
A manual of military surgery, [Confederate States Army], 1863

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A manual of military surgery - Chapter I: Surgical diseases

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A MANUAL OF MILITARY SURGERY.

CHAPTER I. SURGICAL DISEASES.

SHOCK—COLLAPSE.

Shock is a sudden and powerful impression produced upon the heart through the medium of the nervous system, manifesting itself in a general depression of the vital forces. This depression may be more or less profound, involving sometimes the speedy destruction of life; at other times causing only a momentary impression upon the system. Between these extremes the experience of the surgeon will afford every possible shade of difference. When death results from shock, there is no room to doubt that its mode of approach is through the heart; for post-mortem observations have revealed the fact, that that organ is, under these circumstances, constantly and largely distended with blood, and that the fatal issue is due, not to the absence of its wonted stimulus, but to paralysis of its muscular fibres, in consequence of the suspension of nervous influence.

The symptoms of *collapse* (a term employed to denote an extreme degree of shock) are substantially those of syncope, save that in the latter the loss of consciousness and sensibility is more pronounced than in the former. The patient presents a pale, shrunken and anxious face; a cold and clammy surface, and a lack-lustre eye; his respiration is accelerated, imperfect and often sighing; his pulse quick and feeble; at times, intermitting; at times, wholly wanting. The intel-

lectual faculties are occasionally obscured or aberrated, though not unfrequently the mind affords no manifestation of sympathy with the general disturbance. The stomach usually evidences its participation by nausea, vomiting and hiccough. The duration of this condition is very variable; at times, passing off promptly and entirely, leaving the patient in the possession of his accustomed health; at other times, continuing for many hours and terminating either in death or tardy recovery. When recovery awaits the patient, *re-action*, as it is termed, must sooner or later be experienced. The vital functions, hitherto depressed and almost extinguished, are re-established; the pulse resumes its volume and loses its frequency; the respiration, at first sighing and oppressed, becomes deeper and freer; the surface regains its temperature and the countenance its accustomed expression. But this re-actionary effort may and often does transcend the limits of safety, and febrile disturbance with vascular excitement succeeds; or, in lieu of this, we encounter Travers's *prostration with excitement*. This is the traumatic delirium of certain authors, differing in no respect from delirium tremens, save that the limits of cerebral disturbance are wider in the former than in the latter affection.

Causes.—The causes of shock are resolvable into two classes: those which operate primarily upon the mind, as violent mental emotions, and those which act directly upon the body, as severe and sudden, or extensive injuries. The shock consequent upon gun-shot wounds usually illustrates the operation of both, these causes acting in conjunction, and in such sort that the precise measure of each in the given result cannot be determined. As a general rule, the greater the importance of the organ injured, the greater will be the amount of constitutional commotion. And although there is no constant relation between the amount of shock and the severity of the injury, yet the presence or absence of the former affords a valuable diagnostic indication in determining the gravity of the latter. It is true, however, that this indication is not wholly reliable, for we often find that, owing to some peculiarity of constitution, a degree of shock is manifested to which the accompanying injury bears no just proportion. It should be borne in mind, too, that while hemorrhage is itself a frequent source of shock, its presence never fails to aggravate that condition, from whatsoever other source it may

arise. McLeod says that "the commotion," *i. e.*, shock, "succeeding gun-shot wounds, is greater when the lower extremities are injured than when the arms suffer, and this is more especially seen if the person be in an erect position when the injury is inflicted." It is affirmed, too, that the shock is greater when the ball strikes a muscle in action than when it impinges upon one which is relaxed.

The *prognosis* will be favorable or otherwise, according as the collapse is more or less complete. Unqualifiedly bad when the manifestations of life are wholly suppressed, it should be guardedly unfavorable when re-action is long delayed and imperfectly established. But while a long delay in this process may well awaken fears for the safety of the patient, a somewhat tardy re-action warrants a more favorable prognosis than when it quickly supervenes and is strongly developed. If the patient be advanced in years, or of feeble powers, it will be remembered that in these conditions there is a defect of vital resilience, and the prognosis will accordingly be cautiously expressed.

Treatment.—The treatment of the disorder will depend upon its violence, as well as upon its duration. When the shock is slight, the patient having been placed in a recumbent position, with the head low, the case may safely be left to the unassisted powers of nature. If re-action be long delayed, a gentle filip may be imparted to the flagging energies of the system, by means of warmth externally applied, light frictions, and even some of the milder diffusible stimulants. When symptoms of collapse appear, recourse must at once be had to active stimulants, care being taken so to temper their exhibition that re-action be not thereby unduly accelerated or exaggerated. Among the many stimulants with which the surgeon's armamentarium is supplied, there are few more acceptable to the stomach than brandy, and none as well calculated to fulfil the indications which here present themselves. There are limits, however, beyond which its use cannot be judiciously carried. A wine-glassful or two will do all that may be expected of this drug, and should the system fail to respond to its influence in such quantity, nothing will be gained by oppressing the stomach with it; for being unable to appropriate it, the organ seeks relief by the expulsion of its irritating contents. Opium is much lauded for the energy with which it combats this condition of the system,

and, given with this view, it is recommended that the dose be large, and repeated according to circumstances. But, though salutary in its operation when the affection assumes the form of syncope, its use would be manifestly injudicious when the symptoms of coma predominate.

Should vomiting occur as a symptom of shock, it may be relieved by causing the patient to swallow pellets of ice, by mustard plasters to the epigastrium, by the use of soda water or the effervescing draught.

The military surgeon is often forced to decide upon the propriety of performing a capital operation upon a person who is the subject of shock from recent injuries or wounds. Though the question is not without perplexing difficulties, and gave rise formerly to much excited controversy, it has been at length definitively settled. When the prostration is great, delay in the operation is demanded; but it is neither necessary nor judicious to wait till re-action be fully developed. Larrey, indeed, says that the shock, so far from contra-indicating primary amputation, ought to determine the surgeon thereto. McLeod affirms that "if the constitutional depression be the result of an injury, which remains as a source of irritation, then the removal of such must manifestly be a great point gained." The admissibility of chloroform in such cases is a vexed question among medical men, though the ample experience of this war strongly favors its use.

TETANUS.

Tetanus is an affection characterized by tonic or permanent spasm of the voluntary muscles. The spasm may be general or partial; and when limited to the muscles of the inferior maxilla, it is called *trismus*, or, more commonly, *locked jaw*.

Symptoms.—The prodromic or precursory symptoms of the disease, as given by Larrey and others, are pronounced by more recent observers to be neither constant nor reliable, and are therefore omitted. When, however, the attack is declared, the muscles of the lower jaw and neck are the first to signal its onset. The patient begins to complain of soreness of the throat, stiffness of the jaws, and rigidity of the neck; mastication and deglutition are not performed with their accustomed facility, the tongue is with difficulty protruded, the

voice becomes husky and indistinct, and the throat clogged with a viscid mucus, which is excreted only after repeated efforts. As the disease progresses the countenance assumes a ghastly grin, *risus sardonius*—in consequence of the contraction of the facial muscles; a severe pain is felt in the pit of the stomach, passing backwards to the spine, corresponding with the situation of the diaphragm; the breathing becomes laboured, conveying at times a sense of impending suffocation; the muscles of the trunk and extremities are involved, and the body becomes forcibly and unalterably curved backwards, forwards or laterally. When the disease has reached its acme the patient presents a most appalling spectacle. The head is thrown back, the extremities are rigidly fixed, and the body, if placed in the supine posture, rests upon the occiput and heels. The abdomen is hard, unyielding and resonant, under percussion; the bowels are obstinately confined; the urine is either wholly retained, or is expelled only in small quantity during the violence of a paroxysm; an offensive perspiration covers the skin; the saliva, which can no longer be swallowed, flows from the angles of the mouth; the countenance is haggard, the features horribly distorted, and when the spasm has reached its height, cries of anguish are extorted from the sufferer.

