MEDICAL PRACTICE

Contemporary Themes

What is Diagnostic Radiology's Place in Medicine?*

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Summary

The question that the title of this lecture poses must depend considerably on the attitude of physicians and surgeons. I have indicated the very low position diagnostic radiology holds in this country relative to our peers in medicine elsewhere.

If its improvement is considered to be warranted, we must:

- (1) Interest medical students at the beginning of their career.
- (2) Bear in mind that radiologists are likely to be able to teach some anatomy but the reciprocal seldom applies.
- (3) Obtain chairs in radiology, which are desperately needed.
- (4) Obtain the acceptance by the medical establishment of the proper place of radiology in clinical medicine.
- (5) See to the reduction in numbers of unnecessary x-ray examinations.
- (6) Press for the improvement and enlargement of radiological departments with proper provision for expansion.

Sir Walter Langdon Brown, whose name we commemorate this evening, will be remembered by many of the more senior fellows, and some Cantabrigians may have been examined by him for their doctorate. He was regius professor of physic at Cambridge in the 1930s, having been translated there from St. Bartholomew's Hospital. He was distinguished in this College, being at one time senior censor and, in 1936, Har-

veian Orator; and his name is immortalized in medicine by the wise phrase he coined: "The pituitary is the leader of the endocrine orchestra."¹

Though radiology is now only in its seventy-ninth year, the science with which it is chiefly related or, one might say, depicts is very much older. Anatomy, as we all know, is a branch of knowledge which is being played down in medicine in this country today. As the curriculum becomes larger and larger and the behavioural sciences ever more fashionable, anatomy is being elbowed out. The recent Royal Commission on Medical Education recommended setting aside a term and a half to anatomy and physiology, excluding biochemistry.² The same Royal Commission in its long report devoted 12 lines to diagnostic radiology. So it would seem that human morphology is becoming less important, whether depicted with the aid of a scalpel or by a shadow-graph made with or without the addition of a contrast substance. Fortunately the opinion of the Royal Commissioners is not universally held by our profession. One of the most pungent medical critics of our time, Sir Francis Walshe, wrote in 1968 in a Foreword to Professor Sunderland's textbook *Nerves and Nerve Injuries*³ these words:

"His anatomical researches in their immense detail and scope recall the great days of human morphological study when this was regarded as the essential field of the professor of human anatomy and the primary subject of his teaching. These days are long past, and it has become widely, if tacitly, assumed that human morphology is a completed and closed book and the subject a pedagogic burden to be passed by the professor to his assistants, while the holder of the chair follows his fancy in the realms of comparative anatomy and physiology with occasional dangerous incursions into the field of philosophy. Professor Sunderland's book reveals that our knowledge was not complete nor the chapter ready for closing."

The importance of anatomy in the practice of medicine has been recognized by this College almost since its inception. In 1954, that great medical historian Dr. Charles Singer chose as his title for the Lloyds Roberts Lecture held in this College. "How Medicine became Anatomical".⁴ He began his lecture as follows: "For the last 400 years every medical

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man has been trained to regard an accurate knowledge of the structure of the human body as the very foundation of his art. This attitude is now so general that we treat it as self-evident." Later he does say "Most teachers would probably now agree that the medical curriculum is over weighted on the purely anatomical side and the time for lightening the load has arrived." "Nevertheless," said Singer, "there is no likelihood that anatomy will lose its place as the basic, positive discipline of our art." Nevertheless, the recent recommendations made by the Royal Commission on Medical Education rather make one wonder. If Singer was right, we must as practising physicians continue to pay considerable attention to anatomy. I submit that this can be achieved beneficially, to a large extent, through radiology rather than by classical dissection. If we are to pay more than lip service to this philosophy a change of heart by the medical establishment of this country is necessary, as the status of radiology here is lower than in any other medically-advanced country. In that radiology impinges on most branches of medicine, it is the patients, the general practitioners, and the ever-increasing number of specialists and subspecialists who ultimately suffer, if radiology is not of good quality.

