

**Lecture.****ANTISEPTIC SURGERY.<sup>1</sup>**

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IN fulfilling the conditions of this method, the simple application of germicides only partially completes the requirements of antiseptic surgery. There are other causes of inflammation than bacteria, which, it is apparent, must be avoided. The observance of every measure which hastens complete recovery is included in this system of treatment.

The general health of the patient is one of the most important considerations in determining the prognosis and the result of a wound. Freedom from mental and arterial excitement should be secured, as well as perfect rest and comfortable posture for the wounded part. These and many other considerations, varying, of course, to meet the demands of special cases, must not be ignored in fulfilling the requirements of this method.

In the case of accidental wounds, wounds that have been freely exposed to the air are more or less inflamed, and frequently the seat of fermentation when first seen by the surgeon. The same general principles must be observed as in the treatment of wounds made by the surgeon's knife.

The primary object is to destroy all the bacteria and micrococci that are present; this is accomplished by making a thorough application of the lotion to every portion of the wound. Syringing and douching are important measures in rendering the germicide efficacious. The secondary object to accomplish is, by efficient external dressings, to prevent the access of new germs.

Most accidental wounds are of recent occurrence when first placed under the surgeon's care. These, after being well cleansed and rendered aseptic, can be closed by sutures, with a fair prospect of securing union by first intention. The value of absorbent drains and efficient antiseptic covering is particularly marked in this class of wounds. Union by second intention is frequently acquired in such when primary union has failed. To succeed in this, careful coaptation of the granulating surfaces must be made and complete protection from subsequent germinal invasion assured.

It is surprising how rapidly even large wounds of this sort usually heal when treated in this way. Wounds that require weeks of treatment by ordinary methods get well in as many days when fermentation is prevented. The effect of germ exclusion is to immediately diminish the amount of the discharge, and at the same time radically change its character; the pus becomes normal, and the necessity for frequent dressings is obviated.

The importance of furnishing an abundance of porous antiseptic material to envelop the wounded part, for the purpose of filtering the air and absorbing all discharge, should not be forgotten, for the efficiency of the treatment depends upon complete protection.

The antiseptic treatment of abscesses, both acute and chronic, involves the execution of the same gen-

eral details. Their contents should be evacuated in such a way as to prevent the access of air or germs to the abscess cavity. Thorough drainage should be established, employing, if necessary, rubber tubing, spun glass, or horsehair. The entrance or orifice should be well protected from infection by the antiseptic gauze or other equally efficient dressing. The results of similar treatment in the management of pleural and psoas abscesses show a decrease of fatality as compared with other methods.

The injection of abscess cavities is rarely necessary; in fact, the danger of the absorption of the antiseptic is so great, especially in large cavities, that it should generally be avoided.

The important part of the local treatment consists in preventing the access of germs to the cavity. It is quite evident that the discharges of suppurating wounds, as well as the pus of abscesses, constituting, as these substances do, such favorable conditions for the development of putrefactive germs, should be made to flow away as rapidly as possible. To facilitate the speedy removal of such, constant irrigation is often of great service, using some antiseptic solution for the irrigating fluid. In case of wounds or abscesses that furnish discharges so profuse that absorbent dressings fail to afford sufficient protection, this treatment proves very serviceable in excluding organisms. It also tends to prevent any accumulation for the germs to develop in.

The antiseptic water-bath, for treating wounds of the extremities, is a method employed by some foreign surgeons with excellent results. The injured limbs are immersed in water which has been impregnated with alcohol, tincture of benzoin, or some agent to prevent fermentation. The contact of the water relieves inflammation and favors rapid granulation. There is a class of wounds which, I should judge, would do very well with the water-bath treatment. I am not aware, however, that it is employed to any extent in this country.

The recognition of bacteria as the cause of putrefactive fermentation logically led to the search for, and the discovery of, agents inimical to septic organisms. There are many substances that will destroy these microscopic bodies, but only a few are applicable in the treatment of wounds, in consequence of their injurious effect upon animal tissue. The term antiseptics, in its restricted sense, therefore, only includes those agents which can be employed to check germ development without producing serious detrimental effect upon wounds. The specific virtues of the different remedies are somewhat varied. They all tend, however, toward the accomplishment of the same object when properly and intelligently employed. Some of them are vigorous germicides, and destroy rapidly both bacteria and micrococci. Others exert a fatal influence upon bacteria, leaving the spore and micrococci unaffected, to develop in their natural way. There are still others that render the different varieties of germs inactive and inert without devitalizing them. As soon, however, as the effect of the agent ceases they resume their active reproduction and pernicious influence.

The artificial cultivation of these organisms has been successfully accomplished by numerous investigators, and their behavior under the influence of the

<sup>1</sup> Concluded from p. 565.

various antiseptics carefully observed, so that the knowledge we possess of the protective properties of these remedies is the result of scientific research as well as the effect of experiments upon wounds.