From the onset of the disease to its termination, no intermission of muscular rigidity is known, but on the contrary it is liable, ever and anon, to violent exacerbations, which may be determined oftentimes by a touch of the patient's body, a slight shock of his bed, a draught of cold air, or even the tones of a familiar voice.

When the disease approaches a fatal issue, a relaxation of the muscles is sometimes, though rarely observed, but it is the relaxation of exhaustion, and cannot be thought to be-token amendment.

Notwithstanding the violence of these symptoms, the intellect rarely suffers impairment, and the senses are often preternaturally acute. The pulse and respiration, save during a paroxysm, are usually tranquil, and display no sympathy with this terrible commotion of the system till the hour of dissolution approaches, when lasyngismus supervenes, and the heart's action becomes feeble and irregular.

Sleep, unless artificially procured, is wholly denied to the sufferer, who lives in the momentary dread of a paroxysm of

spasm, which sooner or later justifies his fears by terminating his existence.

In the above sketch an effort has been made to portray the features of *acute traumatic tetanus*, and the resemblance of any given case to that picture will be more or less marked as it approaches to or recedes from that variety of the disease.

The modes of death in tetanus are various, though by far the most frequent is that by asphyxia. Death begins in the lungs, and is speedily ushered in when the respiratory muscles and those of the larynx are invaded by the disease.

Occasionally death begins at the heart, and is then due to spasm of its muscular fibres, which, under such circumstances, are shown to be rigidly contracted. But the fatal termination is sometimes delayed till exhaustion or inanition puts a period alike to the life and sufferings of the patient.

Causes.—The causes of tetanus are of a two-fold character; they are remote or predisposing, and proximate or exciting. Among the former are usually classed age, constitution, sex, climate and race, though no time of life, habit of body, country, tribe or sex is exempt from its inroads.

Of *traumatic tetanus* the exciting causes are wounds of all kinds, contusions, luxations, burns, frost-bite, surgical operations, and indeed every conceivable form of physical lesion.

The idiopathic variety is supposed to depend upon exposure to cold and damp, intestinal irritation, intense mental excitement, or the suppression of certain natural secretions or adventitious drains.

The proportion of cases of tetanus among the wounded is computed by Alcock to be one in every seventy-nine, though we have the authority of more recent writers for saying that the number falls very far short of that estimate. Out of 7,740 wounded in the English army in the Eastern Campaign, but 23 cases of the disease are reported to have occurred; while the hospitals of Italy afforded only 80 cases during the campaign of 1859. (Legouest.) The experience of the war in which we are now engaged amply corroborates this conclusion, and proves that in this climate, at least, the complication is rare.

The situation and character of the wound doubtless exert a decided influence in determining the development of tetanus, for observation teaches that it results most frequently from punctured or lacerated wounds, especially of parts covered

with dense structures and liberally supplied with nerves; of such are the feet and hands.

Post-mortem researches have failed to demonstrate any special anatomical lesion peculiar to this affection, and hence its pathology is involved in obscurity. There is reason, however, to believe that it consists essentially of peripheral irritation transmitted through the spinal cord to the muscular system.

Diagnosis.—When tetanus is fully developed, its character is too clearly defined to admit of its being confounded with any other disease, though in its onset it has been mistaken for post pharyngeal abscess and rheumatism of the cervical muscles, and later in its progress for hydrophobia and spinal meningitis, from which, however, it is readily distinguishable.

If the distinction drawn between tetanus and *traumatic spasm* be recognized, the differential diagnosis may be arrived at thus: The latter is characterized at its onset by sudden and painful spasms in the wounded part itself, by localized contractions appearing under the form of paroxysms, repeating and prolonging themselves more and more, and passing speedily from their first seats to the neighboring parts, and finally, to all the voluntary muscles. (Legouest.) Tetanus, on the other hand, makes its appearance first in the muscles of the neck and jaw, without regard to the situation of the wound; it knows no intermission of its spasm, and is not relieved by amputation of the limb which we are informed is the proper remedy for traumatic spasm.

The average *duration* of acute traumatic tetanus is three days, though death may result from it in four or five hours, or be delayed for twenty or thirty days.*

Prognosis.—In forming an opinion as to the probable result of a case of tetanus, it will be necessary to consider the variety as well as the violence of the disease. In the acute traumatic form, a speedily fatal termination may certainly be prognosticated, and so general is the assent of the profession to this conclusion, that the citation of authorities to establish it is deemed unnecessary.

When the disease is idiopathic in its origin, or exceeds twelve

* The apocryphal case of death in fifteen minutes, reported in Rees's Encyclopædia, is purposely omitted.

days in duration; when the muscles of respiration and the larynx are not involved in the spasm; when it is intermittent in type, and the heart's action undisturbed, strong hopes of recovery may be entertained.

Treatment.—To enumerate the means used for the relief of tetanus would require a volume, to record those entitled to confidence does not demand a line. So varied and often conflicting are the remedies used—each one, too, claiming its measure of successes—that to the mind of the impartial observer there must arise a doubt whether any line of practice is capable of influencing materially the progress or termination of this affection. Under treatment, the most opposite, it will often be seen that acute cases die, and the sub-acute and chronic cases recover. Nevertheless, experience has pronounced a qualified judgment in favor of certain measures, which therefore, until superceded by more efficacious ones, are entitled to consideration. These are both local and general. The former consists in a careful exploration of the wound, the removal of foreign bodies from it, and the use of mild and unirritating dressings.

The constitutional resources, after judicious purgation has been premised, are comprised in a supporting diet, and the free exhibition of opium, with some of the more potent sudorifics. As extreme exhaustion has been shown to be one of the sources of danger to the patient, the tendency to death in that direction has been sought to be obviated by the most nutritious and bracing food, administered by the mouth, through a tube introduced by the nostril into the stomach, or by enema, as the circumstances or necessities of the case may dictate. Brandy and opium are called for to mitigate pain and relieve spasm, and to this end should be administered in large and repeated doses.

Amputation of the limb, section of the nerves communicating with the wounded part, cauterization, vesication and free incisions (save for the extraction of foreign matter) have fallen into merited disuse. Chloroform, employed locally, internally and by inhalation, haschisch, woorara, quinia, lobelia, tobacco, mercury, iodide of potassium, alcoholic stimulants pushed to ebriety, tonics, anti-spasmodics, purgatives and anodynes, electricity and galvanism, have each in turn disappointed the hopes of the surgeon. So that, after a careful review of the treatment recommended, we are not surprised to hear the

practitioner of our own day proclaim with John Hunter "for tetanus I know of no internal medicine."

ERYSIPELAS.

Erysipelas has been defined to be a diffused inflammation of the skin, or skin and cellular tissue, with a tendency to spread. (Druitt.) If this definition be accepted, it is with the qualification that the affection is not necessarily limited to the cutaneous or sub-cutaneous structures, but is liable with these to involve most of the tissues of the body, but especially the mucous and serous.

The subject has been variously divided, according to the views or caprices of successive writers; but that division by which the demands of convenience, as well as practical utility, are most fully met is in *idiopathic*—the effect of extraneous causes; or general influences acting upon the economy from without—and *traumatic*—when the result of wounds, injuries or local irritation. These forms are subdivided into *simple* or *cutaneous*, *phlegmonous* or *cellulotaneous*, and *cellular*.

