

A chronic ulcer situated on the lower half of the leg, or about either malleolus, with depressed base, smooth or covered with a few scattered ill-formed granulations or a thin greenish or grey slough, with thickened adherent edge, indurated, congested and adherent surrounding skin, with enlargement of the superficial veins of the limb, is a *varicose ulcer*. These ulcers often originate in some trifling injury inflicted on thickened ill-nourished skin, and their direct dependence upon varicosity of the veins as apart from other vascular disturbances is very problematical. They occur most often in women at and after middle life, and among the poorer classes.

An ulcer with pink or livid undermined edge, with weak flabby granulations covering the base, and thin purulent discharge, occurring in a child or young person of strumous habit, with enlarged glands or other evidence of that diathesis, is a *strumous ulcer*. These ulcers are most common over lymphatic glands in the neck or elsewhere, or over joints. They commence as abscesses, and a history of the bursting of a collection of pus, the thin undermined edge, and the general condition of the patient are their chief distinguishing features.

Syphilitic ulcers have many characteristic features, one or more of which may be present in any given case.

(1) *Number*.—They are often, but not always, multiple.

(2) *Position*.—They may occur in any situation; if on the leg they are not limited to the lower half, and are more common on the outer than the inner side, and are very frequent about the knee.

(3) *Shape*.—Circular or oval, or irregularly sinuous from the coalescence of adjacent sores; most characteristic is an ulcer healing at one edge and spreading at the other, or an annular sore.

(4) *Character*.—A “punched-out” appearance; or a base covered with a tough yellowish grey, “wet washleather-like” slough; or dark conical adherent crusts; or a base covered with very thick and firm mottled grey and pink granulation tissue; or phagedæna, are all characteristic. Syphilitic ulcers may assume all the characters of “chronic ulcers.” The healthy condition of the surrounding tissues is a noteworthy feature of the deep and perhaps chronic ulcers of the leg.

(5) *Origin*.—In an induration, or a gummatous infiltration.

The diagnosis of ulcers of the genital organs is given in chapters xxxvii., xxxviii., xxxix.

CHAPTER XXI.

DIAGNOSIS OF SINUS AND FISTULA.

“A LONG narrow suppurating canal” is a *sinus*, and if the sinus communicate with a mucous, synovial, or serous cavity, and give exit to the secretions of these cavities, it is a *fistula*. An unnatural direct communication between two adjacent mucous surfaces is also called a *fistula*. The diagnosis of a sinus is established by the passage of a probe along it, but the size and character of its aperture, and the amount of discharge which flows from it, or the special means by which that discharge can be made to flow, are other signs by which they can generally be recognised. A sinus being recognised, the surgeon must first decide whether it is a fistula by noticing the character of the discharge, and also whether a probe passed along it enters a mucous, synovial, or serous cavity. *Salivary fistula, branchial fistula, urinary fistula, fecal fistula,*

anal fistula, and *virchal fistula*, which are thus diagnosed, are referred to in subsequent chapters. (See index.) *Recto-vesical fistula* (see page 545) is recognised by the passage of fæces and flatus with the urine, and sometimes by the escape of urine from the anus. *Recto-vaginal* and *vesico-vaginal fistule* are diagnosed by the passage of fæces or urine from the vagina, and also by direct inspection of the part; where urine dribbles continually into the vagina the fistula opens into the bladder, where it only flow into the vagina during the act of micturition, the fistula opens into the urethra beyond the internal sphincter. A direct communication between the mouth and nose (*oro-nasal fistula*), whether congenital, traumatic, or syphilitic, is rarely, if ever, called by this name. A *pleural fistula*, which is more commonly spoken of as a *fistulous empyema*, is known by the history, the abundant escape of pus, often the passage of air into and out of the cavity with respiration, and the freedom and extent with which a probe can be passed. (For *Wound of pleura*, see page 136.)