The antiseptic which, from the inauguration of this treatment until of late, has been inseparably connected with the method is carbolic acid. The fact that it was first successfully employed in demonstrating the principles of the antiseptic system will always contribute to its notoriety, even if its virtues are excelled by some other agent. However, notwithstanding its defects, carbolic acid has not yet been displaced, although it does not at present maintain its former exclusive position in antiseptic surgery. The chief advantage is its universal applicability to all wounds as a germ destroyer, as well as its adaptability as a purificator to the hands and all materials used in an operation and about a denuded surface. Its disadvantages are that it is occasionally absorbed and produces poisoning; that when employed of sufficient strength to act vigorously as a germicide it excites local irritation in and about the wound; that its volatility renders necessary a more frequent change of dressings than is desirable. These objectionable qualities are magnified and exaggerated by the lack of skill and tact in its application. To avoid its toxic effects, the continued application of the acid to an extensive granulating surface should be interrupted and the strength of the solution used, carefully regulated.

Some constitutions are very sensitive to its influence, owing either to individual idiosyncrasy or to the existence of renal disease. Such are apt to feel the toxic effect of the drug, even when sparingly applied to a raw surface. Nevertheless, when the fact of its general employment during the last twenty years is considered, it is astonishing that comparatively so few cases of poisoning have been reported as a result of its antiseptic use.

Scarcely less can be said of the importance of corrosive sublimate as an antiseptic than of carbolic acid. It is certainly a more effective germicide. A very weak solution, one part to a thousand of water, immediately destroys both bacteria and micrococci, while a still milder solution, one part to five thousand, paralyzes, without devitalizing, them. Its application to the surface of wounds causes less irritation than carbolic acid. Its disadvantages are that it occasionally produces fatal poisoning by absorption; that the constant wetting of the skin in the vicinity of the wound not infrequently develops a troublesome eruption; that it tends to chemically combine the albumens in the discharge, forming a compound that is practically inert as an antiseptic; that its corrosive action upon metals unfits it for the purpose of disinfecting surgical instruments.

Another very active germicide is the chloride of zinc, used in solution in water, in the proportion of from two to eight per cent. This agent is not applicable in the treatment of recent wounds, in which union by first intention is expected, because of its caustic effect upon the tissues. It is, however, exceedingly effective in destroying organisms in suppurating wounds, especially where septic material is abundant.

There is also a chemical action exerted by the agent upon the discharges, resulting in the formation of a film of zinc albuminate which covers the surface of the wound and constitutes an efficient protection so long as it remains. Zinc is not absorbed and its use is not attended with the danger of poisoning, although when the solution is too strong it may induce local inflammation and sloughing. It is not adapted for use as an external dressing; other agents are more efficient for this purpose.

There is one other antiseptic that I will speak of somewhat in detail, and that is iodoform. This has proved very effective as an external application in preventing the access of germs to suppurating surfaces. When applied too freely there is danger of absorption and iodoform poisoning. It is therefore kept from too intimate contact with the wound surface by using gauze or similar porous material as a medium of conveyance.

The dressing is prepared by rubbing or pressing finely pulverized iodoform into the meshes of any thin, loosely woven fabric like cheesecloth. The powder not admitted into the interstices of the mesh and there retained should be removed by gently shaking the cloth until the excess of the agent is disposed of. The resulting iodoform gauze constitutes not only a safe but one of the most valuable dressings for the protection of all kinds of wounds from infection. The gauze should be applied in layers to a sufficient depth and extent to absorb the entire discharge. It is a dry dressing and does not favor decomposition as the moist variety do.

The iodoform adheres to the gauze with sufficient tenacity to prevent enough of it from coming in contact with the absorbing surface to induce poisoning. Wounds that have been thoroughly cleansed and rendered aseptic by other agents can be maintained in a healthy condition with the protection afforded by this gauze for a considerable period.

The healing process in many instances is completed with one dressing, even when the wound is ragged, contused, and inflamed.

The progressive development of the principles involved in antiseptic surgery reveals the virtues as well as the deficiencies of the various antiseptic remedies. The search for one that is perfect is as yet unrewarded, although its vigorous prosecution has brought to the notice of the profession quite an array of drugs, possessing in a greater or less degree antiseptic properties.

The comparative merits of these different agents are gradually being demonstrated by many surgeons. Every year adds much to our knowledge of their general usefulness and their individual fitness for wounds and special purposes. Permanganate of potassa, iodine, bromine, salicylic acid, acetate of alumina, naphthalin, subnitrate of bismuth, and the oil of eucalyptus are some of the more prominent agents receiving attention at present.

