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ARTICLE I.

Hospital Gangrene.

A lecture delivered to Prof. Blackman's class at the Medical College of Ohio, session of 1860-61.

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There are several grave accidents that complicate the course of traumatic injuries; some limited to individual cases, others pervading whole wards and hospitals. Hæmorrhage and traumatic tetanus are examples of the former. These complications never become epidemic, but are due generally to constitutional predisposition or peculiarity, that can not itself well be foreseen or its consequences prevented. I say "generally," not universally. But erysipelas, pyæmia and hospital gangrene, examples of the latter class, the accidents pervading whole wards or whole hospitals, are not due to individual peculiarity; on the other hand, they are engendered and propagated by hygienic errors that are in my opinion readily appreciated, and if the authority to put in operation the necessary preventive measures were vested where it ought to be, there is abundant reason to believe that in military hospitals these diseases would henceforth be known only historically.

It is my intention at present to give you some account of hospital gangrene, its causes, phenomena, nature and treatment. It is not necessary to inquire when and where this formidable disease was first recognized. In fact, its nosological history is obscure. Still, there is little doubt that Paré and Wiseman have both alluded to it in their writings; and when we consider the circumstances under which it has always been found to prevail, when it *has* prevailed in modern times, we can not but believe that since wounds were first inflicted upon

numbers and those numbers collected in masses, hospital gangrene has had its share in determining the mortality that has followed. I would not have you suppose that it is in military hospitals alone that we meet with this scourge. On the contrary, we find it from time to time raging in the civil hospitals; and, in fact, Lamotte informs us that it was at the Hôtel-Dieu in Paris that it was first called "Pourriture D'Hôpital" in order that the wounded exposed to, or suffering from it should not have their fears excited by hearing the word *gangrene* applied to it in their presence.

Professor Blackman has told me that he had seen it in some of the London hospitals. But it is in military hospitals that it is most to be dreaded and where its most fearful ravages are recorded; and this, too, notwithstanding its etiology has been so thoroughly investigated and is so well understood by military surgeons. Baudens mentions that it broke out in one of the military hospitals in Africa with such intensity that every man who had undergone a great operation perished with it. We again find it prevailing to a fearful extent in the French hospitals in the Crimea, while the English were almost entirely exempt from it: in my opinion, a severe reflection upon French intelligence and another evidence of the radically wrong system upon which the French medical staff is organized.

Bonnard, a French surgeon in the Crimean war, attributes the appearance of the disease in the French hospitals to a miasm generated by the action of heat and moisture upon decomposing organic matter. He says: "In the present epidemic we have seen the first cases coincide with the accession of the summer heats; the crowding together of men; the continual disturbing of the earth; while the vicinity of the sea rendered the air very humid and saturated it with vapor, morning and evening particularly; a mass of organic detritus was spread over the ground, or buried at so slight a depth that one could literally find no spot free from the offensive odor diffused from these sources. The air vitiated in this manner produced fatal effects, and we believe it is to this we are to impute the cases of typhus and diarrhœa, the scorbutic condition almost general in all those predisposed, and finally the hospital gangrene, that at this period attacked a great number of the wounded." So, too, Salleron, in a most able memoir upon the same epidemic, remarks: "All the wounded were enfeebled and depressed by *ennui*, bad nourishment, fatigue, privation, atmospheric vicissitudes, and by all the debilitating causes that act so energetically upon the soldier placed in exceptional circumstances; more or less anæmic, more or less scorbutic, our wounded presented but feeble reactions, or

none at all, and succumbed easily and rapidly to the miasmatic atmosphere that enveloped them, so to speak, in a permanent and protracted manner, in the hospitals in the Crimea as well as in those in Constantinople. Almost throughout the campaign the hospitals of Constantinople were overcrowded with sick and wounded ; these, with grave and frequently multiple lesions, which furnished a great quantity of morbid products, permanently vitiating the atmosphere of the surgical wards. Thus for two years hospital gangrene prevailed as an endemic : it made numerous victims ; it raged with a violence and intensity that is never seen in either civil or military hospitals in time of peace."

Now, gentlemen, we have here the hygienic errors that produce this as well as most other camp diseases. You are not to suppose, however, that because heat and moisture are enumerated among the recognized causes in the Crimea, that this plague prevails only in warm climates or seasons. On the contrary, Percy says it is most common in winter, while Dusaussois contends that summer is most favorable to its development. Rainy autumns find advocates among other observers. The fact is as Nélaton sums it up : "It has been observed in all seasons and under all temperatures from 14° below zero to 36° above, and in all climates from the northern latitudes of England to the most southerly of Spain. It is developed wherever war has given rise to the circumstances capable of producing it, and it then shows itself only among the wounded exposed to the fatal influences we have pointed out, and very rarely among those who, subjected to the same temperatures, the same season and in the same climate, are placed in less unfavorable conditions." Overcrowding of men, filth, bad diet, unfavorable atmospheric influences—circumstances that I think are all within human control, except the last,—and which ought to be and would be prevented if the sanitary control of armies were committed to those who are capable of appreciating the threatenings of these circumstances and their effects. And so far as unfavorable general atmospheric conditions are concerned, even these might be very considerably limited in their pernicious effects by a prudent foresight that would see to it that no approach to overcrowding should occur where these conditions are known to exist.

But why is it that the same apparent general causes should sometimes produce typhus, and sometimes hospital gangrene ? The relationship between the two we have seen suggested by one observer, and we shall find it insisted upon by several. Thus, Vidal quotes Delpech as believing that it is the poison of typhus itself acting upon the sur-

face of a wound that produces the gangrene, and that the emanations from the latter reproduce typhus. Sanson calls it "traumatic typhus." Salleron says: "He has always seen the development of hospital gangrene preceded and accompanied by general symptoms which announced in an evident and positive manner preëxisting poisoning of the organism. The local affection is always complicated by a subjacent and peripheric serous engorgement, of greater or less extent, according to the seat of the wound and the organic condition of the patients. This complication, which has been so justly termed 'traumatic typhus,' has always appeared to me the local manifestation of a general pathological condition that it was necessary to attack before proceeding to the employment of topical applications; otherwise the latter were most frequently ineffectual or completely powerless."

