

movement or manipulation of the wound breaking down some granulations, and especially if it recur spontaneously, it is probably the forerunner of an extensive secondary hæmorrhage.

(9) If with acute febrile symptoms with or without an initial rigor, the parts about a wound implicating a bone are found much swelled, and the soft parts, including the periosteum, retracted, leaving the bone dry and bare; and if in a case of amputation a soft fungous mass protrude from the end of the medullary canal, and the probe passed into this meet with no resistance and possibly liberates some pus, *acute osteomyelitis* is present.

(10) If after the healing of a wound a part below continue insensitve and cold, and especially if its muscles are paralysed and wasted, with loss of irritability to the faradaic current, it indicates that a severed nerve has not united. This has to be distinguished from the immobility of a part from division of a tendon or a muscle. The *position of the scar* (in the one case over a nerve, and in the other over a muscle or tendon); the *extent of the paralysis* (in the one case affecting all the muscles supplied by the nerve below the scar, in the other affecting only the muscles wounded); and the *accompanying electric and sensory phenomena* are sufficient to establish the diagnosis.

If the skin of the affected part be rough and covered with dry, scaly epidermis, the *nerve or nerves are completely divided*. In cases where the skin is smooth, glossy, devoid of hair, with patches of livid red colour, or herpetic eruption, smart burning pain, and the muscles have wasted rapidly, there has been *incomplete division of the nerve*.

(11) If a scar remain painful and tender, the condition is spoken of as *neuralgia of cicatrix*. Of this it is necessary to distinguish two varieties. Where the pain is localised, and is especially excited by pressure

on a particular spot, the neuralgia may be considered to be of *local origin*, and this diagnosis will be confirmed if there be an induration, or adhesion of the scar to a bone at the tender spot. If, on the other hand, the pain is more widely diffused, and especially if it be attended with marked superficial hyperæsthesia, be intermittent in character or attended with spasmodic jerkings of the part, and if the patient be anæmic, or subject to neuralgia in other situations, the disease may be diagnosed as of *constitutional origin*; the latter form is more common in women.

(12) When a cicatrix enlarges, becoming thicker, prominent on the surface, wider, remaining firm, smooth and of a delicate pink or purplish colour, it is called a *keloid scar*. This disease may attack a scar at any time after its formation, and after a certain advance may remain stationary, or the growth may be absorbed. It may attack a large scar in several situations. Its smoothness, firmness, slow growth, and its not ulcerating, together with its spontaneous recession or disappearance, distinguish this disease from epithelioma attacking a scar. (See pages 286, 337.)

CHAPTER IV.

THE DIAGNOSIS OF THE CONSTITUTIONAL EFFECTS AND COMPLICATIONS OF INJURIES AND OPERATIONS.

It is extremely important to recognise with as much accuracy as possible the constitutional condition of patients suffering from injuries or surgical diseases. The importance of and the interest attaching to the diagnosis and treatment of local surgical maladies may tend to concentrate the attention too exclusively upon

local conditions at the expense of neglect of the constitutional. Such tendencies should be carefully resisted. The constitutional effects of local surgical conditions vary from the most trivial to the most severe, and this makes it impossible to do more than discuss the diagnosis of certain typical forms; but if the student will notice carefully the steps in the diagnosis of these chosen types, and grasp the meaning or the explanation of the different symptoms of constitutional disturbance, he will be able to appreciate the significance of combinations or degrees of these symptoms other than are here mentioned. Here, as elsewhere in diagnosis, it is important not to rest content with learning that a certain group of symptoms characterises a certain injury, or disease, or constitutional condition; but the surgeon must go beyond, and arrive at the meaning or the cause of each symptom, and understand *why* a certain conjunction of symptoms must indicate a certain morbid state. It is impossible in the space at our disposal to discuss in any detail those symptoms upon which the diagnosis of systemic conditions depends, the temperature, the pulse, respiration, state of digestion, general nutrition, and the various manifestations of the functions of the nervous centres. Such discussions are found in works on physiology and to some extent in works on medicine, and to these I must refer my readers, and must content myself here with the following brief notes.

