

## CHAPTER XXI.

## RESULTS OF ANTISEPTIC SURGERY—(concluded).

General consideration of the results. Results of the various methods in saving life. Results in avoiding infective disease. Cleanliness: definition of the term: Mr. Savory's definition and method: cleanliness has not abolished infective disease even in healthy hospitals: cleanliness is a complex method: infective diseases may appear even in the best hygienic conditions. The source of infective disease. Conclusions as to the value of the various methods in preventing infective disease. Deaths from prolonged suppuration after chronic abscesses, compound fractures, &c. Operations on weak or diseased individuals are rendered possible by the aseptic method. Operations otherwise unjustifiable, but nevertheless necessary for the recovery of the patient, may be safely done by the aseptic method. The patient may be made a more useful member of society: joint cases: tenotomy, &c.: compound fracture: dangers of operations of convenience. Local results of wounds treated aseptically: absence of pain, inflammation, &c.: experiments of Yeo and Ferrier: organisation of blood-clot, catgut, sloughs, &c. Histological details of the process: Tillmann's experiments. Temperature in aseptic cases: contrast with septic cases. Local and constitutional course of cases not treated aseptically. Objections to aseptic surgery: carbolic acid poisoning: the surgeon is said to neglect the constitutional state of the patient: expense: trouble: necessity for the spray. Conclusion: great principle of wound treatment is Rest.

WE are now in a position to consider the points referred to at pages 365 and 366, and first as to the results of the various methods in saving life.

In Chapter XVII. I have brought forward a mass of evidence to show *what are the results of the various methods in avoiding infective disease*, and I must now refer to this evidence very shortly. We have seen that the aseptic method, when efficiently carried out, has practically abolished infective diseases, and that this result has been obtained whether the hospital was one in which these diseases were only present in small amount, as in Edinburgh, or whether it was one in which, from some cause or other, they were rife; where the hospital

was, as it is said, infected. We have also seen that none of the other forms of antiseptic surgery give the same *certainty* as regards the result, and that the absence of infective diseases increases in direct proportion to the increase in asepticity of the wounds. I have merely to recall the facts from Mr. Lister's own practice, which show the difference in the results of aseptic treatment and treatment by antiseptics carried on by the same surgeon, in the same wards, during the same time, in cases more or less severe. (I cannot say 'of equal severity,' because the cases treated aseptically were, taken as a whole, much more severe than those treated with antiseptics.) The proportion of infective diseases was four times as great in cases treated with antiseptics as in those treated aseptically. But it must further be noted, that the two cases in which the aseptic method was employed and which died of infective diseases, were both cases in which, through error in the manipulations, an aseptic result was not attained<sup>1</sup>; they were, in fact, septic cases. And so it may be truly stated that in *no case in which the aseptic method was efficiently carried out, i.e. where fermentation and micro-organisms were absent from the wound, did the patients suffer from blood-poisoning. In other words, the aseptic method, when efficiently carried out, was, in Mr. Lister's practice, effectual in entirely preventing infective diseases.*

Similar evidence is furnished by Volkmann, Nussbaum, and others to the effect that in the very few cases in which infective diseases occurred, faulty manipulation could be shown, and this is further proved by the facts that these cases occurred at the commencement of the trial of aseptic treatment, while as yet the surgeons were learning the method, and that since they have become thoroughly versed in its use these diseases have disappeared.<sup>2</sup>

<sup>1</sup> That two cases in which the aseptic method was applied died of infective disease does not prove that the keeping of a wound aseptic is not sufficient to prevent those diseases, because in neither of these cases was the wound kept aseptic, a failure due entirely, as has been previously abundantly shown, to faulty manipulation.

<sup>2</sup> It appears to be generally the opinion of those who have had much experience in aseptic treatment, that while pyæmia and septicæmia are readily enough got rid of, greater care is required to prevent the occurrence of erysipelas. The following is the explanation which I would give of this fact.

The other methods of antiseptic surgery are powerful in this respect chiefly in so far as they prevent or interfere with the occurrence of fermentation in the discharges of wounds. And hence it is that among the best means, not entirely aseptic, for accomplishing the purpose aimed at, are treatment by irrigation and the water-bath, or the very free use of suitable antiseptics. The open method and free drainage are also useful, though to a less extent.