I know that filth enough and overcrowding enough and bad ventilation enough to produce both typhus and dysentery, does not necessarily produce hospital gangrene. I have seen all these causes in operation in more than one military hospital, and still there was no hospital gangrene. It has been thus far very fortunately an unknown disease in our armies, and I can only attribute this to the want of some of the conditions that must concur in order to generate this particular virus. Thus in some instances where the other causes have existed, the heat and moisture have been wanting; in others overcrowding has happily been absent, and again, perhaps, an insufficient number of *wounded* men have been within the building to have afforded vitiated traumatic secretion enough to produce the miasm of the hospital gangrene. Quantity as well as quality of secretion seems to me to be necessary to give origin to this disease. Thus in the Mexican war, within my recollection, no building received and retained successive crops of wounded, from different battles. It was not so in the Peninsula, in the Crimea or in Africa. The poison once generated, there is no further difficulty in its propagation. I can not, however, subscribe to the opinion that it is identical with the poison of typhus,—otherwise we should have had the disease in Mexico; its close affinity I am ready to admit. Bonnard has well reasoned upon this whole subject. "It is to be presumed," he says, "that miasmatic infection produced by animal substances held in suspension in vapor, has proceeded from different sources and has undergone different catalytic transformations; several miasms have been produced, and their particular species must necessarily be shown by different signs and effects, according to their intimate nature and their mode of manifestation. If, in fact, a single miasm had been engendered, as might be supposed

from an examination of the constant changes through which the phenomena of the disintegration of organic matters pass, we should not see different diseases developed under their single influence. It is not here, as in simpler diseases, when the same cause may produce different effects, according to individual predisposition ; specific causes act always in the same way, and produce general and local symptoms always similar among themselves and sufficient to characterize an epidemic. If the miasm of typhus, for instance, were the same as that of hospital gangrene, their effects would be identical. Every wounded typhus patient would have gangrene, and reciprocally every gangrenous patient would have typhus. Now this is not so. We see constantly wounds complicated with typhus without gangrene, and the latter developed without any concomitant typhoid or scorbutic diathesis."

You will observe here some discrepancy of opinion between two able observers of the same epidemic : Salleron asserting that he always saw the typhus complication with the gangrene, and Bonnard asserting the reverse. Both, however, agree as to the circumstances under which the disease broke out and prevailed, and they are certainly such as would lead us to apprehend typhus poisoning, whether it manifested itself positively in every case or not.

But, however this may be, there is no doubt in my mind that the poison once generated propagates itself certainly and rapidly, and herein it demonstrates its specific character. In ordinary traumatic mortification this is not the case ; the disease is local ; it is confined to the individual, and is always due to the mechanical obstruction of the vessels supplying the part with blood, whether that obstruction be the consequence of inflammation, of the particular traumatic injury, or what not. In hospital gangrene, on the contrary, there can be no doubt of the disease being extended by inoculation, direct or indirect, mediate or immediate. Whether the poison saturating the air of the wards is taken into the system by the lungs or primæ viæ, or whether it finds access to the system by the traumatic surface only, or both, may admit of dispute ; but one thing is certain, that this form of gangrene never occurs except where there is an antecedent solution of the continuity of the surface. Hennen says it attacked orderlies and nurses from constant exposure. Blackadder thinks he has seen several cases in which there was no preëxisting division of the skin ; but Vidal has well remarked on this point that he thinks this "an error on the part of Blackadder, and he is inclined to believe that this surgeon has confounded scurvy with the gangrene. It is probable he

has sometimes seen scorbutic abscesses complicated with gangrene, which he had regarded as originally formed by the gangrene itself." I think this the true explanation of the matter. We have already seen from the testimony of Bonnard that typhus, dysentery, and scurvy were among the prodromata of the gangrene in the Crimea and Constantinople hospitals.

That this disease has been produced directly by inoculation we now proceed to show; and first we have the case of Ollivier, a surgeon in the Spanish army, who inoculated himself upon the arm over the insertion of the deltoid. The consequence was hospital gangrene in a few days, which was arrested only by cauterization. Next, we have the accidental inoculation of Mr. Blackadder: "Having punctured himself with the point of his scalpel in one of the fingers, while dissecting the stump of a patient who had died of this disease, the part became inflamed; a vesicle having a depression in its centre, and containing a watery fluid of a livid color, formed upon a hard elevated base. The surrounding integuments became tumefied and extremely sensible to the touch. About the distance of a fourth of an inch from the base of the tumor, a very distinct areola of a bluish red color made its appearance, and continued visible for several days. These local appearances were accompanied with general indisposition, headache, nausea and frequent chilliness, which were relieved by the use of neutral salts, pediluvium and warm diluents. The inflammation gradually subsided, but the sore had no disposition to heal. It did not enlarge externally, but was disposed to burrow under the integuments. This phagedenic disposition was ultimately got the better of by laying open the sore and by repeated applications of caustic; but it was two months before a complete cicatrix had formed, and it was upwards of six months before the part had regained the color of the surrounding integuments." (Ballingall.) Mr. Blackadder in fact considers the disease as being communicated *solely* by inoculation; but here he is certainly mistaken. Hennen, in his account of it as it prevailed at Bilboa, has furnished facts enough to refute this idea, and similar facts will be found scattered throughout the writings of most authors who have treated of the subject. For instance, Prof. Brugman says: "At Leyden, in the end of the summer of 1798, in the French military hospitals, hospital gangrene prevailed in one of the low wards, whilst the patients who had slight wounds and who were placed above this ward in a garret well aired, were found to escape the disease. The surgeon judged it necessary to make an opening in the floor in order by that means to afford an outlet to the air of the infected ward,

by the roof. Thirty hours afterwards, three patients who lay next to the opening were attacked by the disease, which soon spread through the whole ward." In these cases Brugman thinks the miasm was applied directly to the sores through the medium of the atmosphere. The sores were exposed to the action of this poisoned air while they were being dressed. But you will recollect, I remarked, that whether the poison were not sometimes received by the lungs or primæ viæ, might admit of dispute. Brugman gives the following facts as bearing upon this point. He says: "In the month of August, 1805, I saw in one of the wards of a hospital at Amsterdam, four patients whose wounds showed unequivocal symptoms of gangrene. The disease did not exist in any of the other wards. The patients in the above-mentioned wards were removed, and the necessary precautions taken; none were left in the apartment but the four gangrenous patients before noticed. The number of wounded, however, became so considerable that on the following day it was absolutely necessary to place two men in that ward. These patients had each a benign ulcer situated in one above the malleolus of the left leg, in the other on the internal side of the thigh; they were dressed out of the ward, almost in the open air, and the dressings covered with a wet bladder, so that the air of the ward could exert no direct influence upon the ulcers. The dressings were carefully removed twice in twenty-four hours. Notwithstanding these precautions, the fever which precedes hospital gangrene appeared in the first patient twenty or twenty-two hours after his admission into the ward, in the second nearly thirty hours later, and both were attacked by the disease." This fact, though not conclusive in itself, still certainly sustains the idea of constitutional infection by respiration; and it still further refutes Blackadder's notion of the disease being purely local. It goes further, and taken in connection with other facts already noticed, it establishes a relation betwixt this disease and certain zymotic fevers, by showing, for instance, a period of incubation,—short it is true, but still apparent,—twenty to sixty hours. Thirty hours was the time when the hole was cut through the ceiling of the ward at Leyden. But Bonnard has extended this period of incubation to a mean period of eight days, and in some cases even to two weeks. He bases this opinion upon the occurrence of hospital gangrene among some men brought from the Crimea to a hospital at Pera in which the disease had not before existed. When the men arrived, they were in an abnormal condition, their wounds were dry and painful, smelt bad and were stationary. "No doubt," he says, "hospital gangrene already existed, though it

