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SIMPLE SEROUS CYSTS OF THE CEREBELLUM.

A Thesis presented for the degree of M.D.

BY

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INTRODUCTION.

It is my intention to discuss in this paper the subject of simple Serous Cysts of the Cerebellum and to illustrate the discussion with Two cases both of which were patients in the Bristol General Hospital and one of which (Case 1) came under my especial care during my tenure of office as Senior Resident officer of that institution.

I intend to bring out in this paper some of the main points regarding the ETIOLOGY, PATHOLOGY, SYMPTOMATOLOGY, DIAGNOSIS, PROGNOSIS and TREATMENT of this disease paying especial attention to the operative treatment of the condition as illustrated by my cases, the dangers and difficulties that may be encountered and how best to overcome them, so as to ensure that success which is after all the main point at issue. I must express my indebtedness to Dr.Michell Clarke and Mr.R.G.P.Lansdown for their kindness in allowing me to use the notes of the cases.

ETIOLOGY

Simple Serous Cysts of the Cerebellum are of exceedingly rare occurrence. Except the two cases I am about to relate I can find no instances of this condition in the records of the Bristol General Hospital, and I find on searching the available literature on the subject that Gerhardt, during his twenty-five years practice in the Berlin Charité and elsewhere had up to 1906 only come across two cases of this kind. Between the years 1874 and 1906 Scholtz collected but twenty reported cases, and Krauss found that in one hundred cases of Cerebellar tumour only seven were instances of simple Serous cyst. Williamson also says that cases of this sort are exceedingly rare, in fact this author is rather sceptical in reference to these cases and is almost inclined to regard them all as instances of cystic degeneration of gliomata or glio-sarcomata. He rightly asserts that cysts of the cerebellum should never be diagnosed as simple or serous until a minute microscopic examination of the fluid contents and the cyst wall has been made and he cites, in support of this statement, two cases in which the diagnosis of/

of simple serous cyst had been made at the autopsy before the cyst-wall had been subjected to microscopical examination; on this being done a very minute tumour less than $\frac{1}{8}$ of an inch in diameter was found in the cyst wall, in the one case a glioma and in the other a glio-sarcoma but in both cases the tumours, although of such small size, were visible to the naked eye projecting into the cyst cavity. Now these cases of his are to my mind exceedingly valuable in that they go to prove that a glioma or glio-sarcoma may undergo cystic degeneration so far that the tumour itself is reduced to the size of a pea or less, still they do not justify his rather sweeping assertion that all cystic tumours of the cerebellum other than hydatid, cysticercus, and those cysts caused by haemorrhage and softening may be traced to this cause. In both my cases the wall of the cyst, and in one case (Case 1) the contents, were examined as carefully as possible and no trace of tumour growth was found in either case. This fact is also specially mentioned in reports on their cases by Pye Smith, Colman, Hadden in two cases, one reported in 1884 and the other in 1890, Sharkey, Henschen and Homburger. So that we are bound to come to the conclusion that, apart from cysts due to degeneration of tumours we are/

are, in the so-called simple or serous cysts of the cerebellum, dealing with a definite pathological entity.

The age at which this condition is most likely to appear is given by most observers as somewhere between 10 and 30. Very few cases over 30 have been reported. Males seem rather more prone to be attacked than females.

As to the causation of the disease unfortunately little has been made out for certain, although various theories have been put forward by different authors. Scholtz suggested traumatism as a causative factor and, in the cases reported by Schüle, Bastian, and Jackson and Russell, the patients themselves gave in one case a fall and in the other two cases a blow on the back of the head as the starting point of the illness. But in the vast majority of reported cases and in my cases also no history of trauma has been elicited. It is quite conceivable that a cyst may be lying latent in the cerebellum without causing any symptoms and that a severe blow or fall on the back of the head might set up irritative processes in the cyst so that more fluid being secreted in the cavity, symptoms of increased/

increased pressure might supervene and might lead to the erroneous conclusion that the trauma had been the cause of the disease. Hadden, although acknowledging that the causation of these cysts is very obscure, suggests that they are dilatation of lymph-spaces and this view is also entertained by Homburger and Brodnitz. Althorp in a discussion following the report of a case of cyst of the cerebellum by Major advanced the theory that these cysts might be dilatations of a foetal remnant and called attention to the presence of a ventricle in the cerebellum of some birds which communicates with the fourth ventricle. This theory is strongly upheld by Henschen, by Auerbach and Grossman, and by Shüle, the latter authority citing a case of cyst of the vermis which communicated by a minute aperture with the fourth ventricle and he considered that this point was a strong argument in favour of his theory. Which of these theories is the correct one, it is very difficult to say but perhaps the idea that these serous cysts are dilated lymph-spaces arising in the perivascular lymphatis has more to recommend it than the others.

C A S E S.

CASE 1.

A.B. aged 27 - laundress.

The family history was good and the patient had always enjoyed good health until 14 months previous to admission, when she began to suffer from headache in the occipital region shooting towards the frontal region, and from sickness in the morning not associated with meals. After some months she became somewhat better and was able to continue her work with an occasional day in bed. There was no history of injury or ear disease. In November 1906 the vomiting became more frequent and lasted till the afternoon, the headaches became worse and she began to suffer from giddiness and to lose flesh. During the six weeks previous to admission all these symptoms became aggravated and were apt to appear on any sudden or quick movement; when she sat up in bed she felt as if she were falling forwards and she now noticed a tendency to stagger when walking. Occasionally she had noises in her ears like the sound of rushing water. She was only able to lie on her right side in bed and sleep was attended by distressing dreams of/

of being pursued by people or of being in an earthquake. Her sight became impaired.

On admission on February 6th 1907, the general condition was fairly good but she was somewhat emaciated. Temperature 97°. Pulse 88. Respirations 26 per minute. Bowels constipated. Tongue clean and red. Breath rather offensive. Catamenia regular. Sleep disturbed. Chest small and poorly developed. Lungs and heart normal. Abdomen rather hollow, muscles held firmly contracted. Liver and spleen not felt. Stomach normal. Urine specific gravity 1020, acid, no albumin or sugar. The following represents the condition as observed during the first week after admission. When she came in she could just walk across the ward, in so doing she deviated each time towards the left and staggered, having a characteristic cerebellar gait, the staggering being almost invariably towards the left. She stood in a peculiar position the head being bent somewhat down towards the left shoulder and the point of the chin slightly turned towards the right whilst the trunk was bent towards the left side, at the same time the left shoulder was directed somewhat forwards. She stood and walked as well with the eyes shut as open. At the end of 10 days she could/

could neither stand nor sit up in bed without support. On sitting up in bed the head was held rigidly in the position above described. She attributed the inability to sit up to the great weakness she felt in the muscles of the back; when she sat up or stood she felt herself swaying from side to side. She also complained of vertigo in the sense that surrounding objects seemed to move around her from left to right. There was no sensation of rotation of self. It happened that when seen she lay in bed on the left side with the limbs more or less flexed, so that she was curled up in bed with her eyes directed straight forwards; it was said however, that she more often lay on the right side. There was no affection of speech, swallowing, taste or smell. Hearing normal. Memory and intelligence were good and she was not especially drowsy: there was no affection of sensation to touch, pain or temperature over any part of the body. She suffered from intense headaches and during these attacks was (of course) somewhat confused and heavy. There was some general tenderness over the whole cranium, which was perhaps most marked over an area one inch below and to the left of the external occipital protuberance; it was thought that there was a possible alteration of percussion/

percussion note here. No facial or oculo-motor paralysis. Pupils dilated, equal and react to accommodation but very imperfectly or doubtfully to light. There was Nystagmus when the eyes were moved from side to side, but not on looking straight forwards, the lateral excursions were much more marked, and were coarser in character, towards the left than towards the right side. Intense double optic neuritis with numerous haemorrhages was present. Vision was very bad, she could only count fingers when seen in a bright light against a dark background. There was no muscular wasting or paralysis. The left hand and arm were distinctly weaker than the right, there was slight but decided incoordination of movement of the left hand and a curious hesitancy in initiating any movement with it. On flexing the arms against resistance, when the limbs were suddenly released, the left arm moved further towards the body than the right. There was loss of power in the left leg when tested by raising it off the bed against resistance. She said that the right limbs felt stiffer and firmer than the left. Knee jerks, ankle jerks and elbow jerks equal and normal. Superficial reflexes normal. Plantar reflex flexor. From the above/

above signs the diagnosis of a tumour of the left lateral lobe of the cerebellum was made and on February 18th her condition remaining the same Mr.Lansdown operated.

OPERATION. 1st.STAGE. Under the modern aseptic technique an incision was made through scalp and muscle extending from the tip of the left mastoid process upwards and inwards following a line drawn half an inch above the superior curved line of the occipital bone on the left side, till the mid-line was reached, then downwards half-an-inch to the right of the midline almost to the level of the foramen magnum. The flap thus marked out was U-shaped with the base below and was about 3 inches in length and 2½ inches in breadth. The haemorrhage from the scalp, especially in the region of the mastoid process was severe but easily controlled. Four ¼ inch trephine holes were now made in the skull at the four corners of the flap, these were joined by cutting with rongeur forceps and an osteoplastic flap was thus formed and turned downwards. The vena diploica temporalis posterior and the vena diploica occipitalis gave rise to considerable haemorrhage, which was controlled by plugging with pegs of wood. The blood pressure as taken by a Riva Rocci Sphygmomanometer having/

having dropped to about 95 mm.of Hg., it was decided not to open the dura that day. It was arranged that the 2nd operation should be done on the 5th day i.e.February 23rd, but the relief of the headache was so great because of the lessening of intracranial pressure produced by the 1st operation that the patient at first refused to have anything more done - but persuasion having been brought to bear she consented to a 2nd operation on February 27th.