The surgeon having diagnosed a **sinus** must investigate it thoroughly, to ascertain if possible its cause. He should enquire into the history of the case, and examine the neighbouring bones and joints for any evidence of disease, and then with a probe, or, if the patient be anæsthetised, with his finger, he should explore it thoroughly, searching for *foreign bodies*, such as bullets and pieces of clothing, for *exposed bone*, and ascertaining the direction, length, and extent of the sinus. *Necrosis* and *caries* are very common causes and accompaniments of sinus; in necrosis the granulations at the orifice are often pale, flabby, and somewhat fungating, the careful passage of the probe causes neither pain nor hæmorrhage, and the exposed bone is felt to be firm, often smooth, and gives a clear sound on being tapped.

In *caries* the granulations of the sinus are more vascular, the passage of the probe is painful, and is attended with some hæmorrhage, while the bone is felt to be soft, irregular, and yields a grating sensation, and not a clear ringing sound when tapped; these distinctive characters are only observed in typical cases. If neither of these causes for the sinus be found the surgeon must see whether the cavity *drains* efficiently, as retention of discharge is a very common cause of non-healing; in other cases he will find the sinus runs between muscles or other structures which are constantly being *moved* over each other, and rest, with fixation of the part, is the condition necessary to healing. Associated with any of the above causes of sinus, or alone, the surgeon may find an unhealthy condition of the *lining of the cavity* and the surrounding tissues, and a *strumous* habit of body. The examination of a sinus, therefore, consists first in the investigation of local conditions, *i.e.* foreign bodies, disease of bones and joints, passage of any of the fluids of the body, imperfect drainage, movement of the parts around, atonic condition of the lining membrane, and then of the constitutional state of the patient.

CHAPTER XXII.

THE DIAGNOSIS OF GANGRENE.

The diagnosis in a case of gangrene consists in the recognition first of the fact of the death of a mass of tissue, secondly of the variety of the gangrene, and thirdly of its cause.

A. **Gangrene is recognised** by several signs which are variously combined in different cases.

(1) In **complete anaesthesia**, the part is quite insensible to contact or the prick of a pin. This sign is invariably present in gangrene, but it must be remembered that alone it is not evidence of tissue-death, as it may be due to palsy of a sensory nerve. It must also be borne in mind that although dead tissue is quite insensible, its manipulation while it is in connection with living tissues may cause pain; thus, in the case of a boil, where the central slough is exposed, a needle may be passed into the ash-grey slough without exciting any pain, but if it be grasped with a forceps, the traction upon the adjacent inflamed living tissues will be very painful. In applying this test of vitality, therefore, care must be taken to use only such means as shall act upon the particular tissue or part of the body under investigation.

(2) **Arrest of circulation** is another constant sign of gangrene. It is evidenced by absence of all arterial pulsation, by arrest of flow in the superficial veins, as proved by pressure on the cardiac side not causing them to become distended, by the very slow return of the blood to capillaries from which it has been expressed by pressure, or by the failure of pressure to deprive the discoloured tissues of their colour, and by the bloodlessness of an incision into or prick of such dead tissues. This arrest of circulation is one of the chief immediate causes of gangrene.

(3) **Fall of temperature** necessarily ensues upon arrest of circulation, and is one of the signs useful in determining the onset of gangrene. If no means be taken to heat it artificially a gangrenous part falls to the temperature of the surrounding medium. Coldness is not of itself diagnostic of gangrene; some persons who habitually have cold extremities, on exposure to cold may suffer from extreme coldness and numbness of the fingers or toes, which yet recover perfectly.

(4) **Loss of function**.—Muscles lose all power of contraction, glands cease to secrete, and so forth; a gangrenous part is therefore immobile, but while continuous with living tissues may be moved by them; thus in a dead foot no contraction of the intrinsic muscles can occur, but the toes may be moved by the long flexors and extensors, the vitality of whose contractile parts in the leg is unaffected. The skin of gangrenous parts is not bathed in sweat, and while the cuticle is preserved intact is dry. Similarly in gangrenous wounds there is an entire absence of all efforts at repair; a gangrenous flap is never united by coagulated lymph, or covered with granulations.