Cinderellas of Medicine

Perhaps every country has its medical Cinderella. Certainly the two in which I had my training, England and Sweden, had theirs. In 1938 I was privileged to work for a year at the Serafimerlazaret, the then teaching hospital in Stockholm. Perhaps I should interject here why I ever went to Sweden for a year, a country which few English medical men had visited, and then only in passing. In 1936 a young surgical registrar went to Stockholm for a month. Still in his twenties, he was a man of great ability and determination, and, above all, of foresight well in advance of his senior colleagues who were well established in the discipline of neurosurgery on which he was embarking. His name was Wylie McKissock. He went to watch the work of Herbert Olivecrona, then the leading neurosurgeon on the eastern side of the Atlantic. Much impressed as he was by the neurosurgery he saw, he was even more impressed to see the cranial flap exactly placed over the lesion each time. He also noticed that Olivecrona was constantly referring to a man at the back of the operating theatre asking how deep, how big the lesion was. This was something McKissock couldn't understand, particularly as he was frequently used to seeing the flaps either not turned in quite the right place, or finding nothing at all. He was accustomed to rely on the clinical acumen of neurologists to determine the position of a cranial flap. He soon discovered that Olivecrona's adviser was Lysholm, the radiologist, so he spent most of the rest of his month with him learning the arts of neuroradiology of the time. Lysholm told him that if he wanted to get anywhere in neurosurgery, he had better find a radiologist to work with him as it was quite impossible to localize surgical lesions regularly by plain x-rays and clinical means alone. Hence my opportunity.

In 1938 the well-known Karolinska Sjukhus had not yet been built. Swedish medicine's Cinderella was anaesthetics. In 1938 not only were there no specialist anaesthetists there but no medical man deigned to give an inhalation anaesthetic; endotracheal tubes which Magill had introduced in London were unknown. Nurses were the anaesthetists. During that year, 1938, a young Stockholm doctor went to the United States to be trained as the first Swedish anaesthetist. He is now the doyen of Swedish anaesthesiology, and the number of consultant anaesthetists is gradually building up. By contrast, radiology had always held a high position in Sweden and, again by contrast, British anaesthesiology probably led the world in 1938. At that time it was an eye-opener to me to see the difference between Swedish and British radiology.

At the Serafimer Hospital not only was the department far more spacious but it was much better designed and equipped than anything I had seen in Britain, in spite of the fact that the hospital was the oldest in Sweden, founded in 1752. Furthermore, one was immediately struck by quite a different atmosphere between the two countries. The human relationship was perhaps the most striking. In England in 1938 one hardly ever met the radiologist, and the medical students probably would not know his name—and even today they may not. But every morning in Stockholm the medical and surgical teams and their students, and specialists such as neurologists and neurosurgeons with whom I was particularly concerned, visited the x-ray department and discussed the previous day's work with the professor of radiology or one of his assistants, with films displayed in front of them. As many of you will know, the x-ray viewing space in Swedish x-ray departments have been designed for at least the last 40 years to be large enough to hang all the films of the previous day's work. Thus one could immediately see any patient's films properly displayed and without a lot of shuffling and putting one film up at a time, as happens still in the wards of so many British hospitals.

Radiology in Sweden

One asked oneself "Why the enormous contrast between the two countries?" A whole lecture could be devoted to this subject, but time allows only the mentioning of a few factors. The first and most important, I felt, was that British clinical medicine was probably the best in the world in the early days of radiology and one can be proud that this was so. This led to a powerful resistance in this country to seeking the aid of so-called ancillary disciplines. Let me illustrate this with two examples. In 1938 operative cholangiography was practised routinely at the Serafimer hospital. When I returned to normal life after the last war I tried to persuade my surgical colleagues to adopt it, provided they protected themselves against radiation. The classical answer was: "What are my eyes and sensitive fingers for? Are you suggesting that I might miss a stone or some other lesion in the biliary tract?" I could not refrain from being amused when reading a leading article in the *British Medical Journal* published only last autumn entitled "Detection of Biliary Tract Disease at Operation."⁵ I will quote just one sentence from the final paragraph: "Surgeons have been slow to adopt routine cholangiography despite the overwhelming evidence in its favour."