did not present all its characteristics till some days after their arrival." Notwithstanding the opinion of Blackadder, we can not, then, refuse our assent to the constitutional-infection theory unless we suppose that the general system may be the subject of a malignant fever, while a local lesion at the same time is the seat of a malignant and destructive prutrescence, and that the two morbid conditions are entirely independent of each other. When, however, the poison is directly applied to a traumatic surface, its effects are too palpable to admit of any dispute. The facts on this point are more than sufficient—they are abundant. The extreme subtlety of the miasm, the pertinacity with which it adheres to dressings, sponges, instruments and even to clothing worn in the wards where it exists, is almost beyond belief.

In 1797, a supply of charpie was sent from France to the hospitals in Holland. Its use was followed by the occurrence of violent hospital gangrene. Investigation showed that the persons from whom it was procured were in the habit of washing and bleaching the dressings used at Paris hospitals and selling it as new. "In the epidemic at Montpellier in 1814, the charpie having given out, it became absolutely necessary to use the least soiled of that which had been already used. Gangrene immediately became extremely common. Carded tow was then employed, and then the frequency of the disease sensibly diminished."

"While Delpech was making his first investigations of this affection, a shoemaker, who was obliged to have his thumb amputated, placed himself under his care. Every day he came to the hospital where gangrene was prevailing to have his wound dressed, but he never entered the wards. He brought with him everything necessary for the dressing. One day he was out of charpie, and Delpech covered the wound with some he carried in his dressing apron, which had been kept in the wards. The following day the usual symptoms of the gangrene appeared." In the case of a stranger upon whom Delpech had performed castration, and who lived at a distance from any focus of infection and under the best hygienic conditions, he was surprised to find gangrene develop itself. At last he discovered that the coat he was in the habit of wearing while visiting his patients, had contracted the smell and was impregnated with putrid miasmata. Pouteau accidentally wounded the ring finger of the right hand with the point of a scalpel. After dressing three patients suffering from gangrene, he himself was attacked. (Nélaton.)

But whenever hospital gangrene breaks out in a hospital or ward, whatever may have been its origin, it is sure to spread, and that with-

out regard to age, sex, temperament or any other condition. The intemperate, the filthy, the subjects of debilitating disease or depressing emotions, may be the first to suffer, but the robust, cheerful, and well fed can promise themselves no immunity.

"Hospital gangrene," says Nélaton, "constantly declares itself upon wounds so disposed that they may be freely touched by the air or by the pieces of an apparatus. If in the extension of the same wound there are points which from their position may be protected from contact with these externals, they may escape while these favorable conditions exist; but they are attacked in their turn when these conditions are changed. Thus the wound made by a ball which has traversed the whole thickness of a limb is at first attacked by the gangrene only at the two orifices, which are converted into large ulcers, and thus permit the infection to be extended by degrees throughout the whole track of the wound.

"The disease more rarely attacks wounds which have been immediately closed; it first shows itself upon the lips of the wound; frequently the track of the silk used for ligatures after amputations exhibits a phenomenon similar to that which has been observed in the track of balls; these threads occupy in the wound that has been closed a little canal in process of suppuration; the gangrene first shows itself at the mouth of this canal, propagates itself into the interior, and from this purulent channel it extends itself to the whole wound, destroys the recent cicatrix, denudes and necroses the bone, and makes conical stumps wherever it is left to itself. Delpech, to avoid this inconvenience, cut off his ligatures close to the knots; afterwards, having no longer any external wound, he had no more hospital gangrene as the consequence of his amputations."

We proceed now to consider the mode of the invasion of the disease. We have seen that observers differ as to the occurrence of fever before that of the local affection. The weight of authority is decidedly in favor of the local affection being first in the order of phenomena. Thus Bonnard insists that the infection is purely and essentially local. Nélaton says the fever manifests itself from the twelfth to the fifteenth day. Vidal remarks: "It has been asked whether the general symptoms preceded the local, or whether they were consecutive. This question has received different replies, according to the opinion formed of the mode of action of the deleterious agent. Those who believe it acts locally have seen no general symptoms until after the manifestation of the local phenomena; the partisans of the absorption of the miasm think that the gangrene succeeds a disturbance of the whole

economy, similar to what is termed a nosocomial fever. Thomson, who is among the latter, says if general symptoms are not observed before the gangrene, it is because they are slight and not well marked. If it is true that hospital gangrene may exist without general symptoms, it is also true that they generally occur, and that *sometimes* they precede the local phenomena, though most commonly the reverse." Salleron, as already quoted, takes the opposite ground, though I think many of the cases he has reported in detail do not sustain his views. Mr. Guthrie deals with this question, as with most others, in a very short and dogmatic, though philosophical manner. He remarks : " If this disease were entirely a local complaint caused by the application of a morbid poison, giving rise to the destructive changes described on the surface of an ulcer, it should be followed by febrile or constitutional symptoms at the end of several days only ; and Delpech is disposed to think that in such cases these constitutional symptoms take place from and after the sixth day. If it were entirely a constitutional disease, giving rise to the destructive changes described as taking place upon the surface of an ulcer, the febrile symptoms should precede the changes in the ulcerated surface. That the febrile symptoms do seem to follow the appearance of the local alteration is in many cases indisputable ; that they precede or accompany the local symptoms in many other cases is indisputable ; and that the disease in a mild state, although yet capable of committing much mischief, is neither preceded nor followed by febrile or constitutional symptoms, cannot be doubted. The febrile symptoms themselves differ essentially when they do occur, generally partaking the character of the endemic fever prevailing in the country at the season at which they appear." And this, in my opinion, is the true solution of the whole mystery. We have seen that the circumstances in which hospital gangrene is generated are similar to those that produce typhus, etc. ; and when patients with wounds or ulcers have been breathing a vitiated air of this sort before the appearance of the gangrene—that is, the first cases—they will probably have fever before their sores are attacked ; but if men with wounds from a pure air are brought into infected wards, the wounds will show the effects of the poison before the constitution, whether fever appear in the course of the disease or not. When fever is the precursor of the local affection, the patient will complain of pain in the head and eyes, tightness of the forehead, loss of appetite, sometimes diarrhœa ; but if this symptom occurs in the beginning, it is not persistent—constipation, sometimes obstinate, generally succeeding. Quickness of the pulse, some heat of skin, occasional chilliness, and sometimes even