Simple erysipelas may make its advent without any precursory symptoms, though its approach is usually announced by anorexia, lassitude, pain in the head and back, and rigors more or less pronounced. The skin, in strongly-marked cases, speedily acquires an elevated temperature, and becomes dry; the tongue is broad, indented with the teeth, furred and flabby; and the pulse is accelerated, but usually soft and compressible.

When these premonitory symptoms, which are sometimes so slight as wholly to escape observation, have continued for an indefinite period of from three or four hours to as many days, the *local symptoms* manifest themselves. The skin of the affected parts presents a sharply-defined, bright, almost scarlet redness, which, though readily disappearing under the pressure of the finger, as promptly returns. The swelling is inconsiderable, but may be detected by passing the hand lightly from the unaffected to the affected surface. Pain, though not invariably present, is rarely escaped, and is of a smarting, burning or stinging character, never pulsatile. Minute vesicles sometimes appear upon the inflamed surface, filled with transparent serum.

The disease early manifests a tendency to spread by invading the contiguous surfaces, and this tendency may be shown in one particular direction or in all directions at the same time. When different portions of the body are successively attacked, the term *erratic erysipelas* has been employed to denote it.

Phlegmonous erysipelas is ushered in by the same precursory symptoms which have been shown to precede the milder variety of the disease, though their intensity is not in a direct and constant ratio with the violence of the attack. This form of the disease is much more dreaded by the surgeon than cutaneous erysipelas, and justly so, for here we find not only the skin involved but the subjacent structures also, and the constitutional disturbance correspondingly greater. The pulse is quick, though compressible, and may become irregular or intermitting; the skin, hot and dry at first, conveying to the hand a sensation of pungent heat, declines in temperature as the disease advances, and is, at times, moist and clammy; the tongue is dry, brown and fissured, the bowels confined, and the urine scanty, high-colored and acid, containing an excess of urea, and is sometimes albuminous. The affected part is swollen from effusion of serous fluid into the cellular tissue, is soft and admits of pitting; the redness is deeper than in simple erysipelas and does not disappear entirely on pressure, and the pain is more acute and deep-seated. Soon, however, the swelling is greatly increased, and if seated in a limb, its size speedily rivals that of the trunk, it no longer pits, but is tense, hard and unyielding, and presents a dusky red or purplish hue. About the sixth or eighth day large vesicles or bullae stud the surface, and giving way, cover it with scabs or moist incrustations. In debilitated subjects, in whom the powers of life have been enfeebled by previous disease, the vesicles sometimes lose their transparency and assume a dark, purple color in consequence of the escape into them of the coloring matter of the blood. This is an untoward indication and augers badly for the patient in whom it evidences a vitiation of the circulating fluid. If, at this stage of the disease, resolution is not reached, diffuse suppuration with sloughing of the cellular tissue results. The parts become pale, soft, quaggy and doughy, though distinct fluctuation cannot be detected for the reason that the pus is not contained in a sac or limited by the deposit of plastic material. This pulpy, in-

elastic and doughy condition is a certain indication that suppuration is going on in the diseased tissues.

When erysipelas attacks a wound or ulcerated surface its condition and actions undergo marked changes; its lips or edges become puffed and swollen, discharging a thin, sanious matter; if previously suppurating it ceases to do so, and the granulations, pale and lifeless, soon disappear. If pain had existed in the wound it now becomes greatly aggravated, and is tense, throbbing and burning.

Causes.—Erysipelas is essentially a constitutional disease—a local manifestation of a poisoned condition of the blood, and acknowledges, in its production, the operation of two distinct classes of causes, the *predisposing* and the *exciting*.

A predisposition to the disease is engendered by certain atmospheric conditions, exposure to wet and cold, intemperance, bad diet, chronic affections of the liver and kidneys, and above all, to what Dr Gregory terms *ochlesis*, or the poison emanating from the bodies of the sick in closely crowded apartments

The exciting causes are wounds or injuries of any description, in any portion of the body, but especially those of the scalp, and gun-shot, lacerated, contused, punctured and poisoned wounds of the extremities—infection and contagion.

“The *modus operandi* of certain of these causes cannot be doubted, they are *zymotic*; that is, they act like ferments on the blood, and communicate to it a disposition to undergo the same changes in composition which they are themselves undergoing. The blood so poisoned deposits in the affected parts of the body an unhealthy plasma, which causes wide-spreading irritation and exudation.”

The disease is liable to epidemic prevalence, and it is then that it is exceedingly prone to assume its most intractable and fatal form, though we not unfrequently see the different varieties of the disease co-existing epidemically in the same community. When an epidemic tendency of the atmosphere exists, the most trivial injury or the smallest abrasion is sufficient to light up the disease, and hence no surgeon would, at such time, attempt any operation which the most imperious necessity did not demand.

Terminations.—Cutaneous erysipelas may run its course in from five to seven days, and terminate in resolution with desquamation of the cuticle, but where phlyctæna exist, the cure

is delayed in consequence of the superficial ulcerations to which they give rise.

Instead of running its course with regularity, and terminating in the time and manner prescribed, it sometimes assumes the *erratic* form, and, advancing gradually from site to site, declining at one point as it progresses at another, the entire cutaneous surface may, sooner or later, become involved in the disease. When it takes on this ambulant or wandering form, its duration is indefinitely prolonged, and its course should be regarded with suspicion, for though it is of the cutaneous variety, and never ends in suppuration, and rarely in vesication, its subjects are those of feeble constitution, and, for the most part, the victims of chronic organic disease. But the progress and termination of the affection may be modified by a metastatic tendency—a disposition to sudden recession of the inflammation at one point, with an equally sudden developement of it at another and, it may be, remote point, or to its translation from the external surface to the internal organs.

In phlegmonous erysipelas, when the inflammation does not yield to treatment by the sixth or eighth day, sloughing and suppuration of the sub-cutaneous, and also the inter-muscular areolar tissue, take place. Cellular tissue, thus destroyed, is not re-produced, and the skin in such cases contracts adhesions with the aponeuroses or muscles, or it may even be with the bone itself, by means of an adventitious, or, as Delpech terms it, *inodular* tissue, whence result deformity and the abolition of the functions of the part.

Even where suppuration, with extensive loss of substance, is not experienced, the intensity of the morbid action may be such, that the softness and mobility of the skin are for a long period impaired or permanently destroyed, and the cellular tissue is converted, by effusion of plastic lymph, into a brawny and inelastic mass. It sometimes happens that the disease runs on to the destruction of both the skin and cellular tissue of an entire limb, and in such cases, if recovery take place, loss of function is inevitable.

Death by *coma* may terminate the disease in consequence of its extension to the brain or its meninges. Or the mucous membrane of the pharynx and larynx becoming involved, serious effusion may take place into the sub-mucous tissue, and death by *apnoea* result from œdema of the glottis. Death

sometimes begins at the heart, especially when the attack is prolonged and the patient imperfectly nourished and much debilitated by previous disease. The *prognosis* of erysipelas must depend upon a variety of circumstances, as the age, habits, constitution and surroundings of the patient, the condition of the atmosphere, and the seat of the disease, as well as upon the form which it assumes.

Where the malady affects only the skin, and does not involve the integument of the head or face—where the inflammation is not of the erratic form, and the patient is young, vigorous and temperate—a favorable opinion may be unreservedly expressed; but should the disease prove phlegmonous or œdematous in character—should the head and face become implicated, especially in an old and feeble subject—should it attack the throat or brain, or should the accompanying fever prove to be of a typhoid type—the prognosis should be guardedly pronounced.