2nd STAGE. The old wound having been reopened and the osteoplastic flap turned back - a horseshoe shaped incision was made in the tense dura slightly smaller than the bone flap. The left lateral lobe of the cerebellum bulged into the wound; pulsation was palpable but not visible. The cerebellum was palpated with the finger and nothing abnormal was at first felt, but on introducing an exploring needle into the lower part of the lobe some clear fluid was withdrawn, the opening having been enlarged with sinus forceps about one ounce of clear fluid ran out. As the nature of the cyst was uncertain the cyst wall and surrounding cerebellar tissue were freely excised, probably in doing this the greater part of the left cerebellar lobe was removed.

It is as well to state here that the contents/

contents of the cyst and the cyst wall were afterwards subjected to careful microscopic examination and no trace of hydatid hooklets or cysticercus scolices were found in the contents nor tumour growth in the cyst wall.

The wound in the dura was then stitched up with fine catgut and the scalp wound closed with fishing gut, a small drain being left in at each of the lower corners of the wound.

The patient recovered well from the operation and then entered on a slow but steady course of convalescence. The wound did well, there was a discharge of cerebrospinal fluid in considerable quantity for a long time, and eventually healed on May 15th, after the extrusion of the two wooden pegs, to the retention of which the delayed healing was apparently due.

A fortnight after the operation (March 12th) she was able to lie in any position in bed and to distinguish the clock at the end of the ward. There was no return of headache or vomiting, but the vertigo persisted for sometime, she felt as if she were being tossed to and fro in a small boat on a heavy sea. Her mental condition became peculiar, she was dull and drowsy, lay still without taking much notice/

notice and her speech was slow and had a high-pitched monotonous character.

On March 26th she was able to walk up the ward, and on April 1st to go out of doors. She was still however giddy and uncertain of movement and could neither stand nor walk without help. Movement of the arms also, if at all forcible, brought on giddiness. A peculiar feature at this time was the bright redness of the lips, ears and mucous membrane of the mouth. She complained of being very weak, there was also some loss of power in the left arm and leg and slight ataxia in the former. Pupils dilated and nystagmus as before; knee jerks present and active. At this date she was tested for loss of muscular sense by Sir Victor Horsley's method with a ruled glass plate. The tests were necessarily few as she was very easily fatigued.

(1) With glass plate in sagittal plane of body at level of breast.

(a) Error with left forefinger was 4c.too low.

(b) " " right " " 1c. " "

(2) With glass plate above the head.

(a) Error with left forefinger was 5c.too low.

(b) " " right " " 4c. " "

(3) With glass plate in the horizontal plane.

(a)/

(a) Error with left forefinger 6c.too near the body.

(b) Error with right forefinger 5c.too near the body.

She held her head steady and upright but very stiffly from rigidity of muscles at the back of the neck; she seemed slow in initiating movements.

After April 24th she made rapid improvement in every respect and began to walk about by herself though slowly and unsteadily at first. Her mental condition gradually returned to normal and she was bright and cheerful. She steadily gained flesh and was sent to the convalescent home on May 15th. She made still more rapid improvement at the convalescent home and whilst there took a long country walk of 7 miles without fatigue. On returning from the home her condition appeared normal, her gait was normal and she had lost all traces of ataxy and muscular weakness: the nystagmus had disappeared. She had very useful vision, there was 4 D of hypermetropia in the right and 5 D in the left eye, with suitable glasses she could read 6/18 with each eye. There was a certain degree of secondary optic atrophy, which was not surprising considering the intensity of the optic neuritis and the long duration of/

of the illness (14 months) before she came under observation. At the present time (September 1908) it is sufficient to say that she is in as good health as she was before the illness and able to do her work as well as ever.

CASE 2

F.P. a labourer - aged 24. Was admitted to the Bristol General Hospital May 2nd 1906.

The family and previous personal history contained nothing of importance. There was no tuberculous history and the patient had never had syphilis. The illness began with a very definite onset on December 24th 1905 when the patient had an attack of vomiting accompanied by intense headache. The vomiting was incessant for two days, then ceased and for a week he remained well. There was no haematemesis. Since this time the patient has been sick nearly every morning on first waking; the sickness bears no relation to food and is unaccompanied by retching or straining, but sometimes it is accompanied by abdominal pain. He has also suffered from severe headache, paroxysmal in character, the pain being over the vertical and occipital regions of the/

the head and at the nape of the neck. Some weeks after the onset he suffered from diplopia at times but not sufficiently to prevent reading. He has become somewhat deaf during the illness and for two weeks before admission giddiness has come on: he feels weak and giddy when he walks but has never fallen - no fits - he has lost weight.

On admission he was rather thin and had a trick of screwing up the right eye probably to prevent diplopia. The temperature was normal. Pulse 66, regular and of rather high tension. Respirations 19 per minute. Bowels constipated. The thoracic and abdominal organs appeared normal on physical examination. The urine specific gravity 1023, deposited phosphates on boiling but contained no albumin or sugar. There was no facial paralysis. The right palpebral fissure is smaller and the right pupil larger than the left, pupils react to light and accommodation, there is paresis of the right external rectus muscle. Marked nystagmus, movements to the right being more extensive. Marked double optic neuritis most intense in the right eye.- globes prominent. The elbow jerks present and equal; left knee jerk feeble, right absent; no ankle clonus. Plantar reflex gave a flexor response; abdominal reflex/

reflex normal. No alteration of sensation to touch, pain or temperature on any part of the body. Patient has a fair grip on both hands, dynamometer tests gave right 28, left 26. There is however general asthenia. The movements of the arms are slightly ataxic, perhaps most on the right side. His gait is practically normal until he turns round when he shews decided staggering especially on turning to the right. Smell and taste normal. He hears a watch at a distance of two feet from the right ear and six inches from the left. Rinné's test is positive. Memory and intelligence seem quite up to the average of his class.

During the first few days after admission patient suffered from several attacks of vomiting (the vomit contained free H.Cl) and also from paroxysms of intense headache in which he groaned and screamed, the pain being chiefly in the back of the head and neck. During these attacks his vision became still worse, he complained that his sight was blurred and that he saw everything double - movement increasing the pain in his head and neck. By May 29th it was noticed that he frequently, especially during attacks of sickness, lay in bed curled up on his right side with his head bent forwards on the sternum, that at times he was very dull and heavy lying in a stuporous condition, that his right pupil dilated/

dilated to double its usual size during the attacks of pain, that he sat bundled "all of a heap" in a chair, was decidedly weaker, shuffled the right foot in walking and now tended to walk to the right and that there was slight tremor of the left arm and left leg. The staggering on turning had increased.- the right grasp was decidedly weaker than the left. In standing he was apt to lean over to the right, the head was bent towards the right shoulder with the chin slightly turned to the left. At the end of the month the position of lying in bed curled up on the right side with the head flexed and resting on the right forearm was very constantly maintained. He complained now of noises in the right ear - the nystagmus continued. In the first few days of June the attacks of headache became more frequent and unbearable in intensity, necessitating the almost constant employment of morphia injections and the vomiting became much more severe. From the above signs it was considered that there was probably a tumour in the right lateral lobe of the cerebellum. He never complained of a sense of rotation of external objects nor of rotation of self unless his constant tendency to lie curled up on the right side could be taken as evidence of an unconscious tendency to rotate in this direction./

direction.

OPERATION. 1st Stage.

On June 7th Mr.Lansdown operated by making an incision through scalp and muscle from the tip of the mastoid process on the right side upwards and curving inwards following the superior curved line of the occipital bone till the midline was reached then downwards to about the level of the foramen magnum. The U-shaped flap thus marked out was turned down along with the pericranium. A 1-inch trephine was applied to the occipital bone at a point midway between the tip of the mastoid process and the external occipital protuberance, and the bone removed with this and rongeur forceps until an oval opening 2 inches by $1\frac{3}{4}$ inches was made in the right occipital region and the dura mater covering the right lateral lobe of the cerebellum was exposed.

2nd Stage.

On June 14th the wound was reopened, the dura water divided by a U-shaped incision slightly less in extent than the opening in the bone and the right lateral lobe of the cerebellum was examined. Nothing abnormal being detected by the finger, an incision one inch long was made into this lobe of the cerebellum, which appeared normal. The wound was/

was then closed.