sweat, may be observed. The febrile phenomena, however, are not constant in their character: sometimes you may have one set, sometimes another. It is probable Mr. Guthrie was right in asserting that the endemic or epidemic constitution obtaining at the time will determine the assemblage of signs that present themselves. If any set of symptoms are to be generally looked for, they are those of derangement of the primæ viæ. In fact, Sir James McGregor looks upon these derangements "as the principal *cause* in most of the cases that occurred in one situation, and an emetic the remedy which arrested it, followed by the exhibition of bark."

The local phenomena, however, are those that can not fail to arrest the attention, and to those we now proceed. So many writers have given descriptions of these, and they all agree so well in the main, that I suppose you would hardly fail to recognize the affection if you were familiar with any one of these accounts. But as Bonnard's is one of the most recent and comprehensive, and one to which it is scarcely probable that you can have access, I shall translate and quote it almost entire. He remarks:

"We perceive that one may easily be surprised by the appearance of hospital gangrene, and one can not be too much upon his guard during its epidemic reign. Some morning the whole wound appears to be invaded by a gangrenous degeneration more marked in certain spots, and furnishing a brown, fætid and profuse suppuration. Sometimes the lesion is dried up, resembling a rude imitation cut from a block of wood, and painted red by an unskilful hand. The wound in all cases is of its original size, how far soever the process of repair may have previously progressed. The bottom of it is in some places black, and of a deep gray tint throughout the rest of its extent. The cellular tissue forming its border is œdematous *en masse*, and gangrenous wherever visible. When the disease is not cut short, the inflammatory circle extends, the features contract and become pale, the fever increases and becomes continuous, as well as the pain, which is so intense the patient can not sleep. This pain is usually lancinating, and occupies the whole region invaded. Some patients complain of a tearing, burning pain; at the same time, in severe cases and enfeebled subjects, a typhoid condition is set up,—of slight intensity in itself, it is true, but very persistent and liable to become aggravated by the progress of the absorption, which we see manifested at a very early period. Most usually we have the opportunity of meeting the disease at the commencement of the ulceration by suitable treatment, and it is remarkable that its success is not more marked and prompt when it is applied even in resisting constitutions. The force of the localized miasm appears to set at defiance the best general conditions, and to require always for its destruction the same determinate quantity of rational means. In fact, the employment of the latter succeeds just

as well and as promptly in the anæmic or in the subject of diatheses in themselves unfavorable.

"When, from unfortunate circumstances, no obstacle is opposed to the progress of the disease, the wound soon assumes a more characteristic appearance, differing in some degree from that of its first stages by the reunion and the extension of all the symptoms.

Two forms of hospital gangrene are usually admitted—the 'ulcerous' and the 'pulpous' or 'membranous.' The ulcerous form is represented as attacking the solution of continuity in several points, and occasionally losses of substance similar to those made by a Hunterian chancre or a gouge. In the pulpous or membranous form the bottom of the wound is occupied either by a false membrane or by a detritus, the molecular aggregation of which possesses so much cohesion as to render suitable detersion quite difficult. We have not seen these false membranes in the numerous cases submitted to our observation. We do not think the pseudo-membranous exudations of blisters can be referred to a cause the effects of which are so different. The pulpous matter is more common, but we are compelled to reject all classical distinctions of this kind; their utility is very doubtful, and is not sufficient in any case to characterize the disease more precisely. The disease is *one*, and notwithstanding some slight differences there is no constant variation sufficiently well defined to enable us to distinguish several distinct forms, unless it may be in the degree of gravity in the seat of the wound, or the longer or shorter duration of the infection.

"From the moment of the invasion, the progress of the hospital gangrene is very rapid, and the energy of the treatment should be in direct proportion to the attacking force, even when at first sight it seems to be indolent and inactive: a few hours, in fact, suffice that the features of the invasion that we have described shall have disappeared completely, and shall have been replaced by all the most grave pathognomonic signs. Those parts of the body in which the cellular tissue most abounds are much sooner disorganized than the others; it is this tissue, in fact, that yields most easily to the transformation, and which serves, so to speak, as a conductor to the miasmatic agent. Its destruction, more rapid than that of the subjacent layers, is the reason why the ulceration extends more rapidly superficially than in depth, and why absorption thus favored reacts so promptly upon the whole economy. From the third to the fourth day, the red inflammatory circle extends its radius five to ten centimetres from the borders of the sore, which are crimson and tumefied; the pultaceous and dirty matter product of the disorganization is traversed by striæ of filaments belonging to the cellular web, whose cells have disappeared. The superficial aponeurosis, such as the fascia lata, contribute for their part to the formation of bridles that last for three or four days; the external planes of muscle are then denuded. The cellular spaces that separate their bundles disappear in their turn, thus giving place to those variable excavations which may have had some influence in the adoption of a particular ulcerous form. The bodies of the muscles are at length themselves invaded and progressively destroyed, from the external layers to the deepest. The alteration of the organic substances

that we have just enumerated produces a suppuration of an entirely peculiar nature, approaching that of simple gangrene, and in relation to the catalytic modification that has determined it. An ichorous and tenacious liquid of a neutral tint, mixed with a great quantity of black globules and of organic detritus still more recognizable, bathes the whole wound, which is penetrated and soaked with it like a sponge. Its profuse production and constant renewal indicate with what rapidity the mortification is proceeding. When the disease has not been arrested, whether from having been left to itself or from the means employed against it having been insufficient, the power of the miasm increases constantly and tends to destroy everything exposed to its action. Now we have seen that the cellular texture is that which yields most easily; its subcutaneous position singularly favors the propagation of the infecting cause; the edges of the wound, in great part formed of it, bleed at the slightest touch; they fringe out, become detached in spite of their thickness, and constantly lose substance throughout their whole extent. By pressure we ascertain the changes going on in the areolar tissue. At a distance of two or three centimetres from the border it causes to spring out a sanious liquid of a brick-dust color, which is effused toward the interior of the ulceration, forming isolated and numerous little drops, as if each cell had separately furnished its own. The peripheric propagation has its analogue in the deeper seated parts; the intermuscular cellular tissue of the deep layers, that which accompanies and protects the nervous and vascular trunks, undergoes the same modification and furnishes the same elements.