Preventive treatment.—Since the agency of impure air, unwholesome food, intemperance, crowded hospitals, contagion and infection, is recognized in the production of erysipelas, it behooves the military surgeon, to whom is entrusted the preservation of the health of the soldier, to look well to the character of the locality chosen for his camp or hospital, to take care that it be not low, damp, or malarious; that the tents be so pitched, with reference to each other, as to admit of a free circulation of air between them; that the hospitals be freely ventilated; that they be not crowded with inmates—an area of not less than 1500 cubic feet being allotted to each—that their walls be frequently whitewashed, and their floors dry-scrubbed. A frequent use of the warm bath, by promoting a healthy action of the skin, will greatly diminish the tendency to this disease. Should it make its appearance, those affected by it should at once be isolated either in tents or small rooms. The practice of establishing large wards for erysipelas, though doubtless convenient, is nevertheless reprehensible, as tending to increase its violence, by intensifying the conditions favorable to its development and spread.

In describing the treatment of erysipelas, it will be convenient to consider, first, those measures which are adapted to the relief of its milder or cutaneous variety, calling attention to the constitutional, and afterwards to the local remedies. Venesection, though formerly much in vogue in the treat-

ment of this affection, is now no longer countenanced. Emetics are of far less doubtful utility, but may, unless the stomach be oppressed with ingesta or vitiated secretions, be advantageously superceded by purgatives. Constipation, which has been shown to be one of the symptoms of the disease in all its varieties, must be met by the timely use of cathartics, and for this purpose eight or ten grains of calomel, with as many of rhubarb or jalap, should be given and repeated daily, so long as the alvine evacuations are dark-colored, liquid, and offensive. But even here the military surgeon should bear in mind the exceeding proneness to ulceration of the intestines which exists among soldiers in the field, and exercise a wise discretion in the use of this class of remedies. Refrigerants, as acetate of ammonia, or the effervescing mixture, are grateful to the patient, and may be employed to advantage, if there be much febrile disturbance. Tincture of the sesqui-chloride of iron has acquired almost the reputation of a specific in the treatment of erysipelas in all its forms, and may be given in quantities of from two to eight, or ten drachms in the twenty-four hours. In that form of the disease now under consideration, it will suffice to give twenty or thirty drops in a wine-glassful of water every four hours. When the condition of the patient demands tonics—and it is rare that it does not—two grains of quinine may be advantageously combined with each dose of the foregoing preparation. The diet of the patient should be nourishing and supporting, without being stimulating. If the patient has accustomed himself to the daily use of ardent spirits, they should not now be wholly interdicted, lest the vital powers, already depressed by the disease, be still farther reduced through the defect of their accustomed stimulus. Opium may be given, especially at night, to allay restlessness and promote sleep, provided there be no head symptoms present.

The *local remedies* for cutaneous erysipelas are, for the most part, mild and unirritating in their action. They consist in warm fomentations with decoction of poppy heads, enveloping the inflamed surface with carded cotton, or dredging it with flour. Advantage sometimes results from painting the diseased parts twice daily with the tincture of iodine, diluted with an equal quantity of alcohol; the application should encroach somewhat upon the sound skin. The sulphate of iron has enjoyed, since its introduction to the notice of the

profession by Velpeau, a wide reputation as a local remedy in erysipelas. For this purpose a solution containing an ounce of the salt to a pint of water is applied to the inflamed surface by means of compresses moistened with it. The efficacy of blisters in cutting short this morbid action is much insisted upon by certain writers—but experience would restrict their use to the erratic form of the disease, in which they sometimes exert a promptly beneficial effect. The nitrate of silver is frequently applied to the skin of the affected part, either by pencilling it with a strong solution, or by bringing the solid caustic, previously moistened, in contact with every portion of it. This is a measure of dubious propriety, for the blackening which results from the application of this substance, and the consequent concealment of the surface from further observation, is scarcely atoned for by the amount of benefit resulting from it.

A less doubtful use of the nitrate of silver is its employment in limiting the spread of the disease by belting the affected part with a saturated solution of the salt, or with the solid caustic. To render this effectual, the caustic should be applied upon the sound skin in such manner as completely to circumscribe the diseased portion. Collodion, creasote, acetate of lead, tincture of iron, sulphate of copper, mercurial ointment, are a few of the many topical remedies advised, and convenience or necessity may sometimes dictate a recourse to one or other of them. In cutaneous erysipelas incisions are not called for, though, when the swelling, pain and redness are great, benefit will inure to the patient from numerous minute punctures, as recommended by Dobson—from one-fourth to one-fifth of an inch in depth, made with the point of a lancet or bistouri, as by this means the overloaded capillaries are relieved, and the tension thereby greatly diminished. Compression, by means of the roller bandage, though recommended by Velpeau, and practised by some surgeons, can only be used to advantage when the inflammation begins to decline, and the parts are left in an unhealthy and swollen condition.

The influence of position in combatting inflammatory action is nowhere more clearly demonstrated than in the treatment of erysipelas. Throughout the entire progress of the case, the affected limb should be elevated and maintained perfectly at rest.

The constitutional treatment of phlegmonous erysipelas must be determined and regulated by the stage of the disease, or rather by its attendant symptoms. At its onset, when for a brief period, as has been stated, the fever is of the sthenic type, purgatives, with saline diaphoretics are indicated. When typhoid symptoms appear—and their approach is always announced by an increased frequency and loss of force in the pulse, as well as by dryness and brownness of the tongue—the patient's strength should be sustained by the most nutritious food, conjoined with alcoholic stimulants, carbonate of ammonia and quinine. Beef essence, milk punch or toddy, wine whey, or the egg and brandy mixture of the British Pharmacopœia, should be administered *ad libitum*. Should nausea or vomiting supervene, it may often be relieved by brandy and soda water, the effervescing mixture, or a pill of crude opium, with or without a minute portion of calomel.

In phlegmonous erysipelas, however, as in the simple variety, much reliance is placed upon the muriated tincture of iron, in doses of from thirty to sixty drops, repeated at intervals of one, two or three hours, according to the violence of the inflammation.* This drug has been pushed to the extent of two ounces in the twenty-four hours, in cases threatening a speedily fatal termination, with good results. To attain the beneficial effects of this preparation, it will be necessary that the alimentary canal be previously evacuated, and its secretions altered and improved. To the neglect of this precaution is doubtless due the disappointment which some practitioners have experienced in its employment. Quinine may conveniently, as well as advantageously, be combined with the iron in such manner that each dose of the latter shall contain a proportion of the former.

The local remedies for cellululo-cutaneous erysipelas are substantially those recommended for the milder affection, save that in the former greater promptness is necessary in their adoption, and greater energy in their application. Incisions, after the manner of Dr. Hutchison, made through the diseased structures, are most salutary in their effects, and cannot, at certain stages of the inflammation, be dispensed with. A

* When the iron, given in these doses, irritates the bowels, causing catharsis, the dose should be lessened or the medicine pretermitted.

timely recourse to this expedient may not only contribute largely to the recovery of the patient, but may suffice to cut short the disease, and wards off the fearful consequences of diffuse suppuration and sloughing. These incisions to be effectual should be made "through the cellular tissue, down to the deep-seated fascia, which should not be divided in the first instance." (Guthrie.)

When the parts are hard, tense and brawny, and the skin deeply congested or purple, much good may be anticipated from this measure as affording an outlet to the infiltrated fluids which, by their pressure upon the vessels, threaten strangulation and gangrene of the part. Guthrie says "as soon as the inflamed part communicates the springy, fluctuating sensation approaching, but not yet arrived at the quagmire feel alluded to, an incision should be made into it, when the areolar or cells of the cellular tissue will be seen of a bright, leaden color and of a gelatinous appearance, arising from the fluid secreted into them, being now nearly in the act of being converted into pus."