The patient at first did very well after the operation, the headache was relieved, the vomiting ceased and his sight improved. On June 21st there was a return of vomiting and on the 23rd he appeared drowsy and dull not easily understanding what was said to him. On dressing the wound two small portions of cerebellum were found protruding between the edges of the wound in the dura and a moderate amount of cerebro-spinal fluid continued to exude. July 3rd. Since operation the patient can lie on either side and has ceased to lie in his former curled up position. There is marked nystagmus to the right, marked loss of muscular sense in the right extremities, marked ataxia of the right arm and less of the left arm. Knee jerks absent. He is very drowsy but answers questions intelligently. Sight is improved and the swelling of the right optic disc had certainly subsided. His speech is peculiar being jerky, abrupt, monotonous and explosive in character. As there was no improvement in the patient's condition on July 24th it was thought advisable to make a further attempt to reach the lesion. 2nd OPERATION. The wound was therefore reopened, the skin flaps scraped and a portion of the right lateral cerebellar/

cerebellar lobe which partly protruded through the opening in the dura mater was removed. On exploring the lobe more deeply than before Mr.Lansdown came upon a deep lying cyst the size of a walnut surrounded by healthy brain tissue. This was opened to allow the escape of the fluid, the cyst wall was removed and the wound again closed. The cyst wall was later examined microscopically as thoroughly as was possible and no evidence of tumour growth was found.

On July 31st the stitches were removed, the wound looking well. The patient had improved since the operation, was much brighter, not drowsy and the speech was normal. The temperature had remained normal, pulse about 90 and respirations 20 per minute. No vomiting, slight headache on one day only. Nystagmus was present in all directions of movement of the eyeballs; right pupil larger than the left. Has still ataxia of the arms especially of the right and is very inaccurate in localizing a touch on either arm. Knee jerks absent, and the right plantar reflex is extensor. He has had a little difficulty in holding his water but this soon passed off. On August 1st he had a rise of temperature to 102.5°F and again on August 3rd to 103°F.; there/

there was a little discharge from the wound on this day. The discharge gradually got more and more abundant and began to smell badly, the patient got rapidly worse, his temperature remaining high, oscillating between 101° and 103°F., he became delirious and gradually sank and died from septic meningo-encephalitis on August 18th. Unfortunately no post-mortem examination was allowed.

SYMPTOMATOLOGY.

The symptoms which characterize a simple cyst of the cerebellum are unfortunately for the clinician identical with those which are characteristic of any tumour in this part of the brain. Clarus (quoted by Scholz) thought he could distinguish clinically between a cystic and a solid tumour of the cerebellum by the fact that in cystic tumours we are more likely to get (1) disturbances of sight, (2) severe vomiting, (3) absence of hemiplegia, (4) absence of sensory symptoms and (5) frequent remission of the symptoms. Scholz absolutely disagrees with Clarus on all five points, and it is generally agreed that the distinctions laid down by Clarus are of no value at all. The remarks we shall make about the symptomatology of this disease could therefore be applied to any form of tumour situated in the cerebellum.

The onset of the illness may be either gradual or sudden, in Case 1 the onset was gradual with slowly increasing headache and occasional sickness in the morning, which symptoms after a time passed away for some months only to recur again with renewed vigour; whereas in Case 2 the symptoms began very/

very definitely and abruptly on a certain date, subsided for a week only and then gradually became more and more severe until the operation.

The patient usually gives a history of about 12 to 15 months duration since the beginning of the illness; thus Case 1 gave a history of 14 months and the majority of cases reported give a history of about that length of time. But on the other hand we may have a history of only a few weeks or months, Scholz reports a case with a history of only five weeks duration and in Case 2 we find a history of only five months; again a much longer history may be elicited, as we see in a case reported by Sharkey where the patient gave a history of headache and vomiting of ten years duration. In regard to these cases with such a long history, there is no doubt that a cyst of the cerebellum may be present and cause no symptoms whatever for many years, in fact cases have been reported where the cyst was discovered only at the post-mortem examination, the patient having complained of no symptoms pointing to cerebellar disease of any sort during life.

HEADACHE is a constant symptom in this disease, in fact I cannot find a single case reported in the literature where this symptom is absent. It comes on/

on early in the history of the case usually being the first symptom complained of by the patient, it is especially severe and paroxysmal in character as compared with the headache consequent on the presence of tumours elsewhere in the brain, and it is usually referred to the occipital region on the same side as the lesion but occasionally to the opposite fronto-temporal region, as pointed out by Purves Stewart. It very often also radiates down the back of the neck as is instanced in Case 2, in the case reported by Sharkey and also in one of Gerhardt's cases. The Causation of the headache is usually supposed to be the increased intracranial pressure especially in the posterior fossa of the skull and the consequent tension upon the tentorium cerebelli. Luciani's assertion that it is due to direct irritation of the Cerebellar tissue is not generally held.

VOMITING occurs along with headache and is almost as constant a symptom. It is not associated with meals. Very often occurs in the morning, in the early stages of the illness at least, and is not usually accompanied by any great degree of retching or straining.

OPTIC NEURITIS is the third of the classical symptoms of tumour of the brain, but like headache and/

and vomiting it has distinctive features when it occurs as a result of tumour of the cerebellum. Thus we find, that it comes on very early in the history of the case, it is peculiarly intense in character and is usually accompanied by numerous haemorrhages in the retina, it is so intense and acute in onset that impairment of vision may take place very quickly after the neuritis is first noticed, and it very soon gives place to a secondary optic atrophy and actual blindness, unless an operation for removal of the cyst or a decompressive operation for relief of tension is performed. The optic neuritis is often more marked in the eye on the same side as the tumour, but this is by no means a constant rule. In both Case 1 and Case 2 marked optic neuritis was present, with numerous haemorrhages in Case 1 but about equal on the two sides, whereas in Case 2 the neuritis was more intense on the right side i.e. the side of the cyst; this latter fact is corroborated by several authors including Colman, Hadden, and Anerbach and Grossman from observations on their own and other cases; whereas Taylor from examination of a number of cases came to the conclusion that in Cerebellar disease the optic neuritis was likely to be more intense on the side opposite the tumour. So that/

that we can hardly regard the difference in intensity of the optic neuritis on the two sides as being pathognomonic of the side of the tumour. The cause of the intense optic neuritis associated with Cerebellar cysts and tumours is still obscure although a great amount of clinical and experimental work has been done to attempt to elucidate the true causative factor. Ormond in an admirable paper read before the Royal Medical and Chirurgical Society of London in 1906 divides the theories of the causation of optic neuritis by the presence of tumours within the skull into three main divisions.

(1) Theories attributing the optic neuritis to vaso-motor effects.

(2) Theories which refer the neuritis to the results of increased intracranial pressure.

(3) Theories which assume the influence of inflammation as a primary cause.

The first of these theories can be dismissed outright as untenable, as many very competent observers have denied the fact of their being a vaso-motor mechanism in connection with cerebral vessels.

The second and third theories have many arguments to recommend them, both from a clinical and experimental stand point. Ormond, after a review of/

of the work done and the conclusions come to by many observers, is prepared to believe that the optic neuritis may be produced primarily by toxines which are derived from the softened brain tissue around the tumour, and accentuated by the existence of increased intracranial pressure. As to the presence of a toxine in the softening which takes place around a tumour or cyst, I think its presence has yet to be demonstrated more surely before that theory is tenable without question. The theory which refers the optic neuritis in these cases, to increased intracranial pressure has much to recommend it. In all reported cases of Cerebellar cyst where the condition of the disc is mentioned, optic neuritis is noted, (except in one reported by Stewart and Gibson); now the cerebellum is rigidly enclosed by bone on the whole of its under surface and by the almost unyielding tentorium cerebelli on its upper surface, so that any foreign body such as a cyst or tumour situated in this region of the brain would tend to constrict the veins of Galen and thus cause an accumulation of fluid in the ventricles and consequent increased intracranial pressure. As a result of this secondary internal hydrocephalus we get difficulty in the lymphatic circulation of all the brain and consequently of the optic nerve also, there results/

results an oedema of this nerve, which being increased in volume is strangulated in its passage through the optic canal. The artery and central vein are thus compressed and a collateral circulation is established by means of the lamina cribrosa. We thus get an appearance of choked disc and a protuberance of the papilla, which is the condition noted in the early stages of cerebellar tumour. Again as another argument in favour of this theory we have the fact that a decompressive operation to relieve intracranial pressure is in almost all cases followed by a diminution of the swelling of the papilla and a subsidence of the optic neuritis. Probably then the correct theory as to the causation of optic neuritis in these cases is the one which refers it to the increased intracranial pressure.

VERTIGO is a very constant and important symptom: it is mentioned in nearly all the reported cases. It usually attacks the patient in one of two forms either (1) as a definite movement of external objects and of self or (2) as indefinite giddiness. In Case 1 the patient had no rotation of self although she said she felt herself swaying from side to side, but external objects seemed to her to be moving from left to right. Whereas in Case 2 the patient could not describe/

describe any movements of self or of external objects but said that he felt giddy. Some observers have laid stress on the fact that rotation of self and of external objects is of significance in locating the side of the cyst, thus Stewart and Holmes assert that the external objects move from the side of the lesion to the healthy side; Case 1 seems to corroborate this.

MOTOR SYMPTOMS. In considering the motor symptoms we shall pay special attention to

(1) The power of movement.

(2) The Co-ordination of movement.

(3) The attitude of the patient and

(4) The gait of the patient.

