LECTURES ON THE PRACTICE OF MEDICINE.

BY
CHARLES MURCHISON, M.D., LL.D., F.R.S.,
Physician to St. Thomas's Hospital, and Joint Lecturer on Medicine at
St. Thomas's Hospital Medical School; etc.

LECTURE II.—PYREXIA.

1. *Definition.* 2. *Causes.* 3. *Symptoms*; a. *Increased Temperature*; b. *Alterations in the Organs of Circulation*; c. *Accelerated Respiration*; d. *Dryness of Skin*; e. *Derangements of Digestive Functions*; f. *Derangements of Secretions*; g. *Derangements of the Nervous System.* 4. *Varieties of Pyrexia*; a. *Mild*; b. *Inflammatory*; c. *Asthenic*; d. *Typhoid*; e. *Hectic. Intermittent, Remittent, and Continued Fever.* 5. *Pathology of Pyrexia.* 6. *Diagnosis.* 7. *Prognosis.* 8. *Treatment.*

GENTLEMEN,—Before proceeding to the consideration of individual diseases, it is well that you should have correct ideas of what is now meant by pyrexia or fever, inflammation, and dropsy—terms which are of common use in the description of many diseases.

PYREXIA OR FEVER.

I. *Definition.*—Fever is any condition of the system in which the temperature of the blood is elevated above the normal standard. The increased heat is indicated by the term “fever”, derived from the Latin word *ferreo*, to burn; as well as by the synonymous term “pyrexia”, which is derived from the Greek words *πῦρ*, fire; and *ἔχω*, to hold.

The condition of fever is observed in a large number of diseases: in fact, diseases may be divided into two great classes—*febrile and non-febrile*; and in diagnosing the nature of a malady, one of the first things to be done is to determine to which of these two classes it belongs. Febrile diseases follow, for the most part, an *acute* course, while non-febrile diseases are mostly *chronic*.

II. *Etiology.*—The causes of fever are very numerous, and will be considered in detail in discussing individual diseases. Speaking generally, however, of fever in the abstract, they may be divided into two classes, viz.:

1. An abnormal condition of the blood, induced by some poison, or morbid material, received into the body from without (small-pox, typhus, and ague), or generated in the body (gout and acute rheumatism).

2. A local injury or disease (wounds and inflammation of the lungs). In the latter case, the fever is spoken of as *symptomatic* of the local injury or disease; in the former, it is said to be *idiopathic* or *essential*. In both classes, however, it is probable that the febrile symptoms are produced in a similar manner. The morbid state of the blood, on the one hand, and the local injury or disease, on the other, paralyse the sympathetic nerves, which regulate the processes of nutrition and disintegration: but to this we shall return when we come to discuss the pathology of the febrile state. In the mean time it will be well to consider somewhat more in detail the phenomena, or the

III. *Symptoms of Pyrexia.*—They are as follows.

1. *Increase of Temperature.*—This is the essential or pathognomonic sign of fever. Fever cannot exist without it; and any person whose blood has a temperature in excess of the normal standard must be regarded as in a state of fever, whatever the other symptoms may be. Moreover, the intensity of the fever in any case may be accurately measured by the degree of elevation of the temperature.

Fig. 1.

In determining the existence or degree of fever, you must not trust to the sensation communicated to the hand by the skin of the patient, but you must have recourse to the clinical thermometer. The utility of this instrument for distinguishing between different forms of fever has, in my opinion, been greatly overrated; but for deciding as to the presence, or the increasing or declining severity of fever, it is invaluable. Many different forms of clinical thermometers have been recommended. I show you here the one which I have been in the habit of using, and which is chiefly peculiar for the length of the degrees and the smallness of the bore* (Fig. 1). The bulb of the instrument is to be introduced into the

* The thermometer from which the drawing is taken is one manufactured by Mr. Hawkesley, of Blenheim Street, Bond Street.

fork of the axilla, under the tongue, or into the rectum, and left in one of these situations for at least ten minutes.* As a rule, it will be most convenient to select the axilla as the locality of observation; and then care must be taken that this part has not been exposed to the air immediately before the observation, and that during the observation the skin is pressed closely over the bulb on all sides.