At a still later period, when the parts have become boggy, soft and semifluctuating, incisions are indispensable to give exit to the pent up pus and sloughing cellular tissue. The resulting hemorrhage should be controlled by the pressure of the fingers, or a compress applied to the wounds and the elevation of the part, after which it should be fomented or enveloped in cloths wrung out of a warm decoction of poppies or chamomile flowers. So great is the importance of the period at which the incisions should be made, that the following rule upon that subject has been given by a recent author: "In the early stages of phlegmonous erysipelas, in the course of the first two or three days, attempts may be made to arrest the course of the inflammation by the means which are found most effective in the simple forms. Should these not be found of any avail in checking it, incisions should be at once resorted to freely and decisively; and they should be resorted to afterwards whenever it may be found that pus is lodged, or that the cellular tissue has been destroyed in parts removed from the neighborhood of those previously made." The incisions should be made in the direction of the longitudinal axis of the limb, to avoid doing injury to the muscles, nerves and arteries; they should not be more than two inches in length, nor should the spaces between them exceed three.

The objections to the long incisions recommended and practiced by Lawrence are, that the hemorrhage is excessive, having, in some instances, proved fatal, and in others, rendering necessary the ligation of the main artery of the limb; that the shock attending their infliction is very considerable, and is badly borne by those among whom the disease is most frequently encountered; and that the swelling and tension of the inflamed parts are not more effectually relieved by them, than by well-planned short incision. South recommends that they be made diamond shape, thus:



and maintains that by this means more relief is afforded than by incisions, which involve even the entire length of the limb. If suppuration has already commenced, the discharge will be very copious for some days, during which much care and frequent dressings will be necessary. When shreds of disorganized tissue or gangrenous masses are seen, they should, if possible, be removed, since their presence is a source of irritation, and their extrusion, if left to nature, must be long delayed. The subsequent treatment consists in the application to the parts, of moistened lint or linen, which should be retained in position by means of a roller bandage, so applied as to exert a very gentle pressure, and afford an equable support. Should the process of separation be sluggish, and local stimulation become necessary, the lint may be saturated with the "red wash," than which there is nothing better for this purpose. The formula for its preparation is as follows:

Take of Sulphate of zinc, grs. xvi.
 Compound spirits of lavender, ℥ij.
 Spirits of rosemary, ℥ij.
 Water, ℥viiij.

The application may, however, be varied to meet the necessities of the case, or the fancy of the surgeon. Convalescence is usually slow, and recovery is often for a long period very

partial. Pending such a result, a generous diet, with wine, iron and some of the vegetable tonics should be prescribed. Gentle exercise in the open air, as soon as the strength of the patient admits of it, will contribute much towards his restoration to health.

Cellular erysipelas, or, as it is more frequently called, *cellulitis*, or *diffuse inflammation of the cellular tissue*, is, for the most part, traumatic in its origin, though predicated upon a depraved state of the blood, as shown by the typhoid character of its symptoms. Its local manifestations are somewhat peculiar, and serve to distinguish it from cellulocutaneous erysipelas, with which it is nearly identified in its origin, development, terminations and treatment. The skin, not being implicated in the disease, save as a consequence of the destruction of the subjacent tissues, suffers no change of color, beyond, at times, a slight erythematous blush; the swelling is great, though undefined; and the limb is tense, shining, brawny and painful, but very presently becomes soft, and crepitating. The progress of the disease is rapid, and sometimes ends in the destruction of the patient, even before suppuration is established, the vital forces being overwhelmed by the accumulated poison of the blood. Where such an event does not take place, the case may not the less surely, though more tardily, terminate in death, in consequence of the extensive sloughing and profuse suppuration to which it gives rise.

When cellular erysipelas makes its appearance in a wound—it matters not how otherwise trivial—it becomes at once invested with the gravest import, and should awaken apprehensions the most serious; for, though the disease may terminate in resolution, such an issue is exceedingly rare, and should not be reckoned upon.

Its treatment differs from that of phlegmonous erysipelas only in respect to the date of the incisions, which, in the cellular variety, should be made so soon as the character of the disease is declared, without waiting for those local signs that elsewhere determine to their use.

It is not thought necessary to consider separately the special forms of erysipelas given by most authors, as that of the orbit, the head, the scrotum, &c., for the reason that they are all of them—with perhaps some slight modifications—amenable to the rules already laid down.

PYÆMIA.

The terms pyæmia, pyohæmia, purulent infection, purulent resorption, purulent diathesis, purulent phlebitis, and purulent fever, have all been employed, according to the views of each individual writer, to designate the same disease, or some of its modifications, and are only valuable as setting forth in a word the different opinions which are entertained of its nature. They all imply a vitiation of the blood by the admixture with it of pus.

Without an unqualified endorsement of the pathology involved in the foregoing denominations, the term pyæmia is here employed to signify that systematic poisoning which results from the introduction of septic matters into the circulation, and is characterized by a tendency to purulent deposits in one or more of the organs or tissues of the body.

Though it does not comport with the limits or design of this work to enter upon the interesting and still unsettled etiological questions involved in this subject, yet it cannot be omitted to state, that recent observations have failed to detect, with certainty, the presence of pus in the blood; that the secondary manifestations of the disease are sometimes wholly independent of primary local suppuration; and, lastly, that the abscesses which are developed at various portions of the frame are not at first purulent in their character.

These conclusions, if corroborated by further investigation, must overthrow the recently received views on the subject of pyæmia. And it remains to be seen how far the newly ventilated theory that the secondary deposits or collections of pus are due to mechanical obstruction, caused by the entanglement in the lesser veins of the debris of disintegrated clots or detached portions of fibrin, will be sustained when submitted to the same test.

Cause.—The causes of pyæmia are both predisposing and exciting. Among the former are reckoned habits of life, temperament, physical condition of the patient, and epidemic constitution of the atmosphere. Those of temperate habits, equable temper and vigorous constitution are rarely the subjects of this disease, whilst the feeble, desponding and dissipated are especially liable to its attacks, if long confined within the crowded wards of an hospital.

The life of the soldier—its hardships, privations and exposures, its sudden alternations of excitement and despondency—is well calculated to engender that condition of the fluids of the system which predisposes to pyæmia.

The exciting causes are wounds or injuries of any portion of the frame, but especially of the veins and bones.

We find it supervening upon surgical operations, both great and small, resections, amputations and disarticulations, though the subjects of surgical operations are more liable to its attacks than those who have sustained gun-shot wounds.

Symptoms.—The symptoms of pyæmia are local and general, though the local symptoms are not of great significance. If the wound is suppurating at the time of the attack, it no longer does so, but becomes dry, and the adjacent surface assumes a livid or dusky aspect. These symptoms are not constant, for the disease frequently declares itself without any local threat of the coming trouble. A sign to which Legouest (*Chirurgie d' Armee*,) attaches importance, is pain along the course of the veins, which, he says, however, is frequently wanting.