(1) Paresis of the muscles of the trunk, arm and leg on the same side as the lesion is a very constant symptom of unilateral disease of the cerebellum. In Case 1 this symptom was well marked in the muscles of the trunk and was also discernable in the muscles of the arm and leg on the side of the lesion when they were moved against resistance. In Case 2 this symptom was marked in the case of the arm on the same side as the lesion but not in the trunk or legs. This symptom is insisted upon by Jackson and Russell, Niemeyer and by Stewart and Gibson who noticed it in all three cases they report. Russell's experiments on/

on dogs and monkeys go to prove that after ablation of one hemisphere and part of the vermis of the cerebellum motor paresis supervenes first and foremost in the muscles of the trunk, then in the leg and last and least in the arms.

(2) Incoordination of movement of the arm and leg on the same side as the lesion is also very often a well-marked symptom. It was present in both Case 1 and Case 2 in the arm on the side of the lesion, also in the cases described by Schüle, Jackson and Russell, Stewart and Gibson and others.

(3) The Cerebellar Gait has long been recognised as a classical symptom of a lesion of the cerebellum. It has been described as the staggering, reeling gait of a drunken man, but it consists of two distinct components as has been pointed out by Stewart and Holmes, viz:- (1) A tendency to stagger and stumble to the side of the lesion and (2) a tendency to deviate in a circle towards the side of the lesion. The patient when walking suddenly staggers and tumbles towards one or other side, then as suddenly recovers himself possibly stumbling towards the opposite side as he does so. That the stagger is towards the side of the lesion is agreed upon by practically all observers; both our patients shewed it, but in

Case/

Case 2 the patient only staggered to the right when he turned in his walk. The tendency to deviate towards the side of the lesion is also usually very well marked, and to compensate for this the shoulder on the affected side is usually held more forward than the other, this fact was also well shewn in Case 2. It is still a disputed fact whether this typical gait is caused by incoordination of the leg on the side of the lesion, associated with incoordination of the muscles of the trunk, or whether it is due to weakness of the muscles of that side of the body and of the leg, or whether it is due to vertigo. Most authorities on the subject are of opinion that it is caused by incoordination of the muscles of the trunk and legs on the same side as the lesion, this incoordination being caused, as was shewn by Bruce, by involvement in the lesion of the Cerebello-vestibular tract and the connections of Deiter's nucleus. Jackson and Russell on the other hand regard the erratic movement of the legs as attempts to run after and 'prop up' the trunk in its immoderate inclinings resulting from weakness of the spinal muscles. There is probably no doubt that the view of Bruce is the correct one supported as it is by such a wealth of/

of anatomical, clinical and physiological detail.

(4) The Attitude of the patient suffering from a unilateral disease of the cerebellum is very often characteristic both as regards the head trunk and limbs. The most common attitude assumed was illustrated very well in Case 1; the head is inclined as a whole towards the side of the lesion so that the ear on the affected side is approximated to the shoulder on that side, the chin is tilted slightly upwards, and is turned towards the side opposite to the lesion, so that the patient may be said to be looking slightly upwards and away from the lesion. The shoulder on the side of the lesion is held further forwards than the opposite one, and the trunk is flexed laterally with the concavity on the side of the lesion. The leg on the affected side is also usually rotated outwards and abducted, as if to give the patient a broader base to stand upon. Both Case 1 and Case 2 exhibited this attitude but it was most marked in Case 1; it was also present in the cases described by Bastian, Russell and others. But, as mentioned by Stewart and Holmes, the condition is not pathognomonic of the side of the lesion as occasionally the head is held in the reverse position.

Other forms of attitude have been described by various observers, Scholz and Hadden have described/

described opisthotonos as occurring in tumours and cysts of the cerebellum and have noticed that bending of the head backwards is most common in cases of disease of the vermis. In both Case 1 and Case 2 the attitude in bed was suggestive, thus in Case 1, where the cyst was in the left lateral lobe of the cerebellum, the patient more often lay on the left side with the limbs flexed - whereas in Case 2 when the lesion was in the right lateral lobe the patient lay in bed on the right side with the head bent forwards on the sternum and the limbs flexed on the abdomen. This attitude in bed may be indicative of that form of vertigo, which has been described as rotation of self towards the side of the lesion. Whether this is so or not we are unable to state for certain.

AUDITORY SYMPTOMS have been noticed in a few cases of unilateral disease of the cerebellum in two main forms, viz:- (1) Deafness on the side of the lesion either partial or complete, and (2) Noises in the ears. In Case 1 the hearing in both ears was quite normal but the patient complained of a noise in the ears like the sound of rushing water. In Case 2 the hearing was defective on the left side that is the side opposite the cyst, and he did not complain of any/

any noises in the ears. It is very probable that auditory symptoms in unilateral cyst of the cerebellum are of very little importance either in assisting in the diagnosis of the case or in localizing the side of the lesion. Stewart and Gibson think, that if there is deafness, it is due to involvement of the auditory nerve either by direct pressure or by attendant inflammatory effusion. As to the noises in the head, described in Case 1 and also mentioned definitely by Williamson, whose patient also described the noise 'like rushing water', by Jackson and Russell where the noises were ringing, and by Gerhardt, they are probably due to the general increased intracranial pressure and so might occur in any tumour in any part of the brain.

EYE SYMPTOMS are in these cases very often numerous and important. The one which stands out above all the others is nystagmus and it is not only the presence or absence of nystagmus that is helpful in diagnosing the existence of a lesion of the cerebellum, but the character of the nystagmus is of equally great importance in leading to a diagnosis of the side of the lesion. The nystagmus is usually characterised by slow deliberate jerkings towards the side of the lesion, especially when the eye is looking towards that/

that side, and gradual recessions of the eyeball back towards the middle plane. There is also nystagmus usually present when the eyes look away from the side of the lesion, but it is then of a quicker and more flickering character. Nystagmus is not usually marked at all when the patient looks up or down. Both our cases shewed marked nystagmus, and in both cases the movements were coarser and more extensive, when the eyes were turned towards the side of the lesion, practically all observers are at one on this point. Another important ocular sign observed by many and specially mentioned by Hadden, Mills, and Stewart and Gibson is paresis of the external rectus on the same side as the lesion, and hence very often a conjugate deviation of the eyes away from the side of the lesion. These two ocular symptoms have been explained by Bruce in the article mentioned above, by the fact that if the cerebello-vestibular tract or Deiter's nucleus be injured, then the usual stimuli will not pass to the sixth (fourth) or third nuclei. Hence may result the impairment of conjugate deviation to that side, the tendency of both eyes to be directed to the opposite side, and the lateral nystagmus which occurs, especially when the eyes are directed/

directed towards the side of the lesion. The size and reactions of the pupils are so variable as to be of little value in diagnosis or localization of unilateral cerebellar lesions. In Case 1 the pupils were equal, dilated and reacted normally to accommodation, but very imperfectly to light, in Case 2 the pupil on the same side as the lesion was larger than the other, but both reacted normally to light and accommodation. The reason that in Case 1 the pupils reacted very imperfectly to light was due to the fact that she was rapidly losing the light perception. Stewart and Holmes think that in uncomplicated cases the pupils are first contracted or normal in size, and then gradually dilate as vision fails, but reported cases do not support this observation sufficiently for it to be of any value as a localizing symptom. Asymmetrical positions of the eyes have been described, notably by Gowers where one eye was directed upwards and inwards, and the other downwards and outwards, and by Risien Russell where the eye on the same side as the lesion turns downwards and inwards and the other upwards and outwards. This 'skew' deviation as observed by Risien Russell is according to Stewart and Holmes of very short duration only occurring/

occurring at the very outset of the disease and so usually escapes observation. Scholz lays great stress upon the fact that in unilateral lesions of the cerebellum we often get the corneal reflex on the same side as the tumour weak or entirely absent; this phenomenon has also been noticed by Oppenheim and Stewart and Holmes, the latter authorities accounting for the condition by an involvement of the trigeminal nerve.

CRANIAL NERVE SYMPTOMS apart from those mentioned above are rarely, if ever, met with in purely uncomplicated cases of simple cyst of the cerebellum.

SENSORY SYMPTOMS over the body generally are almost always absent.

THE CRANIUM may in the case of children be bulged on the side of the tumour, but this has rarely been described. A more important symptom is the dullness or percussion over the tumour.- this symptom was present in one of our cases (Case 1) and is also specially mentioned by Auerbach and Grossman in the report of their case - another symptom mentioned by them is pain or percussion over the side of the tumour. This has also been noted by Risien Russell.

MENTAL AND PSYCHICAL SYMPTOMS are often well marked; the patients usually exhibit a profound de-

degree of hebetude which was replaced in a case of Stewart and Gibson's by extreme excitability culminating in an attack of temporary insanity. In neither of our cases were mental symptoms a marked feature; but in a case described by Martin the patient "was easily excited and had occasionally impulses of a pugnacious character running after his mother, as well as he could, to strike her".

THE REFLEXES both superficial and deep, are of practically no significance in lesions of the Cerebellum, their variability being noted in nearly all reported cases - not only do individual cases vary in regard to this sign but the same case very often varies at surprisingly short intervals of time. In Case 1 the knee jerks, and other tendon reflexes were normal and equal; whereas in Case 2 the knee jerk on the side homolateral with the lesion was absent and very feeble on the opposite side. Although we may regard this variability of the reflexes as one of the signs of disease of the cerebellum we cannot regard the absence or increase of one reflex or another as at all indicative of the side or extent of the lesion.

