PROVINCIAL MEDICAL & SURGICAL JOURNAL.

A COURSE OF LECTURES ON SURGERY, DELIVERED IN THE MEDICAL SCHOOL OF CAMBRIDGE.

By **GEORGE MURRAY HUMPHRY, Esq.,** Downing
College, Surgeon to Addenbrooke's Hospital.

LECTURE X.

MORTIFICATION CONTINUED.

Atonic Mortification; Bed-sores; Gangrena Senilis, Sicca and Humida, Symptoms; Real Cause of the Disease to be found in the Failing Powers of Nutrition attendant on Old Age, aided by an Ossified State of the Arteries,—not Inflammation of the Arteries; Treatment, General and Local; Amputation not advisable; Symptoms preceding the Gangrene; Mortification from deficient supply of Blood, occasioned by Ligature, Injury, or Inflammation of a main Artery; Mortification from Suspension of Nervous Influence; Traumatic Gangrene; Circumstances under which it occurs, and the cause of it, generally associated with Inflammation and Interstitial Suppuration; Symptoms. Question of immediate Amputation where it is likely to occur, and of Amputation where it has set in; Mortification occasioned by Pressure upon an Injured Part; by Ergotted Rye, Fever, and Exposure to Cold; Cases of Mortification without obvious cause.

Of the three classes into which I divided the several instances of mortification, the atonic, or that in which the mortification is associated with an enfeebled state of the system, or of the part affected, includes by far the greater number of cases. In this, as in both the preceding classes, the mortification is, for the most part, preceded by inflammation, and depends upon it as the immediate exciting cause. The peculiarity consists in its being disproportionate in its extent to the severity of the inflammation; and the want of due relation between cause and effect between the inflammation and the mortification, is owing to the low vitality of the structures involved, which renders them unable to bear the disturbance in their nutritive functions occasioned by inflammation. You must bear in mind throughout the consideration of this division of our subject, that the same want of vigour which entails such disastrous results upon inflammation, entails also a proportionate inability to resist the invasion, or to oppose the progress of that disorder when any slight

event occurs to give rise to it. The liability to suffer inflammation, and to perish under its influence, are unfortunately very often associated together, and are to a certain extent proportionate to one another. Patients who are greatly reduced and weakened by disease, are very subject to inflammatory attacks, and the inflammation quickly passes on to suppuration, ulceration, and to mortification. I have already told you that the disposition to these inflammatory attacks is one of the most frequent causes of death after amputation, the chance of their occurrence being greatest in the patients who are most reduced before or after the operation. You have probably remarked that the fatal termination of cancerous and long-continued diseases of all kinds is often hastened by a sudden attack of inflammation in some internal organ, which is found to have occasioned far more extensive disorganization of structure than the symptoms had led us to anticipate. In two cases of cancer of the œsophagus, examined within a recent period, the premature termination of existence was found to have been caused by inflammatory gangrene of the lung, and in neither case had the symptoms during life been such as to excite the suspicion of such an event.

The sloughing ulcers, or bed-sores, as they are called, upon the sacrum, hips, and other parts which chiefly bear the weight of the body, in persons who have been long confined to bed in an enfeebled and emaciated condition, are examples of this atonic form of mortification. The integuments first become red and tender, and then mortify. The sloughs sometimes extend quickly and very deeply, exposing the bones, which exfoliate in scales, or in large masses if the patient lives long enough. These sores form a very serious addition to the sufferings of a patient, and sometimes turn the scale against him, so that in the management of bedridden persons, your attention should be especially directed to prevent their occurrence, which may often be done for a great length of time by care and good nursing. Cleanliness is of great importance; no irritating secretions should be allowed to remain in contact with the skin; the linen should be often changed, and the bed well made. The patient should be induced to change his posture, and to lie sometimes on his side, or on his belly. For various reasons this very often cannot be done; the skin should then be sponged every day, or every other day, and the parts most subject to pressure be bathed with vinegar or spirit and water, or some slightly stimulating fluid, so

as to harden the skin; this is better than covering it with plaster. The exposed regions should also be relieved from pressure, so far as it can be done, by placing pillows under the neighbouring parts. The water-bed is a very valuable resource, and a great comfort to the patient. When the inflammation and sloughing has commenced, I think a bread and water poultice, to which some lead lotion has been added, answers better than anything I have tried. After the sloughs have separated, simple ointment or water dressing, or stimulating lotions may be used. The sores are often long in healing when they are deep, and particularly so when exfoliation of bone has taken place. In some diseases, where the powers of the patient are much depressed, these sloughs form and spread with great rapidity; thus, in the low stages of typhus fever it is necessary to watch very closely and examine the back daily, so that you may take the hint afforded by the first blush of inflammation, and place the patient upon a water-bed before the mortification sets in.

