

# Introduction

## CLINIC VERSUS LABORATORY

CLINICAL diagnostic tests exclusively are discussed here, tests which can be performed easily in the office or at the bedside and without recourse to any laboratory procedure. For these one needs only a reflex hammer, a pin or a pinwheel, the five senses (sharpened by the gift of observation) and a sixth—common sense.

There is a growing and deplorable tendency to overload neurological diagnostics with mechanical, technical and laboratory procedures and to overemphasize their importance. The physician is more and more inclined to base his diagnosis on the results of these procedures rather than on the findings on simple neurological examination. He does not have a heart-to-heart talk with the patient about his present and past, does not talk to relatives, but sends his patient to the laboratory. The art of diagnosing with the eyes, ears and finger-tips is steadily losing ground. Too many doctors long for standardized foolproof methods as a substitute for "clinical sense" based on observation and judgment. They expect from laboratory procedures a mathematical formula which will give them the diagnosis as a *deus ex machina*. Again, a busy physician, overworked and pressed for time, uncertain about the diagnosis, confused by the results of the preliminary examination, is apt to "pass the buck" to the technician, just to gain time and to postpone his decision on

grounds which seem reasonable to the patient. If this be criticism, it must also be directed against me, since I, too, have been guilty of such practice. This practice has attained such proportions that one can, with some reason, speak of "mechanized neurology." The situation has become so grave that Foster Kennedy sagaciously warned lest doctors become a "Union of Slick Gadgeteers."

Overuse of laboratory procedures and overestimation of their value in neurology and in medicine in general are so undeniable and so conspicuous that every physician, whatever his specialty, will admit it. I have never met the man who maintains that laboratory procedures are neglected at the expense of the clinical.

The last few decades have given neurology epoch-making tools for the advancement of laboratory and technical diagnostics, to mention only electroencephalography, pneumoencephalography, myelography, electromyography, chronaximetry, suboccipital puncture, new serological, chemical and neurohistological tests. It is hardly possible to overestimate their importance in diagnostics, physiology, medicine and biology and the promise they hold. The fact that one generally expects more help from them than they can provide is no reflection on the methods themselves.

It would be completely inappropriate, nay, absurd, to say anything against laboratory procedures per se. However, a critique of the indications for their use in everyday neurological practice is justified. It is not a question of whether, but when, to use them.

Moritz Heinrich Romberg (1795–1873) wrote of "the great aim which we must seek to achieve, *the emancipation of medical science from the trammels of mere mechanical technicalities*" (italics his). This was written in 1840. How much more portentous and significant are these words today!

Before any technical procedure is used, the following points should be considered carefully. (1) Some methods are time consuming. Valuable and irretrievable time may be lost through their

use. (2) Some methods are expensive and to some patients may be an incommensurate economic burden. (3) Some methods are not always harmless, are often painful and sometimes fraught with danger. (4) The objective findings depend on the integrity of delicate mechanical apparatus. (5) The interpretation may be equivocal. (6) Even if by laboratory procedures the presence of a definite pathological process has been established, it does not mean that the finding is clinically significant or that it can account for the patient's present condition. (7) The information obtained, however interesting, may not influence the clinical diagnosis and may be completely irrelevant to the actual management of the patient. (8) The correct evaluation of the most informative and illuminating laboratory findings is possible only when correlated with the findings of a complete clinical examination, for which there is no substitute. The laboratory cannot tell the whole story; it can give only a brief passage. (9) The more thorough and exact the neurological examination, the more informative and helpful are the results of the necessary laboratory procedures. (10) If the laboratory findings contradict the clinical findings, it is, in the last analysis, best to base the diagnostic decision on the clinical findings.

These truths, though plain and self-evident, are worth repeating. Too often they are disregarded.

In considering a technical procedure, the most important and most difficult question is: Is this procedure *necessary*? Experience in neurology of over 35 years has taught me that often it is not. If, for instance, a statistic of unnecessary x-rays in neurological conditions could be compiled, the figures would be staggering.

