The Lettsomian Lectures

ON THE CEREBELLUM AND ITS AFFECTIONS.

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BY

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LECTURE II.

THE various morbid processes by which the cerebrum is affected may be met with also in the cerebellum, but whereas vascular affections are responsible for such a large number of disorders of the cerebrum these play but a small part in the production of diseases of the cerebellum. In consequence tumours supply the most common form of disease of the cerebellum, and according to Dana, about a fifth of the total number of intracranial tumours occur in this region, which is especially liable to be so affected in children.

SYMPTOMS.

Headache.

The same general symptoms occur as in the case of all intracranial tumours, but the headache is especially liable to affect the occipital region and to extend down the back of the neck. It may, moreover, be accompanied by local tenderness, which may be more marked on the side of the tumour when this occupies one half of the cerebellum, while in children a variable degree of bulging may be detected in the occipital region over the seat of the tumour. The pain is commonly severe, and the patient keeps the head in one position, and is disinclined to move it owing to the increase of symptoms occasioned by movement. The pain is not, however, always confined to this region; it may affect other parts, notably the frontal region, and according to Purves Stewart, the contralateral frontal temporal regions are especially liable to be the seat of a fixed pain, a circumstance to be accounted for by the radiation of stimuli along the fronto-pontine tracts. Grainger Stewart and Gordon Holmes, whose analysis of forty cases of cerebellar tumour, studied at the National Hospital, Queen Square, forms the most valuable clinical contribution to this subject within recent years, could find little to favour this assumption, and they also failed to find justification for Luciani's view, that the pain is due to irritation of the cerebellar tissue.

Vomiting.

Vomiting is a constant symptom, and although it does not differ from what obtains in the case of intracranial tumours that have a different seat, it is nevertheless commonly both frequent and severe.

Optic Neuritis.

I do not propose to enter into any detailed discussion of the vexed question as to whether optic neuritis has any localizing value in intracranial tumours, but cannot refrain from saying what my own experience in this connexion has been. Since the days when I was House-Physician at the National Hospital, when I learnt to regard cerebellar tumours as especially liable to occasion optic neuritis early and in severe degree, leading rapidly to loss of sight and consecutive atrophy, I have never seen reason to alter this belief, which has been emphasized by many writers, and which is now commonly accepted. The late Mr. Marcus Gunn, in a discussion on the localization of intracranial tumours introduced by the late Dr. Beevor at the Neurological Society in 1898, was of opinion that "intense double optic neuritis with much swelling and surrounding retinal change, coming on quickly, suggest the cerebellum." I have also long regarded an eye in which the neuritis begins, or in which it is most intense, as probably corresponding to the side on which the tumour is situated, irrespective of whether the growth be in the cerebrum or cerebellum. Grainger Stewart and Gordon Holmes, after commenting on the intensity of the neuritis, often out of

proportion to the general symptoms, and the early impairment of vision that is likely to result, state that in the majority of the cases on which their paper is based the neuritis and swelling of the optic papilla was more intense on the side homolateral to the tumour in the cerebellum, and that blindness due to consecutive atrophy had resulted in that eye first. These observers draw a distinction between intracerebellar and extracerebellar tumours in regard to this point, and find that while the former conform to the above description, the neuritis may be late in appearing in extracerebellar growths, and the greater degree of swelling does not necessarily correspond to the side on which the tumour is situated.

In a paper which was read before the Ophthalmological Society Mr. Leslie Paton adduced evidence which he regarded as opposed to the belief that the greater degree of optic neuritis corresponded to the side of the intracranial growth, but in the discussion which followed Sir Victor Horsley expressed himself as diametrically opposed to this conclusion and Sir William Gowers also considered it at variance with the weight of evidence.

Disturbances of Equilibrium.

After what has been said from the experimental standpoint, it seems superfluous to state here that tumours of the cerebellum occasion vertigo and disturbances of equilibrium and co-ordination. True as this is in the majority of cases at some time or another during their clinical history, this offers a favourable opportunity for calling attention to a feature of cerebellar lesions to which reference was purposely not made at the time when the experimental results were under discussion. I refer to the remarkable provisions for compensation which obtain as long as only partial ablation of the organ is effected, and, according to Luciani, as long as the sensori-motor cortex of the Rolandic region of the contralateral cerebral hemisphere is intact. So complete may be the recovery of the animal within a few months after unilateral ablation of the cerebellum that it may be difficult to believe that it is the same that presented such marked disturbances of equilibrium as the immediate effect of the destructive lesion. This prepares us for what in our clinical work often proves most disconcerting, for it can be readily understood that with the slower destructive effects produced by a tumour compensation may be brought about *pari passu* with sufficient expedition to permit of but little evidence of inco-ordination resulting. Nevertheless, careful investigation will usually result in the determination of sufficient evidence of disordered co-ordination to permit of our coming to a correct conclusion as to the seat of the tumour. What has just been said prepares us for the fact that actual rotation, such as obtains in animals after ablation of half of the organ, is not met with in man as a result of tumour of the cerebellum, except as a rare event, and then usually in connexion with tumours of the middle peduncle. Vertigo in some degree is a common symptom, but in the majority of cases it only amounts to a degree of disturbance which is described by the patients as giddiness, without its being possible for them to give any more detailed description of the sensation they experience. Others are, however, more severely affected, and experience an actual feeling as if falling in a given direction, or an actual sense of rotation may be experienced, in which either they or the objects surrounding them appear to be moving. Stewart and Holmes found that, irrespective of whether the tumour be extracerebellar or intracerebellar, external objects appear to move in front of the patient from the side of the tumour to the opposite side. The subjective sensation of rotation of the individual, however, differs according to whether the tumour is extramedullary or intramedullary, and this is regarded by them as a diagnostic point that proves most serviceable. In the former class of case the patient experiences a sensation of rotation of the body from the normal to the affected side, whereas in the latter the sensation of rotation is from the side of the tumour to the healthy side. These observers had, however, more than the ordinary clinical course of cerebellar tumours on which to make their observations, for so many patients were those from whom tumours had been removed by operation, that they were enabled to

