

THE CLASSIFICATION OF LEPROSY 6

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The nomenclature of leprosy has changed considerably through the times, and even in the present day different authors use different names and designations for the same form of the disease, and in different countries the same name is applied to the different forms. As a result one finds but little profit, or one may even be led quite astray, when comparing the studies and results of different authors. One may easily be led to group quite different forms of the disease as identical, and arrive at very odd results.

For this reason it was most praiseworthy that the Leonard Wood Memorial Conference, held in Manila in 1931 (10), took up this question with the intention of finding a simple and uniform classification of leprosy, so that the existing confusion could be avoided. It is taken for granted that all leprologists are cognizant of this international formula of classification, according to which the two types of the disease are called "cutaneous" and "neural" (to be designated by the symbols "C" and "N"), and both types are subclassified 1, 2 and 3 according to the grade or degree of the affection.

Since that time I have tried to apply this formula to the several forms under which the disease appears here in Norway, but I have not succeeded in finding designations for all of them. Other leprologists have had experiences similar to mine in this matter, and so much experience has now been had in this field that I believe that the time is ripe to take up this question for renewed discussion, and for possible revision and expansion of the formula.

First, however, it would be of interest and advantage to consider briefly the historical development of the question. Obviously, I shall not be able to go into details or to deal with all authors and all countries, so I shall limit myself to Norway.

In their pioneer work Danielssen and Boeck (4) set up two forms of leprosy, *elephantiasis graecorum tuberosa* and *elephantiasis anaesthetosa*. In their description of the anesthetic form praec-

tically all importance was laid on the now well-known changes resulting from involvement of the nervous system. Of the real skin lesions, pemphigus and vesicles were mentioned first and foremost, for these authors considered them to be the first objectively observable symptoms of this form of leprosy; the so-called prodromata, which are the actual first signs of the disease, are of more subjective character. These authors also stated that spots or macules may appear in this form, but that they are far from being constant. These spots they described as being white and slightly anesthetic, and it seems beyond question that they are identical with the "morphoea alba" of the ancients. But it is equally certain that the picture presented by that description does not represent the primary stages of the macules, but rather the later phases which must be looked upon as inactive and residual stages of the once active macules. It is to be remarked that the description of the disease here discussed was based exclusively on examinations of lepers in Norway, among which no colored individuals were included. In contrast to the subordinate part that macules play in their description of the anesthetic form, these authors placed great importance on the occurrence of macules in the nodular form; the nodules always develop on the basis of macules, which are thus the first stage of the nodules. These macules are red and hyperemic, and disappear on pressure; at times they may assume a more dark, brownish color, even almost black—the "morphoea nigra" of the ancients.

Twelve years later Danielssen (3) published another work on the anesthetic form of leprosy, and here we meet quite another picture of its beginning. In this work Danielssen described macules on different parts of the body as the first undoubted sign of leprosy. These spots, he stated, are of a brownish-red color. They may disappear fairly soon, but they may also remain for a very long time, with slightly raised, slightly infiltrated reddish-brown edges, the central parts becoming pale—approaching white—and somewhat atrophic. Skin sensation is at first only slightly reduced, but the spots become increasingly anesthetic as time goes on. These macules may disappear for good at an early stage, but they may also reappear. Danielssen recorded a long list of patients whose histories supported his opinion. All of them presented these macules as the first manifestation of the disease, and if the disease itself did not disappear soon the well known symptoms referable to the nerve system developed.

What was the cause of this change in Danielssen's view of the beginning of anesthetic leprosy? This point he discussed in the preface to his second book, from which I cite the following:

Fourteen years have elapsed since the work "Om Spedalskhed" by Boeck and myself was published, and the studies that I have carried out during this period on this disease have in part been published in various periodicals. It will be evident to every investigator that a work such as that mentioned cannot be exhaustive for all time, even though it may have seemed so at the time of publication, and when I now set forth the results of continued researches on this so singular disease I find myself able to rectify several fallacies that appear in the first main work. At the same time I may possibly throw more light on the anesthetic form of leprosy. It is, then, particularly this form that will be discussed in this treatise, as I have in late years come into possession of the necessary material. So long as this disease was given but slight attention, and was looked upon by doctors as an evil which had to take its tragic course, the unfortunate victims tried to hide the early symptoms of the disease because the conditions in our land were such that the only thing that they could expect when they were no longer able to hide the disease was an existence of privation, lamentation and misery. But when the time came that the doctors made leprosy a matter of scientific study, more attention was afforded it by the State, and the day came when a number of lepers could be given care in several well-equipped hospitals. As soon as the leper found that there were those who busied themselves with his disease, he sought this care in the hope of regaining his lost health, and soon the belief spread that the earlier the sufferer sought assistance the greater was the hope that he could entertain for a successful result of treatment. Thus many of them came to the Lungegaards Hospital, and as a result I was able in the course of time to make observations with regard to the first visible symptoms of the disease. It was such observations that I had previously lacked with regard to the anesthetic form.