How disheartening it is to have a patient with a clear-cut picture of myasthenia gravis bring in x-ray films taken from his head to his toes! Epilepsy, in everyday medical practice, is and remains a clinical diagnosis, electroencephalogram or not. If on clinical grounds idiopathic epilepsy must be assumed, it must be treated as

such, whatever the EEG may say—if anything. Fortunately these two procedures cannot harm the patient. They are only expensive. It is tragic indeed to see a patient with the classical syndrome of Parkinson's disease, of olivopontocerebellar atrophy, of presenile dementia or chorea subjected to pneumoencephalography and/or cerebral angiography. Or to see patients with unmistakable clinical pictures of multiple sclerosis, poliomyelitis or polyneuritis subjected to myelography. One patient had far-advanced, long-standing muscular dystrophy which could have been diagnosed after a few minutes' examination in the office. Yet he spent weeks in hospitals, was subjected to lumbar puncture, myelography, radiography and—finally—muscle biopsy! In 1926 in the Outpatient Department of the Hôpital Necker in Paris, I saw Sicard, the originator of myelography, examine a patient with subacute mild spastic paraplegia of the lower extremities. The same day the patient was admitted to the hospital and myelography with Lipiodol immediately performed. Later clinical examination revealed a huge visible and palpable gibbus due to tuberculous spondylitis. This was clearly seen by the naked eye and x-ray.

The present popularity of the diagnosis "herniated disk" is responsible for the taking of countless unnecessary myelograms. In the search for a "disk," one patient was twice subjected to myelography. Later a short clinical office examination revealed the patient to be suffering from primary lateral sclerosis of many years' duration. More cruel than helpful is muscle biopsy in muscular dystrophy, liver biopsy in hepatolenticular degeneration, lumbar puncture in long-standing cases of multiple sclerosis, when the diagnosis could have been established clinically beyond any doubt. This ends a list which could be greatly expanded.

Should these laboratory and technical procedures become routine and be applied indiscriminately, it is quite true that on an extremely rare occasion a morbid condition might be uncovered

that otherwise would have passed unnoticed even by the most exact clinical examination. However, the price of such a discovery would be far too high.

There are not, nor can there be, undeviating rules for the application of laboratory procedures. In some cases they are an absolute necessity and may be of vital importance to the patient. Yet in every case it is incumbent upon the physician to consult his medical and human conscience, to be guided by the two supreme laws of medical ethics: (1) *salus aegroti suprema lex esto*, and (2) *primum non nocere*. The latter applies not only to therapeutics but as well to diagnostics. Laboratory procedures should be used only in carefully selected cases, as the last resort in diagnosis and only after an exhaustive clinical examination has been made. They should not be "diagnostic luxuries" at the patient's expense, nor should they be performed just to satisfy the curiosity of the physician.

Careful history taking and interpreting, minute and repeated clinical examinations are time consuming. It is particularly the busy physician who is inclined to delegate the diagnosis to the laboratory in the vain hope of saving time. Too many irrelevant technical procedures often confuse the issue, cloud the essential point and broaden the margin for error. Time invested in clinical examination might have paid greater dividends.

The main point is this: laboratory procedures often seem necessary because the clinical examination has not been adequate. They are all too often superfluous, and a thorough clinical examination would have provided grounds for correct management of the patient. The more clinical neurology we know, the less need there is for laboratory procedures and the more valuable these procedures become when they are necessary.

What Penfield and Kristiansen say of epilepsy applies to the whole field of clinical neurology: "Our aim is to emphasize the importance of the critical analysis of seizure patterns. Without it a

physician can hardly treat the patients under his care intelligently. Without it the surgeon lacks his surest guide to radical therapy in focal epilepsy. Without it the encephalographer is deprived of his most helpful collaboration and the neurophysiologist of illuminating clues of function localization."

Cushing, disappointed with the misleading results of a myelography performed in his clinic by Forestier, remarked: "From now on we will use less Lipiodol and more neurology."

Whatever place the laboratory may have in diagnostics, it is clear that the general practitioner needs a better working knowledge of clinical neurology. A well equipped laboratory is often not available to him. He simply *must* get along with what he can uncover by clinical examination.

What has been said here about and against the laboratory applies to everyday, routine neurological work in the office and at the bedside, in the hospital and at home. Only when research is involved are the indications for laboratory procedures widened.

#### THE POWER OF OBSERVATION

"All human science is but the increment of the power of the eye."  
*John Fiske (1842-1901)*

To enhance our clinical acumen we should strive to develop and cultivate the precious art of observation, which Osler called "the most difficult of all arts." Observation is the very basis of all our clinical work. The accent lies on "observation"; to see is not enough. This applies not only to daily practice of neurology but also to teaching. The primary object of neurological instruction is to teach the student to observe.

