



hour to three or four hours. The patient is intensely thirsty and drinks eagerly of cold water.

Sweating Stage.—Beads of perspiration appear upon the face and gradually the entire body is bathed in a copious sweat. The uncomfortable feeling associated with the fever disappears, the headache is relieved, and within an hour or two the paroxysm is over and the patient usually sinks into a refreshing sleep. The sweating varies much. It may be drenching in character or it may be slight.

Chart XI is a fac-simile of a ward temperature chart in a case of tertian ague. The duration of the paroxysms on February 1st, 3d, and 5th was from twelve to sixteen hours. Quinine in two-grain doses was given on the 5th and was sufficient to prevent the on-coming paroxysms on the 7th, though the temperature rose to 100.5° . The small doses, however, were not effective, and on the 9th he had a severe chill.

The total duration of the paroxysm is from twelve to fifteen hours, but may be shorter. Variations in the paroxysm are common. Thus the patient may, instead of a chill, experience only a slight feeling of coldness. The most common variation is the occurrence of a hot stage alone, or with very slight sweating. During the paroxysm the spleen is enlarged and the edge can usually be felt below the costal margin. In the interval or intermission of the paroxysm the patient feels very well, and, unless the disease is unusually severe, he is able to be up. Bronchitis is a common symptom. Herpes, usually labial, is perhaps as frequently seen in ague as in pneumonia.

Types of the Paroxysm.—The periodicity of the paroxysms is one of the most striking features in malarial fever. They occur with regularity, either at the end of twenty-four, forty-eight, or seventy-two hours.

Returning at the end of twenty-four hours the paroxysm is daily, hence the name *quotidian*. This is by far the most frequent type in the acute intermittent fevers in this latitude. Should two attacks occur daily, which is very rare, it is called a double quotidian. The observations of the Italian observers, more particularly Golgi, have enabled us to trace certain definite cycles of evolution in the development of the malarial parasites, and in the character of the organism in the different forms of the disease. In the quotidian type the plasmodia are small at first and display active movements. The parasite gradually increases in size, fills the entire corpuscle, or at the beginning and prior to the paroxysm undergoes in many of the corpuscles segmentation or sporulation.

If the paroxysm occurs at the end of forty-eight hours, it happens upon the third day; hence the term *tertian* applied to this form. This is the next most frequent form, but it is much less common than the quotidian form. In the tertian type the blood-corpuscles contain small amœboid bodies which gradually develop, become deeply pigmented, and, according to Golgi, the segmentation consists of from fifteen to twenty separate

bodies, aggregated about the central clump of pigment. Here, too, the segmentation occurs just prior to and during the chill.

Occurring at the end of seventy-two hours the paroxysm is on the fourth day, hence the name *quartan* ague. This is rare, and in the past seven years I have met with but six or eight well-marked instances. In this form the amœboid bodies become rapidly pigmented. The movements are slower. They grow gradually in the red blood-corpuscles, and, according to Golgi, attain considerable size without removing all the hæmoglobin from the corpuscles. Prior to the chill, segmentation of the bodies takes place into from nine to twelve different portions.

Other types, such as quintan or sextan, need not be considered, as they are very rare.

Course of the Disease.—After a few paroxysms, or after the disease has persisted for ten days or two weeks, the patient may get well without any special medication. In cases in which we have been studying the hæmatozoa I have repeatedly known the chills to stop spontaneously. Such cases, however, are very liable to recurrence. Persistence of the fever leads to anæmia and a hæmatogenous jaundice, owing to the destruction of the red blood-disks by the parasites. Ultimately the condition may become chronic, and will be described under malarial cachexia. Cases of intermittent fever yield promptly and immediately to treatment by quinine.

(2) *Continued and Remittent Form of Malarial Fever.*—Under this head will be described that form of fever in which there are no distinct intermissions, but in which the temperature range is constantly above normal, though there are marked remissions. It is not an uncommon disease in this locality. The severer forms of it prevail in the Southern States and in tropical countries where it is known chiefly as *bilious remittent fever*. The entire group of cases included under the terms *remittent fever*, *bilious remittent*, and *typho-malarial fevers* requires to be studied anew in the light of Laveran's observations.

Symptoms.—The disease may set in with a definite chill, or may be preceded for a few days by feelings of *malaise*. As seen in this latitude, the patient has either chilliness or a distinct rigor in the beginning. When seen on the second or third day of the disease he has a flushed face and looks ill. The tongue is furred, the pulse is full and bounding, but rarely dicrotic. The temperature may range from 102° to 103° , or is in some instances higher. The general appearance of the patient is strongly suggestive of typhoid fever, a suggestion still further borne out by the existence of acute splenic enlargement of moderate grade. As in intermittent fever, an initial bronchitis may be present. The course of these cases is variable. The fever is continuous, with remissions more or less marked; definite paroxysms with or without chills may occur, in which the temperature rises to 105° or 106° . Intestinal symptoms are not present. A slight hæmatogenous jaundice may develop early. Delirium, usually of a