The most striking instances of mortification resulting from a feeble state of the nutritive forces, are those in which it affects the lower extremities of old people. *Gangrena senilis*, which is the name given to this affection, is generally preceded by inflammation. The inflammation, it is true, is often of little severity, so slight as scarcely to attract attention till the dark colour of the part shows the formidable results produced by it. In other cases, however, it forms a more striking feature in the complaint, and may be distinctly recognized as the immediate cause of the mortification. An old man, who appears to be in the enjoyment of his usual good health, suffers slight inflammation of a toe, induced, perhaps, by a scratch in cutting a corn, the pressure of a tight shoe, or other trivial cause. It gives him no great inconvenience, but does not subside; it lingers about the part, and extends to the other toes and to the instep, causing redness and swelling, but, it may be, no great pain. He contrives to hobble about, does not think very much of the complaint, and his sight being indifferent, he does not observe the change of colour which is taking place at the toe first affected. This part becomes livid, the cuticle vesicates and separates, a thin bloody fluid oozing from beneath it, and the skin under the detached cuticle is seen to be dark and excoriated. The change of colour gradually follows the inflammation as it advances to the other toes and to the instep, and the one preceded by the other, and joined to it by various intermediate shades of blue, livid, and white, causing a peculiar mottled appearance, may spread over the foot and up the leg. The rapidity with which the affection advances varies much. It is not generally very quick, and the change from inflammation to mortification taking place in a gradual manner, without any great struggle, is not attended by a severe shock to the system. There are no symptoms of alarming depression, such as occur in the cases of more acute gangrene; but the old man gradually becomes weaker, is kept awake and made restless by the pain, which, though slight at first, is often severe and constant during the progress of the

mortification. At last he falls into a dozing half-conscious state; the mortification follows more quickly upon the advancing inflammation as the bodily powers decline, but the pain occasioned by it is less severe; some slight additional cause, such as a cold, a diarrhoea, or an attack of erysipelas occurs to disturb the balance still more, and the old man generally dies within a few months of the first appearance of the mortification. Sometimes the progress of the disease is much more rapid. I remember the case of a woman, aged 75, in whom the mortification, commencing in the toes, extended nearly up to the knee in three weeks, and proved fatal soon after.

It occasionally happens that the mortification is preceded by scarce any of the usual signs of inflammation, taking place without any apparent exciting cause, and the mortified part then dries up, and becomes black. Any old man finds a black spot upon one of his toes, or upon his heel, and the skin at the part becomes dry, shrivelled, and hard, as well as black. He thinks little of it, and possibly the slough may separate, and the wound may even granulate and heal up; but more commonly, the mortification extends, or another black spot appears near the cicatrix left by the healing of the former one, the whole toe becomes black, dry, and shrivelled, and the mortification spreads up the foot, or abscesses form in the foot and leg, preceded by very little inflammation or pain, discovered for the most part accidentally, and containing thick bloody fœtid pus. The patient becomes gradually weaker, and dies of exhaustion. Although the black spot, which is the first symptom of this affection, may seem a slight affair, and being attended with little or no pain, may be disregarded by the patient, it is an ominous fact, for the disease generally takes the fatal course which I have described. Mortification, taking place in this manner, preceded by very little inflammation, and attended with the formation of a dry black eschar, is called *gangrena sicca*, in contra-distinction to the *gangrena humida*, where the mortification is preceded by more obvious signs of inflammation, and the part being soft and moist, is more subject to decomposition, and the formation of gases in its substance.

Senile gangrene affects chiefly persons in the upper classes who have lived freely, and it is, therefore, observed more frequently in private practice than in hospitals. It is essentially the disease of old age, and I think the cause of the complaint is sufficiently found in that failure of the nutritive powers, which, increasing with advanced years, shows its effects throughout the system in the general wasting and degeneration of structure, and which at length renders the lower extremities unable to support their vitality when any disturbing influence occurs to interfere with their nutrition. That the lower extremities should be so much more liable to suffer this mortification than the other parts of the body will cease to be a matter of surprise, when we reflect upon their late development, their distance from the central organs which supply the pabulum, and, to a certain extent, also, the stimulus of nutrition, the comparative feebleness of their circulation, and their liability to the other effects of inflam-

mation, to suppuration, and to ulceration. Surely the chronic gangrene which affects the toes and feet are no more remarkable than the chronic ulcers which affect the legs of elderly persons. I do not mean to say that the failure of the nutritive powers in the lower extremities is the only cause of senile gangrene, but that it is the chief and predisposing cause, which may be assisted by an ossified state of the arteries, or a varicose condition of the veins, and may be brought into immediate operation by a bruise or scratch, or a spontaneous inflammation. Though essentially the disease of old age, and not often suffered before 60 or 70, senile gangrene may occur in persons much younger in reality, but who are, as regards real bodily vigour, prematurely old, in persons who have lived hard, or worked hard, and so worn themselves out before their time, or whose bodies are constructed with less than the average of enduring power. One of the worst cases of mortification of the toes Sir Benjamin Brodie ever witnessed, connected, as he says, with what might truly be considered old age, occurred in a man of six and thirty, worn out by the operation of bad habits upon an originally bad constitution.