study the effects of acute lesions in man in a way that may be compared to the study of the results of ablation in animals. This accounts for the fact that they are able to give a detailed account of the forced movements which result after such lesions in man, and to compare them with the subjective sensations of vertigo which may or may not accompany the objective displacement of the body which occurs. The most definite rotation movement which they observed was in a case in which there were cerebellar fits, comparable to those to which your attention was directed in our first lecture as described by Dr. Hughlings Jackson many years ago. The rotation in this case was from the affected to the healthy side. In several of the cases in which there was no actual rotation the patients nevertheless lay on the normal side, and stated that although they experienced no giddiness, they nevertheless felt compelled to roll over to this side. When, however, the auditory nerve or middle peduncle was involved by an extracerebellar tumour, and acute vertigo resulted, they have found that the tendency was for the patients to rotate to the side affected, as well as to fall towards that side. This is in accord with what I was able to determine from the experimental standpoint when I instituted control experiments on the labyrinth and auditory nerve in the hope of excluding the possibility of assigning to ablation of the cerebellum results that in reality belong to accidental lesions of the vestibular nerve. Time will not, however, allow me to enter on any theoretical discussion as to why these results and those which follow section of the middle peduncle should occasion a difference in the direction of rotation or falling to what is observed after ablation of one half of the cerebellum.

On being made to stand with the feet together and eyes closed, such patients most usually tend to fall backwards and to the affected side. It further often happens that a patient can stand on the contralateral limb alone more easily than he can on the homolateral one, a sign that may prove of considerable value, especially when considered in conjunction with others which appear to point to the same conclusion.

The homolateral relations of the cerebellum to the spinal centres, so much insisted on in my first lecture, prepare us for this and other homolateral effects of a tumour or other destructive lesion of the cerebellum in man, as opposed to the contralateral effects which result from lesions of the brain.

Attitude.

From what has been said as to the results of experimental lesions we are prepared for a fixed attitude, both in regard to the head and position of the trunk. It accordingly follows that the patient may show an inclination of the head to one side, so that the ear is approximated to the shoulder, while the chin points in the opposite direction, and one side of the face may be turned upwards. This position would, according to the experimental results, indicate a lesion on the side corresponding to the shoulder to which the ear is approximated. But like my colleague, Dr. F. E. Batten, I have seen cases in which the ear has been approximated to the shoulder on the contralateral side to a tumour of the lateral lobe of the cerebellum, so that I agree with his conclusion that this sign cannot be regarded as one of special value in the localization of cerebellar tumours, but must be only allowed a subsidiary place in our deliberations.

Gait.

When the patient is able to walk, general inco-ordination may be revealed in his gait, which has been described as cerebellar titubation, and which has been likened to the gait of an individual who has taken alcohol in excess. The condition has been very aptly described by Dr. Hughlings Jackson as suggesting that the legs are running after the trunk and attempting to prop it up, in its various over-inclinings. The patient walks on a wide base, largely brought about, it may be, by abduction of the lower limb on the homolateral side to the tumour, which limb may also show inco-ordination in its movements during locomotion. The individual may tend to incline towards the side of the lesion, and thus to deviate from the middle line towards this side, or an actual tendency to fall to this side may be observed. But the knowledge of the tendency leads him to attempt to correct it, with the result that it

often happens that over-correction is brought about, so that he deviates from a straight course to the contralateral side, and may even tend to fall to this side.

Ataxia.

In addition to what has been said above, it is necessary to emphasize the homolateral ataxia which results, and which reveals itself even more strikingly in the upper limb on the side corresponding to the tumour. The failure to execute a purposive movement in co-ordinate fashion is not influenced by the aid of vision, and so is not increased when the eyes are closed, as happens in *tabes dorsalis*. The defective control over the muscular contractions which is responsible for the ataxia accounts for a phenomenon described by Babinski as "*diadococinesia*," in which, if the patient be made to attempt rapid pronation and supination movements of the forearms, these can be executed in a normal manner in the contralateral limb, but only in a very imperfect, slow, and awkward way in the homolateral one. This phenomenon cannot be regarded as either constant or pathognomonic of cerebellar lesions, but, taken in conjunction with other clinical symptoms which point to the probable seat of the tumour, must be accorded a place in the symptomatology of unilateral lesions of the organ.

Tremor.

What has already been described in connexion with active movements of the limb must be carefully distinguished from what is about to follow in regard to tremor, for whereas the homolateral limb reveals inco-ordination in the performance of purposive acts, it nevertheless may be possible, according to Babinski, for the same limb to be held extended in front of the patient without revealing even that degree of unsteadiness which is evident in the normal contralateral limb. Stewart and Holmes find that this applies only to intracerebellar tumours, and that when the growth is extracerebellar, tremor is often present, and is equally evident in both limbs.

Motor Paresis.

In accordance with what I described as paresis, but which others have preferred to designate asthenia, it has been abundantly proved that although by no means an invariable result, unilateral tumours of the cerebellum occasion a variable degree of paresis, which may be considerable in some cases. Stewart and Holmes were able to determine that this weakness affected the trunk muscles in some cases of operative lesions of the cerebellum in which the weakness of the spinal muscles, with some lordosis, persisted after all evidence of paresis elsewhere had passed off. This reminds us of Dr. Jackson's contention that, "speaking very roughly and neglecting some parts of the body, the cerebellum represents movements of the skeletal muscles in the order, trunk, leg, arm. . . . The cerebrum represents movements of the same muscles in the order, arm, leg, trunk. . . ."—a contention the correctness of which became evident to me many years ago when, as one of his house-physicians, I carried out at his suggestion a series of observations on the back muscles in cerebellar tumour and in cases of hemiplegia.

