

THE ART AND SCIENCE OF SURGICAL DIAGNOSIS

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Whatever one may hope to do in lecturing or writing of the Art and Science of Diagnosis, it is certainly not to teach people how to make diagnosis. Surgical Diagnosis is first and foremost and almost all the time clinical diagnosis, and as such has to be taught, demonstrated, learned and practised at the "Kline", at the bedside. However, even within the more tenuous ambit of the Arts and more obviously within the hidebound limits of the Sciences, one can teach or learn method and principles and lines of approach.

If I elect to discuss surgical diagnosis, it is not because this is a real entity differing in any material particular from what one may call the physician's or internist's diagnosis. Hardly ever does one know for sure before arriving at a diagno-

sis whether the particular case one is dealing with is strictly "medical" or "surgical". Indeed, should a patient present himself with any such label, it is a wise rule to disregard it completely. It should be superfluous in this day for the surgeon to lay claim to competence in the rational processes of diagnosis, which obviously are not the prerogative of the "doctor" internist as in the far-off days when his counterpart was a mere untutored craftsman. That fallacy was laid to rest when it became true that "the surgeon is a physician who can operate, while a physician is a physician who cannot."

There is, of course, no discrepancy in terming Diagnosis both an art and a science. Art, and whatever pertains to it, may always be of its own nature indefin-

able, indescribable, immensurable and altogether characterised by negative attributes; certainly, it is practically unteachable. It would seem, therefore, that the artistic aspects of diagnosis need not concern us overmuch. However, what is so indeterminable is very often no less real, and though hard put to it to define the artistic we can always recognise the genuine article when we see it. Logan Clendenning has written: "Clinical diagnosis is an art, and the mastery of the art has no end; you can always be a better diagnostician"; to which one may reply: "Poeta nascitur, non fit." Some fortunate few are born with the flair, the inenarrable facility for the right felicitous touch of genius in reaching a diagnosis by mental processes that exclude the fortuitous while transcending mere logic.

For the great majority of us who are artisans rather than artists, there is sufficient consolation in the second attribute of Diagnosis, that of a Science, in as much as sciences can be taught and can be learned, and can even be enshrined and preserved (not to say fossilised) in books. Not that books are anything like the best source of learning any science, least of all clinical diagnosis, and as Damascenus warns us "without exquisite knowledge to work out of books is most dangerous." Yet a strong demand must indicate some legitimacy of need, so that there is an appropriate space in the doctor's bookshelf for such classical works on Diagnosis as Hamilton Bailey's, Noble Chamberlain's and Major's and others of less renown. It is noteworthy that the best among these books make great use of a multitude of excellent illustrations, as an obvious supplement for the physical signs that the student can observe on the patients he examines, and on the principle of the Chinese saying, that Bailey quotes, about a picture being worth a thousand words. Hamilton Bailey's genius for teaching is immortalised in his excellent "Demonstration of Physical Signs in Clinical Surgery", which I would criticise only on the one point that he allowed it in the later editions to grow unconscionably to such proportions that it can no longer fit into its proper place, the pocket of every student's

white coat. No less a physician than Lord Cohen of Birkenhead has written this of Bailey and surgical diagnosis: "I had believed that for surgical diagnosis the prerequisites were having seen the lesion before or an exploratory operation. Hamilton Bailey dispelled this illusion forthwith. He showed that diagnosis was a rational process based on examination and correct inferences."

The science of surgical diagnosis can be taught and learned as can the method of scientific enquiry. It is indeed but one further example and application of the mental processes that constitute what one comes to a University to be trained in from one's very first days as a freshman. It is a matter of correct use of trained senses and a trained brain, so trained that they may never deserve the terrible biblical rebuke of undeveloped and wasted talents, of eyes that see not and ears that hear not and, what is just as futile, of a brain that does not understand what the eyes and ears may have conveyed. In brief, it is a matter of observation and comprehension.

Here one may digress somewhat into considering the very necessity of making a diagnosis, or to put it less crudely: "Where does the diagnosis come in the doctor's dealings with his patient?" It is not too trite to say that the diagnosis comes before the treatment! Without a foundation on diagnosis, all treatment must obviously be purely empirical, which is but a polite way of saying that it is blind guess-work and shooting in the dark. I once overheard a doctor demonstrating a case of "acute abdomen" saying: "Now, here we are faced with a lad screaming with agonising abdominal pain. He wants our help. Never mind what's wrong with him. Think first, how are we going to relieve him?" That doctor's approach to his patient may have been admirably compassionate, but is hardly likely to have been in the patient's best interests in the final analysis. Yet even as eminent a doctor as Paracelsus has a passage saying: "It matters not whether it be God or the devil, angels or unclean spirits: cure him, so that he be eased." Of course, it does matter a great deal to determine as soon

as possible and as certainly as possible whether it be God or the devil that possesses our patient.