"The local mortification continuing its course regularly, a vast loss of substance ensues, with a progress the more rapid, as it is already the more extended. Under the influence of lesions thus deep, and destruction of cellular tissue within a radius greater than that of the wound itself, the inflammatory circle that bounds it tends to gain constantly; its color, of a violet red upon the border, passes into a fresher and erysipelatous shade; a little farther whole regions and limbs are thus invaded.

"Hospital gangrene having reached its last stage, life seems to abandon the region occupied by it and to yield to the dissolving action of the natural laws of matter; large gangrenous patches are formed upon the inferior parts or those kept in contact with surrounding bodies; deposits and channels of matter end by making in every direction new openings, which have all the characteristics of their infectious cause, and hasten its progress by the formation of new ulcers of the same specific nature. The entire region is gorged with fluids of a bad nature; it assumes enormous dimensions, from which the ichorous and fætid matter is constantly oozing. If the walls of the great splanchnic cavities are affected, the termination is rapidly fatal; the internal organs in more or less immediate contact with the miasmatic secretions, speedily become inflamed, and destroy life more or less rapidly according to their special importance. So great visible and tangible disorders are always accompanied, whatever may be their situation, by the most dangerous functional disturbances. The septic

absorption manifests itself further by the leaden discoloration of the skin, which becomes dry and earthy. Emaciation is extreme ; profuse sweats occur upon the trunk and head, at every hour of the day, and without any appreciable cause. When the general infection is complete, and saturates, so to speak, the organism, irregular chills, mingled with the sweats, supervene ; the appetite is completely lost ; sleep disappears to give place to a coma vigil, alternating with moments of lucid waking ; the prostration and sinking are so great, that the slightest motion causes the most acute suffering ; the diarrhœa increases ; the stools are frequent and fætid ; the pulse feeble and very frequent, (120 to 130 a minute) ; the patient dies, preserving to the last the use of his intellectual faculties."

This history of the morbid phenomena of hospital gangrene embodies and arranges almost all that has been said by the multitude of authorities I have had occasion to consult. It requires but little modification ; still we must note that Nélaton, in speaking of the ulcerous form, remarks that "these ulcerations show themselves in recent wounds, and in those whose cicatrization is already almost completed, in the centre of the wound or near its borders. Whilst they are developing themselves, all the phenomena of cicatrization are going on regularly at points that have remained untouched, so that the processes of organization and disorganization are observed simultaneously." And again : "If the disease shows itself under the pulpous form, the wound becomes painful, the granulations assume a violet tint ; a grey, semi-concrete matter is spread over their surface, and covers either the totality of the sore, or only one or more isolated points. When the false membrane is in the first place partial, by its eccentric development it speedily becomes general. Its adherence to the divided tissues is intimate. If we try to remove it by friction, it resists or is detached in shreds, and its separation is followed by a slight sanguineous exudation from the fleshy granulations. In the first place thin, semi-transparent, and of feeble cohesiveness, exactly moulded upon the surface of the wound, every depression of which it shows, it soon acquires more thickness and solidity. Then it masks entirely the violet hue of the granulations, and no longer represents so faithfully the contour and irregularities of the wound. At this stage, which usually corresponds to the tenth or twelfth day of the disease, the wound becomes more painful, its borders are swollen, doughy, sometimes livid ; the thick false membrane loses its consistence, softening from the surface toward the deeper portions, and the softened layers fall under the form of a slough (putrilage.) The secretion of pus, suspended during the formation of the false membrane, is now reëstab-

lished; but the liquid discharged is no longer purulent; it is an ichorous, sanguinolent fluid, exhaling a fætid odor, perfectly characteristic."

Another important observation of Nélaton's is, that "the putrid degeneration affects in its propagation two distinct modes. Ordinarily it remains circumscribed, within a space more or less limited, and extends in breadth and depth by destroying, in the order of superposition, all the tissues it meets with, like cancerous tumors, which are developed in all their dimensions and convert into their own proper substance everything they touch. But it is not unusual to see hospital gangrene depart from this simple march to assume a much more destructive one. The cellular tissue being, of all the organs, that which it most readily invades, if the putrid centre by its continual extension reaches the large cellular interstices, the degeneration immediately takes this route to propagate itself. It then travels under the skin, insinuates itself among the muscles, turns around the tendons, around the vascular and nervous trunks, and thus causes the greatest ravages. It almost always takes this course when situated in the ham, in the groin, the fold of the elbow or the axilla."

In connection with these remarks, I would direct your attention to the striking similarity at least, that the false membrane, so graphically described by Nélaton, bears to the false membrane characteristic of the worst form of diphtheria. I have no time to trace these analogies for you. They will readily occur to you upon reflection. To my mind they suggest an affinity between the poisons of the two diseases, and may in a degree account for the fatality, frequently sudden and unexpected, that attends the latter as it now prevails.

One other point. We can not help being struck with the analogy between the progress of the latter form, as described by Nélaton, and the pultaceous chancre. Those of you who have read Vidal's remarks upon the phagedenic pulpous chancre will readily recognize this resemblance. Vidal himself calls attention to this point, and refers to his description of that form of chancre while treating of this variety of hospital gangrene.

Hennen dwells particularly upon the rapid march of the disease and the circular form of the sore. After describing the signs of the disease, he says: "All these threatening appearances occurred within twenty-four hours, and at this period also the wound, particularly if it was situated upon a muscular part of the thigh, buttock or calf of the leg, whatever may have been its original shape, soon assumed the circular form. I have seen the external ear and the palpebræ destroyed n this manner, as if in a series of concentric circles." Mr. Guthrie

also mentions the circular form and the peculiar odor as characteristic of the disease. He remarks, too, what I do not recollect having met with in any other writer, that wounds or ulcers on the legs are sooner attacked than those upon the upper extremities.

All authors call attention to the liability to relapse in this disease. A patient is never to be considered safe until the last point of denuded surface is covered with the new skin.