The general symptoms, when the disease assumes the acute form, are ushered in by severe rigors or shiverings which may last an hour or even more. The hot stage, with acceleration of pulse, then supervenes, but is of brief duration, and is speedily followed by copious, exhausting and long continued sweats. A period of tranquility succeeds, during which the patient expresses himself as greatly better, and is sustained in that belief by his attendants, who, unless familiar with the treacherous character of this malady, are apt to consider these phenomena as the paroxysm of an intermittent fever. But, ere long another chill is experienced, and is speedily followed by another and another, each it may be more intense and protracted than its predecessor, and separated from each other by short and irregular intervals. The pulse becomes quick, small, thready; the respiration short and hurried, attended with dry cough; the physiognomy altered; the skin clammy and often jaundiced; the tongue dry and furred; the teeth and lips not unfrequently covered with sordes. The patient now begins to experience pain, sometimes in the chest, sometimes in the right hypochondrium, and sometimes, it may be, in the vicinity of the larger joints. These pains point to the formation of the so-called metastatic abscesses, which are liable to be de-

veloped in various portions of the system. Abscesses, however, may and often do occur without such premonition, and even attain a large size before their presence is suspected.

Concurrently with the formation of these purulent collections, there is more or less hebetude manifested by tendency to sleep, though such sleep is neither refreshing nor profound, but is attended with a constant muttering. When roused, however, the patient evinces no impairment of intellect. If, now, the stethoscope be applied to the chest, crepitation is distinctly heard over the greater portion of its parietes, whilst percussion affords a corresponding diminution of resonance.

Death by asthenia usually closes the scene in from five to ten days, though when the disease is slowly developed, it may last for fifteen or even twenty days. Occasionally, this fearful malady runs its course with yet greater celerity. "Within twenty-four hours in *acute* cases there are rigors, vertigo and general uneasiness. Then follow heat, perspiration and increased rapidity of pulse. The seat of inoculation is dusky, indurated, often pustular, or, if it had been before secreting pus, the discharge ceases. Radiating from this centre, the integument is distended with a serous effusion, presently to be mingled with thin sanious pus. The swelling, generally somewhat elastic, is hard and tense over enlarging and painful glands. The blood, deranging the heart's action, is circulated violently and rapidly through the system; exuding from its vessels, as in purpura, it stains the surrounding tissues, forms ecchymoses in internal organs, or is poured out upon mucous surfaces, and is then chiefly removed with purging or vomiting. In another twenty-four hours, the patient—flushed, anxious, restless, even delirious, is in a hopeless condition, with prostration and rapid sinking." (See Callender, Art. Pyæm: Holmes' System. Surgery.) When the disease thus rapidly runs its course there is an entire suppression of local symptoms, and it then assumes the character of typhoid fever, and might, with propriety, be called pyogenic fever.

Prognosis.—When it is known that pyæmia is the cause of death in 43 per cent. of all fatal primary amputations, and in 25 per cent. of all fatal secondary amputations; when it is shown that 10 per cent. of all amputations terminate in death from the same cause, (Bryant,) the fatal character of this terrible scourge will be vindicated. Lalleon tells us that of

539 amputations performed by him at Constantinople, he lost nearly one-fourth from pyæmia; and of those performed in the continuity of bone, his loss was one in two and a half. In the hospitals of Brescia, in Italy, 1839, the mortality from this source, after amputation, was 52 per cent.; at Milan something over 27 per cent.

There is little room to doubt, when the symptoms of systemic poisoning are accompanied by its secondary manifestations in the form of purulent abscesses, that the disease must terminate fatally. Now and then an instance of recovery is recorded, but this is so rare in comparison with the whole number of cases, as to leave no rational ground of hope for such a result. When the symptoms are tardy of development, and the constitution of the patient is not seriously impaired; when the purulent collections are limited to the cellular planes, and do not involve the viscera or their cavities, experience teaches that judicious treatment may sometimes, though rarely, effect a cure.

To arrest the ravages of this terribly fatal disease, we may readily conceive has taxed the ablest talent of the profession, and the amplest resources of the materia medica. No means, whether prophylactic or curative, general or local, which afforded a prospect of benefit, have been overlooked, and yet its mortality is fearfully great, fully justifying the language of a recent writer, (Holmes' Syst. Surgery,) when he states that "practical surgeons acknowledge that very little chance remains for the patient who, after an operation, (or gun shot wound?) is attacked with the symptoms of this disease."

The treatment employed is both preventive and curative. Under the head of the former we find measures, some of which are simply valueless, whilst others are positively mischievous. Thus, we find one surgeon (Teissier) recommends the internal use of aconite; another, sub-cutaneous amputations; another, the use of the actual cautery instead of the knife, in amputations; and yet others—among whom is Legouest—warn us of the danger of seeking union by the first intention! Of these measures the aconite treatment is certainly the least injurious, though the propriety of its daily administration to all the wounded of an hospital, may well be questioned, when it is known that the experience of the profession is adverse to its efficacy.

Something, however, may be effected in the way of preven-

tion, and to such means every attention should be paid. These consist in observing scrupulous cleanliness about the person and apartment of the patient. The room should be freely ventilated, and the wound carefully washed and dressed as often as its condition requires; and in doing this, avoid the use of sponges, as the most prolific source of contagion known to the hospital surgeon. All depressing causes, both mental and physical, should, as far as possible, be removed. Patients should not be crowded together, for experience teaches that they fare better in tents, or even in the open air, than when immersed in the poisoned atmosphere of a crowded hospital.

When the disease has once made its appearance, recourse is had to local, as well as general treatment. As local remedies, we are advised to employ blisters, escharotics—as nitrate of silver, chloride of zinc, per-chloride of iron, the mineral acids, and the actual cautery. The weight of authority is here in favor of the liquor of the per-chloride of iron, diluted or not, according to the degree of effect which it is sought to produce. The liquid should be brought, and retained, in contact with the entire surface of the wound, reaching into its sinuses and depressions, by means of masses of charpie, or lint previously saturated with it. Unless the condition of the wound is particularly unfavorable, manifesting a tendency to diffuse cellulitis, one such dressing suffices for twenty-four hours.

When evidences of amendment appear, the fluid may be further diluted, until its use is superseded by simple dressings. To condemn amputation as a remedy for pyæmia, though recommended and even practiced by some surgeons, it is only necessary to mention it.

The constitutional measures are such as look to the support of the patient's strength, and the improvement of his general condition. It is almost needless to say that depressing remedies of every kind are inadmissible, and that so far from bleeding, purging and vomiting a patient in whom the vital powers are enfeebled by a subtle blood-poison, we should seek to sustain his strength till nature resumes her sway and establishes re-action. To carry out the indications, milk toddy, wine, beef tea, and quinine, are especially worthy of reliance. The salt may be given to the extent of fifteen or twenty grains daily, with or without some of the preparations of iron. Opium may often be employed to advantage, when pain and restlessness

are experienced. And with this view the nightly exhibition of Dover's powder has been strongly recommended.

When secondary abscesses present themselves, they should be freely opened, and subsequently treated on general principles.

HOSPITAL GANGRENE.

This affection, under the names *Sloughing Phagedæna*, *Pulpy Gangrene*, *Phagedæna Gangrenosa*, *Putrid Degeneration*, *Pourriture d'Hopital*, *Humid Gangrene*, *Diphtherite of Wounds*, and *Traumatic Typhus*, has long been known to the profession, and especially to the military surgeon. Though sporadic cases are now and then met with by the general practitioner, its peculiar *habitat*, as its name implies, is the hospital, in which it formerly prevailed to such an extent as to lead its early historian, Pouteau, seriously to inquire, "Are hospitals, then, more pernicious than useful to humanity?" With the modern improvements in sanitary regulations, however, it has nearly disappeared from civil practice, and confines its ravages, in a great measure, to the wounded inmates of the over-crowded, illy-ventilated, and often filthy, extemporaneous hospitals of the military surgeon. So well recognized is the effect of "over-crowding" in causing this fatal disease, that from its earliest notices, through successive generations of writers, especial stress is laid upon it by each; and Legouest, writing in April of the present year, says, after reviewing the supposed agency of various other causes, "But the veritable cause of hospital gangrene appears pre-eminently to reside in over-crowding. It oscillates and vibrates, in short, with the movements of the sick; declining and disappearing when their number diminishes; returning and increasing in virulence when it is augmented." If to this cause be added the operation of contagion and infection, the predisposing influence of all depressing agencies, both moral and physical, together, possibly, with certain atmospheric conditions, or epidemic tendencies, all that is at present known of the origin of this disease will have been said.