Atonia.

The results of experiments prepare us for a loss of tone in the muscles, which is especially evident in those of the homolateral limbs, and which can often be detected in addition to the asthenia or motor paresis to which we have just referred, and which renders the limbs peculiarly limp and flail-like when they are manipulated by the observer. This hypotonic condition of the muscles serves to distinguish the paresis from that which results when involvement of the pons is responsible for the defect, for in this case a hypertonic instead of a hypotonic condition of the affected muscle is revealed. This hypotonism is supposed by Stewart and Holmes to account for the fact that when resistance previously exerted against a movement is suddenly removed the movement continues to an inordinate degree without recoil.

Tendon-jerks.

In contrast to what obtains in *tabes*, the hypotonic condition of the muscles met with in cerebellar disease is

compatible not only with the preservation of the tendon-jerks, but even exaggeration of them, so that although the knee-jerks may be abolished, they may be preserved or increased in spite of the hypotonus. One of the effects of unilateral ablation of the cerebellum which I observed, to which time did not permit me to refer in the first lecture, was exaggeration of the tendon-jerks, in which those of the homolateral side were more active than those of the contralateral. There is, however, no such constancy in cases of cerebellar tumour, for although the homolateral knee-jerk may be more active than the contralateral in some cases, this does not by any means always obtain. Indeed, one of the few characteristics in regard to the tendon-jerks in cases of cerebellar tumour is their variability, so that in the same patient, and within short periods of time, the knee-jerks may be increased, diminished, or abolished.

Superficial Reflexes.

Neither the abdominal nor plantar reflexes are altered in cases of uncomplicated cerebellar tumour, but hydrocephalus, or pressure on the cerebro-spinal path, may occasion alterations such as are characteristic of these lesions. Thus it is that the abdominal reflexes may be abolished, or the plantar changed from the normal flexor to the abnormal extensor type of response. It will be readily understood that there is little likelihood of intracerebellar tumours interfering with the cerebro-spinal system in the way that obtains when we are dealing with an extracerebellar tumour, which may so readily press on the pons. Even in this case, however, it is the exception to elicit the abnormal extensor type of plantar reflex, except in the more advanced stages of the clinical history of the cases.

Ocular Phenomena.

As in cases of experimental ablation defective power of movement of the eyes to the homolateral side, with in some cases even a slight tendency to deviation of the globes to the contralateral side in the resting condition, may be observed. It is, however, especially a difficulty in sustaining the movements of the globes to the homolateral side that is most evident. In this defect it commonly happens that the external rectus of the homolateral side shows a greater degree of disability than does the internal rectus of the contralateral eye. This is explained by the fact that whether or no defect of the conjugate movements is determined the external rectus of the homolateral, and even that of the contralateral side to a less degree, gives evidence of weakness due to pressure effects on the sixth nerve. The external rectus paralysis is rarely complete, however, except when the tumour is so situated as to be able to exert pressure directly on the sixth nerve.

Nystagmus.

Another accompaniment of the weakness of conjugate movement of the eyes is nystagmus, which in its most characteristic form behaves in a manner similar to that obtained with unilateral ablation of the cerebellum in animals, for coarse jerks, which are slow and deliberate, occur when the eyes are directed to the side of the tumour, whereas when the eyes are turned away from the affected side the nystagmoid jerks become much smaller in range, though much more rapid in time. Nystagmus in such a characteristic form is not by any means always present, however, but nevertheless lateral nystagmus in some degree is usually present at some time in the course of the case. It is one of the most constant phenomena, and when present in typical form proves a most valuable aid to localization.

Paralysis of Cranial Nerves.

Apart from the effects that have been noted in connexion with the sixth nerve, and which are common to intracerebellar as well as extracerebellar tumours, though more likely to occur and to do so in greater degree in the latter variety, the cranial nerves are not affected by intracerebellar growths. It is otherwise with regard to extracerebellar tumours, as may readily be understood, owing to the position which they occupy in the cerebello-pontine angle, where they can so readily exert pressure directly on several cranial nerves. The most notable of these to suffer are the facial and auditory, and thus the peripheral

type of facial paralysis, accompanied by deafness on the homolateral side, proves a most valuable sign, not only as localizing the tumour to the side on which these defects exist, but also in deciding that an extracerebellar, as opposed to an intracerebellar, growth is responsible for these phenomena and the other symptoms that exist. Although these are the nerves that are most commonly affected in addition to those which supply the ocular muscles, others may occasionally be involved, and it accordingly happens that both the motor and sensory divisions of the fifth nerve have been affected in some cases. Cases in which the ninth, tenth, and twelfth nerves have been involved have been observed, but these are rare.

TUMOURS OF THE MIDDLE LOBE.

Time will not allow me to give a detailed description of the symptoms that may result from tumours of the middle lobe of the cerebellum, so that I must content myself with calling your attention to a few of the salient features presented by such cases.

In the main the symptoms are the same as those which result from tumours of the lateral lobes, but they are, of course, bilateral instead of being unilateral, so that the limbs reveal inco-ordination and the other defects that have been described on both sides instead of on one. When made to stand the patient may reveal a tendency to fall backwards or forwards rather than to one side, according to the precise position of the tumour in the middle lobe; and when walking no special tendency to incline to one side is evident, so that the reeling is as much to one side as to the other. The same applies to the condition of the eyes, for instead of any impairment of lateral movement to one side, when it exists the defect is evident on both sides, and the nystagmus that is evoked is as marked when the eyes are turned to one side as when they are turned to the other. This tendency to bilateral defects is even manifest in the paresis which may result in the external recti, as both of them may be affected in this way instead of one, as in the case of tumours of the lateral lobes.