(5) **Change in colour**.—This varies. The part may at first be blanched and bloodless, or intensely congested; in the one case it becomes shrivelled, dry, and brown in colour, in the other black with patches of brown or green, and the formation of discoloured blebs containing bubbles of gas. The superficial vessels are usually first marked out by brownish-red branching streaks. The colour depends upon the amount of blood in the part, and its change upon the diffusion of the hæmatin staining all the tissues, and its subsequent decomposition. Sloughs of subcutaneous tissue are usually of an ash-grey or pale yellow colour, as seen in carbuncle; a sloughing gumma is of the same hue.

(6) **Post-mortem changes**.—In some cases these consist in desiccation, all the dead tissues becoming dry and hard; more frequently they consist in decomposition, characterised by liquefaction of the tissues, separation of the cuticle, the formation of blebs, the evolution of gas in the tissues, giving rise to emphysematous crackling and to bubbles in the blebs, and a putrid odour; in the case of gangrene of the lung the putrid odour of the breath is of great diagnostic value.

(7) **Spontaneous separation from the living tissues** by a line of ulceration is a later and absolutely certain sign of the death of the separated portion. Similar separation of living tissues never occurs. Small areas of dead tissue when protected from decomposition by asepticity are separated by a process of absorption, with a gradual replacement of the slough by living tissue.

B. **Two varieties of gangrene** have been generally recognised, called *dry* and *moist*, and great stress has been laid upon the distinctions between them. There are many cases, however, in which their distinctive features are not present, which are spoken of as *mixed*. The variations depend exclusively upon the relative proportions of fluid in the dead tissues; where this is little the gangrene is "*dry*," where great it is "*moist*," and where intermediate in amount, or varying at different places, or able to evaporate rapidly at one part and not at another, the gangrene is "*mixed*."

(1) If the dead tissues become shrivelled, hard, dry, of a dark brown or black colour, with little or no odour, it is spoken of as a case of *mummification* or *dry gangrene*.

(2) If, on the other hand, the dead parts are sodden, mottled grey, black, or green in colour, with desquamation of the cuticle, the formation of blebs containing brown-red fluid and gas, and the evolution of gas in the tissues (giving rise to emphysematous crackling or the presence of bubbles along the line of the superficial vessels), and if a dirty ichorous fluid exude from the exposed cutis or from any wounded surface, while the whole part has a penetrating putrid odour, it is a case of *moist gangrene*.

(3) If in one part of the gangrenous mass the tissues are mummified, and at another they are moist and decomposing; or if they are neither mummified

nor undergoing the rapid decomposition characteristic of cases of well-marked moist gangrene, the case should be spoken of as one of *mixed gangrene*.

Many morbid processes may lead up to and terminate in gangrene, of which the following are the most frequent, and the best ascertained:

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| (1) Injury, | | (3) Arrest of the circulation, |
| (2) Inflammation, | | (4) Trophic lesions. |

(1) **Injury** may lead to gangrene in one of several ways.

(a) It may by severe crushing of the tissues destroy their vitality, and arrest all circulation in the part; (b) or by mere compression it may arrest circulation in the tissues, as in the case of gangrene from improperly applied splints; (c) by the destructive action of intense cold, heat, or caustics; (d) by arrest of the circulation through the main vessels it may cause gangrene of the parts beyond, e.g. rupture or wound of an artery, or compression of the subclavian vein by a fragment of broken clavicle. In these four classes of cases the injury alone by its direct effect causes gangrene; and while in the first three the injured tissues die, in the last it is rather the tissues at a distance from or beyond the injury that necrose. In other cases injury leads less directly to gangrene. (e) When inflicted upon tissues of greatly depressed vitality, in which the circulation is very languid and difficult, quite a trivial injury or the natural effort for its repair, may be sufficient to turn the scale on the side of local death; in this way many cases of senile gangrene arise; the gangrene is not limited to the precise parts injured; (f) an injury not severe enough to destroy may yet so diminish the vitality of a part, that an attack of inflammation of insufficient intensity to cause sloughing of previously healthy parts, may prove fatal to the injured

tissues; illustrations of this may be met with during the repair of contused wounds, and they enforce the importance of guarding against all inflammation in such wounds; (*g*) a wound may be the starting point of morbid processes which lead on to gangrene, quite apart from the original injury, such as spreading thrombosis, septic inflammation, phlegmonous erysipelas, hospital gangrene and malignant pustule or charbon, the poisons of which gain entrance through the wound, or only act when there is a breach of surface. In these three classes of cases injury alone does not lead to gangrene, and the accessory causes are the most important.