When the disease is suffered to go on unrestrained by the remedial measures, it spares none of the tissues or organs. We have seen that the cellular tissue is most rapidly destroyed, whether in its sub-cutaneous or deeper distributions; that muscles, arteries and nerves are denuded of their sheaths and lie exposed in the wound. But finally all yields. "Nothing is more common than the destruction of tendons." (Nélaton.) One author suggests that these organs perish of ordinary sphacelus in these cases, having been deprived of their nutrition by the destruction of their sheaths and the blood-vessels they conduct. "The largest and most important articulations are frequently penetrated and destroyed; the bones are rapidly stripped of their periosteum and necrosed." (Nélaton.) Hennen relates a singular phenomenon in this connection. "In some cases," he says, "a total absorption of the phosphate of lime took place, and the bone was converted into a cartilaginous mass. This circumstance I have met with twice, once in a diseased metacarpal bone and once in the femur. In the former case the dissecting knife cut through the bone with a little difficulty, as if it had gone through the cartilage of the ribs. The latter case was very remarkable; the patient suffered acute torture from a sloughing thigh-stump, which on accurate examination displayed the following appearances: a thickened, cutaneous texture hung like a loose pouch around a hard, projecting mass, apparently consisting of a diseased muscle, within which, corresponding to the size and situation of the bone, appeared a tough, dark body exquisitely sensible. It had been touched with escharotics, lay loosely, and on removal by a forceps had all the external appearance of a stopper of cartilage, about two inches in length." In this case Hennen amputated below the trochanter. The case was at its fifteenth day, and the disease had seemed to be stationary for the last four days. The whole mass of the amputated limb except the skin was found to be cartilaginous, retaining the shape of the bone, but no trace of bony matter except a few specks in the tube of the thickened periosteum.

Of course, when the arteries give way, alarming hæmorrhage occurs, unless nature may have plugged up their tubes by the effect of the

antecedent disease, as sometimes happens. Ligatures, however, even above and at a distance from the lesion, do not promise much success; this might even be anticipated from the fact already noticed, that all solutions of continuity of the surfaces take on the destructive process when this disease is prevailing.

The *prognosis* of the disease is unfavorable, as a general rule, if left to itself. In some rare, isolated cases, as Nélaton remarks, with good and in other respects sound constitutions, the pain disappears and the small ulcerations fill up by degrees, and the wound resumes its first aspect. But in armies, or in civil hospitals when a number of men are collected in the same ward, no such favorable result is to be expected. Vidal denies that it is as fatal a complication of wounds as tetanus or phlebitis,—*i. e.*, in a given number of wounded, more men will die of the latter disease than of hospital gangrene. If we can command suitable means, and can remove our men from infected hospitals and wards, we may expect a favorable result in both cases. If, however, the original wound be grave, and of itself seriously compromises life, though not necessarily fatal, the prognosis is very unfavorable even under the best hygienic conditions. Boggie's tables show a mortality of 1 to 15, and reduced by his treatment to 1 to 131 among his wounded in Spain, most of which deaths were from hospital gangrene. Mr. Guthrie gives us some important tables showing the mortality before the local use of caustic remedies were fully adopted. The cases occurred in the hospitals in the Peninsula in the last six months of 1813. From these it appears that the number of cases was 1614—cured 980, died 512, leaving 80 under treatment. I doubt very much whether tetanus or phlebitis found as many victims among the wounded of that period.

We proceed now to the means of preventing, arresting and treating the disease.

From what has preceded, it is obvious that overcrowding of the wounded is to be carefully avoided. That abundance of pure air is by some means to be supplied to the wards, that cleanliness in all respects is to be enforced among the patients and nurses, that dressings are never, except from necessity, to be a second time employed—I mean lint and charpie (bandages may be washed and used repeatedly when the disease is not prevailing); in short, every agent that can in any way inquinate the air of a ward, is to carefully excluded, and all material saturated with pus, which cannot be perfectly purified, is to be removed as soon as possible and destroyed. But when the disease has appeared, not only are all these things to be attended to, but we must include among things to be destroyed all sorts of dressings and bandages that

have been once used. They must be *burnt*, not buried. Even in the selection of fresh lint one can not be too careful. We have seen that a destructive epidemic was occasioned in the Holland hospitals by the use of charpie purchased as new in Paris, but which proved to have been revamped from the putrid dressings of the Hôtel-Dieu and other hospitals. Parsimony in dressings in this case is the most profuse prodigality. For myself I would not permit a sheet, a blanket or a bed-sack upon which a patient who had been affected with hospital gangrene had lain, ever to be used again in a ward where there was a wound or an ulcer, nor anywhere else until they had been thoroughly and repeatedly cleansed and fumigated. The use of sponges in dressing and washing the sores is inadmissible ; they are too expensive, too easily saturated with infection, certain to be carried out of the ward and to be applied to the uninfected, and thus to propagate the disease. It will be the part of prudence, also, for the surgeon in attendance to keep a particular dress for service in the infected wards, and to change it for another before entering an uninfected ward.

But an important means of arresting the disease is to evacuate the wards or hospitals where hospital gangrene has appeared. "It must not be forgotten," says Vidal, "not only that some hospitals furnish more cases than others, but also certain wards and even certain beds. There was at La-Charité a *fatal bed ;* almost every wounded man who slept in that bed was attacked with gangrene." The position of this bed near an ill-conditioned cistern was looked upon as the cause of the fatality of the bed, and no doubt with reason ; so true is it that any source of offensive matter may keep alive this subtle and destructive miasm. Hennen relies principally upon the evacuation of the hospitals to arrest the extension of hospital gangrene. He remarks : "It is therefore a duty of the most urgent kind at once to break up an establishment when any suspicious sores may occur. In civil life a multiplicity of causes may tend to obstruct this measure, but in military hospitals no such objection can possibly prevail. Tents, huts and other temporary accommodations, which the experience of a campaign sufficiently points out, are always within our reach." The latter remark is true in the field, but in cities occupied by armies it is not so easy to command tents or huts, or ground to pitch them. In these cases fresh buildings should be taken, by force if necessary, and retained until the public buildings can be thoroughly purified by repeated scrubbing, the free use of the chloride of zinc (Sir Wm. Bromett's disinfectant) and a thorough renewal of the air, and at least three or four coats of fresh lime upon the walls.