TUMOURS OF THE PONS.

The proximity of the cerebellum to the pons and the important connexions which exist between these two parts of the central nervous system make it important that we should clearly recognize the chief clinical manifestations which distinguish a tumour of the pons from one which affects the cerebellum.

Although vertigo and ataxia are common to tumours in both situations, the outstanding feature which we must keep clearly before us is that in tumours of the pons spastic paralysis, which is commonly bilateral, results in the limbs, and that accordingly ankle clonus may be determined in conjunction with exaggeration of the knee-jerks, while the superficial reflexes are diminished or abolished, the plantar, however, being preserved, and constantly of the extensor type, such as is never seen in uncomplicated cases of tumour of the cerebellum. Defects of sensibility—notably hemianaesthesia—may be determined, which would be contrary to what could result from defect of the cerebellum, but this is not a necessary consequence of tumours which affect the pons, so that we may be obliged to make our diagnosis without its assistance. Any of the cranial nerves that take their origin in the pons and medulla may be affected, and they are especially liable to be involved on both sides, though by no means necessarily in equal degree. Indeed, one nerve may be affected on one side while its fellow escapes on the other, where, nevertheless, some other nerve reveals evidence of defect. It further happens that the paralysis which results may be the outcome of interference with the nuclei of certain of the nerves, in which case a special grouping of the paralytic defects becomes evident, and is characteristic of certain known anatomical relations which exist in the pons. Bilateral conjugate paralysis of the eyes is especially common as a result of involvement of both sixth nuclei, and as the third and fourth nerves are not affected by tumours of the pons, the upward and downward movements of the eyes may be preserved in spite of the fact that their lateral movement to either side has been made impossible. Yet another feature of lesions of the pons must be referred to—crossed paralysis—in

which there is paralysis of one or more of the cranial nerves on the side homolateral to the tumour, while the limbs are affected by spastic paralysis on the contralateral side. This is most likely to result from solitary tumours of a non-infiltrating character, such as a tuberculous mass, whereas the infiltrating gliomas, which are the most common forms of tumours which affect the pons, are responsible for the bilateral defects, both in regard to the limbs and the cranial nerves. One word is called for in conclusion in regard to optic neuritis. Another of the impressions which I formed in my house-physician days at the National Hospital I have never seen reason to alter, namely, that tumours of the pons may run their whole course without causing optic neuritis, or that they may exist for a very long time without doing so. It accordingly often happens that the neuritis only appears after the terminal stages of the patient's illness have been reached. This is in entire accord with the experience of all who have given attention to the subject, and Mr. Paton, in his analysis of cases of optic neuritis occasioned by intracranial tumours, finds that neuritis only occurs in about half the cases of pontine tumours.

ABSCESS OF THE CEREBELLUM.

It is generally recognized that when the source of infection is disease of the middle ear the two most common seats of intracranial suppuration are the temporo-sphenoidal lobe of the cerebrum and the lateral lobe of the cerebellum. The clinical pictures produced by abscess in these two regions may be so entirely different that there is no difficulty in deciding which of them is affected. This is by no means the rule, however, for in reality it commonly happens that, although the symptoms may clearly point to the existence of an intracranial abscess, it may be almost impossible to say whether it is in the cerebellum or in the temporo-sphenoidal lobe. So much has this difficulty been recognized that Dean devised an operation by which both regions could be readily explored from one and the same trephine opening in the skull, instead of its being necessary to expose each of these seats of possible mischief in turn when one or the other has been explored with negative result.

One of the most perfect clinical reproductions of the experimental picture of ablation of one lateral half of the cerebellum that I have ever seen was supplied by a case of abscess under the care of Dr. Acland at St. Thomas's Hospital, to whose kindness I am indebted for the opportunity which I had of seeing the patient. Mr. C. E. Ballance operated, and successfully evacuated an abscess from the right lateral lobe of the cerebellum, after which the patient made a complete recovery. In addition to the ordinary symptoms of intracranial abscess, including double optic neuritis, the patient presented the following manifestations, which clearly pointed to the right lateral lobe of the cerebellum as the seat of the lesion. He lay curled up on his left side with all his limbs flexed. His eyes were deviated to the left and presented lateral nystagmus. The right arm was markedly weak, while both lower limbs were slightly so. The right knee-jerk was brisk, and of course greater than the left.

In the light of the results of clinical investigations which have been based on the experimental results which first led to a clear comprehension of what was to be expected in unilateral lesions of the cerebellum, we find that certain additions may be made to the clinical picture that was presented by the case recorded by Acland and Ballance. No better example of this is to be found than in a case published by my colleague, Mr. Wilfred Trotter:

A woman with a large extradural abscess, in addition to another large collection of pus in the left lobe of the cerebellum, presented the following localizing signs: Conjugate movement of the eyes to the left was markedly weak. Nystagmus was most marked when the patient looked to the left. The knee-jerks and ankle-jerks were exaggerated on the left side, while the plantar reflex remained of the normal flexor type. There was marked continuation of flexion of the forearm when resistance that had been exerted was removed. Slight weakness of the left arm and leg. Marked diadochocinesis and definite ataxy of the left arm.