Before considering to what degree the temperature may rise in a state of fever, it is necessary to know what is the average temperature of the human body (*i.e.*, of the blood) in a state of health, and what are the variations in this temperature compatible with health. In the healthy human adult, the body being at rest, and the temperature of the surrounding atmosphere about 60 deg. Fahr., the average temperature in the axilla is 98.4 deg., in the rectum 99.4 deg., and that under the tongue is intermediate, or about 98.9 deg. The average healthy temperature is not absolutely identical in every individual, but may vary from 97.75 deg. to 99 deg. It is slightly higher in infancy and old age than in adolescents and adults. In the same individual also there are certain slight variations in the temperature consistent with health, some of which deserve to be mentioned. In the first place, there are *diurnal variations* of temperature constantly occurring in healthy persons, which must be kept in mind in reference to the diurnal variations so common in febrile diseases. As a rule, the daily minimum is about day-break, or between 2 and 8 A.M. After this a rise begins, and continues until late in the afternoon, or to between 4 and 9 P.M. These daily fluctuations are somewhat greater in children than in adults; but in any case they rarely exceed 1 deg. Fahr., and any variation in excess of this is very transient. Secondly, it is well known that *muscular exercise* increases the heat of the body, while repose tends to its reduction. The differences, however, resulting from this cause, are chiefly observed in the extremities. The temperature, in health, of the hands and feet is often much below that of the trunk and internal parts. There may be a difference of 20 deg. Fahr. or more between the temperature of the feet and that under the tongue. The effect of exercise is to raise the temperature of the extremities to that of the trunk. It produces little change—not more than an elevation of 1 deg. Fahr. in the temperature of internal parts, as, for example, under the tongue, and even this elevation ceases on the cessation of exertion. Thirdly, the *ingestion of food* causes a slight rise of temperature. The effect of a full meal is to hasten the normal diurnal rise, or to postpone its fall; but the elevation of temperature resulting from food rarely amounts to 1 deg. Fahr. Fourthly, the temperature of the human body is influenced to the extent of one or two degrees by *that of the surrounding atmosphere*. Brown-Séquard found a rise of atmospheric temperature from 46.4 deg. to 85.1 deg. Fahr., to raise the bodily temperature from 97.9 to 100.22 Fahr. When the temperature of the atmosphere exceeds that of the normal standard of the human body, the temperature of the body occasionally exceeds the range compatible with health. It is also to be noted that young children and persons of advanced age have less power than adults of resisting external cold—the temperature of the body being more easily and considerably reduced by it in the former case than in the latter.†

Keeping in view these healthy variations of human temperature, it may be said that a temperature in the axilla which persistently exceeds 99.5 deg. Fahr. must be regarded as a febrile temperature. The actual increase of temperature varies greatly in different fevers and in different cases of the same fever; and in all cases the intensity of the fever may be fairly estimated by the degree of elevation of temperature. It is far from uncommon to find an elevation above the normal standard of two, four, six, or even eight, degrees. It is not often that the temperature in fever exceeds 106 deg. Fahr., and when it exceeds 107 deg.

the patient is said to be in a state of *hyperpyrexia*. In this condition the temperature may be 14 deg. in excess of the normal standard. I have myself known the temperature rise to 108 deg. Fahr. in rare cases of enteric, relapsing, and scarlet fevers. Wunderlich has noted a tem-

* In observations for scientific purposes, the above rule ought never to be broken; but in private practice, with a sensitive thermometer, three or four minutes will usually suffice.