(2) **Inflammation**, when intense, may induce gangrene by strangulation of the vessels of a part, aided perhaps by the direct lethal influence of inflammation upon all tissue elements; examples are afforded by acute osteomyelitis, phlegmonous erysipelas, furuncle, and carbuncle.

(3) **Arrest of circulation**, however produced, causes the death of a part; as a primary change and cause of gangrene it is seen in arterial thrombosis and embolism, strangulation of parts, Raynaud's disease, sloughing gumma, and possibly also in gangrene from ergot.

(4) **Trophic lesions**, in cases of damage of the central nervous system, is a cause of rapid and deep sloughing, sometimes witnessed in hemiplegia and paraplegia. (*See* page 104.)

Cases of gangrene may be divided into two classes, *primary* and *secondary*. In the former there is direct and more or less immediate death of tissues, the preliminary symptoms being only those indicating a lessened vitality of the part, coldness, numbness, sense of weight, etc.; in the latter case the death of the tissues is preceded by acute inflammation, with its usual phenomena, and the gangrene is caused by the intensity of the inflammation.

Primary gangrene may be "dry" or "moist"; it is distinguished by a more or less abrupt origin, by the obvious death of the part being immediate, as in a case of burn, or preceded only by pain and numbness, lividity and coldness; subsequent to the death of the part the tissues in its immediate neighbourhood become inflamed, and constitutional symptoms arise.

Secondary gangrene is always "moist," and is distinguished by the acute inflammation, with redness, swelling, heat, and pain, with constitutional disturbance preceding the gangrene; beyond the gangrenous tissues there is a wide area of acute inflammation.

The gangrene is primary.—It may be

- (1) Spontaneous. | (2) Traumatic.

The history will at once determine this point.

(1) **Spontaneous primary gangrene** may be

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| (a) Arterial thrombosis, or embolism. | | (c) Trophic gangrene. |
| (b) Senile gangrene. | | (d) Raynaud's gangrene. |
| | | (e) Diabetic gangrene. |

(a) If a patient be suddenly attacked with severe pain in a limb (most often the leg) and the part be found cold, anæsthetic, slightly livid, with no pulsation in the arteries, and the part then undergo the changes characteristic of "dry" or "mixed" gangrene, constitutional symptoms not coming on until the lapse of a few days, when the line of separation has formed, it is a case of *gangrene from arterial thrombosis or embolism*. This variety is met with during convalescence from acute illness, especially typhoid fever, and in the subjects of heart disease. In cause, symptoms, and course, it exactly resembles gangrene following the ligature or rupture of a main artery. Affecting quite small areas of tissue, it is

sometimes seen as the starting point of a chronic ulcer of the leg.

(b) If in an old person with tortuous rigid arteries, a weak heart, and a feeble circulation, shown by coldness of extremities, a dry scaly condition of the skin, and sometimes by œdema, a patch of gangrene appear on the toes, foot, or leg, or on the fingers, either spontaneously or subsequent to some very trivial injury, and is then not limited to the exact seat of the injury, it is *senile gangrene*. It is characteristic of this form of gangrene for all the changes associated with it to progress very slowly, for the gangrene to spread or to recur, and for the ulcers left on the separation of the sphacelus to heal very slowly, or to fail to heal altogether.

(c) The accompanying paralytic phenomena, and the rapid formation of the sloughs, characterise *trophic gangrene* occurring in paraplegia and hemiplegia. It is the tissues which are exposed to pressure that die, but their rate of death is quite out of proportion to the amount of the pressure to which they are exposed. Gangrene plays some part in what are usually spoken of as the trophic ulcers of locomotor ataxy and leprosy.