It has been asserted by some writers, more especially by Mr. Savory, that the good results following the use of aseptic methods were due to cleanliness, and that equally good results are obtainable by cleanliness, combined with good ventilation, &c., as are got by the Listerian method. By the term cleanliness, as ordinarily employed, is meant the cleansing of instruments and sponges, in some cases the use of new sponges at each operation and of fresh instruments in the dressing of a case, plenty of water to wash the wound with, the use of fresh and clean dressings, and great care in the ventilation of the wards. Combined with these is careful nursing, good surgery, good hygienic conditions, &c. Mr. Savory, however, defines it as 'the prevention or removal or destruction of all matter which may prove poisonous,' and this definition corresponds to some extent with the meaning of the term 'antiseptic surgery' as employed in this work, though I have limited it to the methods which *interfere with the production* of these poisonous substances, rather than to those which *neutralise their effect* after they are formed; and I have also defined more clearly

There seems to be little room for doubt that erysipelas is a disease due to the growth of micrococci in the skin and subcutaneous tissue, more especially in the lymph channels. Now, as we have seen, one form of micrococcus enters aseptic wounds comparatively readily, more readily than other forms of organisms. We have no absolute evidence, however, that it is only one form of micrococcus which can get in in the manner described in Chapter XII. and it is by no means improbable that the form which causes erysipelas might enter with considerable facility. Where, therefore, a wound is guarded altogether against organisms, erysipelas is avoided; but where care is sufficiently relaxed to let in micrococci, it is possible that the micrococcus of erysipelas may also enter, though the causes of other infective diseases are excluded. That they cannot enter so easily as the micrococci previously alluded to is proved by the absence of erysipelas in the practice of those who use this method most carefully.

what the nature of the enemy is with which we have to contend. The mode in which Mr. Savory proposes to meet the requirements of his definition is the following: 'Taking a case, say, of amputation through the thigh, or of excision of the breast, I should treat the wound in the way following. Having carefully arrested all hemorrhage, using most probably the carbolic catgut ligature, and having gently removed any particles of blood-clot that may have lodged on the surface, employing only clean water or sponges just rinsed out of it, I should, without any further interference with the surface of the wound, bring the edges together, adapting these as nicely as possible with silver-wire sutures. I should not in any way attempt to close the wound completely, but I should leave spaces between the sutures, perhaps from one to two inches long. Then, over the course of the wound and for some distance on each side of it, I should place a layer of folded lint which had been previously well soaked in olive or almond oil containing one part in about 50 of carbolic acid. Over this again I should place two or more layers of dry lint, either with or without cotton wool; so arranging this as, by gentle and equable pressure, to secure without any violence, as far as practicable, the accurate adaptation of the surfaces of the wound throughout, avoiding thus any considerable cavity in the interior. I should secure all this by strapping or bandage, or both, so adjusting these that they may be hereafter removed with the least disturbance. I should place the patient and the wound in the most comfortable position possible, having especial care to the fact that fluids, as they form, may flow outwards. . . . As a rule I do not disturb this arrangement for forty-eight hours, although very often I change the dressing and inspect the wound after twenty-four. . . . The dressings are removed with the utmost gentleness, and the state of the wound carefully inspected. Especially is attention directed to whether there is any tendency to the lodgment of fluid; whether that which forms can escape freely; whether there is much tension of the edges. . . . If the wound presented no other evidence than that of satisfactory repair, I should dress it as before, and proceed in this fashion, dressing and examining it daily or less frequently, according to circumstances. But if at the first

dressing, or at any time afterward, the discharge became at all profuse, or the surfaces did not remain in contact, or there were much tension or a blush at the edges, I should forthwith substitute a bread and water poultice for the previous dressing, and probably continue to employ this until at least all the deeper portion of the wound had closed. When I dressed the wound, I should wash it probably from the first with tepid water, perhaps containing some permanganate of potash in the form of Condy's fluid, or other potent antiseptic of the least irritating kind. I should accomplish this, washing out, if I thought fit, portions or even the whole of the interior by the use of a syringe, avoiding contact of sponges or other substances with the wound. I aim here at the utmost possible cleanliness, having at the same time due regard to the avoidance of any unnecessary disturbance, that the process of repair be not interrupted. And withal I endeavour, by means I need not indicate, to secure for my patient the most complete rest and the purest air.' Such is the way in which Mr. Savory proposes to carry out the 'prevention or removal or destruction of all matter which may prove poisonous.' I do not intend to discuss whether or to what extent this method will succeed in fulfilling these requirements; I leave that for the reader of the preceding pages to decide. I quote it as showing what the best surgeons mean by the term 'cleanliness,' and it will be seen that Mr. Savory's description of treatment by scrupulous cleanliness does not materially differ from what is ordinarily understood by that term.