The making of a diagnosis is not the same thing as the investigation: this latter is but a part of the process, though obviously an essential part and the first part to be undertaken. The investigation provides the facts which when sifted, arranged, evaluated and understood are shaped by logical thinking into a Diagnosis. When I am supervising a candidate at his "long case" in the clinical surgery finals I start by saying: "You will first interrogate the patient; then you will examine him; then you may ask me for the results of special examinations that you cannot carry out yourself; in the end I shall ask you for your diagnosis." This comprises the tripod on which any diagnosis is factually based: History, Examination, Special Investigations.

The History obtained by interrogation of the patient (and sometimes of other persons as well) is as important as any of the other legs of the diagnostic tripod if the whole thing is to stand up. Sometimes, when no physical signs can be elicited, it can be the single broad base of the structure. Its value is inestimable, its elicitation is a fine art and an exact science. It can make or mar any diagnosis. It can tax all one's skills and all one's patience. When totally deprived of its help, as with an unconscious patient or a small child or an unintelligible language, one can feel hopelessly disarmed. One has to steer nicely between the Scylla of the patient's irrelevance and the Charybdis of what one tends to induce him to say. Many golden rules can be drawn up for the ideal interrogation. Let the patient have his say, using both the spur and the rein; to bring in more metaphors, use also the guide-line and the guillotine prudently. Attach due weight to all he says, in a spirit midway between gullibility and disbelief. Above all, regard the patient as a valuable ally, never a hostile witness. It is difficult to over-emphasize the value of a well taken history; at its best it can give you the diagnosis on a plate. A good many students know this, and particularly at

examination time may use it as a short cut to diagnosis; the story is told of the eminent surgeon, a cripple, who was entering the Examination Hall when he was accosted by a candidate, who mistook him for an examination subject, with an offer of half a crown for information as to the cause of his limp.

When one comes to the Physical Examination, again there are excellent principles to guide one. Among these is the value of comparison. A base line is taken from one's knowledge of the standards of normality, in other words the examination is going to be a recall of anatomical and physiological facts with which the patient's deviations are to be compared. The patient "prima facie" presents abnormalities which must be compared with the normal. Then the patient's abnormalities must be compared with similar abnormalities observed in patients previously encountered. Often one side or one part of the patient's body has to be compared with the other side or another part: there is no better reason for the symmetry of most structures, and indeed for our possessing pairs of certain parts and organs, than that this provides the essentials for comparison.

The examination must be complete. This is the one true, all holy and inviolable commandment. Partial examinations are deadly dangerous at their worst, futile or inconclusive at best. The essential information may well be hidden in the part you have failed to examine. No patient comes to us marked with arrows to indicate where we have to look and probe. Neither lack of time nor inconvenience, neither false modesty nor lack of facilities must be allowed as excuses. At one time or another, every single part of the patient has to be stripped into stark nudity for full examination, even if the patient is a nun most voluminously garbed. Where circumstances require it, there should be no hesitation in insisting on examination under general anaesthesia, the inherent hazards of which practically never outweigh the hazards of incorrect diagnosis of serious illness. The anus in painful spasm from a fissure must be examined under anaesthe-

sia lest a carcinoma be lurking within. Lockwood has written: "If it is a question of doubt in diagnosis, you may often observe that one man solves the doubt when others could not, and the way in which one man happened to solve it is this: he applied to the diagnosis of the case some method of examination which the others had not applied."

The complete examination implies a perpetual and wholesome dissatisfaction with the examination of the exterior only. One must always strive to get as far inside the patient as one can. Nature has provided man, and woman, with various orifices for various purposes, not least among which is to allow the doctor's eyes and fingers and instruments to probe deeply. "All avenues have been explored" should become a medical cliché. "If you do not put a finger in the rectum, you will put your foot in it" — the author of that aphorism, unknown to me, should be identified and immortalised.

Finally, in the examination one insists on seeing everything oneself, with a near-total exclusion of hearsay evidence. This applies not only to detailed personal examination of the patient's body but also to inspection of his products such as sputum, urine, faeces and so on. The descriptions given by patients tend to be vague, sometimes weird, often highly coloured in more senses than one. It is no arrogance but simple prudence for the doctor to disbelieve heartily whatever he has not checked for himself. P.P. Debono used to tell the story of how he was called by a distraught mother to see her baby who she alleged had vomited blood, but when he examined the infant in its cot he found it was writhing with pain from an intussusception which had caused it to defaecate blood and mucus on the pillow. Twice I have myself been alarmed and astounded in operating on cases of alleged inguinal hernia which I had not examined myself but had accepted on other people's diagnoses, to be faced in one case with a psoas abscess and in another with a mycotic aneurysm of the femoral artery.

