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THE SPECIAL FIELD OF NEUROSURGERY*

BY

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When I come to speak of something so Rosicrucian to the general surgeon as neurosurgery I have to remember that although a man has lived ardently for his work what he has to say may yet be very tedious; it should none the less be possible to make some contacts with general interest. This last is no longer so certain as it may well once have been, for specialization has ruined the communal interest of scientific meetings. Or so it seems. Yet it is probably true that at all stages of human advance only a small part of the audience has been willing both to listen and to understand. There must have been folk more interested in astrology than in pharmacology, more interested in elecampane and hellebore than in the circulation of the blood, more interested in the diatheses than in the cellular theory of pathology, in the comforting properties of castor oil and poultices for abdominal pain than in newfangled notions concerning the relationship of perityphlitis to appendicitis. To many in such groups the modernists must have seemed to be cranks, hare-brained folk, later to be called specialists. It has been said that the essence of scientific investigation and of orderly advance is the formation of a vocabulary. And since advances in each special line soon lead to discoveries that must have new names attached to them, symbols by which they can be identified, and since criticism commonly suggests a new and perhaps a better name for the same thing, it becomes difficult before long for the other man to keep track of what is going on in fields outside his own. Not only that, but if he is deeply interested in what he is doing he will be too much engrossed in helping to invent new symbols to bother his head overmuch with the work of others. In neurosurgery these difficulties are specially apparent, but although it may seem to be going off on a track of its own its guide-posts are those which direct surgery generally. The fundamental principle is that for certain conditions surgery is the only therapeutics; but the surgeon is more than an operator, and nothing can prevent him from becoming deeply impressed by the clinical manifestations and the pathological natures of the states he treats, whatever organ they affect. The general surgeon has already proved this truth, the neurosurgeon is necessarily doing so, too, and is led thereby to pick his way as best he can through the neurological thickets.

The Relationship of Surgery to Medicine

Every surgical specialty has had to fight its way out of the general body of medicine, and the spectators have generally agreed that it was an ill-looking brat, needing nursemaids, governesses, and godfathers in plenty, or it would surely come to a bad end. Few specialties have aroused such head-waggings and gloomy forebodings as has neurosurgery. But in this country at least it has not behaved as badly as was feared, and it shows so praiseworthy a tendency to be friendly to its nearest relations that it ought to be able to avoid the more flagrant mistakes. The close bonds between medicine and surgery are much more apparent in neurosurgery than in any other of the special fields. General surgery seems almost to have forgotten its beginnings, and for that matter it is not quite historically certain which broke away from the other. Surgery, as I have said, is based on the logic of certain pathological formulae which indicate that there are many conditions for which it is the only treatment. Nor is there, in general, any quarrel with the validity of this premise, though surgery has at times laid itself open, and will no doubt do so again in the future, to the charge of over-zealousness, a tendency to cure conditions which are not yet present or to intervene too impatiently before more conservative and possibly effective means have been given a fair trial.

It is sometimes held, on the ground of occasional mistakes of this order, that surgery would have done better never to have left the skirts of Mother Medicine, if that is what she was, and that true perfection can only be attained under her controlling hand. This assumes an omniscience on the one hand and a lack of intelligence on the other which everyday experience proves to be false. It is regretted by the diehards, for example, that the abdominal surgeon—that specialist who so often abrogates to himself the title of general surgeon, to the annoyance in particular of his orthopaedic brothers—has won independence, for he is now free to commit daily intra-abdominal intrusions from which a more cultured mind than his would recoil. Probably the worst that could truly be said would be to admit that enthusiasm does sometimes lead to well-intentioned errors, less often due to ignorance than to the insistence of patients who have revolted against the failure of such medical treatment as has been provided to bring about a cure.

* Presidential address to the Manchester Surgical Society, October 18, 1938.

