complete anorexia, obstinate constipation, and sometimes by nausea and vomiting, and the urine is scanty, high-coloured and deposits lithates in abundance on cooling, the case is described as one of *sthenic fever*. This form is met with in adults who were previously healthy, and accompanying acute sthenic inflammations; the temperature range is generally between 102° and 105° Fahr.; if there be delirium, it assumes the active, noisy, or violent type.

If with pyrexia the skin be pale or livid, harsh and dry, or bathed with a clammy sweat, the features sunken, the pulse frequent (120 or more) soft, perhaps dicrotous, fluttering or irregular, respiration being hurried and shallow, the tongue dry, cracked and brown on the dorsum, with sordes about the teeth and lips, the appetite entirely lost but thirst not urgent, the motions dark and fœtid, and possibly loose and frequent, with great muscular weakness, the patient lying flat on his back and slipping down in his bed with, in severe cases, muscular twitchings, subsultus tendinum, carphology, mental obscuration, or a low, muttering delirium, the case is one of *asthenic fever*, and the condition is known also as the *typhoid state*. The temperature may be high or low; the urine is less markedly "febrile" than in sthenic fever, and not unfrequently contains albumen, in the later stages, when the nervous system becomes profoundly depressed or narcotised, it may be retained in the bladder.

It is impossible to give more than a mere outline of the diagnosis of many forms of fever which have received distinctive names according to the views held in regard to their etiology. It is not certain what part "*septic*" processes play in causing surgical fevers, nor how many several kinds of "*septic*" fevers there are, nor how far they can be distinguished from one another. A few years ago "*inflammatory*" and

"*suppurative*" fever were spoken of as quite distinct from *septicæmia* and *pyæmia;* but recent advances in our knowledge have suggested that all acute inflammation is "*septic,*" and that the fever resulting from it is essentially of the nature of "*septic intoxication.*" Experiments on animals, as well as clinical experience, have shown that three varieties of "*septicæmia*" may be distinguished, at any rate, theoretically; "*septic intoxication,*" "*septic infection,*" and "*embolic pyæmia,*" but clinically we may meet with two, or even all three of these combined, and, except in typical cases, it is impossible to distinguish between them in the early stages. "*Traumatic fever,*" too, is a term which is used in different senses. If used to denote any fever attending and complicating a wound, it is perfectly valueless, as it would then include such special forms of fever as hectic and pyæmia, and the most virulent forms of septicæmia. If, on the other hand, it be used to denote the fever immediately succeeding the infliction of a wound, or other injury, there is a difficulty in determining when this can be said to terminate and other forms of pyrexia commence; and yet again, "septic intoxication" may be grafted on to and overshadow this primary wound fever. It seems to be necessary, however, to retain the term, for the recent improvements in wound treatment, together with accurate clinical observations, have demonstrated that in cases of injury or operation where there is an entire absence of septic processes, as well as of all other local complications, such as inflammation, there is a transient pyrexia. This is observed in cases of simple fracture, as well as in "aseptic," well-drained wounds, and, so far as we know at present, is beyond our powers to prevent; that fever, and that fever alone, may, with justice, be called "traumatic," and it is in that sense alone that the term will be used here. Some regard this fever as due to reflex nervous disturbance, and

there is much to be urged in favour of this view; but the powerful influence exerted by modern scientific local treatment upon the primary temperature rise after grave operations affords much support to the theory which attributes this, like all other wound-fevers, to the influence of material absorbed into the blood, and then acting topically upon the nerve-centres governing animal heat.

Where fever is dependent upon acute inflammation, as shown by (1) its onset subsequent to, or, at least, not before the commencement of the local mischief; (2) the proportion between the extent and intensity of the inflammation and the severity of the fever; and (3) by the subsidence of the fever immediately upon the abatement of the inflammation, the fever may be called *inflammatory fever*. But where there is fever in the absence of local cause for pyrexia, or when it precedes, or is out of proportion to local inflammation, or continues when the local mischief has subsided, it is *septic*.