Leprous macules form so important a feature of the anesthetic form of the disease that any description which does not take them into account renders an incorrectly drawn and incomplete picture of it. This has been, and in general still is, the condition in Norway, and as far as I have been able to ascertain in other European countries as well. I may remark that exceptions to this general rule do occur and that there are cases in which it has been impossible to trace the existence of macules, either from the patient's history or by direct examination. However, the number of such cases has become less and less as more thorough search has been made for these lesions.

Not only the Norwegian leprologists have emphasized the importance of the macules in this form of leprosy. I may refer here to Leloir's great work (6), which he published in 1886 after his tour

of study in Norway in 1884. This author devotes a whole section to leprous macules in anesthetic leprosy. Personally, I have found it difficult to shake off the belief that, at one or another stage of the disease, macules appear in all cases of the anesthetic form, and that when their existence has not been established it is because they were of such slight and fleeting character that neither the patient nor the doctor has observed them. It is these cases which, by right, are properly to be called "lepra anaesthetica," or to be designated by the symbol "N."

In the beginning uncertainty and disagreement reigned with regard to the etiology and genesis of these leprous macules. The clinical pictures of nodular and anesthetic leprosy were so different that it was evident that there must be some fundamental reason, as yet unexplained. The only thing that seemed to be certain was that both forms must be caused by the leprosy bacilli. However, it proved to be a very difficult matter to find the bacilli in the anesthetic form. It was not until more than ten years after the discovery of the bacillus that Arning (1), then working in Hawaii, succeeded in finding them in the nerves in such cases.

As for the macules themselves, search for the bacilli gave negative results for another long period. This explains why so eminent an investigator as P. G. Unna advanced the theory that the *leprides* a designation first used by Arning for leprous macules, are not caused directly by the presence of leprosy bacilli in the macules, but indirectly by toxins of the bacilli through the nerves; therefore, he called them *neuro-leprides*. This theory was undoubtedly wrong, and Unna ultimately abandoned it. Looft (8) in 1891 succeeded for the first time in demonstrating the bacilli in typical leprous macules—or leprides, if one prefers that term. This he did in four cases. One of these patients is alive today and still has macules, and in the course of the years I have several times found bacilli in these macules.

The experience of later years has shown that, with scarcely any exception, one may succeed in finding bacilli in the macules. The examinations must, of course, be made in fine microscopic sections, and one may have to search long before finding even a very few bacilli. Examination of smears has always given only negative results. Furthermore, the search must be made in the right place—the slightly infiltrated edges of the lesions—and at the right stage in their development. The bacilli disappear fairly soon in the fading

atrophic centers, but remain in the infiltrated edges for a very long time. Even here, however, they may be sought in vain when the active process is over.

It was this view that leprous macules were directly caused by bacilli present in them, though this could but rarely be proved, that led Hansen and Looft (5) to give the term *lepra maculo-anaesthetica* a more official status, after that term had been employed by Norwegian dermatologists for a long time. To my mind the existence of these macules in a case must be indicated in the designation given that case, and for that purpose the symbol "M" appears to me appropriate. The cases of anesthetic leprosy in which it has not been possible to prove the existence of macules can be indicated by N, and those with macules by NM. To these symbols the figures 1, 2 and 3 may be added according to the degree of advancement of the case, as in the scheme adopted by the Memorial Conference. With regard to this, I would propose that N without a figure should signify that the nerve symptoms are limited to the territory of macules. If the nerve disturbance, besides affecting the macules, has spread to various parts of the peripheral nerve branches this may be indicated by N1. If the great nerve trunks have been attacked, N2 may then be used. N3 should be reserved for those cases in which the nerve affection is so far advanced that there are neuro-trophic affections: ulcers, necrosis, grave mutilations, etc.