Endless parallel examples could be quoted, but just one more might suffice to drive the point home and to redress the balance as the following case tilts against physicians rather than surgeons. Towards the end of the second world war the Norwegians, rapidly followed by the Swedes, established percutaneous carotid angiography as a clinically acceptable procedure. Early in 1946 I returned to Sweden to rub off my war-time rust, having been a prisoner of the Japanese for the greater part of the war. There at the Serafimer I learned the technique of percutaneous angiography and brought it home with enthusiasm and sought for suitable cases from my colleagues at Queen Square. The cases did not come in as quickly as I felt they should. At that time I was about half the age of many of my senior colleagues—world figures in neurology—who had most of the beds. I was naturally reluctant to tell them how to investigate their patients. Also the dictum was still largely accepted then that clinical neurology was such an accurate discipline in defining and locating lesions that ancillary methods were redundant. After some time I was able to arrange for my friend Dr. Erik Lindgren, the radiologist from the Serafimer Hospital with the most experience in this field, to give a lecture at Queen Square on carotid angiography. By then he had performed well over

1,000 examinations and he stated that they were then doing over 400 each year. When the lecture was over one of my contemporary neurologist colleagues took me rather aggressively by the arm and said: "Those Swedes cannot begin to know their clinical neurology. How could they possibly justify 400 cerebral angiograms a year. It is monstrous." Within a year of that remark we were being asked to do more than 400 carotid angiograms by our neurologist colleagues.

Another reason why the young discipline of radiology held a high place in Sweden early this century was the influence of one man, Gösta Forssell. He qualified at about the time of Röntgen's discovery and, like some great admirals or general, he was the right man in the right place at the right time. He had all the qualities that make a leader, besides being an excellent doctor. In 1918 he was made professor of radiology in Stockholm and chairs rapidly followed at the other two universities in Sweden at that time, Uppsala and Lund. There are now eleven chairs of diagnostic radiology (one in neuroradiology) in Sweden, a country with a population about the size of London.

Need for Chairs in Diagnostic Radiology

Today, 56 years after 1918, there is no chair in radiology in any of the 12 undergraduate medical schools in London where about 40% of the medical students of this country are educated. It might have been so different if support had been given to a letter published in the *Lancet* on 6 March, 1920.⁶ That letter could hardly have had a more powerful body of signatories. There were 30 in all, including two Prime Ministers; two were later Presidents of the Royal Society and five other F.R.S.'s; two were presidents of this College and six other Fellows. Among them were six peers and five baronets, all of the first creation, and five knights. No fewer than 14 of them have achieved immortality in the *Dictionary of National Biography* and three were buried in Westminster Abbey. There was one foreigner, W. G. Coolidge, an American, world famous for his revolutionary hot-cathode x-ray tube put on the market in 1913. He is the only one still alive and celebrated his 100th birthday last October. These distinguished men were appealing for money to set up a chair in radiology in London. I would like to quote parts of their 1920 letter.

"In surveying the devastation of five years of war, the nation is beginning to realize that some compensation may be found in the great stimulus that science has received. In no branch of science has this been more marked than in the field of radiology. In the diagnosis of disease and in the localization of foreign bodies and bone injuries, radiology has played a vital part in the war and has given invaluable aid to the thousands of medical officers serving in the Forces. Remarkable as has been the development of radiology during the war, there is need for watchfulness lest full advantage be not taken of this stimulus and a period of reaction set in. There is pressing need for unremitting research. . . . The benefit accruing to the British School of Radiology would be incalculable. . . . A Chair of Radiology should play a worthy part in such development. . . ."

