WARREN (J. C.)

RECENT PROGRESS IN SURGERY.

By J. COLLINS WARREN, M. D.

Reprinted from The Boston Medical and Surgical Journal, December 16, 1875.

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Antiseptic Surgery. — The demonstrations of Professor Lister to the members of the British Medical Association at the meeting at Edinburgh last summer, and the address of Mr. Spence delivered at the same time, the former showing the brilliant effects of his method of treating wounds, and the latter giving equally satisfactory results with the simplest dressings, have given rise to renewed discussion as to the merits of the antiseptic treatment. Since attention was last called to this subject in the JOURNAL, the advocates of Lister's views have greatly enlarged their experience ; they have also gained many converts to the cause, and we have now, in addition to the testimony of British surgeons, that of many Continental surgeons, chiefly German, who have for the last year or two studiously carried out the minutest details of the system as laid down by its originator, and have recently given the fruit of their labors to the public.

Time also has shown some of its shortcomings, and as the literature of the day is teeming with testimony both for and against this mode of treatment, it is proposed to give a brief sketch of the discussion in its present stage.

The principle upon which the entire system is based is thus given in the words of Lister himself: "Putrefaction under atmospheric influence, as it occurs in surgical practice, is due to particles of dust ever present in the atmosphere that surrounds our patients, and endowed with wonderful chemical energy and power of self-propagation, yet happily readily deprived of energy by various agents which may be employed for the purpose without inflicting serious injury upon the human tissues." To deprive these particles of their energy has been the object of a complicated dressing, which, since its first adoption, has undergone various modifications. The latest of these, and the one now in use, is the antiseptic gauze dressing, "which contains in its fibres carbolic acid stored up in common resin, is to be applied in eight layers, with a sheet of some trustworthy impermeable tissue placed beneath the outermost layer to prevent the discharge from soaking directly through the dressing, for if it did so a copious effusion might wash out the antiseptic from the part immediately on the wound and putrefy within twenty-four hours. The most durable and therefore most reliable material for

the purpose, consistent with the requisite lightness, is a fine cotton cloth with a thin layer of caoutchouc on one side, known in the shops as hat lining, or thinnest mackintosh."[1] Another change worthy of note in the system is the use of a large steam spray-producer during operations. The details of the method, both in conducting an operation and in applying the subsequent dressings, can be found in most recent editions of works on surgery. The very latest improvements, however, are to be found in an article by Lister in *The Lancet* for March 13, 1875; also in an able review of the whole subject in the *British and Foreign Medico-Chirurgical Review* for October, 1875.

Carbolic acid is still the favorite agent of Lister, although he has experimented with a variety of other drugs. Chloride of zinc, which was formerly used, in solution of a strength of forty grains to the ounce of water, as an application to disinfect wounds already putrid, has been found to cause sloughing if used incautiously, and has been abandoned. Boracic or boric acid, a knowledge of which was obtained from Dr. Stang, of Norway, has proved to be a valuable antiseptic agent. Lint is dipped in a saturated solution of the acid at or near the boiling point, and is allowed to dry, when the crystals are deposited in it. This makes a soft and agreeable dressing, and one which will act antiseptically for a considerable time. An account of the method of using this acid may be found in the *Edinburgh Medical Journal* for September, 1874.

Salicylic acid is used exclusively by Professor Tiersch, in place of carbolic acid. His testimony, however, does not agree with that of Lister, who finds it useful only when the dressing is to remain on a long time, say a week, or of Mr. Callender, whose experiments with the drug are alluded to in a recent number of the *Medical Press and Circular*. Mr. Callender's treatment, it should be said, was not strictly antiseptic. He says, —

"The acid was used in various ways, and the three following preparations were the ones chiefly employed: (*a.*) Phosphate of soda, three parts; salicylic acid, one part; water, fifty parts. (*b.*) Salicylic acid, one part; olive oil, forty-nine parts. (*c.*) Salicylic acid, one part; bicarbonate of soda, half a part; water, one hundred parts. In addition to these, however, it was occasionally used combined with borax, or in the form of an ointment with prepared lard. I found that salicylic acid was free from odor, and so far was acceptable to the patients; that wounds healed under its influence, and, during the progress of the repair, were free from bad smells; that, unless strong with spirit, or but little diluted, it did not cause local pain. Its bad points seemed to be these: that, above the strength of two per cent., it caused local irritation, with some constitutional disturbance; and, if the patient had a delicate skin, even the weak preparation was a source of trouble; that there was more dis-

[1] Heath's Minor Surgery, fifth edition.

charge from a wound dressed with salicylic than there was where carbolic acid was used; that its influence upon a recent wound, as after an operation, was not so efficacious against the occurrence of decomposition as was that of carbolic acid, chloride of zinc, or of boracic acid; that the repair of a wound was less active, and the granulations, if any, were more flabby than when other simple or antiseptic dressings were employed."