Diagnosis of surgical fevers.—1. If immediately succeeding the depression of temperature and the collapse caused by the shock of an injury, the temperature be found to rise, attaining its maximum on the second evening, occasionally sooner, rarely so late as the third evening, and then gradually falling to the normal, and maintaining the normal level by the third or fifth day (rarely later), the temperature rising usually to 100°, and rarely to so high a point as 102°, the pyrexia being accompanied with slight rise in the pulse rate (to about 90 at the most), a little restlessness for the first few hours, but no marked malaise or loss of appetite, or headache, or loaded urine, or delirium, the symptoms are due to *traumatic fever*. This fever may be very slightly marked; it seems to be quite free from danger to life. In typical instances its most notable features are the slight and transient character

of the fever, and the absence of apparent illness, and of the other constitutional disturbances which usually form so large a share in the picture of fever. Simple traumatic fever may have grafted on to it other forms of fever in various degrees, and hence it becomes impossible in some cases to draw a sharp and precise line between it and them. The late effects of an anæsthetic, such as vomiting and headache, may be prolonged into the period of traumatic fever.

2. If, immediately following the infliction of an extensive wound, the temperature rise to a considerable height, 103° to 105° Fahr., with great increase in the frequency, and diminution in the force, of the pulse, hurried respiration, nausea or vomiting, marked prostration even attaining to more or less unconsciousness, and especially if there be diarrhœa, with loose dark-coloured watery stools, and the urine be albuminous, the symptoms are those of *septic intoxication*. This condition is believed to be the result of the absorption into the blood of a poison which has no power of multiplication within the body; its effects vary with the quantity absorbed, and the symptoms may be much less than described above, even down to fever with quickened pulse only, while they may be so intense as to be fatal in a few hours. The absorption may be sudden, and not repeated, or may be continuous and moderate, in which case we have what may be termed a *chronic septic intoxication*, and the symptoms of this may be blended with those of septic infection or pyæmia. This poison is not absorbed by a healthy granulating surface.

3. If at about the time when traumatic fever should subside, the temperature continue high, or rise above its former level, and the pulse become frequent and rather full, and the patient be restless, with loss of appetite, a furred tongue, and there be pain in the wounded part, the *fever of tension or of inflammation*

should be suspected, and the wound should be carefully examined; if a stitch is too tight it should be cut, any pent-up discharge should be freely evacuated, and if the fever be due to either of these causes, it will at once subside; or the wounded surfaces may be found swollen and red with commencing suppuration, and, in that case, the fever may be fairly attributed to the local inflammation. *Tension* and *inflammation* in a wound are most common from the second to the seventh day of a wound; they may occur, however, at any time previous to its complete healing.

4. If a patient who is the subject of a wound be attacked with high fever, which may be ushered in by a rigor or a succession of rigors, or if a child, by a convulsion, the temperature ranging high and showing but slight variations at different times of the day, and the pulse be quickened to 120 or more, being at the same time small, compressible, often dicrotous; the surface dusky, the skin bathed in a clammy sweat; respiration hurried and laboured; the tongue furred, quickly becoming dry and brown, with sordes collecting on the lips and teeth, and sometimes with an earthy odour of the breath, and thirst, complete anorexia, constipation or fœtid diarrhœa, with urine scanty and loaded, and often containing albumen; and if there be marked nervous and muscular prostration, as shown by the posture, by subsultus tendinum and carphology, with a low muttering delirium; and if, in addition, there be seen petechiæ on the surface, or patches of dusky erythematous redness, the disease is *septic infection*. Typical cases of this are met with in puerperal fever, in the cases of severe fever quickly ensuing upon slight pricks and inoculation with the blood or other fluids of those dying from septic peritonitis, etc. The diagnosis is confirmed where there is evidence of transference of the disease from one individual to another, and by the detection of organisms in

the blood or discharges of the patient. The special features of this form of septicæmia are: (1) The *intensity of the fever*, often to a marked degree out of proportion to the severity and extent of any local inflammatory lesion; (2) the marked *ataxic phenomena*, showing some powerful and profound blood-change; (3) the *absence of the secondary foci* of suppuration and of the recurrent rigors characteristic of pyæmia; (4) in some cases the *evidence of infection*.