(d) Gangrene occurring spontaneously in the hands or the feet, and occasionally in other parts, in patients who are subject to attacks of local ischæmia characterised by lividity, coldness, and a certain amount of pain, lasting from a few minutes to hours, or even longer, and sometimes accompanied or associated with attacks of intermittent hæmatinuria, is the *gangrene of Raynaud's disease*. This disease is met with in children and young persons as well as in adults, and the attacks are most frequent or perhaps limited to the winter months of the year. The distinct attacks of local ischæmia and their frequent repetition are very characteristic signs of this disease.

(e) *Diabetic gangrene* has local characters closely resembling senile gangrene, and the diagnosis is only established by the detection of sugar in the urine, and the symptoms characteristic of diabetes mellitus.

(2) **Traumatic primary gangrene** may be

(a) Local. | (b) Spreading.

(a) If the gangrene immediately follow the injury, and be limited to the parts injured or to the parts on the distal side of the injury, and if the gangrene do not spread beyond the area which at once dies, it is *local traumatic gangrene*. Of this we may mention several varieties. (α) That due to crushing and bruising of tissues, or to the undue pressure of splints; (β) that due to the effects of cold ("frost-bite"), burns, scalds, and caustics; (γ) that caused by tight bandaging or constriction by some other means, "moist" in variety, and characterised by a deep depression, in which the constricting band lay, marking its upper limit; (δ) that caused by rupture of the main artery of a limb in which gangrene of the parts beyond the injury comes on; (ε) that due to ligature of a main artery.

(b) If after an injury in a person with a very feeble circulation from cardiac or pulmonary mischief or general debility, the injured limb become cold, numb, and swelled, and then quickly change to a green or leaden hue, with all the evidences of total death of the part, and this condition rapidly spread up to tissues not immediately affected by the injury, while there is an entire absence of all inflammatory phenomena preceding the gangrene, the case is one of *spreading traumatic gangrene*, from *venous thrombosis*. It is distinguished from the traumatic gangrene due to direct injury of blood-vessels, by its not coming on immediately after the injury, by its rapidly spreading up along the limb towards the trunk to an extent

quite independent of the original lesion, and by the concomitant signs of a generally enfeebled circulation.

It has been mentioned that *senile gangrene* may follow a slight injury, but this form of gangrene is readily distinguished from the above forms of traumatic gangrene by the great chronicity of the process, and by the age and the general condition of the circulatory organs of the patients; it is also generally of the "dry" variety.

Secondary gangrene is met with in many forms, but only two will be considered here; they are

- (1) Acute septic gangrene. | (2) Hospital gangrene.

The diagnosis of its other forms, whitlow, cellulitis, carbuncle, etc., is elsewhere considered.

(1) If after an injury, which may be as trivial as a prick, or more severe, there be rapid swelling of the part, quickly spreading up towards the trunk, with redness, severe pain and heat, along with marked constitutional disturbance, often ushered in by a rigor and characterised by high fever, rapid pulse and marked general depression; and if this intense local inflammation be quickly succeeded by "moist" gangrene of the part, with rapid decomposition, which may spread up towards the trunk with fearful rapidity, the constitutional symptoms assuming still more of the "typhoid" type, the disease is *acute septic gangrene*. Following a severe injury, this is sometimes spoken of as *spreading traumatic gangrene*; but as it is distinctly secondary to septic inflammation it must be clearly distinguished from that dependent upon general enfeeblement of the circulation and consequent venous thrombosis; the two resemble each other only in their rapidity of occurrence, and in the fact that the gangrene spreads to tissues unaffected by the original injury.

(2) **Hospital gangrene** is now happily a very rare disease, only met with in over-crowded, badly-appointed military hospitals. It is a very contagious disease, and when it makes its appearance it quickly affects and kills large numbers of the wounded. It may assume two forms, the *acute* and the *chronic*, and either may develop at any time during the course and progress of a wound.