In selecting and applying these remedies there are several rather important considerations to be borne in mind. Their indiscriminate and unintelligent employment, without reference to individual adaptation and effect, is apt to disappoint the expectation of the surgeon by results that are either

negative or injurious. (1) The nature and requirements of the lesion must be considered. Fresh, clean wounds require simply protection from the causes of inflammation. The chief of these is obviated by excluding the putrefactive germ with the external antiseptic dressing. Whereas suppurating wounds, in addition to, and premising, protection require the extermination of the bodies that have gained admission to, and are multiplying in, the discharge. In accomplishing these different objects not unfrequently more than one remedy can be used with benefit in the treatment of the same lesion.

(2) The efficiency of the agent employed as a germicide should be considered. As a rule, the degree of putrefaction present determines the required strength or vigor of the antidote.

(3) The local effect of the agent upon the surface of the wound should be anticipated.

(4) The toxic influence of the drug, resulting from its possible absorption, should always be kept in view.

The majority of the germicides now in use produce injurious effects when introduced into the circulation in immoderate quantity. The danger of absorption depends in a measure upon the extent of surface exposed, as well as upon the length of the period of contact.

As the principles of the antiseptic method have become more distinctly defined the more fully is the fact recognized that the natural secretions form the most suitable fluid for bathing healing surfaces. When this is normal in character and amount the employment of antiseptic or other lotions to dilute or replace it is an uncalled-for and injurious interference with nature. The aim and object of this method is to protect the normal secretions from the organisms which render them abnormal. The faithful and intelligent application of external protective dressings secures all the advantages that are to be derived from the use of antiseptic agents in the care of many wounds. Many of the cases of poisoning that have been reported can undoubtedly be reasonably attributed to their unadvised and too generous employment.

Some form of protection may be developed in the future which will enable us to dispense with drugs. At present, however, there is little or no light in this direction. In order to appreciate the great changes and the wonderful improvements in surgery since the introduction of the antiseptic treatment it is necessary to take a retrospective view of the results obtained previous to the last twenty years. That this improvement and progress in the surgical art is attributable to the discovery of the putrefactive germ, and the consequent development of the principles and methods comprised in the antiseptic treatment, no fair-minded person familiar with the facts can for a moment doubt.

Formerly the danger of gangrene, septicæmia, pyæmia, and erysipelas following operations and accidental wounds was appalling, and the operator was constantly oppressed with the nightmare of apprehension. The unfortunate complications attending suppuration and the process of healing by granulation induced surgeons to avail themselves of very radical measures to secure healing by first

intention. Many limbs were sacrificed by amputation in order to avoid the risks associated with the healing of inconsiderable wounds by granulation. Even this extreme course of treatment too frequently failed in securing immunity from the evils connected with suppuration. The surgery of twenty years ago was so different from the surgery of to-day that a comparison between the two is unsatisfactory, being rendered so by the great variety of operations that are now practicable which then were rarely undertaken.

The contrast in treatment and results is equally great. Formerly the mortality following major operations was about thirty per cent., the greater number of the fatal cases being the result of pyæmia or septicæmia. The present mortality after such operations is reduced to about five per cent., and septic poisoning is a rare occurrence, except in cases that are not properly protected by the antiseptic method.

Conservative surgery has progressed surprisingly since the elimination of septic poisoning from the list of probable dangers attending the healing of open wounds. The success of conservatism has naturally resulted in narrowing the field of heroic surgery, which is employed now with more caution than formerly. A comparison of the results of similar operations, as formerly conducted and as now treated with antiseptic protection, reveals in a marked degree the advantages of the new method. A list of five hundred and sixty-three amputations, reported by Malgaigne in 1842, including amputations of the thigh, leg, foot, shoulder-joint, humerus, and forearm, resulted in a mortality of three hundred, or over fifty-two per cent.

Paul, in 1854, gathered and reported a list of 5,060 amputations, including both upper and lower extremities, the mortality of which amounted to 1,997, or over thirty-nine per cent. These reports are fair illustrations of the results obtained with old methods of treatment.

Schide reports a list of 321 amputations, including both extremities, treated antiseptically, with a mortality of less than five per cent.

Volkman reports 139 similar amputations receiving also antiseptic treatment, with a mortality of less than four per cent.

I am conscious of the unreliability of such statistics as these in demonstrating accurately the respective merits of different methods of treatment. Still, the marked difference in results is so commendatory of the antiseptic method that a reasonable degree of error in compilation can be admitted without materially lessening the contrast between the two methods.

A very recent report of the results of over twelve hundred surgical wounds and accidents, treated antiseptically with corrosive sublimate, shows a mortality of only five per cent., and only one death could be attributed to the toxic effect of the antiseptic. More than three fourths of these wounds, over nine hundred in number, united by first intention, while more than one half of the balance healed by second intention. The serious nature of many of these wounds is apparent when it is understood that of the whole number 91 were major amputations, 117 were resections of portions of the long

bones, 91 were compound fractures, 69 were joint operations, 84 were operations for hernia, 3 for removal of the kidney, 25 for ovariectomy, and 8 for resections of the intestines.