This all came to nothing 54 years ago. In the U.S.A. there is now a chair of radiology in nearly all of their approximately 100 medical schools and in Canada and France the position is parallel.

Radiology and Teaching Anatomy

I have already suggested that radiology could benefit anatomy, and one can illustrate this by examples. A good one is Lord Brock's classical work on the anatomy of the bronchial tree described so beautifully in 1942 and 1943.⁷ When discussing the variations in the bronchopulmonary segments, he wrote: "This arrangement has also been confirmed by a special study of 180 bronchograms apart from

almost daily confirmation in the routine inspection of many hundreds of bronchograms."

The bronchogram provides a three-dimensional picture of the bronchial tree seen in life without the possibility of post-mortem distortion. In many ways the variations and anomalies can be studied much more easily and in far greater number radiologically than in the post-mortem room.

Other examples can be found in connexion with the brain, where I am on more familiar ground; and I refer particularly to the blood vessels. One cannot do better than borrow from Brock's opening sentence in his classical work, but substituting the words "cerebral blood vessels" for "bronchus." It would then read: "The anatomy of the cerebral blood vessels has been much neglected and it is fair to say that the descriptions given in most of the current text-books of anatomy are so incomplete or inaccurate as to be misleading."

Let us consider the largest artery supplying the brain, the middle cerebral. The neglect by anatomists of this vessel can be illustrated by looking at the first and the latest editions of Gray's Anatomy. In his first edition in 1858⁸ Gray included one drawing of the cerebral arteries (fig. 1). The same and again the only drawing, slightly modified and the arteries now coloured, is in the latest, 1973 edition.⁹ The course of the middle cerebral artery and its branches is admittedly complicated. It can best be studied anatomically by a combination of radiology and by making injection casts of the vessel and its branches. This is the way in which its complicated pattern has been unravelled. Over the last generation neuroradiologists have gradually clarified the anatomy. We now know that the artery and its branches run an almost constant course in three dimensions. One of the stumbling blocks in this example concerns the course of the arterial branches as they pass over the island of Reil, then make their appearance on the brain surface between the lips of the sylvian fissure, and their ultimate and again fairly constant course to the peripheral cortex. Thus, they pass through three planes before distributing branches to cortical areas.

FIG. 1—From Gray's *Anatomy Descriptive and Surgical*, 1st Edition, 1858.

The arterial branches on the island of Reil are so constant in position that they act as very sensitive indicators to the presence and position of space-occupying masses. Neuro-radiologists talk about the Sylvian triangle, whose most important side is the reflection of the Sylvian vessels at the upper edge of the island of Reil. A high percentage of supratentorial masses can be localized by recognizing the distortions of this triangle. Furthermore, the main distal cortical branches have a rather constant pattern as B. A. Ring¹⁰ and others have pointed out.

As a last illustration may I quote from the only medical book that I know still written in Latin, *Nomina Anatomica*,¹¹ a publication drawn up by the International Anatomical Nomenclature Committee. When the last, the third, edition was published in 1966 one found that the list of cerebral arteries and veins was very incomplete and that about half of them were not mentioned. With the aid of English, American, and Swedish neuroradiological colleagues I submitted a more complete list which went to the International Anatomical Committee Meeting in Leningrad in 1972. They accepted the list almost in its entirety and it will be included in the next edition to be published shortly. The number of listed vessels will be rather more than doubled.

The impression must not be gained that this is just an academic exercise. While neuroradiological anatomical work has been developing over the last 40 years we have been able to increase knowledge of intracranial pathology without opening the head.