† For further information on the normal ranges of human temperature, see Wunderlich's *Manual of Medical Thermometry* (Sydenham Society's Translation, 1871, p. 95); W. Ogle, "On the Diurnal Variations in the Temperature of the Human Body" (*St. George's Hospital Reports*, 1866, II, 221); and Gee, "Gulstonian Lectures on the Heat of the Body" (*BRITISH MEDICAL JOURNAL*, 1871, p. 301.)

perature of 110.3 deg. Fahr. in both enteric and scarlet fever.* In a case of acute rheumatism, I found the temperature before death rise to 110.2 deg.; and Wunderlich quotes instances of this disease in which the temperature was as high as 111.2 deg. Fahr. Lastly, cases of tetanus have been observed in which the temperature has been as high as 110.7 deg. Fahr.,† or even 112.55 deg. Fahr.—the latter being the highest temperature yet met with in a living man. During recovery from all febrile diseases, there is a tendency to lowering of the temperature below the normal standard.

2. *Alterations in the Organs of Circulation.*—Next to increase of temperature, acceleration of the pulse is the most constant phenomenon of fever, and by many is still regarded as its chief indication. The pulse, which in a healthy adult varies from 64 to 76, is increased to 90, 100, 120, 140, or even more. The frequency of the pulse is to some extent an index of the intensity of the fever. Thus, ranges from 80 to 100, from 100 to 120, from 120 to 140, and above 140, represent four different grades in the intensity of the febrile process.‡ But though acceleration of the pulse is so common a feature of fever as in the minds of many practitioners to enter into its very definition, it is a mistake to regard it as a pathognomonic or essential symptom of fever. Quickness of the pulse may exist without any fever, and there may be fever without any increased frequency of the pulse. In a hysterical female, or a nervous man, the pulse may exceed 100, or even 120, although there be no fever; while, on the other hand, enteric fever may run its entire course, with little or no rise in the rapidity of the pulse. Quickness of pulse is only a sign of fever when taken in conjunction with increase of temperature; but, from the readiness with which it is detected, it is usually the first sign to attract notice.

The pulse during fever is altered in other ways than as regards frequency. Its strength, fulness, and regularity, vary greatly in different fevers; but it may be accepted as a general rule that the greater the rapidity of the pulse the less is its strength. In severe or protracted cases, the pulse not uncommonly becomes irregular, intermittent, or undulating—the beats in the last condition being ill-defined and running into one another. Some of the alterations in the pulse effected by pyrexia I show you here, transferred by Dr. Burdon Sanderson to paper by means of the sphygmograph. (Figs. 2, 3, 4, 5, 6.) The irregular and

undulating pulses are usually associated with great diminution in the force of the cardiac impulse, and with abbreviation, weakening, or complete abolition, of the first or systolic sound of the heart. When this impairment of cardiac action is persistent, there is reason to fear that it depends not solely upon nervous paralysis, but that there is also an acute granular degeneration of the muscular fibres in the coats of the heart. With this condition of the heart there is almost always a marked tendency to stagnation of blood in the capillaries in different parts of the body, but especially in the lungs.

During fever, the functions of most organs in the body become deranged, as well as those of circulation, giving rise to symptoms which are more or less constant, but which are not essential.

3. There is *increased frequency of respiration* usually in proportion to the rise of the pulse. Sometimes the respiratory movements are quickened out of all proportion to the frequency of the pulse, owing either to organic changes in the lungs or to cerebral paralysis.

4. *Dryness of Skin.*—Not only is the skin hot, it is often unusually dry, and this dryness imparts to it an unusual roughness. But you must not regard dryness of the skin as an invariable accompaniment of fever. In many cases of fever there is increased perspiration, either recurring at more or less regular intervals, as in ague, pyæmia, and many cases of enteric fever, or of a more constant character, as in rheumatic fever. These perspirations are usually regarded as eliminative of poisons or morbid substances from the blood; but, although they are often critical, or mark the termination of the febrile process, in many cases they are exhaustive, and cause little or no abatement of the febrile process, which in fact may be most severe when they are most profuse.