On the value of the power of observation, the greatest in medicine left immortal words. They are classic and bear repeating.

"Don't touch the patient—state first what you see; cultivate your powers of observation" (Osler).

"There is a widespread impression that the scientific quality of medical education and practice is in some fashion dependent upon the part played by the laboratory. This is not the case. Science is essentially a matter of observation, inference, verification and generalization" (Flexner).

"I very much doubt if the modern doctor with the laboratory at his back . . . is as good at the bedside . . . as those who have had to trust to their powers of observation" (Balfour).

"We have instruments of precision in increasing numbers with which we and our hospital assistants at untold expense make tests and take observations, the vast majority of which are but supplementary to, and as *nothing* compared with, the careful study of the patient by a keen observer using his eyes and ears and fingers and a few simple aids" (Cushing).

Our students should at all times strive to apply the infinite wisdom inherent in these words.

There is no substitute for observation, for the experience gained by "seeing much, and seeing wisely." "Seeing wisely" is a prudent integration of seeing locally and generally, with the whole patient in focus. The danger in neurological examination is that the examiner monomaniacally fix too much attention on minute local manifestations of the disease and so miss more general and more enlightening signs.

Failure to observe carefully can lead to tragicomic errors and puzzles. A patient was referred to Cassirer with the diagnosis of left-sided brachial monoplegia. It is quite true that this patient could not move his left arm, but only because on that side he had an axillary abscess which had been completely overlooked by the referring neurologist. Another patient was treated for weeks for a mysterious and undiagnosed disease, until a young doctor inspected

the patient's thighs, discovered numberless scars from injections and found—a case of chronic morphinism. Still another patient was operated on for a unilateral cerebellopontile angle tumor. Only *after* the operation was his skin inspected and generalized neurofibromatosis found. The tumor was, as the autopsy revealed, bilateral! Numerous x-rays of the cervical spine were made of a patient who complained of dysesthesias in one thumb. On careful examination it was found that he suffered from a purely peripheral affection of the cutaneous branch of the radial nerve, which was compressed at the wrist by his watchband.

It is true, neurological diagnostics is now more complicated and more exacting than it was in the time of Babinski and Oppenheim. Still, it is fitting to pause briefly and remember that long before the birth of "mechanized neurology" there were highly successful neurologists who worked with simple clinical tools. The well-trained eye of an experienced neurologist sees what may remain unnoticed by others. Not knowledge alone, but careful observation throughout the years, combined with profound knowledge, has made our great diagnosticians in neurology. Here are some examples of their uncanny gift of observation.

In 1923, as assistant to Nonne in Hamburg, I presented a patient with a diagnosis of epidemic encephalitis. On each of several ward rounds, without personal examination but after merely glancing at the patient, Nonne objected to the diagnosis, insisting that the patient "looked tumorous." Suddenly the patient died, and autopsy revealed bilateral frontal lobe tumor. As an assistant to Foerster in 1924, after several days of most careful examination I presented a patient with a diagnosis of right-sided frontal lobe tumor. At first glance, Foerster noticed that on walking the patient tended to fall back and to the left. This had escaped the notice of all his assistants. Without further examination Foerster suspected not a frontal but a temporal lobe tumor—and so it proved to be.



These stories are told not to encourage short-circuit, intuitive, snap diagnosis by neurologists, young or old, but to show how far diagnostically a glance "of the wise" may lead.

### DIAGNOSTIC TESTS

We first try to establish a preliminary diagnosis on the symptoms and signs as they present themselves; then we perform diagnostic tests to elicit further signs and symptoms. It is here that the gift of observation comes into its own.

The expression "symptoms and signs" is much used for headings in textbooks. But in the text proper the distinction between signs and symptoms is not always made, and the words are used interchangeably. However, the distinction is a valid one, though occasionally a doubt may arise as to which term should be applied.

A *symptom* is a subjective phenomenon. To uncover it we must depend essentially on the statement of the patient. For instance, headaches, dizziness, palpitation of the heart, dysesthesias and pain are symptoms. Though under certain conditions it is possible to objectify a symptom, by and large it is and remains a subjective phenomenon. In their entirety, symptoms constitute the *symptomatology* of a disease.

A *sign* is an objective phenomenon and can be perceived by the senses of the examiner. It is demonstrable. It is signs for which the examiner looks first of all. As Hordes said: "In diagnosis one physical sign is of more value than many symptoms." Exophthalmos, tremor, trophic disturbances, abnormal posture, involuntary movements, reflexes—all are signs. In their entirety signs constitute the *semeiology* of a disease.

