellum, but when this was done the brain bulged greatly and severe hæmorrhage occurred from a vein at its entrance into the torcula Herophili.

This was ultimately arrested and the wound closed, but the child died subsequently from shock.

At the autopsy the following tubercular lesions were found:—

*Seat of tumours.*—(1) In the upper third of the left parietal lobe there was a tumour extending from the plane of the end of the lateral ventricle in front to the plane of commencement of the three zones of the globus pallidus posteriorly.

(2) There was a much smaller tumour extending from the splenium to the hinder end of the parietal tumour.

(3) In the superior temporal convolution at its hinder end and occupying its breadth was a small tumour about 1 cm. in diameter.

(4) In the ventral half of the left lateral lobe of the cerebellum was a large tumour.

A large series of microscopic sections was made through the cerebral hemispheres and neural axis, stained by the

Marchi method. The results obtained were so definite as to afford a contribution towards the correct topographical delimitation of certain tracts.

*Sub-cortical fibre systems.*—The corona radiata of the parietal lobe of the left hemisphere showed wide-spread degeneration of fine collateral fibres and immediately under the cortex degenerated collaterals were given off, which ran horizontally and others which ran from one gyrus to the other, running around and beneath the sulcus. Deeper down in the corona radiata strong collaterals were seen coming off from the pyramidal axones which could be traced to the corpus callosum.

*Corpus callosum.*—In the frontal region the corpus callosum showed no signs of degeneration. At the level of the middle of the third ventricle the corpus callosum showed degeneration in two groups—a dorsal layer in which the fibres were mixed, *i.e.*, both coarse and fine, and a ventral layer in which the fibres were all coarse. The fine degeneration barely extended to the vertical plane of the opposite cingulum—the coarse fibres however passed on through the corona radiata and were distributed to the cortex of the opposite parietal lobe. No fibres were seen to turn downwards and the general horizontal level maintained by the callosal fibres was that of the fasciculus subcallosus.

*The fasciculus subcallosus* was not degenerated in the right hemisphere but was extensively so in the left and fibres (? collaterals only) appear to pass from it into the optic thalamus for a short distance.

*Temporo-thalamic fibres.*—Entering the left thalamus on its outer side were numerous bundles of temporo-thalamic fibres which crossed the descending pyramidal fibres and which were of a much finer calibre. These fibres penetrated the optic thalamus for two-thirds of its width and there broke up first internal to the lamina medullaris interna. They traversed the corona radiata dorsally to the islands of gray matter of the posterior part of the lenticular nucleus running downwards and occupying most of the internal capsule till they approached the coarse pyramidal fibres from which they were sharply distinguished.

*Habenular ganglion.*—There was a fine degeneration in this ganglion and in the tænia thalami. Though there was no degeneration in the crura of the fornix there was a similar fine degeneration in the capsule of the corpora albicantia. These areas of ventricular degeneration are to be attributed to the intraventricular pressure common in such cases and marked in the present instance.

*Pyramidal tracts.*—Numerous degenerated fibres of a coarse calibre descended on the left side from the parietal cortex, *i.e.*, the lower limb area. These fibres passing down in the corona radiata and opposite the middle of the optic thalamus occupied a more ventral position in the corona radiata. The fibres, from the marginal aspect, partly crossed in the corona radiata those coming from the dorsum of the hemisphere. At the level of the posterior commissure the degenerated fibres occupied the following positions in the crusta; thus of the whole crusta in this region there remained free from degeneration the outer one-seventh and the inner three-sevenths, and in the more mesial portion of the crusta the degenerated fibres are almost wholly confined to the ventral border.

A few scattered degenerated fibres could be seen in the substantia nigra.

In the pons it was seen that certain pyramidal bundles were wholly free from degeneration, *viz.*, the most ventral and external bundle and the most mesial bundles. The mesially placed bundles in the pons rapidly decrease in size—the diminution being probably due to giving off of fronto-pontine (Flechsig), or perhaps more correctly thalamo-pontine, fibres—such pontine fibres being quite free from degeneration.

The degeneration is then traceable through the medulla to the decussation where the majority of fibres cross to the crossed pyramidal area of the right side and a few are continued down in the anterior direct pyramidal area of right side.

*Fillet.*—In these sections there is also to be seen some degeneration in the fillet on both sides. The degeneration is first seen in the middle region of the pons and can be

traced as far as the corpora quadrigemina inferior in which the fibres become lost. In the lowest part the degeneration is most marked in the outer part of the median fillet and when the fillet is completely differentiated the degeneration is seen to be most marked in the lateral fillet.