5. If there be a succession of severe rigors with rise of temperature to 105°, or even to 107° Fahr. during the shiver, followed by a very short hot stage, and then a drenching sweat, during which the temperature falls, reaching the normal or even lower, but at once rises to a febrile height when the sweating stage ceases, the rigors occurring at irregular intervals (thus distinguished from *ague*), and not in connection with the passage or withdrawal of urethral instruments or the act of micturition (thus distinguished from "*urethral fever*"); and if the patient become rapidly exhausted and emaciated, with a yellow tint of skin, dry coated tongue, with a mawkish sweet odour of the breath, rapid, feeble, often dicrotous pulse, quickened respiration, constipation or diarrhœa, and the passage of fœtid dark stools, and scanty, high-coloured and sometimes albuminous urine; and if with this there be found a cessation of the healing processes in the wound if any had previously been established, and especially signs of distant local suppuration, rapid, painless effusions into joints, suppuration in the planes of cellular tissue, or a pustular eruption on the skin, plugging of veins, with perhaps signs of softening and suppuration around and in the veins at places, and in some cases pleuritic friction-sounds or the signs of localised pneumonia produced by pulmonary infarcts, the case can be diagnosed as *embolic pyæmia*. It must be remembered that death may occur after only one rigor; and that in

some cases there may be all the other signs during life, and the post-mortem appearances of this disease, without the occurrence of a rigor at any time; such a case was not long ago under the author's care. Then the diagnosis must rest upon the continued high fever and the occurrence of the secondary foci of suppuration. Careful search must be made for the secondary suppurations, for their formation is remarkably free from pain.

Cases are met with where such symptoms as the above extend over a period of weeks and months, the rigors being separated by intervals of many days, with formation of abscesses at various parts of the body at long intervals. These cases, which more frequently end in recovery, are known as *chronic pyæmia*. The exact limits of this disease are very ill-defined. Pyæmia may occur independently of a wound or injury, as in cases of "*acute necrosis*" and of "*ulcerative endocarditis*."

6. If during the healing of a wound the patient suddenly has a rigor, or is sick, and has frontal headache with anorexia, malaise, quickened pulse, and abrupt rise of temperature, and on examining the wound it is found unchanged or with stoppage of the process of healing, while the neighbouring lymphatic glands are swelled and tender, and if in a few hours this is followed by a bright-red, raised, painful, and tender blush, extending from the edge of the wound with abrupt edge, quickly spreading and perhaps attended by vesication of the surface, the disease is *erysipelas*. (For *Cellulitis*, *see* page 79.)

For the diagnosis of *Urethral fever*, *see* page 555.

7. When, after a long exhausting illness, such as the late stages of syphilis with bone and visceral disease, chronic abscesses, and long-standing suppurative disease of joints or bones, it is found that the patient is steadily losing flesh and becoming increasingly anæmic, that there is a febrile exacerbation every

evening, when the skin of the hands and feet feels hot and parched to the patient, and a bright-red flush is noticed on the cheeks, which is in marked contrast to the surrounding pallor, and that in the early morning this is succeeded by a fall in temperature with profuse perspiration, and the pulse is found soft and frequent, 90 to 120, gradually becoming weaker and more frequent, while the tongue is clean and glazed, the appetite (at any rate at first) fair, but later on becoming capricious, the bowels often loose, the urine scanty and loaded, and the mind remaining quite clear, the condition is described as *hectic fever*. This is essentially a chronic fever, with symptoms of gradually increasing exhaustion. It is sometimes spoken of as consisting of three stages. While the evening exacerbations and morning sweatings are but slightly marked, and do not interfere with the patient's rest, and there is neither diarrhœa nor scanty loaded urine, and the appetite remains good, the disease is said to be in its *first stage*.

When the evening paroxysms of fever are more marked, and the sweatings succeeding them are profuse or "drenching," the pulse very soft and compressible, with marked anæmia, capricious appetite and frequent attacks of diarrhœa, and the urine is scanty and deposits urates abundantly on cooling, it is said to be in the *second stage*.

And when the weakness and exhaustion are still more marked, and in addition there is complete loss of appetite and even inability to take food, and the tongue shows aphthous sores, while the feet and ankles become œdematous, the disease has reached its *third stage*. This soon ends in unconsciousness and death from exhaustion. Patients may complain of a sense of chilliness during the febrile paroxysm, but more often they experience a disagreeable sense of heat of skin. Occasionally in the later stages the

febrile paroxysms may occur twice in the twenty-four hours, and whenever the patient falls asleep he may wake up bathed in sweat.

