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THE EARLY DIAGNOSIS OF INTRACRANIAL TUMOUR*

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Perhaps the obvious way for me to deal with the subject would be to plunge at once into a description and discussion of those clinical features upon which we so largely depend for diagnosis, and thus to make my remarks a simple summary of clinical information. While this plan might be appropriate for an ordinary postgraduate lecture, I feel that the circumstances of our discussion call for some introductory remarks of a more general nature.

With the steady increase of technical or instrumental aids to diagnosis it becomes more and more difficult for us to keep a firm grasp of those sound general principles which must always govern clinical diagnosis, and to retain our faith in those methods which have been traditional in English medicine. So much has been claimed for these newer technical methods that we are in danger of being led to suppose that they have rendered the careful physical examination of the patient superfluous. In a word, we are threatened with a triumph of technique over reason, and the moment is apt for a brief restatement of principles which apply as nearly to the diagnosis of intracranial tumour as to that of any other of the ills that flesh is heir to.

Principles in Diagnosis

Diagnosis has been defined as the identification of a disease by the investigation of its symptoms and history. The method of informed and intelligent inquiry by which we elicit the story of an illness does not and cannot change in essence with advances in knowledge. It is a task calling for, and impossible of performance without, a sound knowledge of general medicine. Even the most intelligent patient does not relate complete and unaided the story of his illness. He does not know always what is relevant and what is not. The examiner must know what to ask for without putting the answer into the patient's mouth. Indeed, the taking of a history is an art calling not only for knowledge but for aptitude.

The second stage in the identification of disease—namely, the physical examination of the patient—demands no less in the way of qualifications. It is one thing to elicit physical signs and a more difficult thing to assess their significance. Here experience is essential—a fact which is daily borne home to the neurologist in his work. Further, it needs to be emphasized that the information gleaned by radiological studies and by blood and cerebrospinal fluid examinations can only be rightly assessed in connexion with the clinical findings. They are additions to clinical examination and not substitutes for it. This last is a point which certainly requires stressing. It is painfully common now to have to make one's way

through a barrage of pathological and other reports and through sheaves of x-ray films before obtaining access to the patient, and having at last done so we not rarely find that a large proportion of these expensive investigations have been unnecessary—they are merely recondite explorations of the irrelevant. They have not been dictated by the exigencies of the situation, but used as short cuts to diagnosis. In short, the attractive simplicity of these methods may easily tempt us to omit essential clinical investigation.

Radiographic Methods

Now, while no one will be disposed to dispute this general point of view, many, I fear, pay but lip-service to it, and no student of neurological literature can escape the conviction that, in neuro-surgical clinics especially, radiographic methods such as ventriculography, encephalography, and arteriography have come to take pride of place among diagnostic methods in the case of tumour and of such conditions as may be mistaken for tumour.

The point of view that finds this technician's approach adequate receives passing reference in Cushing's final review of the 2,000 cases of intracranial tumour which have passed through his hands. In this review he remarks that "Dandy's ventriculography placed localization at a point where neurological studies seemed scarcely longer necessary." Now it would not be right to regard this as expressing Cushing's own practice, since the foundations of his renown as one of the pioneers in the diagnosis and treatment of intracranial tumour were laid long before this method was discovered, yet it certainly indicates what is the eagerly accepted gospel of many younger surgeons whose all-embracing faith in the radiograph is seen in their omission to equip themselves with that comprehensive knowledge of nervous diseases which can alone make neurological diagnosis efficient.

In the circumstances it becomes of interest to see what in fact is the nature of the clinical material referred to the neurosurgical clinic, when no neurological clearing-house stands between it and the court of diagnostic first instance—namely, the general practitioner. Fortunately we do not have to speculate on the matter, for Cushing's review, already referred to, gives the figures for what is perhaps the largest and most famous of such clinics. In addition to the 2,000 verified cases of tumours there came to his clinics no fewer than 1,031 cases which proved not to be intracranial tumours—that is, no less than one-third of the total admissions. This third included 157 cases of cerebral vascular disease, fifty of encephalitis, thirty-eight of neurosyphilis, thirty-four of disseminated sclerosis, 125 of epileptiform convulsions, fifty-four of headache, eighty-nine of arachnoiditis

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(probably a mixed and partly undiagnosed category), and seventy-four cases of psychoneurosis. Out of the 1,031 cases no fewer than 275 were submitted to craniotomy, either for diagnosis or because their condition seemed to need it.

If this be the mixed character of so large a proportion of patients admitted as cases of suspected intracranial tumour to a neurosurgical clinic, the absolute necessity for the presence in such a clinic of a trained clinical neurologist admits no denial. Further, the various applications of radiography could not have sufficed to make a diagnosis in any of these 1,031 cases. All they could have provided would have been the label "tumour suspect unverified," and this, of course, is not a diagnosis.