In glancing over British surgical literature we find that testimony in favor of Lister's views is not wanting in that country. Joseph Bell says of it, "I trust, however, that the cases I have mentioned will prove to the society that we are warranted in believing that in the antiseptic principle, explain it as you will, and simplify it as I hope you may, we have a very great addition to our means of combating disease. Even if on theoretical grounds surgeons may deny the possibility of preventing suppuration, and ignore our facts, still if it be granted that by this method we can diminish the amount and destroy the fœtor of pus, we have done much to improve the sanitary condition and diminish the fatality of our great hospitals." Among the advocates of this system the names of McDonnell, Annandale, and Cummings may be mentioned.

On the other hand, Mr. Spence, whose patients were treated in the same hospital in which Lister has employed his system, is able to show a record of sixty-five cases of major amputation with only three deaths, or about 4.5 per cent., and twenty-three cases of excision of the joints with only two deaths, or about 8.7 per cent. "The treatment consisted in thoroughly cleansing the cut surface by pouring tepid water over it, and occasionally applying tincture of iodine, alone or diluted, upon the flaps, whilst the dressing consisted merely in laying a veil of lint or thin muslin over the stumps."

This and like testimony caused many surgeons who were, we might say, fascinated by Lister's demonstrations at Edinburgh, to hesitate, nevertheless, in accepting fully his views. *The Lancet* attributes the favorable results of both parties to the increased attention given of late years to hospital hygiene, while it accounts for the enthusiasm of Continental hospital surgeons in the following way: "No one acquainted with the filthy and neglected condition of many of the Continental hospitals fifteen or twenty years ago, and even more recently than that, will be at a loss to understand why the mortality in these hospitals has so greatly diminished since the introduction of antiseptic surgery. Even the moderate use of clean water and the observance of the ordinary habits of personal cleanliness would have sufficed to reduce very considerably the frightful mortality in them."

Although there is doubtless some truth in these remarks, which are applicable in a limited degree to even some of the best German sur-

geons, the standing of Volkmann and Tiersch is so high, and their work so characteristic of German fidelity and accuracy, that their reports cannot fail to prove valuable contributions to the literature of this subject. Volkmann, whose Contributions to Surgery[1] has lately appeared, devotes a leading chapter in that handsome volume to an account of a two years' trial of the antiseptic method in the clinic at Halle. Although during this period an unusually large series of unfavorable cases presented themselves, he states, "It is my conviction that Lister's method opens the way to the solution of one of the most important problems with which surgery has to deal; to give to open wounds the protection and advantages which subcutaneous injuries possess. This protection is not absolute; no one can deny, however, that it is excessively great." He thinks that if this treatment is carried out accurately, the secretions of wounds are absolutely without odor, even if parts of considerable size become gangrenous. Decomposition of blood-clots is not only prevented, but not unfrequently the clot becomes organized in the open wound under the very eyes, so to speak, of the surgeon. A clot projecting from an open wound may remain dark red for a week, during which time granulations grow into it and destroy it; or it may shrink after a while, and drop off like a scab. Such clots he has watched for six weeks without signs of suppuration showing themselves.

This effect upon blood-clots has not been noticed by Volkmann alone. It is one of the characteristic results of the method, which has been verified by numerous observers. Lister has pointed out that blood-clots filling an open wound will remain in situ, organize, and after a sufficient length of time will bleed if incised. Mr. Chiene reports a case to the Medico-Chirurgical Society of Edinburgh, in which he took advantage of this circumstance, and allowed an open wound on the heel to fill with coagulum, which on the sixteenth day bled when scratched, and retained its characteristic red color until on the thirtieth day epidermis began to form over it, and it healed in a few days.

Volkmann notices the absence of all local reaction in the edges of the wound. First intention becomes the rule in those cases where it was formerly the exception. The dressing greatly diminishes pain in wounds. He thinks that under circumstances when we should expect high fever, we find little or none with this treatment. At the time of his writing, eighteen months had passed without a single case of pyæmia, and erysipelas had been almost unknown. Disturbance in the healing process, which in former times was the rule, has now become with him the exception.

He describes in detail the method. Among the objections is, first, its complicated character, which prevents application with any certainty of success in some portions of the body. The action of the acid upon the

[1] Volkmann, Beiträge zur Chirurgie. Leipzig. 1875.

hands of the operator, as also upon his instruments, if used as freely as it should be, is considered a decided objection. Moreover, carbolic poisoning is to be feared. Volkmann thinks this risk is greater than is generally supposed, and he is quite sure that in one case the death of the patient was due to the poisonous action of the drug. When he first began to use this method many cases of collapse and vomiting were noticed, due to the use of the acid, and dark-colored urine was of frequent occurrence. Small children do not bear well the external application of the carbolic dressing. The cost of the dressing seems to be very great; Volkmann spent four thousand thalers in the year 1873 for the materials of which the dressing is composed, while an estimate made of the expense of Lister's dressings in 1874 came to six hundred pounds.