Symptoms.—In describing the characteristics of the milder form of hospital gangrene McLeod says, "the earliest symptom was pain in the part, which sometimes preceded the ulcerative process by a couple of days. The edges of the

wound did not swell up, but remained thin, as they were undermined. The pain generally continued during the process of destruction. It appeared chiefly in the lower extremities, and in wounds whose progress towards cure had been for some time stationary. It seldom burrowed far into the intermuscular tissue, but confined its ravages to the surface and the circumference of the wound." This is the usual mode in which the disease presents itself when it occurs in isolated cases, and under favorable circumstances of hygiene. But when the predisposing and exciting causes conspire to give it intensity, its progress towards destruction is fearfully rapid. The same author says of the disease in this more malignant form, "The cases of all of those who died in my wards seemed to be doing perfectly well up to sixteen hours, at the farthest, before death. During the night previous to death, the patient was restless, but did not complain of any particular uneasiness. At the morning visit, the expression seemed unaccountably anxious, and the pulse was slightly raised. The skin was moist, and the tongue clean. By this time the stump felt, as the patient expressed it, heavy like lead, and a burning, stinging pain had begun to shoot through it. On removing the dressings, the stump was found slightly swollen and hard, and the discharge had become thin, gletty, colored with blood, and having masses of matter, like gruel, occasionally mixed with it. A few hours afterwards, the limb would be greatly swollen, the skin tense and white, and marked along its surface by prominent blue veins. The cut edges of the stump looked like pork. Acute pain was felt; a cold sweat covered the body; the stomach was irritable, and the pulse weak and frequent. The respiration became short and hurried. The heart's action gradually and surely got weaker till, from fourteen to sixteen hours from the first bad symptom, death relieved his sufferings." Guthrie, in describing the disease, uses the following graphic language: "A wound attacked by hospital gangrene, in its most concentrated and active form, presents a horrible aspect after the first forty-eight hours. The whole surface has become of a dark-red color, of a ragged appearance, with blood partly coagulated, and apparently half-putrid, adhering at every point. The edges are everted, the cuticle separating from half to three-quarters of an inch around, with a concentric circle of inflammation extending an inch or two beyond it; the limb is usually swollen for some distance,

of a shining, white color, and not peculiarly sensible except in spots; the whole of it being, perhaps, oedematous or pasty. The pain is burning, and unbearable in the part itself, whilst the extension of the disease, generally in a circular direction, may be marked from hour to hour; so that, in from another twenty-four to forty-eight hours, nearly the whole of the calf of a leg, or the muscles of a buttock, or even of the wall of the abdomen, may disappear, leaving a deep, great hollow, or hiatus, of the most destructive character, exhaling a peculiar stench, which can never be mistaken, and spreading with a rapidity quite awful to contemplate. The great nerves and arteries appear to resist its influence longer than the muscular structures, but these at last yield; the largest nerves are destroyed, and the arteries give way, frequently closing the scene, after repeated hemorrhages, by one which proves the last solace of the unfortunate sufferer. * * * The joints offer little resistance; the capsular and synovial membranes are soon invaded, and the ends of the bones laid bare. The extension of the disease is, in the first instance, through the medium of the cellular structure of the body. The skin is undermined and falls in; or a painful, red, and soon black, patch or spot is perceived at some distance from the original mischief, preparatory to the whole becoming one mass of putridity, whilst the sufferings of the patient are extreme."

To this picture, drawn by the hand of the great apostle of military surgery, it is needless to add; though, as has been already said, the disease does not always assume a character of such intense malignity. Instead of this rapidly destructive gangrenous variety, we sometimes encounter its sloughing, pulpy, or, as it has been called, diphtheritic form. This is characterized by the formation of a thick semi-concrete, greyish or greenish mass, which attaches itself firmly to the ulcer, the edges of which are sharply defined, everted and circular in form. There is much stinging and lancinating pain experienced, and the discharge is thin, sanious, or greenish brown, and excessively offensive. When these pseudo-membranous masses, or rather sloughs, are detached, there remains a raw, bleeding surface, which may be partially concealed beneath a stratum of thin, greenish yellow, and offensive pus. The parts thus exposed are exceedingly liable to be transformed into the same substance as before, and this, in turn, being thrown off, the limits of the morbid action are gradually ex-

tended. Should a large artery be encountered, its vitality is retained, and its integrity preserved, for a short period, but yielding finally to the resistless nature of the attack, a copious, and, it may be, fatal hemorrhage results, for no effort is here made by nature to seal up the vessel, or to plug its extremity with a coagulum.

Death from hospital gangrene may take place in the rapid and inevitable manner shown by McLeod, through the overwhelming effect of the poison upon the system; or, the disease progressing more tardily, the patient may succumb from exhaustion, hemorrhage, hectic or pyæmia.

Treatment.—The treatment of this “child of the typhus,” as it has been called, comprises both prophylactic and preventive measures. The latter, unfortunately, are little under the control of the field surgeon, who is often compelled, by the necessities of war, to do violence to all his ideas of sanitary propriety, by crowding large numbers of sick and wounded soldiers into very circumscribed, and, it may be, damp and ill-ventilated apartments. Neither can he guard those under his care against the more remotely predisposing causes of this disease, such as excessive fatigue, exposure, insufficient or improper food, and much less can he ward off the depressing effect of a sudden reverse of arms.

The precautions against hospital gangrene consist in affording to each patient an ample space—1600 cubic feet is the area allowed in the best-ordered European hospitals—with free ventilation and pure air; cleanliness should be observed in the minutest particular; the latrines should be so constructed—over running water, if practicable—and so remote, as to leave no chance of atmospheric contamination from that source. The general condition of the patient should claim attention; if febrile action be present, mild antiphlogistics, with purgatives and refrigerants, are indicated; if irritation be manifested, it should be calmed by anodynes and sedatives. The wound should be carefully dressed as often as is necessary to meet the requirements of cleanliness, and, if convenient, disinfectants, such as the chlorides of lime and soda, freely used. When the disease makes its appearance, *nothing short of complete segregation of each case, as it occurs, with a liberal use of disinfectants, can give a promise of security against its further spread.*

The curative treatment is both general and local. As the

attendant fever is of a low grade, a generous diet, with a judicious use of stimulants, will be required throughout the management of each case. McLeod says he derived much advantage from the exhibition of muriated tincture of iron, in half-drachm doses, three times daily. To each dose of the iron, five grains of quinine may be added, with a reasonable prospect of benefit.

The *local treatment* may be summed up in a very few words. The strongest possible escharotic should be applied to the entire gangrenous surface. The mineral acids, the actual cautery—Fowler's solution of arsenic, and the chloride of zinc—have each their advocates, and, perhaps, advantages. But the practitioner of the present day can have no hesitation in giving the preference to chemically pure nitric acid, unless hemorrhage be present, when the actual cautery should be substituted. As its application is attended with much pain, chloroform should be previously administered. The acid is applied by means of a dossil of lint attached to a bit of whalebone or wood, and should be brought in direct contact with every portion of the diseased surface, so as to form an eschar equal to the dimensions of the sore. The use of the cautery should be followed by a full anodyne, which should be repeated, if the sufferings of the patient are great. When the eschar is thrown off, the ulcerated surfaces should be treated upon general principles, taking care to uphold the patient by nourishing food, and a liberal use of wine or brandy.*

AFFECTIONS OF STUMPS.