BABINSKI has described two signs, neither of which were/

were noticed in either of our two cases, one to which he gives the name 'diadococinesia' consists in the fact that the patient is unable to execute rapid alternate movements such as pronation and supination of the homolateral limb; and the other depends upon the fact that when the patient is asked to raise the homolateral lower limb from the bed into the vertical position and hold it there, he does the movement perfectly and holds the limb in that position quite still, whereas in the normal limb held in this position there very soon appears a slight flickering contraction of the muscles of the thigh and then a swaying to and fro of the whole limb. Whether these two signs described by Babinski are of any diagnostic significance in cysts of the cerebellum is not as yet definitely ascertained.

ATONY of the muscles of the body and limbs seems to be present in a number of cases, and there seems to be one phenomenon in these cases which may be associated with hypotonia of the muscles, viz:- the fact, which was well shewn in Case 1, that when the arms are flexed against resistance and then suddenly released, the arm on the side of the lesion travels further towards the body than the opposite one.

This/

This symptom is mentioned by Stewart and Holmes and others and seems to me to be worthy of note as a valuable sign in the diagnosis of the side of the lesion.

THE SPEECH is very often altered in these cases; in Case 1 it was slow, hesitating, high-pitched and of a monotonous character. Collins describes the speech of a patient of his as explosive, staccato and high-pitched in character, and Stewart and Gibson mention that in one of their patients the speech was slow and stammering.

OTHER SYMPTOMS have been described such as muscular wasting, glycosuria, polyuria &c., but none of them are of any importance. In extreme and severe cases of increased intracranial pressure such symptoms as coma, convulsions and slowing of the pulse may supervene - in fact the latter symptom has been mentioned in the writings of many observers among whom are Winter, Hadden, Gerhardt and Scholz. Rigors without a rise of temperature have been noted by Lockhart-Clarke and Sharkey. Tremor in the homolateral limbs has also been mentioned but only in very large destructive lesions of one lobe of the cerebellum whereas most cases of a limited lesion of one lobe shew remarkable steadiness in the homolateral/

homolateral limbs when they are held in various positions considering the marked incoordination of the same limbs when movement is attempted.

It will be seen from the foregoing what a remarkably varied picture may be presented by a patient suffering from a tumour of the cerebellum whether it be cystic or solid or a combination of both. Many experiments on animals, especially on dogs and monkeys, have been carried out by Rolando, as early as 1809, and later by Luciani, Risien Russell and Ferrier and Turner to try and demonstrate the true functions of the cerebellum, and the symptoms consequent on destruction of various parts of this organ, and although their observations and conclusions are exceedingly valuable and helpful, they are in some most vital points so contradictory that they do not help us clinically so much as might be expected. This being so, I think there is no doubt that cases studied clinically and (afterwards) pathologically and reported in detail by competent observers, will go further to elucidate the mysteries still surrounding this most interesting portion of the brain.

DIAGNOSIS.

The diagnosis of a cyst or tumour of the lateral lobe of the cerebellum is in some instances quite simple and easy but in others presents almost insuperable difficulties. It is probable that a small cyst of a lateral lobe not extending into surrounding structures and not exerting undue pressure upon the pons, medulla etc., gives the most typical clinical picture. It is well-known that some cysts and tumours of the cerebellum do not give any symptoms at all, these are probably very slow growing, consequently the cerebellum is able to adapt itself and its functions to the new circumstances without any very evident clinical signs shewing themselves; or a cyst of this sort may be located in a silent area of the cerebellum, or what Bruce designates as the 'area of possible latency', and not involving the cerebello-vestibular tract, Deiter's nucleus will be unaffected and so no localizing symptoms, except possibly headache, vomiting and optic neuritis, be produced. We must try to make, in these cases, a differential diagnosis between cysts of the cerebellum and

(1)/

(1) Tumours and cysts of the Cerebrum.

(2) Extra-cerebellar Tumours.

(3) Solid tumours of the Cerebellum.

(1) From Tumours and cysts of the cerebrum. Tumours and cysts in this situation give with lesions of the Cerebellum the three classical symptoms common to brain tumour, viz:- headache, vomiting and optic neuritis. But the headache is usually confined to the vertex, is not so severe nor of such a rending, agonizing character as in Cerebellar lesions; the vomiting may be more severe in cerebral than in cerebellar lesions, this fact is pointed out by Stewart and Gibson but is not agreed upon by all authorities; and the optic neuritis is usually more intense in character and more quickly goes on to atrophy in cerebellar than in cerebral lesions. Again, in the former we have the distinctive signs of vertigo, characteristic gait and nystagmus which are not usually present in cerebral lesions. The lesion in the cerebrum may be so situated as to give such distinctive signs and symptoms that it would be almost impossible to mistake it for one in the Cerebellum, as a rule the diagnosis in this respect is not difficult.

(2)/

(2) From Extra-cerebellar tumours. The diagnosis between intra-and extra-cerebellar tumours is very often more difficult and is sometimes almost impossible. In the first place we usually have in extra-cerebellar lesions more severe and marked interference with the functions of the cranial nerves especially with the fifth, sixth, seventh and eighth. Stewart and Holmes have often noticed in their study of forty cases of cerebellar disease that tremor of the homolateral limb was more marked in the case of extracerebellar tumours. And again this class of tumour is probably more likely to cause anomalous symptoms by pressure on the pons, medulla and other adjacent portions of the brain. Thus we might get a crossed hemiplegia of the spastic type with an extensor plantar response, which in combination with cerebellar symptoms would give valuable indication of the probable site of the lesion.

(3) From Solid tumours of the Cerebellum. As has been stated above Clarus thought he could distinguish clinically between a solid and cystic tumour of the cerebellum by means of a study of certain of the signs and symptoms presented, but Scholz and most other authorities absolutely disagree with Clarus on all points. But of late years it has been pointed/

pointed out that this differential diagnosis can be made by means of a fairly simple procedure, I refer to the Brain Puncture of Neisser and Pollack. This operation, although practiced in the time of Hippocrates, has only lately been called into requisition by clinicians to help in the diagnosis of cystic disease of the brain, and especially of the cerebellum. As Tillmans has pointed out, when doing this the surgeon must always be prepared to resort immediately to the operation of trephining. The preliminary technic of Brain Puncture is the same as in Craniotomy. The spot to be selected is a point midway between the tip of the mastoid process and the external occipital protuberance. A local anaesthetic is sufficient for the purpose and should be injected both superficially and deeply at this point, and after a suitable interval has elapsed, a hand or electric brace fitted with a round headed Doyen or Sudeck drill is pressed firmly on to the skin, which is pierced at the same time as the bone below. When drilling the bone it is advisable to press more firmly at first than later on to avoid injury to the inner table. Injury to the dura mater is best avoided by using first a broad-pointed, oval/

oval-shaped Doyen drill to pierce the cranium, and then using a ball-pointed Doyen drill to pierce the inner table. Haemorrhage from the bone can be stopped by spreading aseptic wax on the drill. When the cranium has been pierced, a fine hollow needle fitted to a Pravaz syringe that closes well, is inserted and suction produced. This suction must be performed as delicately as possible, so as to avoid causing haemorrhage. If fluid be withdrawn, it should be examined bacteriologically and microscopically at once. If a cyst on this side is not found and the symptoms make it possible that the situation of the cyst is on the opposite side, puncture of this side can be resorted to. If no cyst is found there also, either opening can be enlarged with a drill or forceps, the dura cut through with a sharp knife and the surface of the cerebellum inspected or incised at will. Neisser and Pollack, after pointing out that the operation of Brain Puncture is not difficult and can be carried out in a few minutes without a general anaesthetic, recognise that the danger lies chiefly in the occurrence of haemorrhage; this can be minimised by avoiding places where large arteries run in the meninges and by avoiding the sinuses of the brain. Scholz points out that the needle/

needle must not be pushed into the cerebellum more than 4 or 5 centimeters for fear of injuring the vital centres in the medulla. Auerbach does not altogether approve of Brain Puncture in suspected cysts of the cerebellum because if the cyst be of large size the relations of parts are so altered that the needle may be pushed into the vital centres of the medulla, with a fatal result.

PATHOLOGY.

The pathology of simple cysts of the cerebellum is, like their causation and mode of origin, very obscure. No doubt they have often been described when the condition was merely a dilatation of the ventricles, a cystic degeneration of a glioma or sarcoma (which tumours are very prone to undergo cystic degeneration in the Cerebellum) or a localized cystic collection of fluid, the result of haemorrhage or softening. The first and last of these conditions are distinguished from simple cysts by an examination of the contents, as also are cysts due to hydatid disease, or to the cysticercus cellulosae, and the second condition by an examination of the walls of the cyst. Although these cysts enumerated above may be the more commonly met with in the cerebellum, and although cysts may be met with which are thought at first to be simple and which afterwards on more minute examination prove to be degenerated tumours, still I think all authorities on the subject are agreed that in serous cysts of the cerebellum we are dealing with a definite pathological entity.