But although none will deny that the closest co-operation with the physician and with the physiologist is not only a proper but a necessary ideal, the truth is that the surgeon's march is not so ataxic as armchair critics avow. The worth-while surgeon will always be something more than an operator; he would be wrong if he allowed himself to be persuaded into the belief that he was a machine, a manipulator, a technician—with just enough visual and motor cortex to lead him to the operating table and activated by conditioned reflexes when he got there. He should be absolved from such an indictment by the very nature of his daily work, for he is continually conducting humane experiments, though he may lose sight of this fact in the more human aspects of each case. While with animals we speak frankly of experiments, with the most expensive of them all we speak of experience—a distinction without much difference. Operations are so standardized to-day that their essentially experimental nature is no longer remembered; the ritual has been so often repeated that the result is apt to be regarded as a foregone conclusion. And yet every operation is a new one, an experiment, so far as each fresh individual is concerned. Percentages of success give important but always oblique data: they do not tell us exactly what will happen to the individual. The surgeon, whatever his work, is constantly building up new experimental facts, sometimes of no special interest except to himself, at other times of primary importance to medicine as a whole. Sooner or later he must become well versed in the physiology of disease and its variations. He will begin his work long before the patient reaches the table and continue as long afterwards as a follow-up is yielding knowledge. More than this, he will conduct his operations as well-planned interventions with a specific physiological end in view, in which something is to be done to an immensely valuable animal whose recovery is imperative. How, therefore, in the end can he avoid being a doctor as well as a surgeon? What I have been trying to say is that the surgeon cannot possibly be as ignorant as some critics avow, because the nature of his work gives him opportunities equal to those of the experimental laboratory, and even in defeat he should be able to wring contribution from disaster.

You may wonder that I should have thought it necessary to introduce the relationship of medicine to surgery as a whole, and especially to repeat criticisms. Within these walls I could well assume that surgery is sure to be inviolate, and that in a self-congratulatory body there would be no sound of an adverse voice against our own craft. It seems to me, rightly or wrongly, that it is better to show an awareness of our critics, and that we ought to do more than answer them by the very successful method of pretending that we have not heard what they said.

The Rise of Neurosurgery

Neurosurgery has been a late starter in the field of specialization, for it was but natural that the easier portions of the terrain should be explored first, and in those the rewards of knowledge have been considerable. Furthermore, the surgery of the nervous system was held back in the earlier days of surgical victories by lack of basic physiological knowledge. Thus the great triumphs of Rickman Godlee and, especially, of Victor Horsley were grounded not alone on the discovery that brain and spinal cord were operable fields technically, but upon the demonstration that tumours of these organs could be diagnosed and located in the living. Striving through

improvement towards perfection (not yet attained) in this task, neurology has been aided by many: by experimental physiologists, very greatly by the neurological physician who has applied laboratory work to the human directly and indirectly, by the ophthalmologist, by the otologist, of recent years materially by the radiologist, and, not least, by the neurosurgeon himself. However, neurosurgery only became really attractive when two things were evident—first, that there was enough material to occupy a few men fully; and, secondly, that sufficient good could be done to make full specialization worth while. The latter should perhaps have come first, for continuous work in a medium leads to so considerable a bettering of the average performance that results become possible far beyond the reach of the occasional intervener in the neurological field. Those with the most limited experience are those most likely to be depressed, for reasons that will shortly appear.

We owe to the general surgeon in the main the tools by which the approach to a tumour is carried out. There is, however, a great difference between skull surgery and brain surgery, and while most general surgeons are reasonably good and some even brilliant skull surgeons, it is only after the dura mater has been exposed that the real operation begins. It is at this point that lack of specialized knowledge (either self-obtained or imposed) proves the stumbling-block. Even if the lesion has been correctly localized, how is a subcortical tumour to be found, how is it to be fully exposed, and, above all, how is its nature to be recognized so that a plan of action can be mapped out? It is the combination of these difficulties which has led the general surgeon to retire from this field in some despair, and sometimes with a feeling of the futility of the problem to offset his defeat.