The grading of the macules seems to me to offer greater difficulty. One might let M denote one single macule in the beginning stage, with slight anesthesia. M1 might signify from two up to, let us say, five macules in an early stage, and M2 many macules with pronounced anesthesia and atrophy in the central parts, but with infiltrated edges in which there are active processes. M3 would be reserved for atrophic macules without any sign of reaction on the part of the tissue. One might proceed in this manner designating the course of the disease by a single letter, or symbol. To a case in which there have been macules, but on examination of which these cannot be established, the term M0 (M-zero) is to be applied. An example will illustrate the application of this scheme. At this hospital there are several old patients with considerable mutilations, who in the past had pronounced macules which have completely disappeared. These cases would be designated N3M0.

At about the time that an understanding of the importance of the macules in the clinical picture of anesthetic leprosy was gained, the designation of the disease itself was changed here in Norway from "elephantiasis" to "lepra," in order to avoid any possible confusion with *elephantiasis arabum*. That the term *tuberculosa* was changed to *tuberosa* (usually translated "nodular") was also quite natural and necessary, in order to avoid confusion with tuberculosis in lepers. I am of the opinion that to designate nodular leprosy as C (i.e., "cutaneous") may cause confusion and misunderstandings. It would seem as if this use of the term implies that involvement of the skin is not met with in the anesthetic form, whereas the fact is, as I have already pointed out, that in almost all cases of anesthetic leprosy there are important changes in the skin.

Macroscopically, the difference between the two forms of the disease is only that the process in one of them appears as nodules, and in the other of them as macules. Microscopically, in most cases, macules and nodules present great similarity, particularly with regard to the cell forms present. These vary in numbers and the manner of spreading. The real and decisive distinction between the two forms lies in the great difference that is to be found as regards the numbers of leprosy bacilli present and the cell proliferation. The enormous numbers of bacilli in the nodules cause comparatively little cell proliferation, which is to say that there is but slight reaction on the part of the tissue in comparison to the great number of bacilli. In the macules, on the other hand, the reaction is very severe in comparison to the excessively small number of bacilli, which are thus responsible for a comparatively great cell proliferation. But both of these processes take place in the skin, and thus skin affections are common to both forms; both of them have their "cutaneous type." The symbol C ought, therefore, to be changed to T. To use the letter T to signify "tuber" (nodule) and M to signify "macula" (macule) would present a direct, clear and unmistakable picture of the skin affections of the two forms, which would not require further explanation. As with the other symbols discussed, T may be graded 1, 2 and 3, though I should feel inclined to reserve T3 for the somewhat rare and peculiar cases with great tendency to ulcerate and without tendency to healing or being cured.

We now come to "tuberculoid leprosy" and its classification in this system. The cases of this nature that I have seen personally,

or have had an opportunity to study closely from the literature, have all belonged to the maculo-anesthetic form, with tuberculoid changes in the macules. This condition might be designated by adding a small "t" to M; the case symbol would then become NMt with the addition, if necessary, of the grading 1, 2 or 3 to the N, or also to M, if this would make the picture clearer. If there should exist cases where the tuberculoid changes are to be found only in the nerve trunks, a small "t" may be added to N (ie., Nt), and should there be cases with tuberculoid changes in both macules and nerves, this would receive an adequate expression by MtNt. If one should happen to meet with cases in which tuberculoid changes appear in nodules, this may simply be shown by Tt, but with regard to such cases I think it advisable, for the present, to place an interrogation mark after them, for the reason that in the nodular form undoubtedly tuberculosis may appear together with typical leprous processes.

It now remains to discuss a couple of forms, or rather variations, of the disease that offer points of interest. The first is the old lepra mixta or *lèpre complète*. This, under the plan here proposed, would be termed TN, or TNM, which would most frequently be required since cases without macules are less frequent than those with them. But the conditions in these cases of leprosy differ greatly according to the manner in which the disease commenced. If we have a case of maculo-anesthetic leprosy (NM) in which at a later stage nodules (T) appear, this as is well known indicates an undoubted change for the worse with regard to both the prognosis for the patient and danger for those around him. The condition in such a case might be expressed by adding a small "p" (signifying primary) to the letter which designates the first symptoms that appeared—in the case mentioned, TNMp. If on the other hand we have a case which began with nodules, the term would be TpNM, or TpN. In any event there would be added the figures used to indicate the degree of the changes present, in order to present a clear and complete picture of the form and stage of the disease. The official statistics for Norway do not indicate the course of the disease; all cases with nodules have been recorded as nodular, whether the nodules appeared at the outset or at a later stage. This has been a drawback in attempting to make a thorough analysis of these statistics.