In the field of neurology the discoveries of ventriculography and encephalography by W. E. Dandy¹² and arteriography by E. Moniz,¹³ isotope encephalography by G. E. Moore,¹⁴ and very recently computerized transverse axial tomography by Hounsfield¹⁵ have completely revolutionized the diagnosis and localization of tumours and the differential diagnosis of vascular disease. In the last 25 years, angiography has given an enormous stimulus to the study of cerebrovascular disease, and a vast literature has grown up. The differentiation of haemorrhage, occlusion, ruptured aneurysm or subdural haematoma, or unsuspected tumour heralded by a stroke—all so obvious today, thanks to angiography, was mostly guesswork previously. When I went to the National Hospital, Queen Square, a generation ago, internal carotid occlusion was never considered as a diagnosis, and hardly ever did a neuropathologist dissect the neck vessels. Other fairly recent anatomical advances have been achieved by radiology, particularly in the vascular and lymphatic trees.

Need for More Radiologists

Since the last war the mode of life of a radiologist has probably changed more than that of any other specialist—the increased work load and complexity of many examinations. The serious shortage of radiologists is one of our greatest worries at the moment.

The annual x-ray film consumption is perhaps as good an index as any to show what is happening. It has been found in the United States and in Western European countries (including the U.K.) that the increase has been fairly steady over many years at a rate of about 8% per annum. In the N.H.S. in 1951, 16½ million square feet were consumed; by 1971 the consumption had risen to 42½ million square feet or, expressed another way, it is equivalent to three times the area of Regent's Park. Assuming the same rate of progress it will double in another 12 years (fig. 2).

The number of qualified radiologists does not keep pace with this trend (fig. 3). Not only is our country very short of radiologists but this shortage will probably increase in the next decade. It does not seem possible to convince the powers that be of the seriousness of the shortage. The same problem existed in the United States almost a decade ago and the Americans took steps to correct it. In October, 1966, the

FIG. 2—Rate of increase of x-ray film consumption.

FIG. 3—Rate of growth of numbers of consultant radiologists in England and Wales against rate of growth of x-ray film consumption in the National Health Service.

British Medical Journal drew attention to the crisis with a leading article entitled "Shortage of Radiologists".¹⁶ It pointed out that we were in a much worse condition than the Americans and described how they were tackling the problem. An Advisory Committee to the U.S. Surgeon General had investigated the reasons for the shortage and analysed them as follows: (1) the unusual increase in demands for radiological services; (2) the inadequate number of new medical graduates; (3) the fact that only one-quarter of radiologists made up their minds during their student years what they are going to do, in sharp contrast to those entering such specialties as medicine and surgery; and (4) the little time set aside for teaching radiology in medical schools and thus the average student finds little to interest him in radiology.

The committee was appalled at the shortage of academic departments in radiology in the American medical schools, and those that existed needed more financial support. Three main recommendations were made—firstly, to strengthen radiological instruction of the medical students; secondly, to increase the number of academic radiologists in American medical schools; and thirdly, to increase the number of practising radiologists in the United States. The *B.M.J.* leader also quoted a report made by this College in 1965 on diagnostic radiology.¹⁷ In its opening paragraph the report stated: "Today, medicine consists of diagnosing functional and structural disorders, by laboratory and radiological investigations in addition to the older methods, with treatment by effective

and mostly dangerous drugs. For this reason, an understanding of the principles of diagnostic radiology has become as important to every doctor as biochemistry. Yet in many schools, instruction in radiology and its exploitation in pre-clinical work has actually diminished."

The Americans have now implemented the recommendations accepted by their Surgeon General and have achieved their target. Largely because of their number of chairs of radiology they have had great success in recruitment. Dr. Russell Morgan (Chairman of Radiology at John Hopkins for many years and now Dean of their Medical Faculty) was one of the leaders in the drive to obtain more radiologists. In reply to a letter from me, he wrote in August 1972 "As a result of this recruiting effort we have made enormous headway in bringing more medical students in to diagnostic radiology. When the next written examination of the Board of Radiology is held shortly we expect over 1,100 candidates."¹⁸ This figure for that one examination is in excess of the number of consultant radiologists in Britain.