Fever, by which is meant pyrexia, or increase of body-temperature, is produced (*a*) by the absorption of the products of inflammation, inflammatory fever; (*b*) by the introduction of special substances into the blood, as in so-called "septic intoxication," the infective septic fevers and malaria; (*c*) perhaps by the abstraction of certain materials from the blood, as in hectic fever; (*d*) possibly as a reflex effect of the irritation upon nerve terminals: in this way some explain

the pyrexia attending tension in a wound, but a better illustration is the fever sometimes caused by a tight stitch; (*e*) possibly also as a reaction from the depression caused by the shock of an injury or operation; in this way may be explained the initial transient rise of temperature after all operations or injuries of any moment, the fever which alone should be designated "traumatic," as signifying its dependence upon the injury, and nothing else. It must be borne in mind that the intensity of a fever depends partly upon the intensity of its cause, as *e.g.* the dose of poison absorbed, and partly upon the constitutional peculiarity of the patient. As a rule, children respond more readily than adults to all causes of fever, and some adults present what, for want of more exact knowledge, can only be called an "idiosyncrasy," which makes them peculiarly intolerant of all causes of febrile excitement. The author recently had under his care a lady on whom he operated for anal fistula, in whom emotional disturbance (a fit of crying) was on several occasions found to raise the temperature several degrees. In the same manner the type of the fever is modified by the nature of the exciting cause, and occasionally also by constitutional peculiarity; as an example of the former may be mentioned the asthenic type of septic fevers, and of the latter the influence of previous malaria upon subsequent febrile attacks. In the study of fever attention should be directed to its *mode of onset*, whether gradual or sudden, attended with marked pyrexial phenomena, such as rigors, headache, etc.; the *exact time* of its onset in relation to other morbid symptoms; its *course*, duration, the height of the temperature, its modifications at different times of the day, and the manner and extent to which the other vital functions of the body besides that of animal heat are interfered with.

The pulse.—The observer should note the

frequency, the rhythm, and the size of the pulse-beat, together with the fulness and tension of the artery. It is well known that the rapidity of the cardiac contractions is greatly affected by mental impressions, and care must be taken to eliminate this source of error as far as possible. With this exception, the chief causes of quickening of the pulse met with by the surgeon are collapse, hæmorrhage and fever, while it is notably slower in compression of the brain. The size of the pulse, or the degree to which the artery is affected by the wave passing along it, is dependent upon the tension of the artery and the force of the heart's contraction. The tension of the artery is measured by passing the fingers across the vessel in such a manner as to feel its contour without compressing it, at the same time noting its fulness or the reverse, and also by noting what amount of compression is required to obliterate the pulse; the tension of an artery is a measure of the blood-pressure in the vessel, and as the blood pressure is very largely dependent upon the muscular tone of the vessels, its chief importance is as an indication of the latter: thus, a soft compressible pulse, such as is met with in hectic fever or in septicæmia, indicates a loss of tone in the small vessels or more or less advanced vaso-motor palsy, while the hard wiry pulse of acute peritonitis indicates spasm of the muscular walls of the arterioles and vaso-motor stimulation. In certain cases coming before surgeons the pulse has a special significance in diagnosis; thus, it may be absent in some particular vessel owing to its rupture or occlusion, or it may be smaller and later in one artery than in its fellow on the opposite side of the body, owing to an aneurismal dilatation of the trunk above. Lastly, in middle-aged and elderly persons the nutritive condition of the arteries should always be observed, whether it is tortuous, moving freely in their bed with each cardiac impulse, and presenting a perfectly smooth or irregular

outline to the fingers passed over them longitudinally; the first two phenomena are signs of loss of elasticity, while the detection of irregularities in the vessels point to calcification of the middle coat in the form of calcareous rings.

Respiration.—The frequency, absolute and relative to that of the pulse, and the fulness of the respiratory movements, have the same significance for the surgeon and the physician; but the former is especially concerned to notice whether the movements of the chest are uniform on the two sides, as in the diagnosis of fractured ribs and of impaction of a foreign body in a bronchus, and whether they are both thoracic and abdominal; in peritonitis the respiration is characteristically thoracic only, while in cases of crush of the spinal cord at or just below the fifth cervical vertebra it is as characteristically abdominal only. Mention should also be made of the falling-in of the soft chest-walls of children, and of the epigastrium and supra-sternal and supra-clavicular regions in adults and in children in cases where there is great obstruction to the entrance of air. In these cases, it is important to observe whether the larynx moves up and down in the throat with the exaggerated respiratory efforts. When it does, it indicates that the obstruction to the passage of air is above or in the larynx; when, on the other hand, the larynx remains fixed, it shows that the obstruction is below the larynx.