An ossified condition of the main arteries of the affected limb, and throughout the system, is generally associated with senile gangrene. The vessel at the wrist, as well as in the thigh, may be felt to be of large size, firmer than natural, and knotty. When examined under such circumstances, the coats of the arteries are found to be thick, to have lost their elasticity, and to be studded more or less closely with opaque spots and plates of earthy matter, which sometimes protrude into the interior of the vessels, retarding the current of blood in them, and may even occasion complete obstruction. This hinderance to the flow of blood through the great arterial trunks must necessarily have much influence in predisposing the parts supplied by them to mortification, and is, in all probability, in a few cases, the direct, as well as the predisposing cause. When this happens, the mortifying part being deprived of its proper supply of fluid, appears generally to become dry, or mummy-like, presenting the appearances which I mentioned in speaking of *gangrena sicca*.

I should tell you that the mortification in these and some other cases, is, by some of the French pathologists, attributed to inflammation of the arterial tubes taking place in their larger branches, or in their minute ramifications, which leads to the coagulation of the blood in them, and to suspension of the circulation in the parts supplied by them. The arguments adduced in support of this view, are, the severe pain sometimes preceding the mortification, which is supposed to depend upon the inflammation in the arterial coats, and the coagulated condition of the blood found in the arteries. With regard to the pain, there is no more reason for supposing that it depends upon inflammation of the arteries than upon the altered state of any of the other tissues in the part affected. The pain is not generally felt in the course of the arterial trunks more severely than in other directions, and it is to be remarked that severe pain has not been observed to be by any means a common symptom in the well marked cases of arteritis

which I have seen recorded. In some there was a dull aching pain, with tenderness in the course of the artery, and in others, the first symptom which attracted attention was uneasiness in the limb, or numbness of the foot, which was followed by mortification. Moreover, the coats of the arteries in cases of *gangrena senilis* do not generally present any decided evidence of the effects of inflammation. They may be stained of a deep red colour from transudation of the colouring matter of the blood, but this is often observed in the examination of bodies, and is known to depend more frequently upon an altered state of the blood than upon an inflamed condition of the arterial tubes. The coagula contained in the arteries are sufficiently explained, according to the views of the old surgeons, by the obstruction to the flow of blood through the mortified part. The mottled coagula frequently found in the branches of the pulmonary artery leading to apoplectic portions of the lung, in which the capillary circulation is stopped by the effusion of blood into the pulmonary tissues, are formed in the same manner; and in their appearance, and in the adhesions they acquire to the lining membrane of the vessel correspond very closely with the coagula, discovered in the arteries of a mortified limb.

You must not imagine that these views respecting the cause of the mortification are matters of indifference in a practical point of view, for you will find the treatment which different surgeons adopt in this affection is regulated rather by the views they entertain of the pathology of the disease, than by the results of experience as to the advantage of any particular course. Dupuytren, inclining to the theory which refers the mortification to an inflamed state of the arteries, employed general depletion. Cruveilhier, observing the great benefit derived in phlebitis from the application of a few leeches over the inflamed veins, pursued the same treatment for the arteritis which he supposed to precede and occasion the mortification, but he does not speak in high terms of the result of his practice; he says that the cases thus treated do not appear to have done better than others.

If the view which I have taken of the pathology of this complaint be correct, the greater number of the cases of senile gangrene can scarcely be said to come within the range of treatment for any curative purpose, inasmuch as the primary cause of the disease is the natural decay of the system. We must content ourselves with endeavours to prop the falling fabric and stay a little the ravages of the disease. Even this we are often unable to accomplish, for the patient is sometimes feverish and cannot bear our cordials, or he is restless and will not follow our directions. The treatment must vary according to circumstances, particular reference being had to the amount of inflammation which precedes the mortification, as well as to the general condition of the patient. When the local inflammation is acute, and the constitutional symptoms such as usually accompany local inflammation, mild depletion by means of aperient salines and a low diet will form the best means of arresting the progress of the disease. But it more generally happens that the con-

stitutional symptoms accompanying senile gangrene give evidence of depression at least as strong as those of excitement, the patient is restless but very weak, the pulse may be quick but it intermits, and you must take care not to mistake the feel of the thick firm coat of the old man's artery for that of the hard pulse of inflammatory fever. When inflammation is slight and the symptoms of depression predominate over those of excitement, the skin being cold and moist, the tongue moist and tremulous, and the eyes sunken, a stimulating treatment, with nutritious diet and wine or ammonia are necessary. This being more particularly the case in proportion as the mortification is in the rapidity of its progress disproportionate to the severity of the inflammation which precedes it. The food and medicines must be regulated with much discretion, for fear of offending the stomach and exciting diarrhœa, whereby the progress of the disease is much accelerated.