In considering the affections to which stumps are liable, it will be necessary to bear in mind the several structures which enter into their formation. These are skin, cellular tissue,

* The oil of turpentine has recently been employed, both internally and as a local application, in the treatment of ill-conditioned ulcers and sloughing wounds; and it is claimed that the results of the experiments are such as to entitle it to further trial.

The per-sulphate and the per-chloride of iron have each been recommended as escharotics in hospital gangrene, but their efficacy in this respect must be confirmed by the test of a wider experience before they can be pronounced worthy to supersede the mineral acids.

muscles, aponeuroses, tendons, nerves, arteries, veins, bone, and medulla. Each occasionally has morbid changes impressed upon it during the healing process, which are modified and determined by the character and susceptibilities of the particular tissue involved.

It is here proposed to discuss only such of these morbid conditions as are found more frequently to present themselves as accidents in the history of stumps resulting from the casualties of the battle-field. Convenience of description has divided these accidents into primary and secondary; the primary embracing hemorrhage—venous and arterial—spasm, pain, medullitis, and necrosis; whilst the secondary comprises osseous vegetations, neuralgia, and aneurismal enlargement of the arteries.

When *arterial hemorrhage* takes place from the stump within a short period after the removal of a limb, it will generally be found to proceed from one of the smaller arteries which had been overlooked during the operation, or it may be that the ligature has been placed too low down, the vessel having been cut obliquely, as is necessarily the case when the flap amputation is performed. Should the bleeding occur still later, it may be found to arise from ulceration of the artery at the seat of ligature. Whatever be the cause, ligation of the bleeding vessel is the remedy, and, in order to effect this, the stump should be freely laid open when necessary.

If the hemorrhage be venous, elevation of the limb, cold applications, and proper compression, will usually suffice to restrain it. Failing these, we are advised carefully to dissect the vein from the surrounding tissues, and to convey its extremity through an aperture made therefor in one of the adjacent muscles. It is sought by this expedient to close the vessel through the constriction exerted upon it by the contraction of the muscular fibres. When these expedients are unsuccessful, or impracticable, recourse must be had, without further loss of time, to the ligature.

Spasmodic twitchings of the muscles of the stump, with acute pain in it, are exceedingly common results of amputations, and liable to be developed so soon as the patient has recovered from the shock of the operation. Occurring at this period, opium is our chief reliance and should be given freely; though where the stump has been properly supported by a roller bandage spasm is of rare occurrence.

Medullitis or osteomyelitis—inflammation of the marrow of the bone—is very prone to happen when the bone has sustained a violent shock, either in consequence of the injury, which calls for the operation, or during its section by the surgeon. The occurrence of this event is known when, within a few days after amputation, the marrow of the bone, if seen, presents a dark-greenish or brown color; is separated from the bone, and emits a most offensive odor. For this condition little can be done, but to meet the constitutional indications in each particular case, observing, at the same time, much care and cleanliness in dressing the stump. It has been suggested that nitrate of silver might prove serviceable if freely applied to the parts.

Necrosis.—Necrosis is a serious and not unfrequent effect of amputations, and may be the result of ostitis or medullitis, or the bone may perish through lack of nutrition, in consequence of the stripping off of its membranous covering. This disease must be left to nature, in the hope that it may be arrested and the dead portions detached. Any attempt at their removal, before their separation has been thus effected, is liable to be seriously resented by the system. Amputation of the bone for necrosis has repeatedly resulted in the destruction of the patient.

Protrusion of the bone is a very untoward, though not uncommon accident, after amputation of the limbs. It is sometimes due to carelessness on the part of the operator in not leaving a sufficiency of flap to protect the bone; at other times, as occasionally happens in amputations through the thigh, the most judiciously planned and skillfully performed operation will not suffice to guard against it. It is commonly due, when it presents itself as a primary affection, to retraction of the muscles, and much may be done towards its prevention by the use of the roller bandage during the treatment. After this condition has once arisen, something may yet be done by the application of long strips of adhesive plaster, supported by a roller applied from above, downwards, the stump being elevated and supported in such manner as to relax its muscles. Should these means fail, it has been advised to dissect out the bone from its attachments, and to saw off so much of it as is necessary to secure for it a proper covering. But as this procedure is attended with great risk to life, and is hardly less grave in its effects upon the system

than amputation itself, it should only be resorted to when all other means fail.

Conical, or, as they are sometimes called, *sugar-loaf stumps*, may be classed among the secondary effects of amputations. These are due to an insufficiency of soft parts to cover the extremity of the bone. This insufficiency, when it arises from retraction of the muscles, and does not depend upon any defect of the operation, is especially apt to occur in the thigh, when the soft parts have been attacked with inflammation prior to the operation. In such cases, either the flaps fail to unite, and leave an intractable ulcer corresponding with the situation of the end of the bone, or, if union is effected, there results a delicate, irritable, and painful cicatrix, which will not sustain the weight of the body.

This accident, like the primary affection just considered, protrusion of the bone, with which it is so nearly identified in its origin and development, is more easily prevented than cured. Here, too, as in the former case, the tendency to such a result is sought to be counteracted by a judicious and prolonged use of the roller bandage. When, however, this condition is established, the only remedy lies in the removal of a segment of the bone.

Osseous vegetations, or *stalactites*, as they have been called, are sometimes encountered among the secondary affections of the stump; and after amputations of the fore-arm and leg, we often find the bones firmly united by a deposit of osseous material between them, or by the approximation of their divided extremities. In such cases, nervous filaments are liable to be pressed upon by the vegetations, or to become entangled in the bony arches or osseous deposits above alluded to, and thus to give rise to one form of neuralgia of the stump. But this is not the only mode in which such growths give rise to inconvenience and suffering, for we presently find them assuming hygrometric functions, and announcing atmospheric vicissitudes with painful accuracy.

To relieve this morbid condition, when it gives rise to the inconveniences just detailed, section of the diseased portions of the bone, and amputation of the limb at a higher point, have each been advised. But since neither of these expedients is free from hazard, recourse to them is not recommended, unless the grievance can no longer be borne.

It will be remembered, that after amputation of a limb, the

extremities of the truncated nerves undergo a bulbous expansion, which, within certain limits, gives rise to no inconvenience. Developed beyond these limits (and they sometimes attain the size of an English walnut), they constitute veritable neuromata, which, by their presence, and the pressure brought to bear upon them, create much suffering.

We find, too, that a similar hypertrophy, with not less distressing results, may arise from the looping together of the extremities of the divided nerves. Another and frequent source of neuralgia in the stump is the involvement of some of the smaller nerve branches in the cicatrix. Pressure, in such cases, is productive of much pain, and an artificial limb cannot be borne till this condition of the parts be removed.

But neuralgia may present itself in yet another form, and as a local manifestation of a constitutional vice. The cases now referred to are met with among those of irritable fibre, and of what is termed "nervous" habit. Here the sensibility of all the nerves of the stump is exalted, and, together with hyperæsthesia, we have acute pain and spasmodic twitching of its muscles.

The two conditions first described are sometimes amenable to excision of the nervous bulbs, or resection of the limb. The last form yields only to constitutional remedies which tend to build up the powers of the system. Of these, the chalybeates, with quinine, are most to be depended upon. As local applications, lead plasters and anodyne liniments have been advised, and may sometimes prove beneficial. The stump should be protected from sudden changes of temperature by wrapping it in flannel or furs.