Other disquieting figures relate to the age of the consultant radiologists in this country. In a fairly recent unpublished memorandum from the Department of Health and Social Security it was stated that of 604 consultants, only 54 were over the age of 60, but 188 were between the ages of 55 and 60. Thus, within a decade, something approaching half of the present radiologists will have retired. The date may be nearer than that, for one has heard recently that many radiologists are so disenchanted with their working conditions and being unable to control their waiting lists that they literally count the days to their 60th birthdays when they can first take a pension. They also know that locum positions are easy to obtain, and it is alleged that by working for three months of the year they can augment their incomes to preretirement level. Can one assess the real shortage and what is the optimum number of radiologists that a country should have? This is another way of posing the question: "what is diagnostic radiology's place in medicine?" The best guide that I can suggest is to compare ourselves with other countries. Recently Dr. A. Zuppinger (Professor of Radiology at Bern and Chairman of International Committee on Radiological Education), compiled a report.¹⁹ Data from 49 out of 52 countries showed that the number of radiologists per million inhabitants varied from 0.3 to 87, with an average of 40 in the industrialized countries, 12 in central and southern America, and 2.5 in even less industrialized countries. The U.K. came out badly at about half the average of what he

called industrialized countries but just better than the average for Central and South America (fig. 4).

If the place of radiology in this country is to be improved, a powerful recruitment drive is vitally necessary. This College has done its best and the Department of Health has gone some way to correct the situation by creating supernumerary registrar posts. It is the universities who should be providing the real driving force, as was pointed out by the Americans.

Need to Improve and Enlarge Diagnostic Radiology Departments

Combined with the shortage of radiologists we, in this country, have very cramped x-ray departments, many of them improvised and fitted haphazardly into our old hospitals. Radiology is just coming up for its eightieth birthday, and a high percentage of our hospitals are much older than that, naturally designed with no thought for ancillary departments. A very large number of the 1,173 x-ray departments in England and Wales (the figure for 1968) are improvised, and in many the space was allotted years ago. Also it is astonishing that when demands double about every 12 years, spare space in newly designed x-ray departments is vetoed by the Planning Division of the Department of Health and Social Security. The sort of problem created by this state of affairs can be illustrated by a personal experience. Some two years ago at a district general hospital which serves an expanding population the senior medical staff were very concerned about the poor morale existing in the hospital. This was largely attributed to the bad relations between the x-ray department and the rest of the hospital. The long waiting lists for major x-ray examinations of up to two or more months, the inability to get reports or find films, and many other inconveniences, were all very frustrating. As a radiological adviser to the Department of Health and Social Security I was invited to make a visit. It was not difficult to discover the cause of the trouble. There were two consultant radiologists (one full-time and the other maximum part-time) who had been together in the post for the last nine years with no additional help until the last few months, when they had acquired a foreign trainee. On asking them if the consultant staff had increased in other disciplines in their nine years, one found that nearly all had doubled their numbers, and new specialties such as geriatrics had come in, this last being a potentially heavy burden on radiology. One asked if the general surgeons, whose number had risen from two to four, had any additional operating theatres provided. "Oh yes," was the reply, "the operating theatres have doubled from two to four and two further theatres are to be opened shortly." With such a situation existing it was not surprising that an unhappy atmosphere existed.

Acceptance of Radiology in Clinical Medicine

History shows that a paradoxical situation has developed towards radiology in this country. Forty years ago when I was a student, one was expected to make a diagnosis by clinical means. In about the year 1933 I well remember listening to a lecture at St. George's Hospital on the radiology of the chest by Dr. Peter Kerley, as he was then. He had recently studied in the famous Vienna school of radiology and he fed us with heretical ideas. Essentially the message was: "If you want to know what is going on in the chest, x-ray it." Our dean, who was shortly afterwards a Censor of this College, was present at the lecture. I well remember how shocked he was. I think he regarded it as a form of heresy and cheating. Inspection, palpation, percussion, and auscultation were the steps to the diagnosis of diseases

FIG. 4—Numbers of radiologists per million inhabitants, compiled from data from 49 countries (Zuppinger).

of the chest. An x-ray film was used for confirmation. The dean was not out of step—his view represented that of the establishment of the time. My fellow students of the 'thirties, now at the top of the tree in medicine and surgery, were thus taught quite differently from our Swedish colleagues. This may have something to do with the poor position radiology now holds in this country.