Now as to the constitutional treatment : When a scorbutic diathe-

sis prevails, as was the case in the Crimea, manifested very commonly by the peculiar spongy condition of the gums, sometimes by the ecchymosed spots, it is obvious that our constitutional remedies should be directed to that special cachexia; and so in dysentery or typhus. This is not the place for you to receive instruction on those points. What we have to do with is the ordinary constitutional initiation of hospital gangrene. We have already said that functional disturbance of the primæ viæ seems to be the usual pathological condition. All authors agree in the propriety of emetics and purgatives to meet this condition. Even if diarrhœa existed in the commencement of the attack, I should give a purgative of sulph. magnes., ʒj., tart. ant., gr. one-quarter to one-half. After the action of this, if the tongue remains furred, with a bad taste in the mouth and dryness of skin, a few grains of calomel or blue mass would be proper, and action upon the bowels promoted by the exhibition of a few drachms of fluid extract senna some six hours after. There is a singular discordance of opinion among authors upon the eligibility of quinia in this affection. Vidal says its constitutional exhibition is of no use, but he approves of its local application. Nélaton and Bonnard are of the directly opposite opinion. There is no doubt in my mind that it must be a valuable agent when the fever accompanying this disease is of the remittent type or betrays any sign of a malarial origin. We have seen also that insomnia is one of the most distressing accidents of hospital gangrene. Here opium, by Hennen and others, has been found of great efficiency, where the inflammatory type did not predominate. I do not doubt that even in this case the use of Dover's powder would be attended with happy results. There is nothing, however, peculiar, nothing specific in the febrile action attending this disease. Use such means of acting on the skin as your judgment may point out; being careful to discriminate accurately the type of the fever, treat it as you would the same fever if it were independent of any external local complication.

The propriety of bleeding in these cases has given rise to a good deal of discussion among military surgeons. Its great advocate is Mr. Boggie of the British army. He bled to the amount of one or two pounds, and sometimes three or four, at Bilboa in Spain, in 1813, and he gives decided testimony to its efficacy. He admits that it must be used with caution in debilitated patients, and in those who have been long in the hospital. Hennen bears testimony to its good effects in Boggie's hands. Blackadder, a few miles from Boggie, the same year, is as decidedly opposed to it. He says that in robust men, in highly inflammatory cases, the abstraction of a little blood may not be perni-

cious and may even do good, but that bloodletting ought to be avoided as much as possible in gangrenous phagedena, particularly when the previous injury has been extensive, such as that of a penetrating gunshot wound. Pouteau is also opposed to bloodletting. He thinks it a feeble resource, and one that ought to be employed only in sanguine temperaments. Mr. Guthrie has also but little confidence in its utility. He says he saw it apparently successful in one bad case, and fail as signally in another in the next bed. In this strange conflict of opinion one knows scarcely how to decide ; but, fortunately, Hennen has given us some clue to the difficulty. I find from his record that it was not till late in the season that Boggie began with his bleedings, when from change of season the disease had essentially changed its type, as shown by the fact that the local hæmorrhages that at a former period had prostrated the patient and exhausted his strength, were now attended with marked relief. In such a condition of things I do not doubt that venesection might be proper, or rather admissible. Still I believe that we have in the tart. ant. and the veratrum viride agents equally powerful in controlling the heart's action, without to the same extent exhausting the vital powers of the patient. To these agents, then, I should give the preference. Another objection to bloodletting is, that the wound will be apt to become a new centre of infection. True, Boggie says he never saw this occur, but others have not been so fortunate. Mr. Guthrie says he has seen this result, and he wisely suggests that Boggie's assertion shows that the disease was on the decline when he instituted his practice.

The local treatment is the last, though the most important point that claims our attention. While the disease was considered constitutional rather than local, the local means suggested and used were of course feeble and insufficient ; but when the local idea became the predominant, a marked improvement in the local remedies was the result. It is not necessary for me to recapitulate such topical remedies as have been found inefficient and have therefore been abandoned. I go on, therefore, at once and say that caustic applications alone are now relied upon. Pouteau, Delpech, Dupuytren, Boyer and Larrey look to the actual cautery as the heroic remedy. Strong nitric and muriatic acids, nitrate of silver and caustic potash have their advocates. Fowler's solution, tincture of iodine, perchloride of iron, have in late years seemed to supercede all other applications.

Vidal says he has seen this method succeed very well : First wash the wound well with aromatic wine or a decoction of walnut leaves. Then small dossils of lint or charpie, well saturated with nitric acid, are to be thrust into the softened tissue. It is important that the acid

should come in direct contact with the living tissue underlying the crust or false membrane. The wound is then to be dressed like any suppurating wound. The cauterization is to be repeated daily, and if the ichor is abundant, the other dressings are to be removed twice a day. When the putrid covering is destroyed and healthy granulation is established, the cauterization is to cease.

Blackadder was very successful with Fowler's solution. He first washed the wound with a weak solution of subcarbonate of potash, and when partly cleansed, he took a piece of soft linen rag and pressed it over the crusts so as to make as much as possible of this adhere. He was careful to thrust the cloth well into all the sinuosities, so as to detach as much of the putrilage as possible, and to dry the wound well. Then he used the solution of arsenic, saturating pieces of lint with it, and carefully pressing them into every fissure and sinuosity of the wound. At the same time he met the gastric trouble with emetics and purgatives. There is obvious danger of the system becoming poisoned from so free a use of arsenic, and, in fact, Blackadder himself had some cases exhibiting abdominal symptoms of arsenical poisoning.

Mr. Guthrie claims a good deal of credit for introducing the use of the mineral acids as caustics; but Dr. Rollo, who wrote upon diabetes, used them and published his treatment as early as 1797. He used the oxygenated muriatic acid, nitrate of silver, nitrate of mercury, muriatic acid gas, and even strong nitric acid, if an active caustic was required. Mr. Guthrie says: "In his hands constitutional treatment and every kind of simple, mild detergent application always failed unless accompanied by absolute separation, the utmost possible extent of ventilation and the greatest possible attention to cleanliness, and not even then without great loss of parts in many instances." This induced him to use the mineral acids as caustics. He always accompanied the caustics, however, with constitutional treatment. Mr. Taylor strongly recommends the caustic use of nitric acid. The plan he adopted was: "The application of the strong nitric acid, so as completely to cut off the diseased from the sound part, or part so far sound as only to be affected with inflammation. The acid, however, required to be rubbed in with the blunt end of the probe, so that it not only destroyed the cuticle, but killed the cutis vera, and probably the cellular membrane underneath. The narrow yellow ring of dead skin thus formed separated like a piece of leather, generally carrying with it the whole slough, and leaving a clear, healthy surface, as wel as edges to the wound. I never attempted to apply the acid to the surface underneath the slough, neither is such an application necessary.