The Problem of Early Diagnosis

One more point remains to be made. The subject of our discussion is the *early* diagnosis of intracranial tumour, and it is important that we should be clear as to the way in which the problem presents itself to the general practitioner. When the patient who ultimately proves to have such a tumour first comes to his doctor, the latter has to ask himself, not "Has this man got a tumour, and if so where is it?" but a much larger question: "What is the matter with this patient?" The specialist is apt to forget that this question has been partially answered before he sees the patient. A number of diagnoses have been ruled out, and the case comes to the neurologist as a presumptive case of nervous disease. By the time it is referred to the surgeon the diagnostic issue has been still further narrowed, and a diagnosis of tumour has been made or suggested. The diagnosis of intracranial tumour may therefore come to seem deceptively easy in its final stages. Thus I read in a surgical account of intracranial tumour: "The diagnosis of a space-occupying lesion within the skull is usually an easy matter. Headache is the characteristic symptom."

Now let us examine this statement from the general practitioner's point of view. Headache must be the commonest of all the symptoms of bodily ill-health, and one of the commonest expressions of neurosis. Even in a neurological clinic, from which many cases of headache have already been filtered off by the family doctor, headache is a principal symptom with at least half the patients who attend. Of these only a minority have any organic affection, the majority being cases of neurosis or of migraine. Only a tiny residue prove to be cases of tumour. Therefore, for the general practitioner, and almost equally for the neurologist, to jump to the conclusion that every patient who complains of headache is likely to have an intracranial tumour would land them in innumerable absurdities and their patients in a succession of unnecessary alarms and diagnostic ordeals. This single example will suffice to indicate how vitally necessary to diagnosis is wide clinical knowledge and sound judgement. No amount of technical ingenuity will allow us to do without them.

The Clinical Course of Intracranial Tumour

Passing now from the general to the particular we may say that the clinical course of an intracranial tumour is likely to follow one or other of the following four main lines of development.

1. RECURRENCE OF GENERALIZED EPILEPTIFORM FITS

Generalized epileptiform fits are clinically indistinguishable in most instances from those of what we call idiopathic epilepsy. For weeks and even months, physical examination of the patient in the interval between fits may

fail to elicit the presence of any abnormal physical signs whatever, while the patient may be equally free from abnormal subjective symptoms, such as headache. When such fits first make their appearance in a middle-aged individual who has been previously free from them they should always give rise to a suspicion of tumour, for this is probably the commonest cause of fits occurring in these circumstances. I believe that fits so caused are rarely, if ever, nocturnal, but I should be interested to hear what others may have to say on this point.

Focal, or Jacksonian, fits may also occur as the first or as a later developing symptom in tumour, but I believe that generalized fits—contrary to what is often supposed—are more common. Conversely, recurrent focal fits of uniform character are not invariably associated with a macroscopic cortical lesion, whether tumour or a lesion of some other order, and the exposure of the relevant area of the cerebral cortex in the hope of finding one of an operable character is frequently negative in result.

2. RAISED INTRACRANIAL TENSION

A more common mode of onset is that in which the signs and symptoms of raised intracranial tension develop—namely, headache, sickness, and papilloedema. While this headache rarely has any localizing significance, it often has features which may put us on the track of tumour. Thus it often wakes the patient in the early hours of the morning, and is most severe at this time. When at its worst it is apt to be accompanied by vomiting, which in turn aggravates the headache. It is not usually continuous: the patient may enjoy hours or days of complete freedom, though in the terminal stage of a rapidly growing glioma it may be present for several days, fluctuating in severity and rising to peaks of frightful severity. I have never been impressed by what is spoken of as the "projectile character" of cerebral vomiting, except in young children, who in any case are apt to be sick with unheralded suddenness.

Slowing of the pulse is by no means a common sign, except in rapidly growing glioma. One may find indications of grave rise of intracranial tension, but even in the final stage of the case the pulse may not fall in rate. I believe that the rate of rise of intracranial tension is an important factor in the production of bradycardia. Thus it is in my experience more frequently seen in subdural haematoma than in tumour. As far as I have been able to determine it has no localizing significance, but when present it indicates marked intracranial hypertension.

It is important to remember that a high degree of papilloedema may coexist with normal vision, or perhaps it might be more accurate to say with a degree of visual acuity which appears normal to the patient, though it may prove less than this on testing. In the end failure of vision may occur with startling rapidity.

It is perhaps surprising how severe may be the signs of raised intracranial pressure and yet no indications of the situation of the underlying tumour be obtainable, at least by clinical methods. Yet we have to remember that a large tumour may be clinically entirely latent, being occasionally found as an unexpected post-mortem discovery. In a fatal case of cerebral thrombosis with hemiplegia of my own, a previously apparently healthy man had but a few days' illness before death. Yet necropsy revealed the presence of a meningioma over an inch in diameter near the middle line in the parietal region.