There are two kinds of signs. The first are discernible immediately and usually on simple inspection of the patient, without contact between him and the examiner. The second are those which must be uncovered by action, either of patient or of examiner. In

this second category the examiner really tests something and observes the results exactly as a chemist does when he notes the reaction produced by mixing various chemicals. The difference between a sign and a test is the same as between seeing and doing. A test is a sign in action. We make a test to produce a sign or symptom. Therefore the well-known signs of Romberg, Kernig, Lasègue, Brudzinski and Froment should be called tests. Into the category of tests fall those signs which require certain maneuvers to disclose them.

All reflexes belong in the category of tests. We speak correctly when we say "testing the reflexes." They are signs uncovered by some maneuver. But since reflexes represent such a large and independent group, they will be discussed under the heading "Reflexes."

Of the diagnostic tests discussed here, some are new, some so new that they have not been mentioned in any neurological Baedeker. Older, time-honored tests which have not found proper recognition are mentioned if they need special emphasis. The constant endeavor has been "to make new things familiar, and familiar things new." Tests which not only have local significance but also colorfully illustrate some general physiological principle of broader application are given their due.

Definite, decisive, "high-powered" tests have been selected. However, to these proved tests have been added a few whose diagnostic significance and value have not as yet been fully established. But they are promising and worth trying. Tests which serve to uncover the inception of a disease, those which alert the examiner, have been particularly stressed.

Sometimes it has been found advisable to offer a choice of several tests to demonstrate a single diagnostic phenomenon. The examiner will find that, in order to prove one point, it is advantageous to have several tests at his disposal. The result of one test may be inconclusive, but even when it is conclusive, it is always precarious

to base final judgment on it alone. The sign usually regarded as pathognomonic for a certain condition may be absent. The Babinski reflex, for instance, is often absent in amyotrophic lateral sclerosis. It is always well to keep the following simple rule in mind: if some sign pathognomonic for a morbid condition is absent, the condition still may be present. It is best to base a diagnosis on the results of several tests, all of which point in the same direction.

All tests described in this book are simple and can be easily performed in the office or at the bedside. None is time consuming, none will make the patient uncomfortable. They are proved tests, based not on bookish wisdom but on years of practice. Here there is no borrowed experience; only what I have seen with my own eyes is reported.

Since the whole structure of our diagnostics is based on the results obtained from the evaluation of symptoms, signs and responses to tests, the technique of these tests will be described in detail. The minutiae, "the little things" that appear trivial, will be carefully considered. Upon the accuracy of these minutiae may rest the final diagnosis.

As in everything else, in the performance of a neurological test there are many ways to do it wrong, but only one way to do it right. A slight imprecision in technique may indicate an abnormality where none exists. Here lies the source of the gravest mistakes of the uninitiated, who may regard as pathological that which is normal. The cumulative power of such mistakes is immeasurable. One basic precept derived from an inaccurately performed test may lead to a diagnostic impasse and utter confusion. In 1926 William Spiller said to me: "Do not try to explain anything that may be wrong in the first place." The whole examination should always be guided by this wise admonition.

The newer textbooks outline disease entities in the greatest detail but tell little about the technique used to establish their diagno-

sis. It is highly regrettable that the exposition of such fine techniques is being neglected. Clinical neurological examination is losing ground and is being relegated to a minor position. The recent neurological literature contains few advances in this field as compared with those made by the European schools at the turn of the century.

For each test discussed here there will be a brief description of the physiological mechanism involved. It is not enough to memorize the name, content, physical happenings and allocation of a given test. It is essential that the reader understand its physiology. Only then will he be able to evaluate the result correctly.

In discussion of the physiological mechanism the utmost simplification and synthesis must be achieved, and the main goal of the physiological interpretation is to reduce diverse tests to a common denominator. Such an attempt to simplify must, of necessity, lead to some dogmatism. As John Ruskin said: "It is far more difficult to be simple than to be complicated." Where opinions differ, *one* has been accepted and followed—with a minimum of "but's," "on the other hands's" and "however's." Such a didactic method of presentation, which bars all controversy, naturally invites criticism but is used in order that the reader may not become confused.