The digestive system.—There are no special points in connection with the digestive system to which reference need be made here; the state of the appetite and thirst, the condition of the tongue, the ease and painlessness of deglutition and of digestion, freedom from vomiting, flatulence, constipation or diarrhœa will, of course, engage the attention equally of the surgeon and the physician. Of

much importance as an indication of great vital depression is a dry brown *tongue*, protruded with difficulty, and exhibiting marked fibrillar tremor, and usually accompanied with sordes on the teeth and lips. In works on medicine the student will find discussions on the causes of *vomiting* and the diagnosis of its different forms. The causes of vomiting most often met with in surgical practice are (1) the circulation in the blood of certain toxic agents, such as chloroform, morphia, and the poison of erysipelas; (2) reflex nervous irritation, as in rupture of the liver, intestinal obstruction or strangulation, peritonitis, uterine and ovarian congestion; (3) and, less often, affection of the brain, as meningitis and tumour, the vomiting occurring during the reaction from collapse should be ranged in this class.

The **urine** is an important aid in determining the state of general nutrition, as well as a valuable guide to the correct diagnosis of diseases of the urinary organs. The excretion of a small quantity of *water*, while the usual quantity, or even an excess, is taken into the body, there being also no unusual loss by other sources as the skin and the bowel, is an indication of retention of water within the body, one of the most marked effects or accompaniments of fever. Excessive excretion of water by the kidneys is similarly due either to excess in absorption of water, lessened excretion by other channels, to the excretion of sugar, to the disease called diabetes insipidus, or to a chronic disease of the excreting portions of the kidney by which increased filtration of urine is permitted. Similar modifications in the amount of *urinary solids* excreted are observed; their increase shows an excessive oxidation within the body, while their decrease may be due either to diminished oxidation, or to a lessened power of excretion by the kidneys. This subject is again referred to on page 541. For remarks on the

diagnostic value of disturbances of the nervous system, see pages 87 *et seq.*

The **constitutional effects of injuries or operation** are either *immediate* or more *remote*; either *primary*, produced directly and solely by the injury, or *secondary*, both in point of time and also in the influence of causes other than the mere injury. Of the former, collapse may be taken as a type; and, of the latter, septicæmia or tetanus. Injuries may cause general disturbance by affecting seriously one or more of the great vital functions, especially those of circulation, respiration, and of the central nervous system. These are intimately interdependent; mere stoppage of the heart will abolish all the functions of the nervous system, and arrest respiration; and a lesion in the floor of the fourth ventricle will at once stop the action of both the heart and the lungs. Similarly an insufficient supply of blood to the brain will induce a feeble performance of all its functions; while any influence upon the nerve-centres reducing their activity, may enfeeble and impair the action of the heart. Hence it comes about that the final effects of severe injuries, damaging the brain or the organs of circulation or of respiration, may be closely alike.

While, however, injuries can only tell primarily upon the functions of circulation and respiration (except through the nervous system) by direct interferences with those functions, in the one case, by loss of blood or stoppage of the heart's action by pressure, laceration of its walls or incompetence of its valves; and, in the other case, by obstruction to the passage of air or arrest of respiratory movements; they can affect the nervous centres both directly and indirectly; directly, as when the brain is concussed or compressed; indirectly, by an impression made upon a nerve terminal being conducted up to the centre, and then exerting its influence, as when a crush of the