Unnecessary Radiological Examinations

The contrast today is astonishing. Very few young hospital doctors will make a diagnosis without a battery of tests, including many x-ray films, most of which are normal and often ordered twice in a very short time, first as an outpatient and then on admission. I think this trend is partly to hedge against criticism by the chief on his next ward round. By getting every conceivable investigation done the houseman protects himself from the criticism of leaving something out. I would like to see a new philosophy adopted when a patient is being investigated; this would be "what x-ray examinations can I avoid asking for?" The situation has been reached where some medical men will not see a patient who complains of, let us say, cough or pain in the back until he has had the appropriate part x-rayed. I was very glad to read that Dr. Stuart Mason, the Editor of this College's *Journal*, had the same idea in mind when he queried the necessity of an intravenous pyelogram on every case of hypertension in his editorial in January last.²⁰ Where general practitioners have direct access to diagnostic x-ray departments they are seldom guilty of requesting unnecessary x-ray films. Dr. Irvan Yentis, consultant radiologist at King Edward VII Hospital, Windsor, wrote recently: "I have yet to see a general practitioner ask for a barium meal, cholecystogram and a pyelogram on the same request form; but I know one hospital consultant who relishes this medley!"²¹

Sometimes when under pressure with too much work the thought has often crossed my mind—"Where would they be if x-rays suddenly became unavailable?" This would test doctors' clinical acumen and, as Dr. Johnson wrote to Boswell in another context, "Depend upon it, Sir, . . . it concentrates his mind wonderfully."²²

It seems clear that steps should be taken to try to reduce demands on radiology. The 8% annual increase is intolerable, only beaten by chemical pathological examinations, the annual increase of which runs at 15%.²³ What can we do to stem the ever-increasing demands made upon us?

Several years ago I became conscious of the overwhelming number of normal x-ray investigations made on our neurological out-patients. One thinks of such conditions as migraine, headache, Parkinsonism, vertigo, Menière's disease, epilepsy, pain in the neck, pain in the back. Besides having x-ray films of the skull or spine as the case may be, nearly all of them had chest x-ray films. Perhaps at a specialist hospital, often the last port of call, one is abnormally obsessed with the fear of missing something.

With the help of my neurologist colleague, Dr. Kevin Zilkha, we made a retrospective study of a large number of these cases, together with a follow-up for a year. We came to the conclusion where physical signs were absent—and this was our criterion—that lateral views alone of the skull and of the cervical spine were nearly always enough.

This retrospective study gave ample evidence that radiology did not contribute materially to diagnosis in the absence of physical signs. In 1968 we published a small paper entitled "Rationalizing Requests for x-ray Films in Neurology"²⁴ and at the same time put the proposition to our neurologist colleagues. Some were rather horrified and shocked, though all but two accepted it. For the last six years we have applied these rules, and so far as I know have not been caught out.

In an attempt to take this a stage further, I recently super-

vised two small pilot projects involving inpatients, many of whom had physical signs. It is hoped to make savings in x-ray films in some of these patients.