When the affection is attended with much pain, restlessness, and inability to sleep, the greatest comfort is sometimes derived from the administration of opium, in doses varying from half a grain to a grain, two or three times a day. It now and then happens when the mortification has been induced by some extraneous cause such as destitution, exposure to cold or injury, that a change of circumstances, comfortable lodging, the warmth of bed, and good food will arrest the disease, the slough will separate, and the wound heal up. During the winter before last there were in the hospital two cases of mortification of the great toe commencing under these circumstances, and both the patients got well and left the hospital cured. Neither of them were very old, and one is since dead of a disease of the œsophagus.

The local treatment consists in raising the limb, keeping it warm, and preventing injurious pressure and friction. The two last objects may be sometimes attained by wrapping it up in carded cotton, which should be changed every two or three days. Poultices seem often to afford the greatest comfort; and disinfecting agents, such as charcoal or chloride of lime, or mild stimulating fluids, such as a solution of sulphate of zinc, may be occasionally added. Do not let the inflammation which precedes the mortification induce you to apply leeches upon the inflamed part. I remember a case of the kind, where the inflammation and the pain being unusually severe, the surgeon was induced to place some leeches on the foot, and each one of the leech-bites became a centre from which the inflammation spread. Indeed, the disposition to mortification in the lower extremities of elderly persons constitutes a serious objection to the application of leeches to those parts under any circumstances.

The majority of surgeons are strongly opposed to amputation in these cases, because the operation is found to accelerate the fatal termination in the greater number of cases, and this result of experience is no other than we should have been led to anticipate from the circumstances under which the mortification occurs. The stump generally sloughs, or it does not heal, abscesses form in it, or bleeding takes place in consequence of the diseased state of the arteries not per-

mitting the ligatures to be applied securely; in short, it is found that the chances of recovery, when the case is left to nature, are greater than when amputation is performed; we must therefore content ourselves with endeavouring to assist nature in her efforts to separate the putrid mass when the mortification has stopped, by cutting through the bones and tendons which are slowly detached by the ulcerative process, and in doing this we must be careful not to injure the living textures, for fear of exciting fresh inflammation and mortification in them. Even by this operation we merely remove the dead mass, but do not actually relieve nature of any part of her work, for the process of ulceration continues to proceed through the fibrous tissues and bones in or near the line of separation previously established; and if the patient lives long enough, fragments of bone and tendon are detached above the point at which the knife and saw were applied.

Senile gangrene is often preceded for several months by some uneasy sensations in the lower extremities, such as numbness in the feet, and cramps in the legs at night, or the lower extremities are with difficulty kept warm, and the patient experiences an unusual feeling of being tired in the legs after slight exertion. I have been occasionally consulted by elderly persons suffering these sensations, and have recommended them to wear soft warm stockings of worsted or angola, and easy shoes, to rest the legs at times during the day by laying them upon the sofa, and when there was no contra-indication, to improve the diet by a little more meat, and an extra glass of wine.

One of the most common causes of mortification in early life, and in the adult, is a deficiency in the supply of blood to a member, consequent on some injury or disease of the main artery. It may result from an aneurism or other tumour pressing upon the artery, or from the application of a ligature for the cure of aneurism. I remember a man whose toes had sloughed after the ligature of his femoral artery, by Sir Astley Cooper, on account of popliteal aneurism, many years ago; the toes separated, leaving a stump of the metacarpal bones, over which the skin cicatrized. And I have seen the whole foot and leg, and part of the thigh, mortify after the femoral artery had been tied a little below Poupert's ligament, on account of an aneurism high up in the thigh. The same thing may follow an injury to a limb involving the main artery. Not long ago there was a man in this hospital with mortification in one foot and leg, occasioned by severe contusion of the ham, attended, as it appeared, with injury of the popliteal artery. I remember the case of a lad, in St. Bartholomew's Hospital, in whom the femoral artery was injured by an omnibus falling on his thigh; the foot and leg were at first cold and pulseless, but afterwards recovered their temperature, and retained their vitality, with the exception of the tips of the toes, which became black and dry. In course of time the sloughs separated, and the ulcers healed. When I was dresser at the Norwich Hospital, a man was admitted with fracture at the lower part of the femur, the leg and foot being cold and pulseless. A heavily-loaded cart had passed over the thigh. The limb became greatly