(a) If a patient the subject of a wound, who perhaps has been progressing satisfactorily, become restless, with a severe tight frontal headache, and complain of a dull, heavy, smarting pain in the wounded part, which in a few hours is found much swelled, with its edges and surfaces firm and looking like boiled pork, and quickly becoming converted into soft pultaceous slough, the constitutional signs meanwhile assuming a grave "typhoid" type, the disease is *acute hospital gangrene*.

(b) But if, with similar or less marked constitutional symptoms, the wound break down, enlarge, assume a circular crateriform appearance, the edge being thickened and indurated, and the whole surface covered with a soft slough, the tissues beyond being inflamed, it is *chronic or ulcerative hospital gangrene*.

Gangrenous affections of the face.

- (1) Charbon, or malignant pustule. | (2) Carbuncle, or malignant carbuncle.
(3) Cancrum oris.

(1) *Charbon* is met with in butchers, farriers, shepherds, curriers, or persons who have been in contact with animals suffering from "splenic fever," or with their hides or hoofs. It is characterised by the formation of a vesicle containing dark serum, the base of which forms a dry slough, while around it fresh vesicles form in a few hours, and the slough extends, and at the same time the parts beneath become swollen

and hard, and the skin around livid in colour, there being but little pain and an entire absence of suppuration. If the serum of the vesicles, or of the infiltrated tissue be examined, the bacilli characteristic of splenic fever will be detected. Constitutional symptoms (rigors, headache, depression, a rapid weak pulse, dyspnoea, and collapse) usually come on two or three days after the local signs.

(2) If the affection commence with a small vesicle or pustule, around which firm, extensive œdema of the lip, cheek, nose, or eyelid comes on, which increases and becomes of a livid colour, with the development of fresh pustules and the appearance of sloughs of cellular tissue at the bottom of the pustules, the swelling being attended with very severe pain and febrile symptoms of asthenic character (hot skin, rapid weak pulse, dry tongue, muttering delirium), the disease is *facial* or *malignant carbuncle*. Death is usually preceded by signs of pyæmia, and the plugged facial vein may be felt as a firm cord. Some cases of facial carbuncle do not assume this malignant type.

(3) Gangrene attacking a young child, and beginning as a livid, firm swelling of the gums, or of the mucous surface of the lips or cheeks, on which a grey slough appears, and extends to all the tissues of the part, there being meanwhile a discharge of very foetid saliva and symptoms of nervous depression, is *cancrum oris*. It is most usually met with in debilitated children, and particularly after the occurrence of measles, or other acute specific disease. It is limited to children, and is frequently fatal. It is to be remarked, that in *cancrum oris*, the sloughing commences on the mucous surface, and spreads outwards; in charbon it begins in the skin and spreads inwards; in carbuncle it begins in the subcutaneous tissue and spreads out to the skin.

It may happen that a carbuncle in a late stage,

but before the separation of its slough, may rather closely resemble a sloughing gumma; it may be well, therefore, to point out the features by which the two affections may be distinguished. A *sloughing gumma* is a chronic affection commencing in a painless induration, the skin over which slowly ulcerates in one aperture, exposing the slough, which is usually of a yellowish colour; the area of redness around is very slight and narrow. There are other evidences of the syphilitic diathesis; gummata often occur where carbuncles never occur, as in muscular tissue, or around the knee joint. A *carbuncle* is a much more acute and painful affection, commencing as a red, tender, brawny infiltration, the skin over which ulcerates in several parts, exposing a grey slough, which some believe to have a distinctive odour. Carbuncles are most common on the back of the trunk, and in men past middle life.

CHAPTER XXIII.

THE DIAGNOSIS OF DISEASES OF JOINTS AND BURSAE.

It will be convenient to consider, in the first place, the general principles of diagnosis of articular disease, and then afterwards to refer in detail, where that is necessary, to the diagnosis of affections of individual joints. It is well to indicate at the outset that among joint diseases will be considered not only those affecting the joint cavities with their synovial membranes, ligaments, and cartilages, but also those of the joint ends of the bones; in discussing these we shall have occasion to point out how affections of neighbouring structures, *e.g.* bursæ, may be identified.