Nowadays the diagnosis in many cases, though by no means in all, requires

the evidence provided by special investigations. These are usually beyond the scope of the clinician at the bed-side as to their actual performance, though often not as to their interpretation. They can be invaluable, even essential. Yet in the past one used to hear or read of sterile and futile debates as to the relative value of the clinical examination on the one hand and of radiological or laboratory examinations on the other. The two are obviously as complementary as marriage partners. Equally obviously, it is the clinical examination that must come first in time, and must be as complete as humanly possible. Then the special investigations come in to supplement the corpus of information already obtained. Usually it should be possible to reach a provisional diagnosis by clinical means alone, and this then provides the essential guides as to what special investigations are called for. It is only common sense that all available sources of aid within reason should be drawn upon. However, the approach should never be that of firing off a barrage of investigations. Some of these may be quite unnecessary, some may be unpleasant, some may be downright dangerous. The clinical examination will indicate, for instance, whether a barium meal or a barium enema is the more likely to give the best information, and even, sometimes, which is the safer procedure. The provisional diagnosis, or at least an indication of the main signs and symptoms, is essential to the radiologist and the pathologist in their interpretation of the tests we ask them to carry out for us. The clinician must realise that he has no right to expect others to do his diagnostic work for him; indeed, when he receives reports of the results of special tests, he must attempt his own interpretation of them. As we shall see, at this stage only half of the work is done and the definitive diagnosis has yet to be made — by the clinician.

Special tests have nothing magical, mystical or holy about them, no matter how elaborate or sophisticated may be the instruments or the techniques involved. It is the ignorant layman who thinks otherwise, and one must disabuse the mind

of the student as to this fallacy right from the start. If anything, it is the simplest tests and the simpler workings of the trained mind that are the more fool-proof. Machines, measurements, calculations can all go wrong. Sometimes one gets the wrong answer because one has asked the wrong question, or because one has supplied the wrong basic information. The examiner's finger can detect a carcinoma in the lower reaches of the rectum unerringly; to omit this elementary test and ask for a barium enema in a case of rectal bleeding, as I have often seen done, is nothing but criminal ignorance and negligence. During a practical examination I have no hesitation in ploughing the candidate who neglects to look at the temperature chart and tells me that he would rely on erythrocyte sedimentation tests to judge whether a haemothorax has become infected.

In this context, the history of medicine can provide many classical instances, none more dramatic or tragic than that of the Prussian Crown Prince suffering from a carcinoma of the larynx which the eminent specialist Morell Mackenzie repeatedly diagnosed as a benign condition, largely on the strength of repeated negative biopsies. The reports of the biopsies carried the hallowed name of the pathologist Virchow; this, of course, gave no guarantee, even that the material submitted to the pathologist was a true and fair specimen of the lesion. Yet a fairly characteristic clinical presentation and the unrelenting progress of the case were regarded as less significant than reassuring "special" investigations. So easy is it for anyone, however gifted, to be blinded by "science".

The subject for diagnosis is always a living patient in bed, and not a portfolio of radiographs or a sheaf of laboratory reports. This we must always remember, for reasons of science no less than of humanity. The end of all rational medicine will come upon us when without properly examining the patient, we start making our diagnosis by processing "data" through an electronic computer, forgetting that even these super machines can go crazy when fed with the wrong information.

When the three legs of the diagnostic tripod have been fully fashioned, the results can usually be classified under the two headings of anatomical and physiological data, and correlations between these should be sought. A good example is provided by the patient with a lump in the abdomen, wherein the anatomical characters suggesting involvement of the stomach should be placed alongside any evidence of disordered function of that organ.

We have now reached the stage of completion of the investigation, not yet that of making of the diagnosis. This is, in fact, a process akin to criminal detection and like it depends wholly on a liberal supply of facts. One may recall that Sherlock Holmes when baffled, cried in anguish: "Facts, facts, give me facts!" Here one may also take note that negative facts exist and are very real and usually quite as significant as positive ones. This too Holmes fully realised as when he stressed to Watson that what was important about the dog in the night was that it had done nothing.