New Techniques

One has high hopes that Mr. Godfrey Hounsfield's discovery of computerized transverse axial tomography will lead to a diminution of x-ray investigations in neurology. In place of x-ray film he uses a crystal to detect the x-ray photons. By this means he has stretched the spectrum from black to white about 100 times and this allows such structures as the ventricles to be shown. Taking as an example a recent case of a 73-year-old man who became confused, disorientated, and dysphasic; he was found to have papilloedema and a left homonymous hemianopia and was thought clinically to have a right parietal lesion. A chest x-ray film showed a mass at the apex of the left lower lobe thought to be a carcinoma. Computerized transverse axial tomography showed two masses, one in the right parietal lobe and the other in the left frontal lobe (fig. 5). Clearly these were metastases and thus the patient was saved from having to undergo any con-

FIG. 5—Computer-assisted tomograms to show two metastases, right parietal and left frontal, from carcinoma of bronchus.

trast procedures, and one lateral skull x-ray film would have been enough. When this new method has been fully evaluated it is hoped to reduce contrast examinations considerably.

Integration with Anatomy in Curriculum

It marvels me that men like Vesalius and Caius and physicians right up to the turn of this century so greatly stressed anatomy's importance. In their clinical practice it could have had little application. They could not do much more than look at the tongue and urine, palpate the abdomen and examine the chest, and in recent times listen to the heart. This could hardly be called applied anatomy.

Now every doctor can see many aspects of anatomy depicted by radiology, and the spectrum widens almost daily. Surely, anatomy is very much more important today than ever it was, but a complete reorientation is necessary in its teaching and application. The 2nd M.B. medical student starts with great enthusiasm and dedication. When he has finished his "dry as dust" anatomy dissecting a smelly, senile, desiccated, cachectic corpse he has lost most of his enthusiasm. Anatomy must be made to live and only those teachers who see patients can make it live.

The other day I was privileged to sit unknown at the back of the anatomy lecture theatre at King's College, Strand, listening to Dr. Oscar Craig (Consultant Radiologist at St. Mary's Hospital), lecturing on radiological anatomy to 2nd M.B. students. It was the most refreshing experience I have had for a long time. The theatre was packed and one could have heard a pin drop, they were so attentive. They were being exposed to live medicine. We asked them to let us have their comments in writing. I will quote a typical example. The student wrote:

"1. Radiology is the only means of bringing living anatomy into a course so remote from surgery and casualty.

2. It reminds one that surgery is not the only thing one needs to know anatomy for.

3. It makes the course interesting—vital."

In this connexion you may have read a recent article in the *Lancet*.²⁵ Dr. M. A. Simpson, a psychiatrist at McMaster University, Hamilton, Ontario, writing on "A Mythology of Medical Education" had this to say:

"Students can cope surprisingly well with clinical problems from their earliest weeks at medical school; not playing at being sham doctors but learning the language and principles of the basic sciences via clinical problems. In this way they can appreciate the beauty and the excitement of sciences that all too often present themselves as appallingly dull. These sciences are too important to be treated in this way."

"Students learn more effectively material which they perceive as relevant to the future practice of medicine. But it is they who must

recognize the relevance; it is not enough that the teacher or dean perceives it as relevant."

We know that the teaching of anatomy is in the melting pot, so let us get its future right. I would like to see an authoritative committee set up to make recommendations concerning its teaching in its relation to radiology. Remember it was a President of this College who introduced and established the science of anatomy in this country over 400 years ago. I must interpolate here that what I have in mind is not a surgical problem, but rather anatomy for general practitioners and physicians and all non-surgical medical men. The would-be surgeon would obviously receive additional training in classical anatomy as a postgraduate.

I would appeal to you, Mr. President and Censors, to establish a committee of appropriate experts to look into and report on this important problem.

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Clinical Problems

Complications of Carbenoxolone Therapy

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Summary

Side effects from carbenoxolone are common and are due to electrolyte disturbance, such as sodium retention and hypo-

kalaemia. They occur particularly in the elderly, who may already be being treated for other illnesses. Eight patients are described with serious side effects from carbenoxolone therapy, some of which were unrecognized for some time because of inadequate follow-up or because clinicians were unfamiliar with them.

Introduction

Carbenoxolone, a triterpenoid compound, accelerates healing of gastric ulcers,^{1,2} and is widely used. While the side effects

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