mild type, may occur. The cases vary greatly in severity. In some the fever subsides at the end of the week, and the practitioner is in doubt whether he has had to do with a mild typhoid or a simple febricula. In other instances the fever persists for from ten days to two weeks, there are marked remissions, perhaps chills, with a furred tongue and low delirium. Jaundice is not infrequent. These are the cases to which the term bilious remittent and typho-malarial fevers are applied. In other instances the symptoms become grave and assume a character of the pernicious type. It is this form of malarial fever about which so much confusion still exists. The similarity of the cases at the outset to typhoid fever is most striking, more particularly the appearance of the facies, and the patient *looks* very ill. The cases develop, too, in the autumn, at the very time when typhoid fever occurs. The fever yields, as a rule, promptly to quinine, though here and there cases are met with, rarely indeed in my experience, in which they are refractory. It is just in this group that the observations of Laveran will be found of the greatest value.

The *diagnosis* of malarial remittent fever may be definitely made by the examination of the blood. Vandyke Carter, in his monograph, alludes to the value of this method in the fevers of India. In many cases here we are at first unable to distinguish between typhoid and continued malarial fever without a blood examination. A more wide-spread use of this means of diagnosis will enable us to bring some order out of the confusion which exists in the classification of the fevers of the South. At present the following febrile affections are recognized by various physicians as occurring in the subtropical regions of this continent: (a) Typhoid fever; (b) typho-malarial fever, a typhoid modified by malarial infection, or the result of a combined infection; (c) the malarial remittent fever; and (d) continued thermic fever (Guitéras). In these various forms, all of which may be characterized by a continued pyrexia with remissions or with chills and sweats (for we must remember that chills and sweats in typhoid fever are by no means rare), the blood examination will enable us to discover those which depend upon the malarial poison. In this latitude we have not the opportunity of seeing many of the protracted and severe cases, but I am inclined to think that future observations will show that apart from the thermic fever there are only two forms of these continued fevers in the South—the one due to the *typhoid*, and the other to the *malarial* infection. The typhoid fever of Philadelphia and Baltimore presents no essential difference from the disease as it occurs in Montreal, a city practically free from malaria. Dock has shown conclusively that cases diagnosed in Texas as continued malarial fever were really true typhoid.

(3) **Pernicious Malarial Fever.**—This is fortunately rare in temperate climates, and the number of cases which now occur, for example, in Philadelphia and Baltimore, is very much less than thirty or forty years ago. Among the cases of malaria which have been under observation during

the past two years there were only two of the pernicious form. The following are the most important types:

(a) *The comatose form*, in which a patient is struck down with symptoms of the most intense cerebral disturbance, either acute delirium or, more frequently, a rapidly developing coma. A chill may or may not precede the attack. The fever is usually high, and the skin hot and dry. The unconsciousness may persist for from twelve to twenty-four hours, or the patient may sink and die. After regaining consciousness a second attack may come on and prove fatal.

(b) *Algid Form.*—In this, the attack sets in usually with gastric symptoms; there are vomiting, intense prostration, and feebleness out of all proportion to the local symptoms. The patient complains of feeling cold, although there may be no actual chill. The temperature may be normal or even subnormal; consciousness may be retained. The pulse is feeble and small, and the respirations are increased. The urine is often diminished or even suppressed. This condition may persist with slight exacerbations of fever for several days and the patient may die in a condition of profound asthenia. In a recent case the patient, admitted on October 10th, had been ill since the 7th, but there were no chills. When first seen he was prostrated and weak, and looked as if he had been drinking, but there was no alcoholic odor of the breath, and on learning that he had recently come from Savannah, the blood was at once examined and large numbers of Laveran's organisms were found, chiefly of the small intra-corpuscular variety. The temperature was only 101°. During the next five days the prostration, extreme depression, and vomiting continued; the pulse ranged from 70 to 80, and the temperature, after the first day, did not rise above 98°, but sank as low as 96°. This is essentially the same as described as the *asthenic* or *adynamic* form of the disease.

(c) *Hæmorrhagic Forms.*—In all the severe types of malarial infection, especially if persistent, hæmorrhage may occur from the mucous membranes. An important form is the malarial *hæmaturia*, which in some instances assumes a very malignant type. Paroxysms of ague may precede the attack, but in many cases called malarial hæmaturia there is no febrile paroxysm. The condition is usually hæmoglobinuria, though blood-corpuscles are present also. In severe cases there is bleeding from the mucous membranes. Jaundice is present, but to a variable extent, and is hæmatogenous, due to the destruction of the red blood-corpuscles. Malarial hæmaturia occurs in epidemic form in many regions of the Southern States, and in some seasons proves very fatal.

Many different forms of pernicious malarial fever—diaphoretic, syncope, pneumonic, pleuritic, choleraic, cardiac, gastric, and gangrenous—all of which depend upon some special symptom, have been described.

(4) **Malarial Cachexia.**—The symptoms of chronic malarial poisoning are very varied. It may follow the frequent recurrence of ordinary intermittent fever, a common sequence in this country. A patient has chills