Yet one more intermediate step must be interposed before starting on the actual making of the diagnosis. This consists in a translation of the facts already established as signs or symptoms into terms of Pathology. For example, at this stage one interprets a *peau d'orange* appearance of the skin of the breast as indicating underlying oedema; or a trabeculation of the bladder as indicating muscle hypertrophy and therefore obstruction; and so on. This translation is essential. No case is really understood until its pathology is understood. No branch of medical science is more truly basic and fundamental than pathology. So it is after this stage, and in no circumstances before it, that a diagnosis can be worked out.

Let us digress briefly to say that a massive mental process is not always essential, there being quite a legitimate though strictly limited place in practice for the "spot" diagnosis. It is not necessary to take two bites at a cherry, nor advisable to use a sledgehammer on a nut. Some familiar lesions are diagnosable at sight. Of course there are obvious limitations, readily imposed by common sense,

on what is allowable under this heading; simplicity has its dangers too. An obvious requisite *sine qua non* is richness of experience providing familiarity, a "deja vu phenomenon" with a very concrete factual basis.

This said, one returns to stressing that the diagnosis of any case, and not just the very obscure case, is essentially an intricate mental exercise which draws correct inferences from the established facts, a very exact science of interpretation using all the methods and devices of logic. Here and now one sets out to argue, with oneself or with others, using both deduction and induction, working from the general to the particular and vice-versa, reasoning as to causes and effects though more especially deducing from the former than the latter. Either the analytic or the synthetic approach can be used, often both on the same case. Thus one can start with a general presentation of the patient's complaint as a dyspepsia and gradually break it down into its component features which spell it out as a duodenal ulcer; or one may start with a series of facts like cough, haemoptysis, pain in the chest, a shadow on X-ray film and so on, which one integrates into a diagnosis of cancer of the lung.

The reasoning process can take one of two forms, or if necessary both, that is the Direct Diagnosis and the Diagnosis by Exclusion. The terms are self explanatory. It is on the latter method that one relies more especially when considering the differential diagnosis, that detailed knowledge of the various possibilities which is a hall-mark of the experienced clinician. Diagnosis is very like an exciting game of cops and robbers, the cop relying not just on the possibility of catching a culprit directly *in flagrante*, but quite often on drawing up a list of suspects; to these he proceeds to give varying marks of suspicion according to the evidence. Herein comes the nice judgement of exactly what weight to give to each item of the evidence, so that the balance will come down unmistakably on one side. Obviously there will often be clinching facts, there will appear some

definitive pointer, which will bring the case to an end as unarguably as a (true) confession.

A useful diagnostic procedure consists in passing the assembled facts through the "surgical sieve", whereby a condition is first identified as coming into one of the five categories: congenital, traumatic, inflammatory, neoplastic or degenerative, and then successively passed through finer and finer sieves appropriate to the category. This can be a somewhat rough and ready approach at times, but it will often suffice. Never, however, should facts be forced or altered to fit a diagnosis; prejudice and preconception are strictly prohibited in the diagnosis game.

The many golden rules which direct the processes of logic all find their due applicability in Diagnosis. Thus, one has often to "wield Occam's razor": this enjoins that "*entia non sunt multiplicanda sine necessitate*" which for our purpose may be interpreted as: "Do not make two diagnoses where one will suffice". Of course, prudent judgement or rather simple common sense will indicate where this holds true and the occasional exception which proves the rule. A patient I had recently who presented with oedema of the legs, a tumour in the abdomen, a varicocele, haematuria, haemoptysis and an ocular palsy could very well have had six different diseases to account for those six symptoms, but of course a single condition, carcinoma of the kidney, was responsible for all these manifestations. Even a rare event should be fitted into the general prevailing picture, if at all possible, as when a woman's haematuria was found to be caused not by a common papilloma but by a bladder mucosal metastasis from the malignant melanoma which we knew she had elsewhere.

Extremely reliable is the dictum that common things commonly happen. Other things being equal, always plump for the common diagnosis and not for the rarity. A wise old examiner thus dismissed a Final Fellowship candidate who had presented a very *recherché* diagnosis: "Son, when you go out into Queen's Square and encounter a quadruped of the feline race,

it may just possibly be a tiger but it is far more likely to be a cat." On simple mathematical grounds, the common condition is likely to prove you right ninety-nine times as often as the rarity. The temptation to seek kudos by diagnosing great rarities rather often must be strongly resisted as simply not worthwhile. The epigastric mass in an old man is always *prima facie* a carcinoma of the stomach, the commonest lump in the right iliac fossa in the young most likely an appendicular abscess! Again the usual occasional exception comes up to prove the rule, like the old woman whose intestinal obstruction after several abdominal operations turned out to be due not to adhesion but to intussusception of a rare leiomyoma. But this is simply to say that there are times when one has no right to be right!