The vital seat of the disease is in its circumference, however large the area. I must admit that the disease sometimes crossed the acid boundary, and a second and even a third application of the remedy was required; but this was rare."

But we have the most conflicting reports of the effect of the actual cautery. Nélaton says the actual cautery is the most heroic and expeditious means, a single application being generally sufficient, if the iron reaches every part of the sore. The dryness of the eschar is the evidence of this, a moist spot showing that *that* point remained untouched. If the sore is in the vicinity of a large vessel, the cautery requires great boldness and prudence in the surgeon. Bonnard makes this one great objection to its use. Nélaton recommends, in cases where amputation is required, as, for instance, when so much of the soft parts of the leg has been destroyed before the disease was arrested as to preclude all hope of a useful limb being preserved, to pass the cautery over the limb at the point of amputation as a prudential measure, with a view of dissipating the subcutaneous engorgement, so as to prevent the stump being attacked with gangrene.

We turn now to Bonnard, and he says: "Escharotics and particularly the actual cautery have been employed against the deep and tenacious disorganizations, as well as to limit their encroachments. The results have been trifling and indecisive. We have seen a number of failures for one successful case." He has no confidence in any of the usual applications, or in any of those we have mentioned. His grand remedy is the tincture of iodine. On this subject he says: "Our object being to act upon all the infected surfaces, it was necessary to find a very active liquid remedy, without dangerous corrosive action, capable of penetrating everywhere, and thus bringing about a favorable change at all points. . . . The tincture of iodine had succeeded very well in superficial wounds, and its nature was adapted to the preceding indications. It was then employed in circumstances the most grave, but at first with great caution. The first quantities used were quite small; the surfaces were lightly washed with a pencil dipped in the tincture, taking care that a few drops should flow into the anfractuosities by a slight pressure of the pencil against their superior walls. The improvement was sensible as to the external parts, but it was evident that the internal had had but little share in it. We then thought it necessary to increase the dose of the tincture, and after its harmlessness was established it was poured into the deep wounds so as to fill them completely. Pledgets of charpie, moistened with the same liquid, were placed over the fenestrated lint spread with styrax, that immediately covered the wound. And to remove as far

as possible all bad smell, a layer of charpie charged with camphor and powdered charcoal was placed over all, and kept in place by compresses and bandages moistened with chloride of soda. The improvement was now very manifest. The wound was cleaned off from one day to the next, and in the most complicated cases the parts had resumed their natural aspect in three or four days. This result seemed to us the more valuable in that the tincture of iodine can be used everywhere, that its application is very easy, and finally that no general disturbance of the economy was produced by its absorption."

One would suppose from this strong and unqualified endorsement of the merits of the tincture of iodine that the question was settled, and we now had an unfailing means of combatting the worst forms of hospital gangrene. But, no; far from it. Like Boggie's lancet, which failed in the hands of his next-door neighbor in the same epidemic, we find the claims of the tincture of iodine to confidence controverted almost upon the spot. Salleron, while admitting that it may be of use in a superficial lesion, and rather in a relapse than in a primitive case, says he has never seen it produce any sensible dynamic action, never any general reaction, followed by the calm and comfort that the actual cautery frequently, and the perchloride of iron almost always produces.

Salleron goes on in his memoir to examine critically and analytically all the caustics we have enumerated, discusses their advantages and disadvantages in a philosophical manner, points out the objections to their employment in some cases from their immediate danger, as in the case of the actual cautery over a denuded joint, in the vicinity of the femoral or carotid artery, etc.; in other cases, from the difficulty of controlling and limiting their action, as in the use of the caustic potass., and in all from the uncertainty and insufficiency of their results. All these difficulties, he insists, are met and obviated by the use of the perchloride of iron, while it possesses positive advantages that are to be derived from no other agent that has been yet proposed. For example, he asserts that it is less frightful, though much more painful, than the hot iron; it causes no loss of substance; it never enlarges the wound,—on the contrary, it usually contracts it by unloading the neighboring tissues. Applied to joints denuded of their soft parts, it has no pernicious effects upon the ligaments or synovial membrane; it rather promotes the absorption of any effusion into the articulation. I have not the time to go on with the long catalogue of advantages cited. I will only add that the author confesses that the pain caused by the application is excruciating to the last degree. He has even persuaded himself that this pain itself is an advantage, and

objects to anæsthesia beforehand on that very account, a degree of enthusiastic logic too paradoxical for me to assent to. It only remains to give you the author's method of using the perchloride, and we have done. In the first place, the wound is to be carefully cleansed after the very manner that Blackadder directs for the use of Fowler's solution. Then a layer of charpie of one or two centimetres or even more in thickness, and at least as broad as the wound, well moistened with the perchloride, is to be applied to the traumatic surface; this to be covered with dry charpie and one or more compresses, and the whole confined by a bandage. This dressing to remain for twenty-four hours, unless in urgent cases, where it may be renewed in twelve hours. It is better, he says, to make too many, than too few applications, taking for guide first the general, and then the local condition of the case. In deep wounds or in tortuous superficial canals, debridement may be necessary, but pieces of saturated charpie are to be introduced and pushed well home. In dependent wounds with two openings, Salleron recommends to plug up the lower opening, then fill the wound with the liquid and stop up the superior opening. As improvement is manifested, the strength of the perchloride used may be diminished by dilution with water, in order that the applications may be less painful. Salleron concludes his able paper with these remarks: "But whatever may be the efficacy of perchloride of iron when this disease breaks out in war times or from overcrowding, under an endemic or epidemic form, in wounded men always more or less exhausted, I repeat that there is poisoning of the whole system; that the condition of the wound is only the local manifestation of a general pathological condition that must first be met; that isolated local medication will seldom succeed, and only in slight cases; with the perchloride, as with all other means, we must always commence with the general treatment before having recourse to the topical. And in urgent cases, where delay might be dangerous, we should institute both at the same time, in order to limit the local disorganization as rapidly as possible."

Note.—Since this lecture was prepared, a mild form of hospital gangrene has appeared in some of our military hospitals. To the list of remedies heretofore suggested, Prof. Goldsmith has added bromine, pure or in solution, and its effects are well spoken of. Deleau, in an able monograph on the perchloride of iron, has corroborated Salleron's testimony to the value of that agent. I would suggest a trial of the permanganate of potash in solution, proportioned in strength to the severity of the affection. But whatever form of caustic is selected, the secret seems to be that its application should be so thorough that no point of the diseased surface should escape its touch.