We come now to the investigations of Professor Tiersch.[1] He accepts the theory that atmospheric ferments are the cause of septicæmia, pyæmia, and hospital grangrene. Erysipelas, however, he does not think is produced by bacteria, which are to be looked upon as merely accidental accompaniments of the disease. He has tried carbolic acid with his antiseptic dressings thoroughly, but much prefers salicylic acid, which he now uses exclusively. The latter is neither volatile nor irritating, and it possesses no disagreeable odor. Its chief advantage, however, appears to be that it exercises no injurious influence upon fresh and granulating wounds if brought into direct contact with them, and has no poisonous action if absorbed into the circulation, although it may sometimes produce an olive-green coloring of the urine. At the temperature of the room three hundred parts of water take up one part of the acid; to this mixture the name salicylic water is given. This is sufficiently antiseptic to prevent decomposition, and does not irritate the part to which it is applied. The other form of dressing is called salicylic cotton. This is used of two strengths, a three per cent. and a ten per cent., the latter being colored with carmine in order to prevent mistakes. It is prepared in the following way: —

Three per cent. salicylic cotton: 750 grammes of salicylic acid are dissolved in 7500 grammes of alcohol of 0.830 sp. gr., diluted with 150 litres of water from 70° to 80° C., in which 25 kilogrammes of cotton batting, which has been freed from fatty matters, are soaked. The batting, being soaked in the solution, is then allowed to dry in a moderately warm room for twelve hours, when, evaporation taking place, the crystals are deposited in the cotton. Tiersch uses also a jute dressing prepared by three or four per cent. saturation, with the addition of twenty per cent. of glycerine to prevent the acid being given off too freely in the form of dust.

The salicylic water prevents the appearance of bacteria in the wound. The cotton dressing has remained on fourteen days without their appearance. The jute dressing is most suitable for suppurating wounds,

[1] Volkmann's Sammlung klinische Vorträge, 84 and 85.

in consequence of its being able readily to absorb fluids, in which process the cotton is comparatively deficient. In operating, Tiersch takes all the precautions insisted upon by Lister. He employs the spray and carbolized catgut ligatures. He bears testimony to the absence of fever and the prevalence of first intention.

Finally we find a comparison between the open and the antiseptic treatment of wounds, by Dr. R. U. Krönlein,[1] compiled from cases occurring in the clinics of Zurich, Leipzig, and Halle. The results of amputations treated by the open method were found to be better than those of amputations treated by the antiseptic. The open method was also more favorable in compound fractures and in operations for the removal of the breast. Both methods, he thinks, reduce greatly the number of cases of pyæmia and septicæmia, but do not prevent the occurrence of erysipelas. The time which wounds take to heal is much shorter under antiseptic dressings than when left open. The writer complains of the expense of the antiseptic dressing and of the danger of poisoning by carbolic acid. He is unable to give preference to either mode of dressing.

In summing up the objections to the antiseptic dressing, the writer in the *Chirurgical Review* says that it is troublesome, and requires to be watched, and that the requisite minutiæ are tedious. The surgeon himself must therefore do it, and not leave it to an assistant. He is rather disposed to believe, however, that it is one of the chief advantages of the system that it demands a very special individual watchfulness over each patient if it is to succeed. "But alas," he says, "not only must the patient be watched, but the most unremitting attention must be paid to every action during the period the wound is exposed to view. Is a friendly surgeon going round your ward? A touch of his finger, if unprotected by washing in carbolic acid, may ruin the case. Does an instrument fall to the ground or even lie for a second on the table? To introduce it into the wound again, unless dipped, is theoretically destructive to your hopes. Is it a warm day, and are you liable to sweat? A drop falling into the wound or on the dressing will be fatal to its success. Such being the case, it is not wonderful that in the practice of many who honestly aim at following out antiseptic treatment, and believe they succeed, the results have not always been equal to expectation. . . . The surgeon cannot be expected to lug about with him a steam engine which requires twenty minutes to get up its steam, or an assistant to work a hand-spray every time he wants to dress an abscess or an ulcer. . . . Cases there are, however, which even in the purest air, and under the most wholesome conditions, will be treated more safely, rapidly, and fortunately by the adoption, in all its strictness, of the antiseptic treatment."

[1] Archiv für klinische Chirurgie, xix. part 1.