swollen, livid, and vesicated, mortification taking place. Amputation was performed on the sixth day, the patient having been unwilling to submit at an earlier period, and the femoral artery and vein were found torn through, just opposite the fracture at the point where they pass through the tendon of the triceps muscle. One of the surgeons in the consultation upon this patient mentioned a similar case, in which the limb vesicated and sloughed, and on amputation being performed at the end of six weeks, the femoral artery was found pressed upon by the broken bone and obliterated. Sir Benjamin Brodie, in his "Lectures on Pathology and Surgery," relates two cases in which it is probable that mortification of the lower extremities was occasioned by inflammation of the arteries. In neither instance was there any swelling of the limb or vesication; the mortified parts becoming dry. In one case the *post-mortem* examination showed marks of inflammation everywhere about the principal artery and vein of the limb; and in the other, which terminated more favourably, the slough separating, and the stump healing, the mortification was preceded by pain and tenderness in the course of the femoral artery. I do not recollect an instance in which mortification was clearly attributable to inflammation of a vein.

You are aware that the influence of the nervous system upon nutrition is not so direct as that of the circulation, and you will not, therefore, expect that the suspension of nervous supply will have so obvious an effect in producing mortification as the ligature or injury of the main artery of a limb. Nevertheless, it is sufficiently certain, that parts whose nervous function have been impaired by injury or disease, are particularly prone to inflammation; and further, that the inflammation in such parts very quickly passes on to mortification. The rapidity with which sloughs form upon the nates and lower extremities of persons suffering under paraplegia, especially when the paralysis results from injury of the spinal cord, is an instance of this. It is necessary that you should be well aware of this circumstance, and you should watch these patients closely, for, unless you do so, large sloughs will form before you suspect there is anything wrong. Mortification has been known to begin in the ankle within twenty-four hours of an injury of the spine. The inflammation and speedy destruction of the eye, which follows division of the fifth pair of nerves within the cranium, and the well-known fact that mortification may be induced in a paralysed part by exposure to a temperature which would have no injurious influence upon a sound member, are additional illustrations of the liability of a member to lose its vitality under a slight amount of inflammation when its nervous functions are impaired.

The mortification of a limb, then, may be induced by an injury which renders the main artery impervious, or causes a suspension of nervous supply. It may be occasioned at once by the severity of the injury annihilating the vital properties of the part; and it may also be caused by the shock of an injury, which, without at once destroying the vitality of the limb, produces such an impression upon it, that it soon falls into a

state of gangrene, perhaps during the reaction following the injury. The term traumatic gangrene is applied to mortification taking place in this manner; after an injury which has not been attended with the immediate destruction of the life of a part, or with laceration of the great arteries and nerves; and it may be worth while to enter a little more fully into the circumstances under which this kind of mortification takes place. When speaking to you in a former lecture of the simultaneous occurrence of abscesses in various parts of an injured limb, as well as in the more distant organs of a patient who had suffered any severe accident, I endeavoured to explain their occurrence by the supposition that the impression or shock of the accident had been propagated from the injured part through the limb, and, in a greater or less degree, through the entire system; the depressed condition of the nutritive and circulatory forces so induced being favourable to the appearance of inflammation and the formation of abscesses. I said, moreover, that the same condition sometimes induced mortification, and that mortification and the formation of abscesses, thus depending upon the same cause, often went on together at different parts of the same limb. Both seem to occur during the reaction, or the attempt at reaction, following the injury—both are preceded by more or less obvious signs of inflammation, and both extend at times for a considerable distance from the immediate seat of the lesion. In a case of severe injury, it not uncommonly happens that the vitality of one part of the limb is destroyed in the first instance, that the adjacent part falls subsequently into the state which is called traumatic gangrene, while suppuration, circumscribed and interstitial, is taking place in the more distant regions; and it is most probable that the immediate death, and the subsequent mortification and suppuration, are the result of the same shock, operating with different degrees of violence upon the near and more remote parts of the limb.

The following case, which may be in the recollection of some of you, will illustrate the subject of traumatic gangrene:—A healthy lad was admitted into the hospital with severe contusion of the left ankle, and a wound, through which protruded the torn belly of the long flexor muscle of the toes. It was not certain that fracture or dislocation had taken place, and the accident was not supposed to be of so severe a nature as it afterwards proved. It was occasioned by a loaded railway truck passing over the ankle. The limb was lightly supported with splints, but the boy complained of a great deal of pain, became restless and delirious, and when the splints were removed on the morning of the second day, the foot was cold and livid, the ankle and lower part of the leg swollen and dark coloured, and a dark bloody fluid, with air bubbles, issued from the wound. The upper part of the leg was hot, swollen, and of a dusky reddish-brown colour; and this colour, with some swelling extending above the knee, was gradually lost in the thigh. The boy had a flushed anxious face, quick sharp pulse, and hot skin. When we met in the afternoon for the purpose of removing the limb, the dark colour had extended nearly up to the knee, and the swelling, with the dusky hue, had advanced further

up the thigh. The lad was weaker; his countenance sunken; he was muttering deliriously; indeed, his condition, was such, that we dare not proceed with the operation. He lived a few hours longer, during which the whole leg became quite black, but the inflammation did not extend much higher in the thigh. After death the ankle was found to have been dislocated inwards, the fibula was chipped at its lower end, and there was a good deal of laceration of soft parts. The tissues of the gangrenous limb near the knee were infiltrated with pus, and there was serous infiltration into the thigh. The tibial arteries were not injured, but distended with mottled coagula, such as are often found in the vessels of a mortified limb.