Simple or serous cysts of the Cerebellum may be single or multiple, in most reported cases they/

they have been single but Winter and Lussana have found them multiple and Lockhart Clarke found two cysts in one hemisphere, one the size of a walnut and the other the size of an almond. The size of the cyst varies between that of an almond and that of an orange, in Case 1 the size was about that of a large plum, in Case 2 that of a walnut. The contents of the cyst are variously described as clear, watery, serous or viscid.- the colour may be white, yellow, or, as in a case described by Brüchner reddish yellow. The wall of the cyst has been described by many observers amongst whom are Stewart and Gibson, Pye-Smith, Hadden, Ormond and Scholz, as being of a very indefinite character, the cyst being according to the microscopical observations of these authorities surrounded by dense layers of normal cerebellar tissue. Colman describes the cyst-wall in his case as being composed of dense layers of neuroglia and mentions that there was no epithelial lining at the time of examination. On the other hand Henschen and Gerhardt describe the cysts in their cases as being lined by a single layer of cubical epithelium, whereas Hadden in another of his cases describes the cyst-wall as consisting of ordinary connective tissue.

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The microscopical examination of the cyst-wall in both the cases here described was carried out under some difficulties as only the part cut away at the operation was obtainable, but in neither case was an epithelial lining found and the wall (if indeed it can be so designated) seemed to consist merely of ordinary brain tissue.

Damage and dislocation of surrounding structures are often found, and we can readily understand this, when we consider the anatomical structure and environments of the cerebellum. Besides the unaffected parts of the cerebellum the pons, medulla, and even the corpora quadrigemina have been found to have been damaged in the various cases that have been reported. As a direct result of the cerebellar cyst, we often find a dilatation of the lateral ventricles, and a resulting internal hydrocephalus. This has been supposed by some to be due to pressure on the veins of Galen, and by some to direct pressure on the foramen of Majendie, and by others, to a combination of these two circumstances. It is a fact, that in most post-mortem examinations of brains, in which a cyst of the cerebellum is found, the ventricles have been noted as dilated and full of cerebro-/

cerebro-spinal fluid, and in many the foramen of Majendie has been found patent. As a result of this dilatation of the ventricles we find flattening of the convolutions of the brain noted in many cases.

PROGNOSIS.

The prognosis to life in a case of cyst of the cerebellum must always be regarded as very grave. Death is almost certain to occur at a sooner or later period, unless operative interference is resorted to, and even then the dangers and difficulties which arise during and after an operation on the cerebellum, in a patient debilitated by disease and suffering, are such that we must not be too hopeful of the ultimate result. It is certainly a fact that an operation for cyst of the cerebellum is much more likely to be attended by good results, both immediate and remote, than one for a tumour in the same situation. And I think there is no doubt that when our technic with regard to operations on the brain is improved, we are more likely to get better results in these cases than was at one time thought probable. We shall have more to say in regard to this subject, and the chances of recovery as given by operative interference, when we are discussing the treatment by operation.

Sudden death is by no means uncommon in these cases, and may occur either before operation during/

during the time the patient is under observation for diagnosis with a view to operation, as in one of Stewart and Gibson's cases, or during operation or immediately after operation, as in a case reported by Mills. In the cases of sudden death reported, there is always failure of respiration before the heart fails - Thus we find that in a case reported by Colman the heart continued to beat for ½ hour after the respiration had ceased, and in another recorded case where respiration failed, artificial respiration was carried on for 8½ hours before the heart ceased to beat. The explanation of this was given by Spenser and Horsley as being due to the fact that part of the cerebellum was driven by pressure through the foramen magnum, thus causing compression of the structures as they go through that opening - Jackson and Russell think that it is due to the cyst pressing on the Medulla oblongata directly.

Death may take place gradually from asthenia or coma - or may supervene after operation from shock, haemorrhage or septic infection.

T R E A T M E N T.

MEDICAL. Before an absolute diagnosis has been arrived at in cases of Cerebellar disease the patient should be placed on gradually increasing doses of Potassium Iodide with the application of ice to the head. Cases of cyst of the cerebellum thus treated have been known to improve vastly as far as the symptoms are concerned. If the headaches are very severe in character the exhibition of morphia is indicated. But as soon as the possibility of a gumma or tubercle have been as far as possible excluded, and a definite diagnosis of cerebellar tumour or cyst has been arrived at, we should have resort to operative interference, as therein lies the only real hope of success.

SURGICAL. In regard to the time at which operation should be undertaken Sir Victor Horsley in 1890 suggested 6 or 8 weeks as the limit and Starr in 1893 put the limit of time of drug treatment at 3 months, but Cushing thinks that the time at which operation should be undertaken should be judged by the appearance of the fundus, if the choked disc is progressing to actual optic neuritis the operation should not be delayed/

delayed, even if the subjective symptoms are getting less, and considering the liability these patients have to sudden and unexpected death he thinks that it is unwise to prolong medicinal treatment even as long as Horsley suggests.

THE PREPARATION OF THE PATIENT. No special ward preparation is required except that the patient's bowels be kept moving regularly for some days before the operation, and that the whole head and neck be shaved on the evening preceding the operation and scrubbed up in the usual manner.

POSITION OF THE PATIENT. This shaving and preparation of the head and neck may with advantage be repeated on the operating table before the anaesthetic is administered, the parts being then firmly enveloped in a couple of dry sterilized towels. Many operators, amongst whom are to be numbered Cushing and Jacobson, prefer for operations on the Cerebellum a special adjustable head and shoulder rest so that the patient is able to lie on the face with comfort to the operator, and also to the anaesthetist; but this seems unnecessary, especially when the side of the lesion is accurately ascertained, as then with the patient rolled well over on to the side and propped up with pillows and sand-bags, sufficient-

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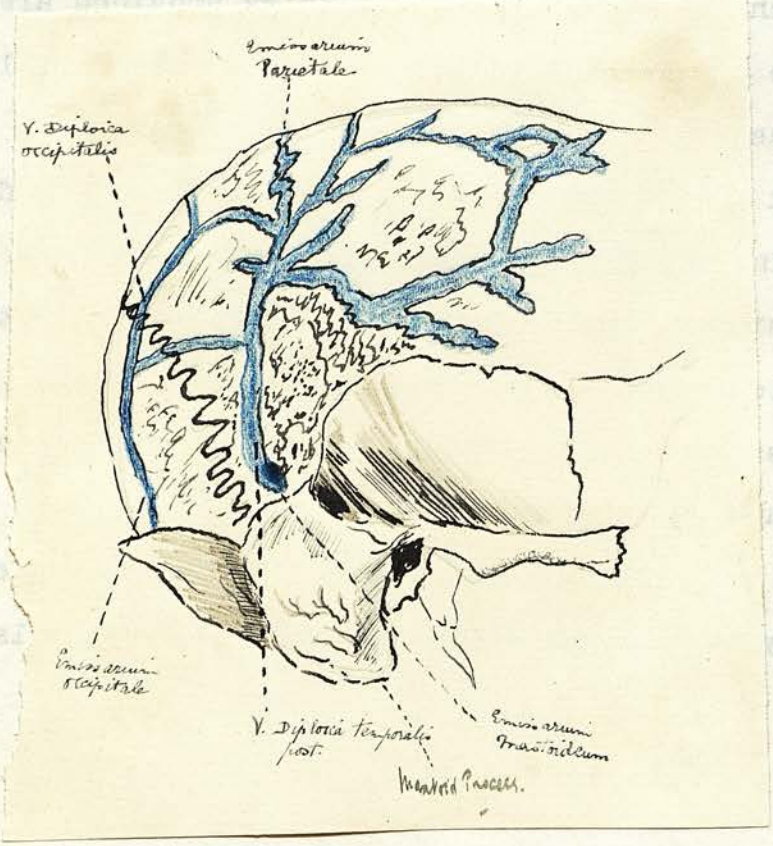
sufficiently good access to the occipital region can be obtained, both the operations mentioned in this paper were done in that position. That portion of the table however, upon which the head rests should be capable of being raised or lowered at will. The head should be bent forward, that is flexed towards the sternum and maintained in that position. A good light is essential.

THE ANAESTHETIC. Regarding the question of the anaesthetic great difference of opinion exists. Sir Victor Horsley regards chloroform as the ideal anaesthetic and he also advises the administration of a small dose of morphia immediately prior to the operation. I think probably Horsley's views are those generally held in this country provided always that the drug is administered by an expert. Chloroform causes less venous engorgement of the head and neck than Ether, it is safer to give a second or third time, within a few days, if the operation is done in two stages, and it is easier to administer with the patient lying in the rather cramped position that is necessary. Ether by the continuous open method is perhaps next to be preferred, but is difficult to give with the patient lying on his face or side. Ether by the closed method is the least desirable of all/


Emissarium Parietale
V. Diploica occipitalis
Emissarium occipitale
V. Diploica temporalis post.
Emissarium mastoideum
Mastoid Process.

all, although preferred by some operators in this country and America. Very little anaesthetic is as a rule necessary especially after the skull has been opened; some few operators prefer to do the second stage of the operation under local anaesthesia. The patient's blood-pressure should be taken at intervals of five minutes all through the operation and marked upon a chart, where it can be seen by both the operator and the anaesthetist.