“*Accessory fillet.*”—This is well marked in this case as a few coarse scattered fibres arising from the outer part of the pyramidal bundles, crossing the band of gray matter which separates these from the fillet and entering the latter in the outer part of the mesial fillet, *i.e.*, in the lateral angle that the mesial and lateral fillet make with each other.

*Optic tracts.*—Both of the optic tracts show marked degeneration, and as they pass backwards no fibres are given off to the crusta or pass from that round to the corpus subthalamicum (Luisii). The majority of tract fibres pass into the corpus geniculatum externum, but the most posterior and inner enter the optic thalamus and pass inwards in two sets, ventral and dorsal.

*Posterior commissure.*—There is heavy degeneration in both divisions of the posterior commissure.

*Posterior longitudinal bundle.*—This was degenerated on both sides. The degeneration could be traced upwards as far as the plane of the middle of the red nucleus. The fibres of the posterior bundle show distinct decussation near the origin of the third nerve.

*Spinal cord.*—In the spinal cord there is no degeneration at all in the region of the so-called cerebellar tract. The region of the antero-lateral descending cerebellar tract is quite free from degeneration. The only degeneration seen in the cord in addition to the pyramidal is a marked coarse degeneration in both columns of Burdach. This degeneration can be traced upwards as far as the sensory nuclei of the medulla, beyond which it cannot be traced. The nuclei themselves appear to be quite normal. This degeneration may possibly be due to meningitic changes, but on this point of posterior column degeneration occurring in association with encephalic tumour, reference should be made to the valuable paper by Collier and Batten, *BRAIN*, 1900, p. 39. In the medulla degeneration is more marked on the left than

right side. No degenerated fibres can be seen to run from the olivary nuclei to the opposite side to enter the restiform body, and similarly none can be traced from the sensory nuclei of medulla crossing to opposite side, but the medulla itself is grossly distorted by the growth in the left cerebellar lobe, there are some degenerated fibres among the right superficial arcuate fibres.

There was no degeneration in Deiters's nucleus on either side nor was there any degeneration in relation with it. Rollers' bundle presented no degeneration.

*Cerebellum.*—There was partial degeneration of the superficial pontine fibres leaving the cerebellum. In the cerebellum there was heavy degeneration in both flocculi, the uvula and inferior vermis as well as the fleece fibres around the dentate nuclei of the cerebellum. The degeneration was principally on the left side. There was degeneration about the roof nuclei and on the left side the degenerated fibres formed a distinct bundle running beneath the ependyma. The ventral commissure was also degenerated. The degeneration of fibres around the right dentate nucleus occurred in the form of a funnel shaped area originating (1) outside the nucleus; (2) from hilum. Both superior cerebellar peduncles were degenerated but especially on the left side. The degenerated fibres could be traced to the middle of the red nucleus. In the left red nucleus the degeneration was speedily lost, and higher up no degeneration could be made out in Forel's area.

On the right side the degenerated fibres soon became lost in the red nucleus, but a fine degeneration could be traced passing the inner aspect of the red nucleus into Forel's area. The degeneration in this case passed to the inner side of Vic d'Azyr's bundle and was lost in the thalamus. The red nucleus on either side is quite normal in size and extent.

It appears justifiable to draw the following conclusions from this case :—

(1) *With destructive lesions of the cortex of the Rolandic area.*—(a) The association fibres of the homolateral hemisphere undergo extensive degeneration. (b) The fibres of the corpus callosum connecting the two areas are of medium

size and do not turn down into the capsule of the opposite hemisphere. (c) The pyramidal fibres give off collaterals in their course through the corona radiata. (d) The fibres from the upper third of the Rolandic area run through about the junction of the middle and posterior thirds of the hinder limb of the internal capsule and for the most part in the outer side of the crusta of the peduncle, and maintain their relative position in passing through the pons.

(2) No fibres are given off by the optic tract to the infundibular region or to the corpus Luysii, in fact no fibres leave the tract before it reaches the level of the lower border of external geniculate body. This is contrary to the views of Bechterew, Stilling and Kolliker.

(3) Although there was widespread destruction in left lobe of the cerebellum there was no descending cerebellar degeneration in the spinal cord. This is contrary to the opinion of several authorities, *e.g.*, Marchi and Biedl; but inasmuch as Deiters's nucleus was intact the present observation supports the views of Risien Russell, and Ferrier and Turner.

(4) The accessory fillet is a descending tract contrary to the opinion of Bechterew, Schlesinger and in support of the view of Redlich and Hoche. The "accessory fillet" may be simply fibres of the pyramidal tract leaving to gain cranial nerve nuclei.