Although such complete pictures of the cerebellar syndrome are rare, many of the cases of cerebellar abscess that occur present a sufficient number of signs by which they can be recognized and localized. It is

nevertheless a fact that in a very large number of recorded cases no mention is made of any of the signs which may be so characteristically seen in other cases. It is not surprising that there should be so many such cases in the records antecedent to the time of the publications of Luciani and others of us who have paid attention to the results not only of total destruction of the cerebellum, but also of unilateral ablation of the organ. It is, however, disappointing to find, on reviewing the cases that have been recorded since these experimental results were published, how few of them are said to have had many, any, of the signs by which an abscess could be located in the cerebellum. I am sure that I shall not be accused of wishing to belittle the powers of observation of members of our profession who have not made a special study of disorders of the nervous system, when I say that it is impossible to escape from the belief that the number of these cases would not be as large as they are if more of them came under the observation of those specially trained in the detection of defects such as are to be looked for, and which may be present only in very slight degree. This belief is forced upon us when we compare the records of cases of cerebellar abscess by those especially trained in the way I have indicated, with others in which aural surgeons, who have not had the same opportunities of studying the symptomatology of cerebellar disease in general, are responsible for the observations. There can be no doubt, however, than even in the hands of skilled observers, cases occur in which abscesses in the cerebellum do not give rise to any of the signs which in other cases may occur in ones and twos, and which in others make up a complete clinical picture that it is impossible to confuse with one produced by disease in any other part of the central nervous system. A study of such cases as these, which unhappily form a very small minority of the total number of cases of cerebellar abscess, shows how closely the experimental picture of unilateral ablation of the cerebellum may be reproduced by disease in man. Although this complete picture is only to be expected in so few of the cases, a clear recognition of what may be looked for will enable the close observer to determine one or more of the clinical phenomena in other cases in which the diagnosis of abscess of the cerebellum is under consideration.

Thus it is that with complaint of vertigo, and the patient too ill to be got out of bed to test his powers of standing and walking, we have to rely perhaps on the presence of nystagmus and its characters, detection of slight inco-ordination in the execution of movements by the upper extremity on one side, which may also reveal a hypotonic condition of the muscles and a certain degree of paresis as compared with its fellow on the opposite side. Moreover, one knee-jerk may be more active than the other, while there is no ankle clonus, and the plantar reflex preserves its normal flexor type of response. Although there is no active rotation, and we are deprived of the possibility of ascertaining whether the patient presents any peculiar attitude in standing or cerebellar titubation in attempts at walking, there may, nevertheless, be an irresistible inclination of the patient to lie curled up in bed, always on the same side, which may prove of considerable significance when taken in conjunction with such other signs as exist, and which makes it probable that the cerebellum is the seat of the abscess.

Attitude.

Very little information can be obtained from the literature on abscess in regard to any special attitude assumed, except that several observers have noted the tendency which there is for the patient to lie curled up in bed on the normal side, as occurred in typical fashion in a case recorded by Betham Robinson, in which with this symptom were associated weakness of the left arm, exaggeration of the left knee-jerk, and marked lateral nystagmus, in a case of abscess of the left lobe of the cerebellum. Voss, however, describes a case in which a boy with an abscess of the left lobe tried to keep his head somewhat rotated to the right. The paucity of information on this subject may in part be due to the fact that so many of the patients suffering from intracranial abscess are too ill to be sat up in bed or to be made to stand with a view to determine any abnormal attitude, such as has been met with as the result of experimental lesions, and the same may be said in regard to the want of information with reference to any reeling

or tendency to fall to one side; for in but few cases are we even informed that the patient presents staggering on attempts at walking.

Nystagmus.

This is naturally one of the most constant signs, and in recorded cases, when the direction of the nystagmus is noted, it is usually lateral; while, when any mention is made as to which lateral movement of the eyes evokes the more pronounced nystagmus, it is usually stated, in accordance with what we expect from the experimental results, that it is when the eyes are turned to the side of the lesion. As labyrinthine disturbance may in itself occasion nystagmus, it is important to be able to distinguish between the nystagmus of one of these sources as opposed to that from the other, so that attention must be paid to such points as have been emphasized by Neumann and Barr. Neumann's view, which is supported by Trotter, is that, in accordance with what has been said, in cerebellar disease the nystagmus is more marked when the eyes are turned to the side of the lesion, whereas labyrinthine nystagmus is usually in the opposite direction. Barr draws the following distinction: In cerebellar suppuration the nystagmus is slight at first and becomes more pronounced as the disease becomes worse, whereas labyrinthine nystagmus is most marked at first, and gradually disappears. How the nystagmus may stand alone as the only localizing sign is well illustrated by a case recorded by McBride, in which there was nystagmus on looking to the left, with an abscess of the left lateral lobe, and one reported by Whitehead, in which, with a left cerebellar abscess, nystagmus on extreme rotation of the eyes to the left was again the only localizing sign.

Conjugate Weakness.

Although actual deviation of the eyes to one side is rare, it may nevertheless be determined that the patient experiences some difficulty in conjugately turning the eyes fully to the side corresponding to the abscess.

Paralysis of Cranial Nerves.

It might be supposed that, as in the case of cerebellar tumour, valuable assistance is to be derived from associated paralysis of certain of the cranial nerves, which may prove so helpful in cerebellar localization. It is otherwise, however, as was only to be expected when we remember that it is only with extracerebellar tumours that we derive such assistance from the cranial nerves, and that with intracerebellar growths, to which an abscess of the cerebellum is to be compared, no such paralysis of these nerves results. Even had it been otherwise, we should yet have been deprived of two of the most valuable of the nerves found affected in extracerebellar tumours, the facial and auditory, for the reason that such impairment of hearing as exists may be the direct outcome of the ear disease, and that the facial paralysis may similarly be produced by involvement of the nerve in the Fallopian canal. The published cases show that there is a general consensus of opinion that, apart from the presence of optic neuritis, the sixth cranial nerve is that most likely to be affected in cases of abscess of the cerebellum, and that it is the nerve on the homolateral side that is liable to suffer. It thus happens that even where there is no difficulty of conjugate turning of the eyes to the side of the lesion, the patient may nevertheless present a weakness of the external rectus on the homolateral side, which either results in an internal strabismus, or more commonly reveals itself by an inability to turn the eye completely outwards. Thus it is that in the absence of basal meningitis as a complication, the case of right cerebellar abscess recorded by Paterson, in which there was paralysis of the left external rectus, is altogether exceptional. As this case recovered after operation, it is of course impossible to be as sure of what actually obtained in the intracranial cavity as might have been possible had the patient died; and as head retraction appears to have been a notable feature, it is permissible to suspect the possibility of some localized meningitis as a complication, although abscess of the cerebellum alone could, of course, account for the head retraction. It is quite the exception to find any other cranial nerves affected in cases of abscess of the cerebellum, except when the aural suppuration has been directly responsible for defects of the facial and

auditory nerves, which accords with what we have seen in cases of intracerebellar as opposed to extracerebellar tumours.