When the diagnosis has been made, make sure that it is complete, that it leaves no questions unanswered, that it accounts for causes and even for causes of causes. Thus an acute empyema may have to be traced back to a bronchiectasis and this in turn to a long-forgotten inhaled foreign body; or a pyelonephritis is found to be caused by stones and these again by a parathyroid tumour.

The diagnosis should be carefully inspected to make sure that it has a real meaning, sometimes even that it has any meaning at all. One must not be satisfied with a quick and haphazard labelling process. There are many medical clichés which are but transparent cloaks for ignorance. To tell a young woman who comes to you complaining of her legs being cold and red and blue that she has 'erythrocyanosis crurum puellarum frigida' is to invite the obvious retort when she has this translated into plain English.

Occasionally, one will make a diagnosis "ex juvantibus", as when a puzzling acute hepatitis resolves rapidly with the exhibition of emetine and so one diagnosis amoebiasis. Rarely in surgery one is allowed to argue from the operation which removes the patient's symptoms to the original cause of those symptoms. This can be treacherous ground. Foresight is always to be extolled though hindsight need not always be contemptible.

Diagnosis by exploratory operation is quite commonly and legitimately resorted to by every surgeon. This is nothing to be ashamed of or to apologise for, being but an honest confession of ignorance which no one but a fool hesitates to make as often as necessary. The essential requisite beforehand is a thorough attempt at least at a provisional diagnosis. In fact, an exploration very often does not supply the diagnosis, but merely completes it or allows for its revision. Rightly regarded in this light, exploration is a privilege and an advantage which the surgeon enjoys over many of his colleagues enabling him to complete his diagnosis *intra vitam* where others do so only *post mortem*. But the conscientious surgeon in search of the final clues will when necessary follow his case to the abode of the truth which is the autopsy room, there to learn humility as well as medicine, so that when he is next faced with a similar case he will diagnose it *pre mortem* and not *post mortem*. Moynihan has enjoined upon all surgeons the study of the pathology of the living; but we grasp all opportunities of supplementing this with the pathology of the dead.

Even in the hot pursuit of a diagnosis, as in the enthusiasms of treatment, the surgeon must remind himself that the diagnosis is made solely for the patient's benefit. Certain diagnostic procedures have an inherent morbidity and mortality. One must always ask oneself: "Is this really necessary?" Curbs must be put on scientific curiosity, and humane discretion must rule. One of Grey Turner's favourite quotations were the words of Frank Jeans of Liverpool: "Better a living problem than a dead certainty".

Though the surgeon's usual role is to diagnose the most concrete and palpable of conditions, like all other doctors he will often end up with a diagnosis of Neurosis, badly so termed or disguised as "functional disturbance". This is indeed a common condition and therefore a legitimate diagnosis; it should, however, be only a last resort when all other possibilities have been excluded. It must not serve as a cover for slipshod diagnostic work, and should call for as much science as any

other diagnosis. Otherwise it can be deadly: many a "neurotic" has died of a condition to which this all too convenient label had been foolishly applied.

The mental processes involved in Diagnosis, will always benefit immensely in clarification and concretization by discussion and argument. This, indeed, should be the basis of every real consultation between doctors, whereas all too often the very meaning of the word consultation is forgotten and a single individual is expected to make the diagnosis on his own. We should remember how Father William strengthened his jaw in the early years of his legal career by arguing every case with his wife: in the process he undoubtedly strengthened his reasoning powers too. A corollary that derives from discussion is that we should regard our diagnoses as provisional, in the sense that we must always be ready, willing and able to correct them ourselves or to have them corrected by others.

I have tried to stress that diagnosis can be a stimulating exercise and a valuable discipline, and as one form of the

search after Truth a soul-satisfying experience. This is not to imply that it is a perquisite of the superman; it is actually the everyday chore of every doctor. There are artists who achieve higher flights than others, and there are specialists in diagnosis as in every branch of medical work. I believe it was one of the Mayo brothers who said: "If I had an obscure abdominal condition I should get Ochsner to diagnose it and my brother to operate on me — and God help me if it should go the other way round!" But in the last analysis, what is essential to any diagnosis is that it should be factual and logical, and no gilding from "authority" is required for that.

This longish disquisition on an essentially practical matter must end, as it began, with an exhortation to learn and practise diagnosis at the bed-side. When Jenner wrote to John Hunter outlining his thoughts on vaccination, the eminently practical surgeon did not send back a dissertation; he simply said: "Why think? Why not try the experiment?" And I in biblical language would say: "Go thou, and do likewise."