8. When, during the course of acute inflammation with its attendant fever, a rigor or a sense of chilliness is perceived concurrently with a rise in temperature, and especially if these phenomena be repeated, and the temperature maintain a higher general level than before, but show greater diurnal variations, it indicates the formation of pus. This stage of the fever is sometimes spoken of as *suppurative fever*, which must be carefully distinguished from hectic fever, the result of prolonged suppuration. In the majority of cases of suppuration, the surgeon is able to detect the presence of pus by local phenomena; but the occasions are not rare when the diagnosis of suppuration depends entirely or mainly upon the course of the fever. (*See Abscess of breast*, page 444.) The chilliness observed may be followed by slight sweating.

Diagnosis of constitutional complications and sequelæ other than fevers.—If, in a patient suffering from injury to a bone (especially a comminuted fracture of the shaft of a long bone), after the collapse from the shock has passed off, and generally in from twenty-four hours to three days subsequently to the injury, there are sudden symptoms of dyspnœa, with rapid laboured respirations and increasing cyanosis, although auscultation shows the air to enter and leave the lungs freely, and the pulse becomes frequent, irregular, and weak, the action of the heart being found to be turbulent, and if with this there be hæmoptysis, or fat be observed floating on the surface of the urine, the diagnosis of *fat embolism* must be made. When severe, the condition passes into one of coma and ends fatally. Fat embolism, to a minor degree, which gives rise to no marked symptoms, is said to be a frequent if not a

constant phenomenon in all cases of fracture. The condition is to be *distinguished from collapse*, the result of the injury, by its occurrence at the interval of a day or two after the injury; and *from pulmonary embolism* by its occurrence at an earlier period than that accident, which is most common in the third week, as well as by the particular nature of the accident, and the presence of fat in the urine in the cases in which that excretion can be examined.

If a patient who has been in the habit of indulging freely in alcohol become restless and be unable to sleep on the second or third day after an accident or operation which keeps him confined to bed, the surgeon may suspect the oncoming of *delirium tremens*. And if a few hours later he find his patient still more excited, delirious, with some fixed idea of a disagreeable character which makes him constantly busy (avoiding an imaginary foe, for example), with marked muscular tremor of the limbs, lips and tongue, jerky voluntary movements, the skin bathed in a profuse foul-smelling sweat, the tongue large, moist, covered with a white or brownish-white fur with sticky mucus adhering to its sides and to the teeth, morbid thirst, complete anorexia, constipation, dilated pupils, and rapid, soft, often dicrotous pulse, the *delirium tremens* is fully developed. When occurring after an accident or operation, it is sometimes called *traumatic delirium*, but as it does not differ in essential characters from idiopathic delirium tremens, it is better not to use a separate name for it. The taking of food and the securing of sleep are the two signs of improvement in this condition. If, on the other hand, the tongue become dry and brown, the delirium incoherent and muttering, and the patient cannot be made to answer questions, or if epileptiform convulsions interrupt the other symptoms, it indicates increasing nervous prostration, and death, heralded by complete

coma, generally ensues. There is a marked tendency to the occurrence of low hypostatic pneumonia in severe cases of delirium tremens, and the surgeon should therefore carefully examine the chest every day.

If a patient with a recent wound, or a wound but recently healed, complain of pain and stiffness about the muscles of the back of the neck, and on examination these muscles are found firm from tonic contraction, and if a voluntary effort to bring them into action cause a painful spasm in them, the onset of *tetanus* is to be feared. And if this tonic spasm quickly spread to the muscles of the jaw and the face, then to those of the trunk, and eventually to those of the limbs (the hands usually remain free), while paroxysms of painful and very intense spasm occur in the affected muscles, causing opisthotonos, or emprosthotonos, or occasionally pleurosthotonos, the mind remaining clear, the temperature being normal, slightly raised, or ranging very high indeed, the diagnosis of *tetanus* is established. Cases of tetanus are divided into *acute*, those running a very rapid course, with frequent paroxysms; *chronic*, those in which the progress of the disease is more gradual and the intensity less marked; these cases provide the great majority of the instances of recovery from the disease; *idiopathic* when the disease arises without being immediately preceded by any known breach of surface. As very unusual features, may be mentioned: delirium, remission of the symptoms, and the first appearance of the spasm in the muscles immediately adjacent to the wound. The disease is distinguished (1) from simple *muscular spasm* by the occurrence of the paroxysms of very violent tonic contractions; (2) from *spinal meningitis* by the absence of pain and tenderness down the spine, the absence of shooting pains in the trunk and limbs apart from the paroxysms of contraction, by the absence of marked superficial hyperæsthesia, by the