In neurological literature, texts and records, one is struck by the number of proper names. A symptom, sign, reflex, test, syndrome or disease is often not characterized clinically, pathologically or descriptively but usually bears a proper name. In texts, proper names alone sometimes constitute chapter headings. There is scarcely a sign in neurology that is not encumbered by an eponym. This "eponymania" is endemic particularly in European countries. For instance, a leading European neurologist, reporting a case in 1937, in a single paragraph and without further comment used 14 proper names (including his own) to describe the reflexes in his case. Eponymization of a scientific discovery is often due to the

purely personal benevolence of writers, among whom there is no unanimity. An eponym may denote the man who first described, introduced, explained or effectively modified something. A phenomenon may be thus variously termed: A, B, C, A-B, B-A, and so on *ad infinitum*. Local and national patriotism contributes to this plethora of eponyms. The great confusion which is rampant is understandable. Indeed, it is well-nigh impossible to attribute a scientific discovery to a single person. It is rare that single eponyms are historically correct.

The disavowal of eponyms may discourage the overambitious from mass production of unnecessary signs and reflexes.

In this work the eponyms will be kept at a minimum. A fitting physiological name for a test tells more than any proper name can. We need more physiology and fewer eponyms, more understanding of neurology and less memorizing of proper names.

#### PLAN OF EXAMINATION

The neurological examination should be careful, concise and complete, the accent being on "complete." It is therefore imperative always to follow a definite plan, even to the point of pedantry; to think of everything, to forget nothing. In a formalistic fashion the minutiae should be scrupulously checked and nothing taken for granted. The great neurologists were true pedants in their diagnostic work.

Examination should be complete in every way, every system covered evenly and without bias. That the examination be done evenly is all-important. Every physician has his favorite diseases, so also has his favorite methods, regions, signs, tests. These "special interests" should never be allowed to prevail. The generally accepted plan of examination is: (1) cranial nerves; (2) motility; (3) reflexes; (4) sensibility; (5) vasomotor-trophic system.

But whether we follow this or any other plan, we must realize

that an ideal scheme of neurological examination has never been devised and never will be. The reason is that all divisions and subdivisions we make are artificial. The entire nervous system is a single indivisible unit, and no part of it works independently or in isolation. In any scheme, some overlapping is inevitable. But it must be remembered that it is better to repeat than to omit. While concerned with the minutest part of the nervous system, the examiner must not lose sight of the fact that the whole being—body, mind, nervous system—is one. This reminder is general, hackneyed, outworn and overworked but contains a basic, useful and highly practical truth. Another reminder, old, but still of value: although you are interested in neurology or are a neurologist, although a patient is referred explicitly for neurological examination and thinks "a nerve is pinched," his affection still may be arthritic, vascular or what not—and not neurological. Another, and a last, reminder: if you are confronted with a "neurological" problem which seems very complicated and baffling, where signs contradict symptoms, and symptoms contradict signs; if you have a clinical picture full of unusual and bewildering features, it might be worth while to remember that the whole problem may be psychiatric.

#### EXAMINATION IN THE OFFICE

The complete and over-all neurological examination, as practiced by the fourth year student in the hospital, suffers a modification when he becomes a busy practitioner facing the patient in his office. Lack of time requires that completeness of examination be sacrificed to some extent. Increased knowledge and ripened experience make this possible. According to the requirements of the case, special or local examinations are favored at the expense of the complete examination. This specialization and localization are dependent on what we assume the lesion to be after taking the history and a "first glance." The "sense for the essential" arises to compete

with completeness. The goal is not only to arrive at a workable diagnosis but to arrive with a minimal expenditure of time and effort. It is a compromise, but a bitter necessity. The practitioner immediately adapts his plan of examination to the requirements of the case; he focuses his attention on a certain region or on the leading symptom or sign. He stresses some signs and tests, touches lightly on some and neglects others. His attention is immediately directed to the site of the lesion. Certainly the course of an office examination differs when we suspect a temporal lobe abscess, *tabes dorsalis* or *meralgia paresthetica*. This abbreviation of the complete neurological examination is acceptable since otherwise the physician runs the danger of not seeing the forest for the trees.

In view of these requirements of an examination in the office, which is concerned with localization of the morbid process first of all, the tests discussed are arranged in the following order:

1. Cranial nerves
2. Peripheral nerves
3. Pyramidal system
4. Extrapyramidal system
5. Cerebellar system
6. Sensory system
7. Vasomotor-trophic system