ANATOMICAL CONSIDERATIONS. The cerebellum when considered from the point of view of its anatomical relations is peculiarly unsuited to operative attacks. In the first place it is surrounded by large venous sinuses, viz:- the lateral and occipital, and besides these two large ones there are present one or two small ones, variable in position, but no less of considerable importance, as haemorrhage from them may be very severe and seriously embarrass the operator; one of these is usually just internal to the mastoid process and the other usually just below the external occipital protuberance. There are also two large Diplöic veins in this neighbourhood, the Vena Diplöica Temporalis posterior, and the Vena Diplöica Occipitalis (the position of which is seen in the accompanying drawing) and both these veins gave considerable/

considerable trouble in the operation on Case 1. Another very considerable anatomical factor to be reckoned with, is the proximity of the Medulla oblongata, damage to which is accompanied by the gravest possible danger. Again the cerebellum is enclosed within rigid walls for the most part, thus below and behind we have the occipital bone, in front the petrous portion of the temporal and above the tentorium cerebelli and, as is pointed out by Frazier, even the normal cerebellum will bulge out of any opening made in these walls, and thus hamper the operator should it be necessary to search deeply for the cyst. Another consideration is that the portion of the occipital bone usually removed, is deeply situated beneath the muscles at the back of the neck, and considerable haemorrhage may be experienced in reflecting the flap from the bone, in fact I have seen the haemorrhage at this period of the operation so severe and uncontrollable, especially around the region of the mastoid process, that the operation had to be abandoned before the skull was opened. So we see that from an anatomical standpoint operations on the cerebellum are exceedingly difficult and dangerous.

THE INCISION. This should start at the tip of the mastoid/

mastoid process and should extend upwards and inwards along a line about half-an-inch above the superior curved line of the occipital bone, to the midline. From this point the incision should be carried vertically downwards, till it ends about opposite the level of the foramen magnum. And now arises the question as to whether to open the skull by reflecting an osteoplastic flap as was done in Case 1 or by the older method of taking out a circle of bone with the trephine, and then enlarging the opening with rongeur forceps. Very few operators are in favour of an osteoplastic resection of the skull in this region owing to the facts that, firstly, it is very difficult to perform in this situation, secondly it is not necessary as the large pad of muscles and aponeurosis form a protection against the formation of a hernia of any considerable size, and, thirdly, it takes longer to perform. Krause, Cushing, Kocher, Frazier and others are greatly in favour of removing the bone with trephine and rongeur forceps and that is the method we shall here describe.

OPENING THE SKULL. The flap described having been reflected the trephine is applied at a point midway between the tip of the mastoid process, and the external occipital protuberance, the bone is removed and the/

the opening enlarged towards the mastoid process till the lateral sinus comes into view, downwards and inwards to within about half an inch of the foramen magnum, inwards to within about ½ inch of the middle line and upwards till the lateral sinus is well exposed to view. The lateral and occipital sinuses will be exposed but should be carefully avoided. Any haemorrhage that occurs from the diploic veins should be checked by means of Horsley's Wax or preferably by small pegs of wood, prepared beforehand and placed in readiness for immediate use. At this period of the operation comes the question as to whether the procedure is to be completed in one stage or two. I think most surgeons prefer to do the operation in two stages, both the operations described in this paper were done in two stages. In deciding this point, at this stage the blood pressure chart should be carefully consulted and the general condition of the patient should be noticed, both as regards the force and frequency of the pulse and the character of the respirations. The two stage operation is undoubtedly the safer and is the one to be recommended, but one argument against it is well illustrated in Case 1, where the 1st stage of the operation relieved the headache to such a degree that she for some days refused/

refused to have anything more done, to obviate this it would always be as well to warn the patient that two operations may be found to be necessary for her complete relief. If the two-stage operation is going to be done the dura is now covered with perforated oil-silk protective and the wound closed and dressed in the ordinary way.

OPENING THE DURA MATER. The second operation should be undertaken within 5 days of the first, that is before granulations have formed to such a degree as to embarrass the proceedings and obliterate the land marks. The old wound is reopened, and the dura is cut through about half-an-inch within the line of section of the bone. It should be opened by a horse-shoe shaped incision similar in shape to the skin flap.

EXPLORATION OF CEREBELLUM. The cerebellar lobe now exposed to view should be palpated gently with the finger - if nothing abnormal is made out in this way, an exploring syringe should be pushed gently and with care in various directions into the cerebellum - if the cyst is found by this means, a pair of sinus forceps should be introduced into it, along the track made by the needle, and opened so as to let the fluid in the cyst flow out. If the nature of the cyst is uncertain/

uncertain it should be excised by cutting it away carefully with the brain knife, this was done in Case 1, until almost the whole of the lateral lobe of the cerebellum was removed and no harm resulted. The alternative to this is opening the cyst and draining it, but in these Cases the drain has to be kept in for a long time, and even then there is a danger of the cyst refilling and causing all the former symptoms. If it is impossible to find the cyst, the bulging portion of the lobe of the cerebellum may be removed with the brain knife, and this procedure may give the patient unspeakable relief, the headache and vomiting disappear, and the intensity of the optic neuritis diminishes. If the symptoms then recur a second attempt may be made and is often rewarded by success as in Case 2.

CLOSURE OF WOUND. The incision in the dura is closed by a continuous suture of fine catgut, the edges being approximated as accurately as possible and the skin and muscle flap is sutured with silkworm gut, after all bleeding has been stopped. It is best to put two small drainage tubes in at each of the lower angles of the wound. The patient should be put back to bed as quickly as possible with hot bottles/

bottles to the feet and if necessary should be given hot saline solution by the rectum. The first dressing should be made in 48 hours when both drainage tubes should be removed. The patient should be propped up in bed as soon as possible especially if there is any considerable escape of cerebro-spinal fluid. The stitches should be taken out about the tenth day and the patient (if possible) be allowed to get up.

THE DANGERS AND DIFFICULTIES which arise during the operation are numerous and very often require prompt remedial measures to save the life of the patient. In the first place the patient may suddenly and without warning cease respiration during an operation upon the cerebellum; this happens very often before the opening of the dura mater, and if so, the opening of this membrane often puts matters right again; this being so, artificial respiration must be kept up as well and thoroughly as possible till the operator can, in some way, relieve the intracranial tension. Some surgeons recommend that Lumbar Puncture should be performed so as to relieve intracranial tension, but although relief is undoubtedly obtained in some cases, there is a great danger of sudden death either immediately following the lumbar puncture/

puncture or a few hours or days afterwards. This is accounted for by Frazier and others, as due to the fact, that the foramen of Majendie being in some of their cases greatly narrowed if not altogether closed, we thus have a vacuum produced below this, and the structures of the posterior fossa of the skull are consequently brought into violent contact with the foramen magnum. Whether this is correct or not, it is a fact that there is danger of sudden death, and for this reason lumbar puncture in these cases had better be avoided. Death during the operation may occur also through Cardiac failure, and this is usually brought about by disturbance of the vital centres in the medulla through rough handling of the cerebellum. All manipulation of the cerebellum should be done with great care for this reason, and the use of the chisel and mallet should be rigidly avoided in operations on the cerebellum. In this connection it is perhaps as well to mention the warning given by Jacobson, as to the lowering effects of the iodides, if they are continued right up to the day of operation. Jacobson suggests that the use of these drugs should be stopped some days before the operation for this reason. Haemorrhage is always a difficulty, and may be a great danger during the/

the operation. Haemorrhage from the scalp is often very severe especially in the region of the mastoid process, it may be circumvented by only incising an inch or so at a time and stopping the bleeding with forceps before the next cut is made, by reflecting the pericranium along with the scalp and muscles, and by elevating the patient's head. Haemorrhage from the diploïc veins can be arrested by Horsley's wax or preferably by small pegs of wood as pointed out above. The venous sinuses ought never to give trouble as they can be easily avoided with care. Shock is also a condition which may come on during an operation on the cerebellum, and should be met by transfusion, lowering the head and brandy and hot salines by the rectum. Great difficulties are sometimes experienced in finding the cyst, but this should not deter the operator from searching for it again at a subsequent operation. Other dangers which can be avoided with care are consequent upon opening the lateral ventricles, sepsis and hernia cerebri. We have already pointed out that the latter condition is not a common sequel to operations on the cerebellum, and if it occurs it is so small as to be almost ignored. One of the chief preventative measures/

measures to be taken, besides the osteoplastic resection of the skull, is the accurate apposition of the edges of the dura mater and the avoidance of sepsis.

Two other operations for removal of Cerebellar cyst may here be mentioned firstly, Bilateral Craniotomy or simultaneous exposure of both lateral lobes of the Cerebellum; this operation is specially recommended by Cushing and Frazier, when there is a doubt in the mind of the operator as to which lobe the tumour has invaded. It is a far more severe operation than the one described in this paper, involving as it does, the removal of such a large area of bone and the ligation of the occipital sinus, and so is not to be recommended as a routine procedure. Secondly, simultaneous exposure of the occipital lobe of the cerebrum and the cerebellar hemisphere of that side, this procedure is open to the same objections as the one mentioned above, and is only to be employed in those extreme cases where a reasonable doubt exists as to whether the tumour is situated in the occipital lobe or in the cerebellum.