Hemiparesis.

A review of the literature impresses the fact that homolateral paresis is becoming more and more recognized as part of the clinical picture that may result from an abscess of the cerebellum, and this motor defect has been especially noticed in the arm on the affected side. In that paresis of the limbs may thus be the outcome of cerebellar as well as of cerebral abscess, too much stress cannot be laid on the fact, so much insisted on already, that such motor paresis, the outcome of cerebellar disease, is homolateral, while that which appertains to the cerebrum is contralateral. Thus it is that when middle-ear suppuration on one side is complicated by symptoms which point to the existence of an intracranial abscess, the detection of any paresis on the homolateral side would indicate the cerebellum as the probable seat of the mischief, whereas with paresis of the contralateral limbs there would be every justification for regarding the cerebrum rather than the cerebellum as the seat of the morbid process responsible for the paresis.

Convulsions.

It is quite an exception to find any suggestion of convulsions that can be regarded as cerebellar fits, either general or unilateral, such as obtained in a case published by Drummond and Hume a good many years ago, in which, with an abscess in the right lateral lobe of the cerebellum, the patient had paralysis on the homolateral side, with convulsions on this side. The spasms commenced in the face, and then spread to the arm and sometimes to the leg, but never became bilateral. An interesting case that deserves attention in this connexion is that recorded by Voss, in which a boy with an encapsulated abscess in the right cerebellar hemisphere presented stiffness of the neck, with head retraction, paralysis of the right upper extremity, nystagmus to the left, tremors in the muscles of the right face, gradually passing into clonus, with simultaneous tremors in the right thumb, which developed into clonus of the arm and leg on this side.

Reflexes.

In spite of the hypotonic condition of the muscles that may obtain in the homolateral limbs there seems no doubt that increased activity of the knee-jerk on this side, in accordance with what obtains after a cerebellar ablation in the laboratory, is another of the signs to be looked for. The number of recorded cases in which the homolateral knee-jerk is stated to be exaggerated is sufficient to suggest that this sign, like the homolateral paresis, will gradually become recognized as of value in the localization of abscess in the cerebellum, even if we are unable to rely on it in cases of tumour. In all recorded instances of the kind the observers are agreed that the plantar reflex has been of the normal flexor type, and has not been altered in the way that is characteristic of a lesion of the pyramidal system. Thus increase of the homolateral knee-jerk should be regarded as supporting the probability that the abscess is in the cerebellum, while increase of that on the contralateral side should suggest the cerebrum as the seat of the mischief, in which case ankle clonus may obtain, and the plantar reflex be of the extensor type.

TEMPORO SPHENOIDAL ABSCESS.

Before dealing in detail with the symptoms which characterize temporo-sphenoidal abscess as contrasted with the effects of suppuration in the cerebellum, it is necessary for me to recall to your memories certain points connected with the anatomical relations of the temporal lobe, and others which relate to the functions of this part of the cerebrum. In the first place, it is well for us to remember that the hinder part of the upper portion of the lobe abuts on the angular gyrus, which is identified with certain visual processes concerned with speech. We have next to recognize that the temporal lobe is so related to the sensori-motor convolutions of the Rolandic region, and to the internal capsule and basal ganglia, that it is possible for morbid processes in the temporal lobe, which are capable of exerting pressure on other parts, to do so on both of these. Yet another important part which may similarly suffer is the crus cerebri, in which case the third nerve, which is so intimately related to the crus, may of

course become affected by the process. It only remains for me to remind you that in the temporal lobe are centres for the reception of auditory impressions, and that the tip of this lobe is concerned with taste and smell. A large portion of this part of the brain, however, belongs to the so-called silent regions—so called because morbid conditions in such parts evoke no clinical manifestations that enable us to say that these regions are affected. Indeed, in attempts at intracranial localization we have to depend on the negative rather than on the positive in determining whether these parts are the seat of disease. It is by a process of exclusion, then, that we arrive at the probable seat of the mischief in such parts; so that we are led to suspect them because, with other unmistakable signs of intracranial disease, we are nevertheless unable to determine any of those which would justify us in suspecting one of the parts of the brain, disease of which gives rise to a very definite group of manifestations that are readily recognized.

Deafness.

It is, further, necessary for us to remember that, although the temporal lobe is that part of the cerebral pallium which receives the afferent impressions from the auditory apparatus, mechanical destructive processes in one temporal lobe are not capable of producing complete deafness in the contralateral ear, so that we get very little, if any, assistance from this function of the lobe when we attempt to determine if it be the seat of an abscess. So it is with the functions subserved by the tip of the lobe; although Ballance and Acland refer to a case at St. Thomas's Hospital in which an abscess in the right temporo-sphenoidal lobe gave rise to deafness of the left ear, as well as paralysis of the left arm and leg, and a stable right pupil.

Taste and Smell.