I have the impression that the old idea of the uselessness of brain surgery—an idea certainly less widely held than it was a few years ago—was brought into being by operations on the glioblastoma. This tumour, which must rival the osteogenetic sarcoma of the long bones in its impossibility of surgical cure, is the easiest of all tumours to diagnose. It occupies for preference roughly the territory of the middle cerebral artery, involves or springs from the basal ganglia, and leads to a more or less rapidly increasing paralysis. It is a tumour affecting the middle-aged, often occurs without very apparent pressure signs, and is uniformly fatal. The march of an aphasia and a progressive paralysis with a rapid deterioration in the patient's well-being leads in a high proportion of cases to its ready recognition. We know to-day that operations on this type of tumour are futile, yet it is this type with which the surgeon has only too often been presented as his chief material. Were this to be all, neurosurgery would have been ended before it had well begun. The more benign tumours, on the other hand, are commonly much more difficult of recognition, and consultation between physician, surgeon, perimetrist, and radiologist may have been necessary before it is certain that a tumour even exists, let alone its precise localization known. Those with the fewest signs are usually the best cases of all. Before the neurosurgeon has won through to this type of case he will himself have had to become sufficiently cultured and sufficiently strong-minded to resist the temptation to prove his worth on impossible cases. Fortunately for neurosurgery there were three lesions that called for surgical attack, where the performances of the few were notably better than those of the general—trigeminal neuralgia, pituitary adenomas, and the acoustic neurinomas.

Tumour Variety and Sites of Election

Those without special knowledge are prone to believe that intracranial tumours all behave in the same way, that nearly all are gliomas, that gliomas are of uniform nature; and they picture the life of the neurosurgeon as a dreary round of opening the skull to attack incurable lesions. Nothing could be further from the actual facts. The neurosurgeon may even sympathize with his less fortunate brothers condemned to duller routines. There is no doubt that the results of brain tumour operations compare most favourably with those of tumours elsewhere in the body. I remember very well that when I started neurosurgery I began, as all at that time were compelled to do, with little preknowledge of what the tumour was likely to be. And as a result I did what I recognize now to have been a number of useless operations. The paralysed and comatose patient that I was expected to resuscitate was then, and still remains, a depressing subject for surgery. Furthermore, the medical and lay public, impressed with the results of abdominal emergency work, expected miracles that were not forthcoming, as is their way. The worse the patient the greater the need for immediate operation. One cannot quarrel with the superficial logic of this equation, but, confronted by a dehydrated, semi-starved, and toxic subject without a striking rise in intracranial pressure, I learned by painful steps to seek my operation material elsewhere. Close on eight years elapsed after my tentative entrance into this field before the first meningioma came along; for the ground had to be sown before it could be reaped, and the crop contained many weeds. A few suitable cases declined operation, fearing disaster. Only one pituitary tumour had been operated upon prior to the foundation of the Neurosurgical Service, and that many years ago. It was long before the conservatism of the ophthalmologists engendered by that case was overcome. Nowadays their co-operation is a most prized asset.

I vividly recall saying to a master of neurosurgery fourteen years ago that until we knew what and where intracranial tumours were with something like the precision of our knowledge of breast tumours, and could reasonably forecast the future of that tumour, we should not make much progress. It seems odd that that was such a short time ago, for during the years that have passed this knowledge has come very near indeed to achievement. New knowledge on the behavioural characteristics of intracranial tumours has vitalized neurosurgery. Scarcely had the operations of subtemporal and suboccipital decompressions become standardized and their technique established than they became of subsidiary importance in the realization that if operations are to be done at all they will have as their object the extirpation of the lesions (a generalization with few exceptions). It is not only on the histological side that knowledge of intracranial lesions has altered, but, thanks to the reviews of Van Wagenen and Cairns on Harvey Cushing's material, their life-history has become known. These results were the more readily accepted because they corresponded with the trend of survival in the records of surgeons whose material was neither so extensive nor dated so far back as Cushing's. Thus it emerges that the cerebellar astrocytoma is the most benign of all the gliomas and is, happily, a fairly common tumour in the young. And so my second longest surviving glioma patient had one of this type in the cerebellum, operated upon in 1924 at the age of 10, and now, after a second operation in 1932, is a healthy young woman of 24. The longest survivor is

a 23-year-old, first operated upon by Mr. Rayner at the age of 2, and though I have never been able at repeated attempts to remove the whole of this boy's tumour, its slow evolution is evidenced by its duration for twenty-one years at least. The long history of some gliomas (seventeen, fifteen years, and so forth in my own series) is a fitting subject for longer comment than can be given it here. Next would come the ten-year and less survivals (with many still living) of meningiomas, acoustic neurinomas, pituitary adenomas, haemangioblastomas, and so forth. It is clearly among this type of tumour that surgery has its best opportunities.