5. The *digestive functions* are always more or less deranged. The *tongue* is altered in appearance; epithelium accumulates upon it in greater or less quantity, constituting what is called "the fur." This fur may be white or yellow, but ultimately it often becomes dry and brown, or the tongue becomes coated with thick crusts of brown "sordes", which may likewise accumulate upon the teeth, gums, and lips. The latter appearances always indicate a state of great prostration. In some cases of fever, the fur which appears at first upon the tongue soon peels off, leaving the mucous membrane preternaturally red and clean; the papillæ being either unduly prominent, as in scarlet fever, or the surface being abnormally smooth and glistening, or marked by transverse fissures, as often happens when there is local mischief in the bowels. With these changes in the tongue there is *thirst*, the *appetite* for food ceases, and there is a tendency to *constipation*, unless there be something special in the case to determine an intestinal flux.

6. *Derangement of the Secreting Functions.*—The elimination of water is more or less checked, and thus we have the dryness of the skin and tongue and the constipation referred to. In the celebrated case of St. Martin, in whom there was an opportunity of watching what went on in the interior of the stomach through a fistulous opening, it was found that the quantity of gastric juice diminished greatly during a febrile attack. The urine in pyrexia is also diminished, sometimes to one-half or one-fourth of the normal quantity, and this notwithstanding that the patient drinks much more fluid than in health. When, however, the fever abates or remits, there may be an unusually large flow of urine. It is obvious that in pyrexia there is a tendency to retention of water in the system; and it has been suggested that this may be due to the formation in the blood of some substance having a strong affinity for water, such as gelatine. Although this explanation is at present purely theoretical, it is not improbable that gelatinous compounds may be formed in the blood in fever as the result of the rapid transformation of the albuminous principles. Gelatine is in its turn convertible into urea; and we know as a fact that an excessive formation of urea is a constant feature of fever. But while the urinary water is diminished, the urinary solids, and particularly those which represent the destructive metamorphosis of the nitrogenous elements of the blood and tissues, are increased. Many years ago, Prout pointed out that the amount of urea formed in the body is always increased in fever, notwithstanding the diminution of the food; and this statement has been amply confirmed by recent researches. In a case of typhus under my care, the quantity of urea excreted in one day was 1,012 grains; and A. Vogel found 1,065 grains in a case of enteric fever, and 1,235 grains in one of pyæmia—the normal amount for an adult on a fever-diet not exceeding 200 or 300 grains. These were, no doubt, extreme amounts; but it is now an accepted fact that, in fever, the quantity of urea formed in the body is much in excess of the healthy standard of the individual. The increase of uric acid is even relatively greater than that of the urea. On the other hand, the chlorides of the urine are greatly diminished, or may be quite absent. Even when large quantities of chlorides are ingested with the food, they cease to appear in the urine during fever, nor are they eliminated in any other secretion, so that, like water, they appear to

Fig. 2.—The Firm and Long Pulse of Vigorous Health.

Fig. 3.—Normal Soft Pulse.

Fig. 4.—Soft and Frequent Pulse of Mild Pyrexia.

Fig. 5.—Irregular Pulse of Irritative Fever.

Fig. 6.—Irregular Undulatory Pulse of Typhus.

* Wunderlich, *op. cit.*, pp. 295, 350. Many years ago, Currie stated that he had met with cases of scarlet fever in which the heat on the surface of the body measured 112° F. (*Medical Report on the Effects of Water, Cold and Warm, as a Remedy in Fever*, 1804, p. 428.)

† Carpenter's *Principles of Human Physiology*, Fifth Edition, 1855, p. 409.

‡ Wunderlich, *op. cit.*, p. 425.

§ In reference to quickness of pulse and respiration as signs of fever, it is necessary to remember that both are naturally quicker in infancy and childhood than in adults.