great toe causes collapse or syncope. When an injury affects the nerve-centres by an impression conveyed up to them by afferent nerves, the injury is said to be attended with "shock" to the nervous system. *Shock* is sometimes used to designate both the ascending nervous impression and the symptoms resulting from it; it should be employed in the former sense only; and for the latter, or the effects of shock, the term "*collapse*" should be used. Shock and its consequent collapse may be caused by other conditions than injury, e.g. depressing mental emotions. The intensity of shock varies with the intensity of the injury, and with the part injured, that due to visceral lesions is particularly severe; while the resulting collapse varies with the intensity of the shock, and what may be termed the "stability of the nerve-centres." Children, "nervous" women, and old persons show the effects of shock more markedly than robust men, while the influence of pre-occupation or intense mental excitement or concentration in opposing the influence of shock, is instanced by the numerous accounts of severe injuries received upon battle-fields without any collapse being produced at the time. It is further to be observed that, in consequence of the rapidity of all nervous processes, the effects of shock and of direct injury to the nerve-centres, are instantaneous, although when the injury increases, as in subcranial or meningeal hæmorrhage, the symptoms vary or increase in proportion. On the other hand, the constitutional effects of direct injury to the respiratory and circulatory organs are nearly always more or less gradually induced.

Every injury produces some degree of *shock*, and the impression in every case exerts a depressing influence upon the nerve-centres. The resulting *collapse* varies from a systemic disturbance unnoticed and transient, up through all grades, to

an intensity such as to cause instant death. When the constitutional symptoms are due to failure of the heart's action, and the consequent anæmia of the brain, the condition is called *syncope*; this may be produced by shock, being, indeed, one form of collapse, as when it is caused by the passage of a catheter, or by fright; or it may result from direct interference with the circulation, as from hæmorrhage and the toxic effect of chloroform. Like collapse, *syncope* varies between the wide extremes of brief insensibility and sudden death; when pronounced and severe it may be indistinguishable from collapse. In addition to constitutional states, primarily resulting from injuries, the association of recent injuries with conditions quite independent of them, such as apoplexy, alcoholism, and epilepsy, must be borne in mind; and it will be well, therefore, to consider the diagnosis of all these together:

Collapse.	}	Apoplexy.
Syncope.		Epilepsy.
Concussion of brain.		Alcoholism.
Compression of brain.		

1. If a patient be pale, with blanched cheeks and lips, sunken features, dull motionless eyes, cold skin, with beads or drops of sweat on the brow or other parts, with a frequent small very compressible pulse, or even a pulse imperceptible in the radial artery, with shallow noiseless respiration, muscular relaxation, so that the limbs are flaccid and fall about under the influence of gravity, while no resistance is offered to movements at the joints, the relaxation of the sphincters being attended with involuntary escape of fæces or urine; and if there be mental apathy, which may be exaggerated up to complete unconsciousness; the condition is said to be one of *collapse*. In a typical case all the vital functions are equally depressed,

and the recovery is gradual and slow. As a variation may be mentioned a state in which, with extreme pallor, coldness, feebleness or absence of pulse and muscular relaxation, consciousness is preserved intact; this is especially, but not exclusively, observed in cases of *collapse from hæmorrhage*. In collapse from this cause it is to be noted that the circulatory phenomena precede the nervous and muscular.

2. If a patient suddenly becomes quite unconscious, with general muscular relaxation, and either sudden stoppage of the heart or great diminution in the force of its contractions, with pallor, dilated pupils, insensitiveness of the conjunctiva, weak superficial respiration, and these symptoms quickly pass off and end in recovery; or, on the other hand, if sudden death ensues from the sudden arrest of the heart's action, the condition is generally known as *syncope*. The distinctions between syncope and collapse are not absolute, and individual surgeons employ the terms somewhat differently; the main point is to discover whether the symptoms are due to a general failure of nerve force, or to a primary arrest or enfeeblement of the circulation; from true collapse there is never the sudden or rapid and complete recovery that is witnessed in some cases of syncope.

3. When a patient presents the above general symptoms, but it is observed that the mental phenomena are out of proportion to the feebleness of the circulation, there being perhaps apparent complete unconsciousness, the patient only being roused to mutter when shouted at, or severely pinched, while the pulse is plainly felt at the wrist, *concussion of the brain* is to be suspected; and if there be no signs of paralysis or convulsions, while a history of a blow on the head, or of a general shake of the body with immediate onset of the unconsciousness, can be obtained, the diagnosis is established. As will be mentioned

later on, the symptoms of concussion vary greatly in intensity, from slight vertigo up to instant death; but they are always sudden in their onset, immediately succeeding the injury causing them, and the cerebral phenomena are the most marked and the most enduring, unconsciousness often lasting for many hours after the pulse has fairly recovered. (See also page 91.)