The same may be said of taste and smell, for, although Ballance records a case in which there was loss of smell in temporo-sphenoidal abscess, the usual seat of suppuration in this lobe makes it improbable that these functions would be readily disturbed. I have, nevertheless, had under my care at the National Hospital a young man in whom, as a result of some intracranial complication which followed ear disease, but the precise nature of which was not determined, fits occurred, which began with an aura of an unpleasant taste and smell. He further presented as part of his attacks the dreamy state which has been described by Dr. Hughlings Jackson, and which is so characteristic of temporo-sphenoidal fits. In this condition he imagined he was speaking to a friend whom he sometimes was heard to address by name. It must be noted, therefore, that, although loss of taste and smell do not obtain in abscess of the temporal lobe, nevertheless fits, beginning with an aura relating to these special senses, may occur, and be followed by a peculiar condition which has been described as a dreamy state. Even such discharges, however, are not to be usually expected in abscess of the temporal lobe, for the reason that has already been explained, that the seat of suppuration is, as a rule, too remote from the tip of the lobe. MacEwen and Acland and Ballance refer to two cases in which there was a dreamy state, which may have been of the nature described by Dr. Hughlings Jackson, but in neither of these is reference made to any aura of taste or smell.

Aphasia.

It remains for me to remind you of yet another function subserved by a part of the temporal lobe, which may prove more helpful to us in localizing an abscess in this region as opposed to the cerebellum. I, of course, refer to the part which this lobe plays in connexion with the speech processes, and to the disturbances of speech which result from lesions of it. Unfortunately for us in our attempts to solve the problem now under consideration, the temporal lobe of only one hemisphere subserves this function—the left in right-handed individuals—so that word-deafness, which is the variety of speech defect to be looked for, is not to be expected except when the left temporal lobe is the possible seat of the abscess. Moreover, it does not follow that, because the patient is right-handed and the left temporal lobe is affected, word-deafness or any other form of aphasia must of necessity result, for as only the hinder two-thirds of the

superior temporal convolution is concerned with speech, there is left a considerable area of the temporal lobe that may be involved in suppuration without aphasia being a consequence. Enough has been said to make it clear that, as in the case of the cerebellum, so in the temporo-sphenoidal lobe, an abscess may lurk without being compelled to disclose its whereabouts by occasioning any symptoms or signs which are positively characteristic of a lesion in this lobe of the brain. Thus differential diagnosis may be rendered exceedingly difficult. It nevertheless behoves us to call your attention to those signs which may enable us to decide without any degree of uncertainty that the abscess is in the temporal lobe as opposed to the cerebellum. Foremost among these must be mentioned aphasia in any form, for an abscess in the cerebellum is incapable of producing this symptom. A word of warning is, however, made imperative by the fact that aphasia, and especially word-deafness, the variety with which we are most concerned in our present deliberations, is liable to be diagnosed, when in reality all that obtains is that the patient is in a state of general mental obtuseness, partly the result of the toxic state, and partly owing to the general increase of intracranial pressure, which is responsible for the behaviour that leads to the erroneous belief that he is suffering from aphasia. When true aphasia exists some degree of word-blindness may co-exist with the word-deafness in consequence of the proximity of the angular gyrus, and a certain degree of object-blindness has also been noticed. Logan Turner regards the inability to name objects as a diagnostic sign of great value in the differential diagnosis between temporo-sphenoidal and cerebellar abscess. He has seen six cases of abscess of the temporal lobe, in all of which this symptom obtained, and so impressed is he with its importance that he considers that absence of the symptom in a given case favours the probability that the abscess is in the cerebellum. An interesting case of the kind, in which the patient was unable to recall the names of people or objects, and in which an abscess was found in the angular gyrus and posterior part of the first temporal convolution, is recorded by C. K. Russel of Montreal. The patient could read and write, but was unable to understand figures—a condition of things which is regarded as confirming Miller's view that the centre for figures is distinct from that for words.

Hemiplegia.

There remains for our consideration the motor paralysis that may result from an abscess of the temporo-sphenoidal lobe. The hemiplegia may be the chief positive sign on which we have to rely for locating the seat of the abscess, but when the suppurative disease of the middle ear happens to be bilateral an analysis of the characteristics of the hemiplegia becomes necessary before any conclusion can be arrived at. It would be a matter of no difficulty if we always could be certain of the ear from which infection has been derived, and which is responsible for the intracranial process, for with hemiplegia on the contralateral side, as opposed to the homolateral, we should have no hesitation in pronouncing in favour of the temporo-sphenoidal lobe as contrasted with the cerebellum. As we are not always in this happy position, however, and as it often happens that we are uncertain as to which ear has supplied the source of infection, a more detailed analysis of the hemiplegia becomes essential. Were the face always involved in such hemiplegia, we should have in this one feature in which the paralysis differs from that which results from an abscess of the cerebellum, for an uncomplicated abscess in this situation, while capable of producing paresis in the limbs, does not occasion any such defect in the face, except where the facial paralysis has been brought about through involvement of the nerve—a condition of things which we have already recognized to be unlikely to occur except as a consequence of involvement of it by an inflammatory process in the Fallopiian canal.

We have seen that there are three possible ways in which the paralysis may be brought about—by the pressure of a large abscess of the temporo-sphenoidal lobe on the sensori-motor convolutions of the Rolandic area, the internal capsule and the crus. In that which results from pressure on the sensori-motor cortex of the Rolandic region the face suffers first and in greatest degree, the arm

next, and the leg last; whereas if the pressure be on the internal capsule the leg would be likely to suffer first, the arm next, and the face last, if at all. But in reality no very definite information is forthcoming as to the production of hemiplegia in this way through pressure on the internal capsule. Where the crus is to be held responsible for the paralysis we may reasonably expect involvement of the third nerve, with as a consequence crossed paralysis, in which ptosis, external strabismus, and the other manifestations which result from paralysis of the oculo-motor nerve are present on the side of the abscess, while paralysis of the face and limbs obtains on the contralateral side.