It has become increasingly clear that tumours in certain locations tend commonly to be of certain types, and that there is in a wide sense a connexion between site and structure. This is particularly clear in the case of the cerebellar tumours, where certain types are proper to certain age groups, and where the symptomatology varies with tumour type (acoustic neurinomas, astrocytomas, ependymomas of the fourth ventricle). It has become as a consequence easier to write and talk about tumours according to their nature than to give a global view of focal symptomatology. The syndromes of certain regions, whatever they may be, are conditioned to an appreciable extent by the histology and life-history of the tumour, by its tendency to cut neuronal connexions or only to push them aside. At times signs may be negligible, at others so gross that the picture of a major neurological disaster is recognizable to the least-informed observer. The latter picture is most often presented by the highly malignant and invasive tumour (the glioblastoma) and to a scarcely less extent by the cellular astrocytomas. The glioblastoma represents about one-third of the glioma group and roughly one-tenth of the neurosurgeon's work. The more benign gliomas make up a considerable total, with the very slowly growing at one end of the scale and those with malignant tendencies at the other. The difficulties here lie not so greatly in the inherent tendencies of the tumour as in its extent and position. A benign glioma that infiltrates the motor area or the chiasma, for example, is one which cannot be properly attacked radically.

Material

Let us now turn to the material which has come into my Service. The cases are analysed in Tables I and II. I will begin with the neuralgias.

TABLE I

Neuralgias to October, 1938:

Trigeminal (total interventions, 746) :			
Root sections	..	..	277 (2 deaths)
Peripheral injections	..	..	376
Ganglion injections	..	..	93 (mainly by anterior route)
Glosso-pharyngeal Neuralgia (5 cases) :			
Intracranial division of ninth nerve	..	..	5 (+1 divided in neck)
Mortality, 1 (male aged 73)			

Vertigo (Mènière's Disease):

Sections of the eighth nerve intracranially for vestibular crises	..	16 cases
Mortality, nil		

The plan with the neuralgias has been to operate upon those with pain in divisions two and three, some where it was in one and two, but when it affected all three divisions to inject the ganglion by the Hartel technique, introduced and perfected in this country by H. H. Rayner and Morris. The many peripheral injections are evidence of the belief that it is well to give a preliminary injection first to accustom the patient to numbness. Moreover, the pitiable state of many of these sufferers calls for some treatment that can be given at once. Many more sensory-

root operations would have been carried out had it not been for the pressure on in-patient accommodation by tumour bearers. The figures in Table I are self-explanatory.

TABLE II.—*Analysis of 1,000 Cases*

1. Gliomas	365
2. Meningiomas	110
3. Pituitary adenomas	117
4. Acoustic neurinomas	70
5. Congenital cysts :	
Pituitary	22
Third ventricle	2
Meningeal	9
Epidermoids	15
6. Vascular tumours :	
Angioma cerebri	10
Cerebellar haemangioblastomas	17
7. Intracranial aneurysms	48
8. Tuberculomas	38
9. Syphilitic lesions	4
10. Chiasmal gliomas	7
11. Pseudo-tumour :	
Serous meningitis	33
Chiasmal arachnoiditis	10
Occlusive meningitis	15
12. Metastatic tumours	20
13. Cerebral abscess	45
Not histologically verified	43

There were at the same time 58 primary tumours of the spinal cord, its roots, or membranes.