CONCLUSION. As to the advisability of operation in cases of simple cyst of the cerebellum there is no doubt/

doubt that if we could diagnose with certainty that the case was one of simple cyst, operation should be undertaken without delay and with a fair prospect of permanent success. As this absolute diagnosis is impossible, we must be content to state that in all probability such a case is either one of cyst or tumour. Goodhart, Taylor and others are of opinion that all such cases should be operated on, on the chance of the case turning out to be one of simple cyst - as even if the case be found on operation to be one of irremovable tumour the relief of intra-cranial tension is so great that the patient is relieved of a great number of his most distressing symptoms, even though death will eventually supervene. I think there is no doubt that surgical interference on the cerebellum will continue to grow more popular with improvement of the technic, and that the results of surgical intervention in simple serous cysts will be found as time goes on to be surprisingly successful.

I give below a resumé of the cases of simple cysts of the cerebellum, which have been operated on and the results obtained, as culled from the recent literature on the subject (except in the case of (1) which/

which cases have not been reported.)

(1) CLARKE & LANSDOWN (in this paper) 2 cases. 1 cured and remains well 9 months after operation. 1 died of septic meningo-encephalitis 10 weeks after operation.

(2) STEWART & HOLMES. 3 cases. 3 cured. 1 remains well 2 months after operation, the other 2 remain well 6 months after operation.

(3) STEWART & GIBSON. 2 cases. 1 cured and remained well one month after operation. 1 died suddenly of respiratory failure on the 7th day after operation.

(4) FRAZIER. 7 cases. 6 cured with no notes to say how long they remained well after the operation. 1 relieved of symptoms.

(5) ORMOND. 1 case which died of suppurative meningitis after decompressive trepannation had been performed over the Rolandic area.

(6) SCHOLZ. 2 cases both cured and remained well for some time after operation.

In all 17 cases, all operated on with only three deaths or a mortality rate of 17.6%.

SUMMARY.

We conclude therefore from the foregoing remarks that -

Simple serous cysts of the cerebellum is a rare condition -

It is a disease of youth and early adult life. It is slightly commoner in males than females. The causation of the condition is very obscure but it is probably a dilatation of the lymph spaces of the perivascular lymphatics.

The Symptoms are usually those of headache, vomiting, optic neuritis, vertigo, flaccid paresis of the muscles on the homolateral side, incoordination of these muscles, typical cerebellar gait and attitude, sometimes homolateral deafness and noises in the ears, nystagmus and sometimes mental and psychical disturbances.

The Diagnosis must be made from tumour of the cerebrum, extra-cerebellar tumours, solid tumours of the cerebellum (the latter only to be made by means of Brain Puncture), in occasional cases Insular Sclerosis and Meningitis.

The Pathology is very obscure, but that there/

there is probably no cyst wall that can be described as such, that the cyst is surrounded by normal brain tissue, that the size of the cyst varies from that of an almond to that of an orange, and that it usually contains clear, watery fluid.

The Prognosis is always grave but that nowadays surgical interference gives more hope than was possible in bygone years.

The Treatment is essentially surgical (except during the diagnosis of the condition when iodides may be given in increasing doses.) That the easiest operation for removal of the cyst is one by means of which part of the occipital bone is removed altogether, and not by means of an osteoplastic flap (except in rare cases.) That a two stage operation is safer, and gives better chance of success, granting that the symptoms are not of a very urgent nature.

That the dangers and difficulties of the operation are chiefly Haemorrhage, shock, cardiac and respiratory failure, sepsis, failure to find the cyst and hernia cerebri.

That the mortality rate from the operation is somewhere between 15 and 20%, but that this can probably be improved by increased improvement in the technic, and the rigid avoidance of interference with, or damage to the vital centres in the medulla.

REFERENCES.

AUERBACH and GROSSMAN. Zur Diagnostik und Chirurgischen Behandlung der Kleinhirncysten. Mitth. a.d. Grenzgeb.d.Med.u.Chir. XVIII 1 1907.

BABINSKI. Revue Neurologique. May. 1902.

BASTIAN. Clinical Lecture on Two Cases of Cerebellar Disease. Lancet. August. 1878.

BRUCE. Diseases of the Cerebellum. Transactions of the Medico-Chirurgical Society of Edinburgh. January 1899.

BRÜCHNER. Fall v.Tumor Cerebelli. Jahrbuch f.Kinderheilkunde. 1894.

CLARUS. Ueber Kleinhirncysten. Inaug.-Diss. Würtzburg 1874.

COLLINS. Remarks on the Functions of the Cerebellum New York Medical Record. 1908.

COLMAN. Simple cyst of the middle lobe of the Cerebellum. Transactions of the Pathological Society of London. 41 p.16. 1890.

CUSHING. Keens Surgery. Vol.III p.233. 1908

FERRIER & TURNER. Proc. Royal Society, London. 1893.

FRAZIER. Remarks upon the Surgical Aspects of Tumours of the Cerebellum. New York Med. Journ. Feb. 1905.

GERHARDT./

GERHARDT. Kleinhirncyste. Charité – Annalen. Vol. XXIV.

GOODHART. Diseases of Children. p.468. 1899.

GOWERS. Quoted by Schweintz in ocular symptoms of Cerebellar Tumour. New York Med.Journal. Vol. LXXXI. 1905.

HADDEN. Simple Cyst of the Cerebellum. Transactions of the Pathological Society of London. 41. 1890

" On some Clinical and Pathological points in Cerebellar Disease. British Medical Journal. June. 1884.

HENSCHEN. Seröse Cysts und partieller Defect des Kleinhirns. Zeitschr. f. Klin. Med. Bd.LXIII, S.I.

HOMBURGER & BRODNITZ. Zur Diagnose, Chirurg. Behand. u. Sympt. D. Kleinhirngeschw. Mitt. a.d. Grenzgebiet. d. Med. u. Chir. 1908. Bd.19, H.2.

JACKSON & RUSSELL. Case of Cyst of the Cerebellum. British Medical Journal. I. 1894.

JACOBSON & ROWLANDS. The Operations of Surgery. Vol.1, p.381. 1907.

KRAUSS. Quoted by Osler, Principles & Practice of Medicine. p.953. 1906.

LOCKHART CLARKE. Case of Cerebellar Cyst. Medical Times. 1873.

LUCIANI. Quoted by Stewart & Holmes in Symptomatology of Cerebellar Tumours. Brain Vol.XXVII. 1904.

" Ergebnisse der Physiologie (Asher and Spiro). 1904.

LUSSANA./

LUSSANA. Cyste im Kleinhirn. Ann. univers. di Med. Marzo. 1856.

MAJOR. Diseases of the Cerebellum. British Medical Journal. Nov 1889.

MARTIN. Case of Cerebellar Cyst. Lancet. Dec. 1878.

MILLS. The Diagnosis of Tumours of the Cerebellum. New York Med.Journal Vol.LXXXI. 1905.

NIEMEYER. A text book of Practical Medicine. translated from the 8th German Edition by Humphreys & Hackley. Vol.II, p.244. 1876.

NEISSER & POLLACK. Die Hirnpunktion. Mitt. a.d.Grenzgeb. der Med. u. Chir. Vol.XIII H.4 & 5.

ORMOND. One hundred cases of Intracranial Tumour with special reference to the ocular symptoms. Medico-Chirurgical Transactions. Vol. LXXXIX. 1906.

PURVES STEWART. A contribution to Localization of Cerebellar Lesions. Edin. Hospital Reports. Vol.3 1895.

PYE-SMITH. Cyst of the Cerebellum. Transactions of the Pathological Society of London. 36 1885.

RISIEN RUSSELL. On Cerebellar Disease. The Clinical Journal. XXVIII 1906

" Phil. Trans. London. 1895.

ROLANDO. Saggio sopra la vera struttura del cervelle. Turin 1823.

SCHOLZ. Ueber Kleinhirncysten. Mitt. a. d. Grenzgebiet d. Med. u. Chir. Bd.XVI, H.4 & 5 1906

SCHÜLE. Ein Beitrag zu der Lehre von den Kleinhirncysten. Deutsche Zeitschrift für Nervenheilkunde Bd.18, H.5. 1900.

SHARKEY./

SHARKEY. Case of Simple Cyst of the Cerebellum. Transactions of the Pathological Society of London. 33. 1882.

SPENSER & HORSLEY. Transact of Roy. Soc. B.1891. p.201.

STEWART & GIBSON. Report on cases of Cerebellar Disease treated in the Royal Infirmary during the last 3 years. Edinburgh, Hosp. Reports. Vol. 5, p. 173. 1898.

STEWART & HOLMES. Symptomatology of Cerebellar Tumours. Brain. Vol.XXVII. 1904.

TAYLOR. On Intracranial Tumours. British Medical Journal. II, p.1439. 1905.

TILLMANS. Something about Brain Puncture. British Med.Journal. p.983. 1908.

WINTER. Fall von Neubindung im Kleinen Gehirn. Berlin Klin. Wochenschrift. No.37. 1875.

WILLIAMSON. Serous Cysts in the Cerebellum. International Journal of Medical Sciences. 1892.