	PULSE.	RESPIRATION.
In first few months of infancy	120	40
From 6 to 18 months	120	30
From 18 months to 7 years	100	24
In adults	64	16

be retained in the system. The diminution of the chlorides in the urine is not peculiar to the fever of inflammation of the lungs, but is common to most fevers.* Recent observations have also shown that there is an increased elimination of carbonic acid in the expired air of pyrexia. The percentage of carbonic acid in the expired air may be less than in health; but, owing to the frequency of respiration, the quantity of air expired is increased, and the total amount of carbonic acid eliminated is augmented by one-half or more.†

7. *Derangements of the Nervous System.*—Pain is usually one of the earliest symptoms of fever. If the fever is not caused or accompanied by local inflammation, which would determine the seat of pain, this is usually of a general character—all over the body, and is attended by a feeling of *lassitude* and *disinclination for exertion*. Sometimes, however, independently of local disease, the pain is referred to one part of the body more than another, and the locality of greatest pain may assist in pointing to the cause of fever. In the primary fever of facial erysipelas and influenza, the greatest pain is in the head; in that of small-pox it is in the back; and in that of typhus it is in the limbs. In the early stages of fever, *sleeplessness* is usually associated with the pain; and in severe or protracted cases there is often *delirium*, which at one time is acute and noisy, and at another low and muttering, which is not unfrequently associated with involuntary evacuations, *muscular tremors*, *subsultus*, *floccitatio* or *carphology*, and even general *convulsions*, and which is apt to be followed by *stupor* passing into *coma*.

IV. *Varieties or Types of Pyrexia*—There are numerous varieties of pyrexia, according to the cause on which it depends, which will be discussed under the head of individual diseases. At present, we have to deal only with fever in the abstract, of which there may be said to be five varieties, or "types," as they have been called; viz., Simple, Inflammatory, Adynamic, Typhoid or Ataxic, and Hectic.

1. *Simple Fever* is characterised by mildness of all the symptoms, and has no prominent characters.

2. *Inflammatory Fever* is usually ushered in with a rigor, and is characterised by great heat and dryness of the skin, a full firm pulse, intense thirst, tongue coated all over with a thick white fur, severe headache and general pains, and great restlessness. It is in this type of fever that there is prominently developed the condition of the blood formerly so familiar to physicians under the designations of "buffed and cupped," but which there is now rarely an opportunity of observing. When the blood coagulates, a portion of the fibrine at the upper surface of the clot parts with its colouring matter and forms a yellowish layer from a line to an inch in thickness, which is contracted, so that its diameter is less than that of the subjacent coloured coagulum, while it is also hollowed out on the top or cupped. This condition of the blood is not normal, and is chiefly met with in inflammations; but it is not always present in inflammation, and may exist independently of it.

The inflammatory type of fever is that which often accompanies local inflammations in their early stage, but in the advanced stages of most inflammations it is apt to take another type; and in many inflammations it is adynamic, typhoid, or hectic, from the first.

3. *Adynamic, Asthenic, or Low Fever* is characterised by great prostration of the muscular system and of the circulation. The pulse is quick, but small and weak; there is not great heat of skin or thirst; the tongue is moist, and may be but slightly furred. When the fever has lasted for some time, the weakness may be extreme, so that the patient cannot sit up, or even turn in bed. There may be slight delirium at night; but, as a rule, cerebral symptoms are not prominent, the mind is often clear, and the tendency is to death by asthenia.

4. *Typhoid or Ataxic Fever.*—In this type of fever the tongue is dry and brown, and the gums and teeth are often crusted with sordes. The pulse is soft and compressible, and often becomes irregular or undulating; the cardiac impulse is weakened, the first sound of the heart may be more or less obliterated, and the blood often stagnates in the capillaries in different parts of the body. The respiration is quickened, and hypostatic congestion of the lungs is not uncommon. There is a marked tendency to the cerebral symptoms already described—sleeplessness and delirium, followed by stupor, and the tendency is to death by coma. When hæmorrhages are conjoined with these symptoms, the fever is often designated "putrid" or "septic." You must not confound what I have now described as the typhoid type of fever or "the typhoid state," with what is commonly known as "typhoid (enteric) fever." The latter is a malady having a distinct specific cause, and in

the course of which the typhoid state may, or may not, appear; while the former may be developed in the course of any febrile disease.