3. SLOWLY PROGRESSIVE LOCAL BRAIN LESION

Yet another mode of evolution is that in which we see the indications of a slowly progressive local lesion of the

brain. These may precede the various signs and symptoms of raised intracranial tension. In this case it is the time factor as much as the character of the signs that betrays the probable nature of the lesion. But even such a mode of development of organic signs is not free from danger for the unwary. Thus, take the case of an elderly man who complains of a slowly developing weakness of the limbs of one side. His tale may easily suggest the insidious onset of a hemiplegia and the presence of a tumour in the depths of one cerebral hemisphere. Yet the commonest explanation of such a complaint in such a patient is the onset of paralysis agitans without tremor, or with but infrequent tremor. Of course an adequate examination of the nervous system would reveal the true nature of the situation, yet I have known two patients submitted to exploratory craniotomy from a failure to recognize early paralysis agitans.

Another symptom-complex which has a localizing value is one in which somatic signs may long be wanting, one in which a progressive temperamental change is the initial symptom. Such a change may occur with tumours in other situations than in the frontal lobe, but I believe that the opening of the clinical course by an increasing apathy and loss of initiative, a tendency to unaccustomed reticence and to defective attention, and a poverty of ideas is pathognomonic of a frontal lobe tumour. When added to this we find the unnoticed, or perhaps it would be more accurate to say the unregarded, incontinence of urine wherever the patient may happen to be when nature calls, the picture is a characteristic one that cannot be mistaken. It may exist and grow for months before any complaint of headache is made, and in such a case papilloedema may be but a terminal symptom. I have known such patients to be regarded and treated as primary depressives, yet actually they are readily to be differentiated from this psychosis.

4. SECONDARY CARCINOMA OF BRAIN

One other clinical picture calls for mention here—that of secondary carcinoma of the brain. It cannot always be recognized, but there are certain indications that it may provide. It is perhaps most common in association with primary carcinoma of the lung, and its incidence in this and other visceral carcinomas is probably greater than has been realized in the past. It may become clinically evident before the primary growth—especially if this be in the lung—has been suspected, and such peculiarities as it may present probably depend upon the fact that the secondary growths are multiple within the brain, and that the leptomeninges may be extensively infiltrated—sometimes in the absence of macroscopic nodules within the brain.

The presence of very numerous secondary growths in the brain substance is probably responsible for the difficulty of making any localizing diagnosis and, I believe too, for the frequency with which mental disturbances—muttering delirium, gross defect of memory, confusion, and so on—are present in these cases. The meningeal involvement leads to signs suggestive of meningitis, neck and back rigidity, Kernig's sign, stupor, and so on. Very rarely carcinoma cells have been found in the cerebro-spinal fluid.

Years ago, when meningeal infiltration by growth was unrecognized, Oppenheim discussed the late appearance of mental and cerebral symptoms in cases of visceral carcinoma, and attributed these to a toxic action of the primary growth upon the nervous system. When such a confused picture, accompanied by signs of raised intracranial tension, is associated with progressive cachexia and

loss of weight, secondary carcinoma should always be suspected and the primary growth sought for before any question of surgical intervention is raised. In fact, I believe that progressive loss of weight in any case of suspected intracranial tumour should be carefully investigated as a possible case of primary visceral carcinoma.

Conclusion

In conclusion it will be apparent from what I have said that the *early* diagnosis of tumour is in some instances, though not the majority, difficult, and may even be impossible. This is perhaps most often the case in elderly persons with some cerebral atheroma. The presence of this not only blurs the picture of tumour but adds difficulties of differential diagnosis. We have seen, too, that rarely a tumour may be clinically latent. These facts will warn us not to expect invariable success in early diagnosis, even though we employ every available technical addition to clinical investigation. I know that some observers are more sanguine than this, but they have not convinced me.

Of the various technical methods which are from time to time necessary to amplify such information as may be obtained by purely clinical means it is not my province to speak. Perhaps the one from which the clinician might reasonably hope most is arteriography after thorotrast injection according to the newer technique adopted in Germany but not yet in use here. Unfortunately the suspicion that thorotrast is a carcinogenic substance must make us cautious of its use.

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In discussing the early diagnosis of intracranial tumours it may be well that we should consider "tumour" in its wider and etymological meaning of a swelling, rather than restrict ourselves to the narrower significance of a neoplasm. Thus we shall include in our survey lesions whose gross pathology or clinical behaviour simulates tumour of the brain. We shall include in addition to neoplasm such conditions as chronic haemorrhagic collections, certain types of hydrocephalus, chronic abscess, tuberculoma, aneurysm, etc.

We are to consider their *diagnosis*. To be of clinical value the diagnosis must answer three questions: Is there a tumour? Where is it located? What is its probable nature? It must answer these questions with a view to practical treatment. It is important to realize that for the adequate direction of surgical or radiological treatment it is no longer sufficient to make a gross regional diagnosis such as "right frontal tumour." To treat it adequately we must know much more before we open the head or direct x-radiation to it. We must, if possible (and with adequate investigation it often is possible), define its nature and histology. We must know its exact outlines and boundaries, its relation to important blood vessels, ventricular cavities, etc.

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