The second variation referred to, one that is not so very rare, is met in cases that commence with nodules, but in which these dis-

appear after a time, so that there remain only the changes caused by involvement of the nerves. These cases are the ones that hitherto have been known as secondary anesthetic. These may be designated by T0N, with the necessary grading. As with M0 (discussed above) the "0" (zero) signifies that nodules have been present but have disappeared.

The matters so far discussed concern almost exclusively the theoretic, scientific side of the leprosy question. However, the practical, administrative side of the question, which concerns the condition of the patient with regard to those around him (i.e., the danger of infection), is of equal importance. We thus come to the question of the presence or absence of the bacilli. As Wade⁽⁹⁾ has recently noted, Muir used to classify cases according to whether bacilli were found or not. Those found negative were classed as "A," and those found positive as "B." In the present connection it might be useful to adopt "B" to denote the status of the cases with respect to the bacteriological findings, the positive cases to be B+ and the negative ones B-. These symbols would be added to the aforementioned designations for the various forms: e.g., NMB+ or NMB-; NMtB+ or NMtB-. Such an addition would be of considerable help, even though it has also its drawbacks.

Frequently the seat of the bacilli is of outstanding importance, even more in some cases than the number of bacilli. For instance, bacilli in the nose must be looked upon as being of more danger to the persons around the patient than bacilli in the macules or the nerves. However, to express by a single letter or number the fact that such a condition exists is so difficult that for the present I will go no further than to suggest that "B+ in the nose," or "B+ in the macules," or in both, might be added to the case symbols. If one should wish to emphasize that the bacilli are only to be found in the nerves, one would add "B+ in nerves." These cases play an insignificant role in administrative respects, but I will revert to this matter later. Corresponding additional notations can, of course, be applied in the nodular cases.

There is one side of the question with regard to the bacteriological examination that is so important that it must be discussed further. I refer to the value of a negative finding (B-). This depends to a great degree upon how thoroughly and carefully the examination has been made. In nodular cases it is generally a sim-

ple matter to find bacilli in the nose in the later stages of the disease, but even in such cases it has happened that I have sought them once or twice in vain, getting positive results only on the third examination. In the earlier stages it is almost always necessary to search several times before one can feel perfectly satisfied that there are no bacilli in the nose. With regard to the nodules themselves, the discharge of bacilli is not necessarily dependent upon ulceration. Even when the epidermis is normal they can get to the surface along the hairs, following the hair sheaths (2). As is known, in the earlier stages of the lesions there lies between the leprous infiltration in the nodules and the epidermis a layer of normal connective tissue which is quite free of bacilli, and this prevents the bacilli outside the hair follicles from getting to the surface before the stage of ulceration (7). But conditions are quite otherwise in the macules. Here as a rule the leprous infiltration reaches right up to the epithelium, whence fine strands of it are sent out to a greater or lesser depth. Thus there is no protective layer of normal tissue under the epithelium, and for this reason we may not so infrequently find bacilli wandering or being transported up through the epithelium (7). Since here, in contrast to the nodules, the number of bacilli is very small, one cannot be content with an ordinary examination of smears of material obtained from a cut, as one can when dealing with nodules. This procedure will very rarely result in a positive finding in the case of the macule. Consequently, one must make very careful examinations of sections of excised skin, as has been said. Until such a thorough examination has been made one cannot record B— with any degree of certainty. And even so it is probable that in all macules, even when bacilli cannot be found in this way, occasional bacilli are present as long as there are signs of active processes in the skin. Before the patient can be said positively to have “closed” leprosy, all bacilli must have disappeared from the skin and mucous membranes—a thing which it will be very difficult to prove as long as there are active processes in the macules—and when nodules have been present one must thoroughly assure oneself that the reactionless scars left by them do not contain any bacilli.

It is my hope that in this scheme, drawn up by me, may be found expressions for the greater number of forms in which leprosy may appear and develop, even though life cannot be outlined exactly

in a scheme. Objection may perhaps be raised to this scheme on the ground of its being intricate and complicated. To this the answer must be that if one is to probe deeper and deeper into these difficult questions, then designations as well as examinations must become more detailed and exact. One cannot be content with, or adhere to, more or less superficial examinations and terms, even though they may be easier and more convenient. I am of the opinion that if this scheme is fully applied in all cases one will succeed, in a comparatively simple way and without long descriptions of the individual cases, in learning what course leprosy takes in different climates and in the various races of man.

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