order in which the parts are affected, by the freedom of the hands and feet, and by the absence of palsy except from exhaustion in the last stages of the disease; (3) from *epilepsy* and *hystero-epilepsy* it is distinguished by the absence of unconsciousness, and the great liability to a fatal issue from apnœa, syncope, or exhaustion; (4) from *strychnia poisoning*, by the more gradual onset of the symptoms, the longer course of the disease, and the less frequency of the attacks of opisthotonos (strychnia poisoning is usually fatal in twenty-four hours), by the commencement and chief intensity of the disease in the muscles of the neck, jaw, and face, while strychnia affects first and most the muscles of the lower limbs, then those of the trunk and the muscles of respiration; (5) from *hydrophobia*, by the persistence of the muscular rigidity between the paroxysms, by the intense trismus as opposed to the marked laryngeal spasm of hydrophobia, by the absence of delirium or mania, and often by the shorter incubation period and the absence of the history of a bite of a rabid animal.

If a patient have been bitten by an animal suffering from rabies, and at some interval subsequently, usually between three weeks and three months, although it may be earlier or later than this period, he become very depressed in spirits, apathetic, irritable, or restless, and this be succeeded by a spasmodic attack brought on by an attempt to drink, the spasm affecting chiefly the muscles of the larynx, face, and those of inspiration, and ending in complete muscular relaxation; and if this be succeeded by other similar and more severe attacks, always brought on by some external excitation, such as the attempt to drink, or even the sight and thought of water, a sudden noise or bright light, a puff of cold air, or the contact of the hand; and with these symptoms there be great mental excitement and restlessness running on up to paroxysms of maniacal frenzy, fixed and terrible illusions,

or irresistible impulses, with intervals of calm in which the patient may sleep; with moderate pyrexia, accumulation of sticky and frothy mucus about the mouth and throat, the diagnosis of *hydrophobia* may be made. In some cases small or large vesicles have been found around the frænum linguæ, but their significance is doubtful. If the patient do not die in the acute stage from respiratory or cardiac spasm, he passes into a stage of gradually increasing palsy, in which the mind becomes clear only to be again clouded by the increasing asthenia just before death. The signs by which hydrophobia can be distinguished from tetanus have been already given (page 73), but it must be carefully distinguished from what is called *false hydrophobia*, which may be a wilful or an unintentional close imitation of the real disease, and when ending fatally presenting great difficulty of diagnosis; chief reliance must be placed on discovering whether the patient have been concentrating his thoughts and attention upon the disease, constantly reading and talking about it, or dreading its onset, and on noting the occurrence of exaggeration of the symptoms, such as barking noises, snapping of the jaws, running about on all-fours, and so on, which are all popular delusions concerning the disease, and noting other departures from the usual course of the disease. Where recovery follows, the diagnosis of false hydrophobia becomes extremely probable, some would even say certain. Whenever possible, care should be taken to ascertain whether the animal suspected of inoculating the patient undoubtedly suffered from hydrophobia.

CHAPTER V.

THE DIAGNOSIS OF INJURIES OF THE HEAD.

FEW cases are of more interest or importance from a diagnostic point of view than those of injury to the head. With the exception of the scalp, the condition of which can be thoroughly explored, it may in some cases be quite impossible to determine whether serious injury has or has not been inflicted upon various parts of the head. The skull may be extensively fractured or bruised without causing any signs by which it may be recognised, and serious and various lesions of the cerebral membranes, or of the brain itself, may exist without symptoms enabling the surgeon to discriminate between them, or even to predicate their existence. It follows from this, that the utmost care must be expended upon every case of head injury, as those apparently trivial may really be most grave. While availing himself of all evidence which can enable him to make a positive diagnosis, the surgeon must never accept the absence of such positive evidence as sufficient to warrant the conclusion that lesions other than those clearly recognisable are not present. In other words, while symptoms may enable the surgeon to prove a positive, they do not warrant him in asserting a negative diagnosis.

Diagnosis being beset with so much difficulty, it becomes especially important that the examination of the patient should be made in the most thorough and painstaking way; and the mode of procedure, which is at the same time the simplest and the best, is, first, to search for signs of injury to the *scalp and pericranium;* then for those of *fracture of the bone;* and,