In the case which I mentioned to you on a former occasion, a strong healthy man, aged 23, received a contused wound of the thumb, with fracture of the metacarpal bone of the forefinger, from a heavy bar of iron falling upon the part. The bellies of some of the muscles forming the ball of the thumb were torn and presented in the wound. He was placed in bed, the hand raised upon a pillow, and lint applied to the wound. Nothing particular attracted attention till the second day, when the wrist was found to be swollen and dark coloured, the hand cold, the forearm swollen, and of a dusky colour, and the man very restless, and complaining of intense pain. On the next day the wrist and lower part of the forearm were gangrenous; dirty fluid, with foetid gases, bubbled through the wound; the dusky redness and swelling had extended up the arm. On the fourth day the mortification and the inflammation had not advanced very much further. Amputation was performed just below the shoulder. Several of the metacarpal bones were found to have been dislocated from the carpus, and chipped at their articular ends, so that the wrist-joint was freely opened, and the cartilages were stained of a bloody colour. There was interstitial suppuration among the muscles of the forearm, and serous infiltration into the arm. He subsequently suffered, as I before related to you, from the formation of abscesses in various parts of the body, and died about ten weeks after the operation.

I have also before alluded to the liability of the stump to slough when amputation has been performed within the range of the severe shock of an accident, attended with much contusion of soft parts,—that is to say, the same condition of a limb which leads to the extension of traumatic gangrene above the seat of the injury, would, in all probability, occasion the stump to slough, if amputation be performed within a given distance. For instance, in the lad whose case I have just related to you, where traumatic gangrene following an injury to the ankle, spread up to the knee. Had amputation been resorted to below the knee in the first instance, although there was no appearance of any injury above the ankle, it is most probable that the stump would have sloughed. This view of the matter is founded upon the observation of several instances in which sloughing stumps and interstitial suppuration in the limb have followed amputation for severe railway injuries.

Traumatic gangrene does not, I believe, often take

place, unless there has been compound dislocation, or some severe injury, to a joint; such, at least, was found to have been the case in all the instances which I have seen. We have had several severe compound fractures, occasioned by railway carriages, and some of these have been followed by extensive sloughing of the contused soft parts, but I do not remember any in which traumatic gangrene occurred to the extent I have described in the two last mentioned cases, unless a joint were implicated in the injury.

The liability to this formidable event, in cases of compound dislocation of a joint, which has been occasioned by such a force as results from the wheel of a railway carriage passing over a limb, should be borne in mind in considering the question of immediate amputation. You should remember that the mortification is likely to extend beyond the seat of the injury, and that the dusky inflammation, with interstitial suppuration, which generally precedes the mortification, will extend to a much greater distance, the patient at the same time becoming feverish and delirious, so that the chances of recovery after amputation may be much diminished by the delay of a few hours. If it be evident that amputation will be required, it should be done at once, for the risk of the operation is much increased when gangrene has set in, and it should be performed at a considerable distance from the injury, otherwise the stump is likely to slough. I must confess, that when the construction of the railway in this district was commenced, I was not prepared for the formidable events ensuing upon injuries which did not at first sight appear to be so very severe, and I had reason to regret that immediate amputation had not been performed in some cases, and in others, that we had been too scrupulous in endeavouring to save as much of the limb as possible. When gangrene has once set in, amputation affords the best chance, and it is not necessary to wait till the mortification has stopped, and a line of separation been established, for cases have not unfrequently done well where the operation was performed while the gangrene was in progress, and where the divided parts were swollen from the infiltration of serum.

It is well that you should bear in mind that the occurrence of gangrene, after an accident, may be occasioned by the injudicious employment of pressure. I remember a lad who had simple fracture of the forearm, not attended with much bruising or other serious complication, so far as we could learn. Splints were applied and secured by a circular bandage passed many times tightly round them. The lad suffered very intense pain, but the bandage was not removed for several days, when mortification of one side of the forearm, including great part of the ulna, was found to have taken place, and amputation was in course of time performed just below the elbow. I believe the practice of applying moderate pressure, with or without splints, to fractures, and indeed to injured parts generally, immediately after the accident, is a good one, and is found to afford relief to the patient; but to render it a safe practice, two precautions are necessary; first, the bandage should not be very tight;

and, secondly, it should be removed or loosened as soon as the pain is found to increase, or the patient to become restless.