5. *Hectic Fever.*—The chief peculiarities of this fever are alternations of chilliness or actual rigors, with great heat and flushing and profuse perspirations. Both pulse and temperature are liable to great variations. A circumscribed pink, or "hectic", flush on one or both cheeks is not uncommon. The fever often runs a very protracted course, and is attended by extreme wasting of the body and rapidly increasing debility. The mental faculties are rarely much impaired except at the last, when the type of the fever often becomes typhoid.

In addition to these five types of pyrexia, we speak of intermittent, remittent, and continued fever. The term intermittent denotes successive attacks of pyrexia separated by intervals of complete apyrexia. A remittent fever is one with alternate exacerbations and remissions, but no decided intermissions; and by continued fever is understood a protracted pyrexia with neither intermissions nor obvious remissions. The thermometer, however, has shown that there are remissions more or less decided in fevers commonly regarded as continued.

[To be continued.]

ABSTRACT OF AN ADDRESS ON THE ADVANCEMENT OF MEDICINE.

DELIVERED AT

The Annual Meeting of the Clinical Society of London.

By SIR WM. W. GULL, BART., M.D., D.C.L., F.R.S.,
President of the Society.

IN addressing you this evening, gentlemen, I have in some sort to throw myself on the forbearance of the Society, for, though I have been able to bring certain ideas together on the subject on which I desire to speak, I have not, for want of time, been able to adopt a form of words such as I would have liked. In some sense I am the spokesman of the Society as its President, in especial when laying before the public the objects of the Society as I would now do.

We, in our calling, differ from some theologians in one important respect: they look on this world as a decaying world, as much worse than it once was; we, as students of nature, are opposed to this view, for if we look to the history of nature we see we are ever advancing towards perfection, even if we are not likely to reach it. This is an improving world, and we are met to advance that idea. We believe that this world has something better in store for all than anything which has yet been seen, and are like to the convalescent, whose last day should always be the very best he has ever spent. Some men are apt to think that science has certain limits set to it, beyond which no man may go; but we believe that knowledge extends far beyond the strictly scientific limit. Doubtless, were the early lower animals assembled together in conclave, they would conceive it quite impossible to transcend their status; that when the world came to megatheriums, let us say, then it must stop. They could not conceive the possibility of such a being as man. But at this point we join the theologians again in accepting a metaphysical element, in forming conceptions of things of which we can have no positive knowledge. In this way we may be said to worship nature, but only in a very limited sense. We look upon our being, not as perfect, but as becoming perfect, and, we are here to-night—and at all times have it as our object—to improve these defects of nature, and in endeavouring to perfect the human frame.

Respecting the object we work for—this living organism of ours—no great advance has of late been made. We are acquiring a physiological notion of disease. Disease is no entity; it is but a modification of health—a perverted physiological process; and this must at all times be insisted upon. Were it not that we fear death, and dislike pain, we should not look upon disease as anything abnormal in the life-process, but to be as part and parcel of it. Few would now venture on a definition of disease; for in reality it is but the course of nature in a living thing which is not health. In health the balance of function is even; incline it to either side, and there is disease. That being so, just as the life-process constitutes an individual and puts him apart from his fellows, so must any alteration in it be individual, and not general. But to the ignorant disease is an entity—an evil spirit which attacks us and seizes us. Hence arises the word "seizure," which, though in a somewhat different way, we still use, but with a

* Ague is an exception. The researches of Traube, Ringer, and others, seem to leave no doubt that there is an increase of chloride of sodium as well as of urea during both the cold and the hot stages of ague. (See *Med.-Chir. Trans.*, 1859, vol. xlii, p. 362.)

† See Leyden, Ueber die Respiration im Fieber, *Deutsch. Archiv. f. Klin. Med.*, 1870, p. 536.