Formerly the mortality of cases of compound fracture of the long bones averaged one in every four. The complicated nature of this double wound in every way favored the absorption of septic material. The long-continued suppuration reduced the vigor and vitality of the constitution, while at the same time it delayed indefinitely osseous union.

A remarkable change in the results of these injuries has been occasioned by antiseptic treatment. This consists in practically closing the external wound at once by the dressing. The danger of septicaemia is thus greatly diminished, suppuration is prevented, and the bone unites with the same facility and rapidity as in cases of simple fracture, while the mortality is reduced to about the same ratio as that following fractures uncomplicated with an external wound.

Some of the most brilliant achievements of modern surgery are the results of operations involving the exposure and exploration of the abdominal cavity. The protection afforded by the exclusion of germs has rendered these operations successful, although formerly they were so uniformly fatal that their performance was considered unjustified, except as a last resort.

Fifty per cent. of recoveries used to be thought a fair and reasonable expectation in operations of ovariectomy, the mortality being caused in a large majority of the cases by septicaemia or septic peritonitis. At the present time the death-rate of unselected cases is reduced to about ten per cent.

When every condition is favorable ovariectomy is almost invariably successful, provided modern rules and precautions are observed and a fair degree of skill is exercised. The astonishing success attained in this particular operation is unquestionably the result of a comprehension of the principles and faithful execution of the details involved in the antiseptic method. Other operations, requiring exposure of the abdominal cavity and its contents to the influence of the external air and the irritation of manipulation, have also proved surprisingly successful. In a corresponding degree have the results of most other surgical operations been favorably influenced by this method. Exsection of joints, exsection of portions of shafts of bone, opening into and exploring joint-cavities, amputation to check senile gangrene, besides many other operations which, in former times, were considered extremely doubtful as to results, are, at the present day, performed with an assurance of success not dreamed of thirty years ago. In fact, there are few, if any, external wounds known to surgery that have not, at least in some degree, contributed to the vast and increasing fund of accumulated testimony which establishes the great importance of the principles embodied in antiseptic surgery. Allusion has been made to the importance of recognizing the fact that there is a limit to the beneficial application of antiseptic agents. Since this limit has become more distinctly defined and its value more fully appreciated, there has been increased success in wound treatment. It is also important to remember that the antiseptic agent employed is not necessarily the

*sine qua non* of the method, but that success depends largely upon the faithful, intelligent, and persistent execution of the details required to prevent inflammation. It is unnecessary to say more. Even now I have trespassed too far upon your good nature in stating facts that are an open book to the profession. The subject is worthy of a more facile pen than I can wield, and should be presented by one who has more perfect knowledge than I possess and a wider experience than I have enjoyed. The knowledge that I am addressing to-day some who are endowed with these accomplishments does not deter me from exerting my influence, however slight it may be, to induce every member of this Society to avail himself of the advantages connected with the practice of antiseptic surgery. The fact that there are scores of physicians in this Commonwealth, members of this Society, who have never fully employed the antiseptic method in wound treatment places me under an obligation as a medical brother to convince them, if possible, of its superior merits as compared with other practice. To assert that antiseptics, especially carbolic acid, are not generally employed by my fellow country practitioners would be most assuredly false. But they are not applied in a manner to secure the advantages entitled to the antiseptic method. In the form of lotions and washes they do exert, to a certain extent, a beneficial effect, but the protective dressing, upon which depends the question of putrefaction in most wounds, is practically omitted except by a minority of physicians. The application of lotions to fresh wounds is of very slight importance in comparison with the value of protective dressings to prevent the access of germs during the process of healing. However, to omit either the lotion or the dressing, except in special instances, is a violation of antiseptic rules. The best results have been obtained by surgeons who have most carefully observed all the requirements and details of the treatment. Furthermore, in addition to strictly professional reasons for using this method, there is to be considered the claim of the patient. The members of the medical profession are not the real beneficiaries of the antiseptic treatment. Our patients have a right to enjoy the advantages and blessings conferred by antiseptic surgery and it is our moral duty to afford them its benefits. The only apology entitled to acceptance that a member of this Society can offer a patient for neglecting to employ this treatment is a lack of familiarity with its principles and details. This, however, is so easily acquired at the present time that even such excuse should barely suffice to satisfy the expectation of the patient. If the presentation of this subject to-day results in stimulating my associates who are united with me in the rural practice of our noble profession to adopt more completely the principles and practice of antiseptic surgery, the present hour will not have been unprofitably employed.

— Two hundred and forty of the Boston police received diplomas of the Massachusetts Emergency and Hygiene Association this spring, having attended and passed an examination upon the lectures provided by the Association the last winter.