There are other circumstances under which mortification may take place. Persons who have been fed on rye containing ergot are said to be liable to mortification of the extremities, and you will read of the same thing taking place in some of the low fevers. A few months ago there was a man in the hospital with mortification of the toes, which had taken place during fever. When the sloughs had separated the granulating ends of the bones projected a good deal on the face of the stump, so I performed amputation through the middle of the metatarsus, but the wound was a long time in healing, and the foot remained swollen when he left the hospital.

Mortification may ensue from exposure to cold, the intensity of the cold being sometimes so great as to freeze or kill the part outright. Commonly there is a stage of reaction, more or less approaching to inflammation, following the depressed state to which the vital powers of the limb are reduced by the cold, and that reaction terminates in mortification. It is probable that the cold operates much in the same manner as the shock of a severe accident, by lowering the vital powers of the limb, and rendering it liable to reaction, to inflammation, or to mortification, according to its intensity or the length of time during which it is applied. We observe this reaction in a slight degree in our own persons when we pass from the cold air into the warm room, the skin becomes red, and the glow, as it is called, is attended with rather an agreeable sensation. When the cold has been more severe the reaction is also more acute, and may be attended with pain or may even pass on into distinct inflammation. When the depressing influence has been carried further still, the attempt at reaction may be productive of mortification, or the vital energies of the part may be so enfeebled that the inflammation following the reaction quickly runs on to mortification. The more sudden the reaction the more likely it is to produce these disastrous results, so that the best means of regulating it, and the safest mode of restoring a chilled limb, is that which raises the temperature most gradually. We have not much experience of such cases in this climate. In Russia and other northern countries, where they are of more frequent occurrence, the common practice is to rub the part with snow till the temperature is somewhat restored; and in the memorable campaign of the French army in Russia, many of the soldiers' limbs were by this treatment, and by careful management, restored, after they had been for some time completely deprived of sensibility by the cold.

I have seen a few cases in which inflammation was attended with very severe pain, and terminated in mortification without there being any very obvious reason for its so doing. A middle-aged man, of rather unhealthy appearance, was admitted into St. Bartholomew's Hospital, with mortification of all the fingers and the thumb, as far as the metacarpal bones of one hand. The attack appeared to have commenced as one of gout, to which he had been liable for several years.

The pain became unusually severe, and the fingers one after the other turned blue and mortified. He used to obtain some relief from the severe pain by keeping the hand in cold water, but it did not appear that this was the cause of the mortification. A line of separation took place, the sloughs were detached and the stumps healed.

In the month of October, 1846, I saw with Mr. Hammond a thin delicate female, who had a haggard anxious expression, and had been kept awake for six nights and days with intense burning pain in the tips of the fingers and thumb of the right hand. She could not bear the slightest pressure upon them, even a soft warm poultice was intolerable. The fingers were therefore kept exposed to the air, except that she sometimes obtained a little relief by dipping them in cold water; to which laudanum had been added. The pain was increased when she laid down, so that she constantly sat upright in bed, and occasionally fell asleep in that position, but was soon awake by the pain. The tips of the fingers were cold, a little swelled, and of a dusky colour. The rest of the hand retained its natural temperature, and the arteries at the wrist beat as forcibly as on the opposite side. She had been keeping a public house in Cambridge for three months, and during all that time had been out of health, subject to frequent numbness of both hands, particularly of the right, and had been much employed in washing out the drinking glasses with cold water. Two weeks before I saw her she had been seized with an attack of giddiness and numbness felt all over her. This had been relieved by cupping, purging, &c., but the pain in the tips of the fingers commencing at that time, had been constantly on the increase. Soon after my visit she was attacked with paralysis of the left arm and leg. An incision made into the right forefinger gave vent to some pus, but the pain was not relieved till the tips of the fingers mortified, which they gradually did, becoming dry and black. A month after I first saw her the tips of the fingers were black, shrivelled, and mummy-like, with a commencing line of separation between the dead and living parts. There was some redness of the fingers and hand, with slight burning pain and more severe itching at the roots of the fingers and the palm. The thumb, which had been less severely affected than the fingers, had nearly recovered its natural condition without any mortification. The dead parts sloughed off in the course of time and the stumps healed.