Intracranial Lesions

Space will not permit of detailed analysis of the foregoing list of the intracranial lesions which form the main body of the neurosurgeon's work. A certain number of gliomas have been omitted because the patients died immediately after admission or were in too bad condition to allow of surgery. One important thing must be said on this point: that a most careful evaluation must be made to decide whether a very ill patient is so because he has (a) an invasive destructive lesion, or (b) a benign one with general high pressure. It is only the latter group which are worth considering surgically. And it should be added that once a patient is known to have a tumour a waiting policy, for fear of possible operative fatality, is the surest way to bring about that result. A degree of high pressure may develop which will invalidate attempts at removal later. To make a comparison, it is generally held that the results of extirpation of carcinoma of the colon would be brilliant were it not for the high mortality introduced by obstruction. In neurosurgery the results would be even better were the pressure problem to be eliminated by very early diagnosis. Certainly the easiest cases are commonly the safest, and the greatest measure of safety can only lie in early intervention. Best of all, therefore, a benign tumour before pressure has introduced such technical difficulties into the picture that no proper exposure of the tumour, much less its removal, can be accomplished. We cannot, unfortunately, cause our patients to have the kind of tumour that we would wish to find, but we should be able to recognize its type and to use a wise discretion as to what to do and when, and to learn, above all, when to do nothing.

What mortality can be expected? This is a vexing question: mortality can be kept at a very low level by refusing to take risks. We may well sympathize with J. B. Murphy, who refused the condolences of his wife on some fatalities by saying that he ought to have been a good enough surgeon to know that the patient would die if he operated. Most of us know what Murphy felt,

but we have equally to beware of timidity that may work to our patients' disadvantage. But if we have some figure, such as 10 per cent., to aim at it may help us at times to resist man's itch to achieve the impossible. During the last twelve months there have been 140 major operations for intracranial tumour on 125 patients, with fifteen deaths—an operation mortality of 10.7 per cent. and a case mortality of 12 per cent. (pituitary adenomas fifteen cases, no deaths; congenital cysts ten, two deaths; meningiomas eighteen, two deaths, twenty-four operations; tuberculomas four, no deaths; acoustics nine, two deaths from pneumonia; gliomas sixty-nine, nine deaths). One meningioma had four operations in a futile attempt to extirpate a large tumour straddling the wing of the sphenoid.

The tables give some idea of the perspective of neurosurgical work. The awakening of interest in the subject seems to ensure that it will increase rather than diminish, and most of us are hard put to get through our work. Neurosurgery has a reputation for long and arduous sittings; but one has to make a choice, and I have made mine. The spectacular operator went out of fashion with the invention of anaesthesia, and in his place have come men of a less dramatic school. There is such a thing as style in operating: some people look better, others worse, than they really are. We all know the apparently poor technician who gets such good results, and feel that something is wrong there. But we remember that more important than what the surgeon does with his hands is the quality of mind which he brings to his task.

AN UNUSUAL CASE OF LEAD POISONING

BY

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AND

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Late House-physician to Middlesex Hospital

This case presented the unusual combination of fever, severe abdominal pain, vomiting, jaundice, and epileptiform fits associated with temporary blindness.

Clinical Record

Previous Illnesses.—The patient, a railway signal clerk aged 16, living at Crawley, Sussex, had a history of frequent attacks of abdominal pain, vomiting, and jaundice since childhood, resembling the present one but not so severe. For this reason his appendix had been removed four years previously, without benefit. In 1927 he had pneumonia, followed by empyema with rib resection. No previous history of fits was obtained.

Family History.—There was no family history of epilepsy. His elder brother had suffered from one attack of jaundice, and his sister had had a mild attack similar to our patient's about three years previously, since when she had not lived in the same cottage.

Present Illness.—On May 28, 1938, he collapsed while going to work, with general malaise, sleepiness, and severe central abdominal pain. His doctor found nothing abnormal except slight icterus and a temperature of 101° F. The patient remained in much the same condition for a week, with a temperature ranging from 99.2° to 100° F. He then gradually improved and the temperature fell to normal in about eighteen days from the onset, when he was allowed to get up. He was constipated throughout the illness, and his appetite was very