4. As the diagnosis of conditions of unconsciousness associated with injury is considered separately in the chapter on injuries of the head, page 91, it is only necessary here to point out that the distinguishing features of *compression of the brain* and of *apoplexy* are the completeness of the unconsciousness and the attending paralysis; those of *epilepsy* are the occurrence of tonic succeeded by clonic convulsions.

5. **Alcoholism** to a degree short of producing unconsciousness may complicate the diagnosis of the constitutional effect of an injury. Unfortunately, its features are almost too familiar to need description, but special notice should be taken of the flushing of the face and surface generally, the unsteadiness of all muscular actions, as seen in the tremor of the tongue and the stumbling gait, and the mental inco-ordination, as seen in the incoherent talk, often foul or foolish, the inability to grasp an idea, or the obstinacy with which a false idea is held.

The surgeon must not forget the possibility of the *entrance of air into a vein*, or the occurrence of *cardiac* or *pulmonary thrombosis*, complicating an injury or an operation.

Collapse, unless fatal, after a time passes off, and is succeeded by reaction. The earliest signs of *reaction* are increased fulness and strength with lessened frequency of the pulse, sighing respiration, a return of warmth to the surface, slight voluntary movements, and vomiting. Reaction is complete when the surface is warm, and consciousness is restored and it is

generally attended with restlessness, heat and dryness of skin, and abiding quickness of pulse. If, however, the patient be restless, unable to sleep, and even delirious, with hot dry skin, anxious flushed face, quick bounding or sharp compressible pulse, with weak tremulous movements, thirst and frequent vomiting, and hurried respiration, the condition is known as *prostration with excitement*. These symptoms are sometimes met with after severe hæmorrhage, and if they do not end in recovery, the pulse becomes fluttering and very quick, the skin cold and clammy, and convulsions and coma usher in death.

The **secondary constitutional effects of injuries or operations and diseases are:**

Fever.	Exhaustion.
Fat embolism.	Tetanus.
Pulmonary thrombosis.	Hydrophobia.
Delirium tremens.	

The existence of pyrexia, or increased body-heat, is the essential and pathognomonic sign of *fever*. This is usually accompanied by increased frequency of pulse and respiration, and disturbance of the cerebral, cutaneous, and other functions. It is not sufficient to recognise the mere existence of fever, but an attempt must be made to determine the kind and degree of the constitutional disturbance, and then from this and other facts to decide as to its cause and nature.

Fever varies very widely in different cases; it may be a mere transient pyrexia, accompanied by scarcely noticeable disturbance of function, while in other cases it may be fatal from the intensity of the body-heat or from extreme prostration. Two chief types of fever are usually described, sthenic and asthenic, and well-marked cases of either form are frequently to be recognised; but there is a large intermediate class of cases exhibiting all the marked characteristics of neither of

these types, and which forms a continuous gradation between them. The student should carefully remember that in the study of fever it is most of all important to regard it as a general disturbance of vital function, and that to form a due estimate of any case it is necessary not simply to measure the rise of temperature and study the temperature curve, although that is of great value, but he must regard the patient as a whole, and estimate the kind and degree of disturbance of all the vital functions. In one case the temperature may be very high and out of proportion to the intensity of the other signs of illness, in another this due proportion will be observed; in a third the frequency and softness of the pulse will indicate that the disturbance of the circulation is greater than that of other functions; in yet a fourth case, the nervous symptoms will predominate, and so on; and it is only when a good estimate is formed of the character and amount of the general systemic disturbance that is caused, or accompanied by, fever that a diagnosis of this condition in any true sense can be said to have been arrived at. In these days, when the thermometer is used as a matter of routine, and temperature charts are carefully drawn up so that the course of the pyrexia can be seen at a glance, there is a temptation to rely too exclusively (not too much) on this one manifestation of the febrile condition, and to neglect an equally careful and painstaking examination of the others.

If with pyrexia the skin be hot and dry, the patient experiencing a "burning" sensation, and complaining of great thirst, restlessness, and frontal headache, with inability to sleep, and the face be found flushed, the eyes suffused, the pulse full, bounding, quickened to 90 or 110, the respirations proportionately increased, the tongue moist and coated with a white fur, digestive disturbance being further indicated by