I will relate to you another case which happened close to this hospital, where the mortification, also occurring in the upper extremity, was much more severe, and equally doubtful as to its cause. A fine healthy woman, aged 50, was apparently quite well on the 19th of December, 1846, enjoyed a good night's rest, and on the morning of the 20th observed a sensation of numbness in the right hand, with some stiffness in the fingers, and soreness of the end of the thumb. During that day and the following night the part became painful. On the 21st the affection was thought to be of rheumatic nature by her medical attendant, who prescribed warm fomentations and some aperient medi-

cine. The pain increased to an intense degree, so that she resorted to various measures to allay it, such as hot salt, warm and cold water. On the 22nd a dull red spot appeared on the ulnar side of the root of the little finger, and another on the fore-part of the wrist, and there was some swelling about the wrist. Eight leeches were applied, and a grain of opium given every six hours. She could not endure poultices, but preferred cold applications, cold water giving her more relief than any other thing. On the 23rd a bulla appeared upon the red spot at the root of the little finger. On the 24th the hand, wrist, and fore-arm were swollen and hard, the hand rather cold, but the pain not so severe. I saw her for the first time on the 25th, and found her talkative and delirious, with pale anxious countenance, skin moist, pulse 120, feeble, and intermitting. The fore-arm and arm, up to the shoulder, much swollen, very hard and knotty, with a slight dusky hue on the skin. The hand and fingers were less swelled, but they were cold, livid, and devoid of feeling. The prostration quickly increased, hiccup followed, and she died on the morning of the 26th. On examination, the swelling had extended from the upper extremity to the adjacent coverings of the thorax. The hand and wrist were gangrenous, gas being generated in them, and the tissues stained of a livid colour. Serous infiltration had taken place into the deep as well as the superficial tissues of the fore-arm and arm. There were several diffused dark patches in the muscles, looking as if they had been bruised, and interstitial suppuration had taken place in them at various parts. The subclavian, as well as the great vessels of the arm and fore-arm, showed no sign of disease, and contained fluid blood. The large nerves also appeared to be healthy. There were a few dusky vesicated spots in the skin of the fore-arm and arm.

The mortification in this case resembled much the gangrene following a severe injury; it was rapid in its progress, attended with great swelling and severe pain, and with interstitial suppuration of the limb where the mortification was not complete. Though I made careful inquiry, I could not ascertain that she had suffered the slightest injury, not even a prick or a scratch; neither could I discover any cause for this sudden and severe gangrene.

You have, doubtless, remarked the peculiarity of the pain in each of these three cases; it was very intense, forming indeed the prominent feature in the early stage of the complaint, and not ceasing till the mortification had taken place. It was increased by pressure and warm applications, and relieved only by cold water.

There are many other interesting points connected with the subject of mortification, but time will not admit of our entering further into them.

ON LONGEVITY.

By H. L. SMITH, Esq.,

*Surgeon to the Southam Eye and Ear Infirmary, and
Projector of Self-supporting Dispensaries.*

(Read before the Leamington and Warwickshire Medical and Surgical Society.)

Were I to introduce this paper on longevity by a definition of life, or an account of the functions by which it manifests itself, I should find that any such definition or general account, however brief, attempting to explain the variety of forms and degrees, under which vitality presents itself, would lead our attention too far away from those observations on which I desire to concentrate your attention, as leading to original, or hitherto, neglected views, of the important subject of the *prolongation of human life*, by demonstrating that its shortening in the beginning, was from moral causes exclusively.

We find a living principle in all organized bodies certainly, and in some bodies, the organization of which escapes the cognizance of our senses. We find it in animals and vegetables; we may perhaps even admit its existence chemically and geologically; we find it in the ovum, in the foetus, as in the adult. It varies in its circumstances as in its effects; and although it may appear to us to be derived from, in some cases, other living bodies, in others to be spontaneous or self-derived, it must in all be originated in the *ever-breathing will of the first cause*. Any attempt then, to define the living principle would be impossible, without limiting, qualifying, and excepting the explanatory circumstances belonging to it, to so great a degree, as to become tiresome, if not unintelligible. Therefore, without attempting *any definition*, we may safely affirm, that to prolong life is one of the first feelings of our nature, and for which the reasoning *prospective feeling* appears to be especially given to mankind,

It may be observed that most animals, which are born with their natural qualities far advanced towards completion, are enabled to preserve their lives instinctively; but that man, who is so much their superior, can only do so by a continual exercise of his reason, and that if mere natural ability to preserve life in his offspring, were to be the test of his wisdom, man, unaided by experience and educated skill, would rank under the lowest animals. His race would become extinct; and as this self-preserving knowledge is necessary to civilized man, there arises a greater necessity for its cultivation, in proportion as mankind become artificial, and abandon the simple and more nearly animal life of the earlier stages of civilization.

The children of the affluent, in cities where intellect and all the arts, which we chuse to call civilization and fashion, much abound, are at least twenty per cent. shorter-lived than the children of the same class in the rural districts. It appears from the report of the Board of Health, that at Manchester, the average length of life is nineteen years, and in the purely agricultural life of the same class in Rutlandshire, where there are no manufactures, the length of life is