A further analysis of the hemiparesis may enable us to determine some spasticity or increased tonus of the muscles of the affected limbs, which contrasts with the hypotonic condition to be expected in the muscles in cerebellar hemiparesis, and while the increase of the knee-jerk may differ in no way from that which is met with in cerebellar abscess, it may be possible to evoke ankle clonus, or to elicit a plantar reflex of the extensor type, either or both of which would stamp the hemiplegia as of cerebral rather than of cerebellar origin. As a cerebellar abscess, like an intracerebellar tumour, is not characterized by affection of cranial nerves, it follows that when, as sometimes happens, the third nerve is affected, owing to involvement of the crus, we may take this as positive evidence strongly in support of the temporo-sphenoidal lobe as being the seat of the mischief and not the cerebellum.

Dilated and Stable Pupil.

Apart from the defect of the pupil which may obtain in conjunction with the other manifestations of paralysis of the third nerve, it has been repeatedly observed that the pupil on the side corresponding to a temporo-sphenoidal abscess has been dilated and stabile, so that there is little doubt that this is a valuable sign in the localization of intracranial abscess. It cannot, however, be said that such a condition of things never obtains in the case of abscess of the cerebellum, for Griffith has recorded a case of abscess of the right lobe of the cerebellum in a boy in whom the right pupil was widely dilated. Both pupils were, however, large in this case, and the knee-jerks were abolished, so that there was evidently marked increase of intracranial pressure, and the defect was evidently a secondary consequence of the abscess rather than a direct result of the cerebellar disease.

Reflexes.

With or without definite hemiplegia, the reflexes may be altered on the contralateral side in the way that has been already described, but in addition to this special attention must be directed to the abdominal reflexes, which may be abolished or diminished on the side contralateral to an abscess of the temporal lobe.

The Value of Negative Points.

In attempting to come to a definite conclusion in a matter that often presents so many difficulties it becomes important that we should pay almost as much attention to negative as to positive points. It thus follows that when in a given patient we are in search of an abscess of which there is evidence from the general symptomatology which characterizes intracranial suppuration irrespective of its precise seat, we must allow certain negative points to favour the temporo-sphenoidal lobe as opposed to the cerebellum, and vice versa. Thus it is that complete absence of vertigo or other evidences of disturbances of co-ordination, and the absence of nystagmus, must be allowed their proper place in our deliberations, and must be regarded as favouring the probability that the abscess is in the temporo-sphenoidal lobe and not in the cerebellum. Great care is, however, necessary in making a proper use of such negatives, for, as has already been said, it is often extraordinary how few indications of disturbance of cerebellar function may obtain, in spite of the presence of an abscess in the organ. From the cerebellar standpoint the absence of aphasia is to be regarded as a negative point in favour of an abscess in this organ, as opposed to the cerebrum, but we cannot forget that it is only when an abscess exists in the left side of the brain in right-handed individuals that such disturbances of speech are to be expected, and moreover, that but a limited region of the temporal lobe is concerned with speech processes, so

that a considerable area of the brain may be involved in this region, even on the left side, without aphasia resulting.

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Memoranda:

MEDICAL, SURGICAL, OBSTETRICAL.

GOUNDON.

I REPORT this case, as it is probably the first recorded for Nyasaland (British Central Africa), and because of the interest which attaches to its history.

The patient, a girl aged about 14, daughter of a local chief of the Yao tribe, her mother being also a Yao, was sent to me on April 21st by the Mission authorities from Domasi, ten miles from Zomba. Her history was that about a month ago, on waking in the morning, a fly went up one of her nostrils. She compressed the nostril, and on releasing it the fly flew out. A week after this there came a discharge of blood from both nostrils accompanied with about ten "worms," described as being nearly half an inch in length, of a whitish colour and black at one end. The bleeding continued for a day or two longer and then ceased; there was no pus. After this she became aware of a pain over the bones of the nose, later a swelling became apparent, though there was no commensurate increase of pain. She stated that the swelling was gradually growing larger.

The condition was diagnosed as goundon, the nose having an expanded appearance about its middle, giving a false sense of flatness. Externally there was no inflammation or signs of any having previously occurred, the skin being quite natural and not adherent to the bony structure beneath. There was no tenderness; at the situations of the nasal processes of the superior maxillae small exostoses about the size of a pea, though more or less of oval outline, directed downwards and outwards, smooth and symmetrical, were felt on both sides. On examining through the external nares ulceration was observed on both sides of the septum, extending to the sides of the nostrils, but situated chiefly in the mucous membrane covering the upper lateral cartilages. It could not be said that there was a discharge; the nostrils were moist and the ulcers were covered with soft crusts. There was a rather disagreeable odour noticed during examination. The nasal ducts were patent, there was no epiphora. The sense of smell was impaired to a slight degree only. The patient was otherwise in good health.

This tallies with Macleod's theory of the causation of this disease, and more or less with descriptions of it. There is no reason to believe that the history given by the girl is otherwise than true, though the statements as to length of time must not be taken too literally. The information regarding the larvae was volunteered before any questioning referring to them. The patient stated she had never had yaws, and there were no such lesions.

The fly is said to have been a small one, and not either the *A. luteola* or *Bengalia depressa*, both of which are to be found in this Protectorate, and are familiar to my servant, who acted as interpreter. Whether the fly went in to deposit its larvae, or whether the larvae were discharged by the pressure exerted by the patient, as mentioned above, I do not know, but it is a matter familiar to all that a fly full of larvae requires very little pressure to expel them.

Slides were prepared from scrapings from the nose and stained with thionin blue, carbol-fuchsin, and Gram's iodine. The organisms observed in these were cocci, and could be termed streptococci, though the chains were not long—not more than five or six in a row. They retained the stain with Gram's. These were the only organisms observed.

J. O. SHIRCORE, M.B. Edin.,
 Medical Officer.

Zomba.