I must now proceed to inquire whether this cleanliness<sup>1</sup> is

<sup>1</sup> It is too much the fashion at the present time to assert that cleanliness, as the term is now employed, existed long ago, and to speak of it as an explanation of the results of the aseptic method which has been overlooked by Mr. Lister. On the contrary, cleanliness as at present understood is one of the leading developments of Mr. Lister's writings. The *disinfection* of instruments, sponges, &c., is the leading feature of his system, and was not attended to before he wrote. The avoidance of silk ligatures by the use of catgut ones is due entirely to him, for, though catgut had been tried before, it had failed, and it was not till Mr. Lister discovered how to prepare it that it was of any use. Drainage also, though introduced long ago, and again brought into notice by Chassaignac, was very imperfectly used till Mr. Lister worked with it, showed its importance, and demonstrated the best mode of employing it. Cleanliness in the common acceptation of the term is not a feature of

really as effectual in preventing infective diseases as the methods of treatment founded on the Listerian principle. If we look at the evidence on this point we shall find, that no amount of cleanliness, ventilation, &c., has succeeded in abolishing infective diseases to the same extent as the aseptic method. This is at once evident if we again look at the comparative results in Mr. Lister's own hands of cases treated aseptically, and of those treated with antiseptics, &c., *i.e.* by scrupulous cleanliness (p. 376). It is still more strikingly evident if we contrast the results obtained by Professor Spence (p. 378) with those got by Mr. Lister in the same hospital and during the same time. For there we find that the total mortality in Mr. Spence's practice was very much greater than in Mr. Lister's, whether we take the results of individual operations or the total results in the two cases. It will also be seen from Mr. Savory's statement at Cork,<sup>1</sup> and still better from the Report of St. Bartholomew's Hospital for the following year (p. 414), that infective diseases are far from abolished by the use of the 'most scrupulous cleanliness' apart from truly aseptic means.<sup>2</sup> This is the result in healthy hospitals.

But, supposing that it were the case that these diseases are abolished in healthy hospitals by cleanliness, free ventilation, &c., there is abundant evidence to show that these remedies are but feeble in hospitals which are unhealthy or, as it is termed, infected. Look for instance at Professor Volkmann's results before and after the introduction of the aseptic method (p. 385). Before he employed it he had used cleanliness in its best sense, that is to say, he had irrigated his wounds with water and with antiseptics, treated them with the water-bath, treated them with antiseptics, &c., and yet infective diseases increased to such an extent that he had resolved to close the hospital altogether. Nevertheless, as soon as the aseptic method was introduced these diseases disappeared. Perhaps the most striking piece of evidence on this subject derivable

Mr. Lister's method, for he is glad to allow accumulation of blood and dirt around the margin of the wound, so long as micro-organisms do not enter this dirt, because it protects the wound from the irritation of the antiseptic employed.

<sup>1</sup> *British Medical Journal*, August 9, 1879.

<sup>2</sup> See also the results of amputations in St. George's Hospital, p. 414.

from Volkmann's experience, is that with regard to the use of thymol (p. 404), showing that where the *antiseptic* employed was inefficient the surgeon might take the most scrupulous precautions with regard to cleanliness and yet fail to exclude infective diseases.

Similar evidence was brought forward by Professor Nussbaum (p. 393), and his testimony is the more striking as it is clear from his results in the country hospital that he really had been treating his cases with 'scrupulous cleanliness' before he introduced the aseptic method, and yet his patients were dying in large numbers from infective diseases in the hospital in town. Nevertheless as soon as the Listerian method was introduced these diseases at once ceased. That in his practice 'scrupulous cleanliness' when thoroughly carried out was without effect is still better shown by the fact to which he alludes, viz. that even after years of aseptic work with absence of infective disease, these diseases, of as violent a type as formerly, were apt to attack wounds not treated aseptically. Many other facts bearing on this subject will be found in Chapter XVII., and I need not recapitulate them here.

It follows from what has gone before, that a method which is ineffectual under unfavourable circumstances has only a limited usefulness when they are favourable; for, as soon as from any cause, accidental or otherwise, the circumstances become unfavourable, the method becomes ineffectual. In truth cleanliness alone is no method. To be effectual it must be combined with careful nursing, efficient ventilation, good hygienic conditions, careful medical treatment, good surgery, and so forth. Remove one of these conditions, and in proportion to the importance of the factor displaced does the treatment become ineffectual. What the aseptic method does is to substitute a unity for a complexity, and thus to render the patient independent of any disarrangement of a number of factors. Exclude the causes of fermentation from wounds and, as the evidence I have brought forward abundantly proves, you at the same time exclude the causes, whatever they may be, of infective disease.

With the exception of a few extremely rare cases which may be left out of discussion, the causes of infective disease enter the body through a wound. If therefore these causes be

excluded from the wound, they may be abundantly present in the surrounding air, and the patient may be in a fit condition, or in other words, may be a favourable soil for their reception, but nevertheless he will remain safe. And thus the surgeon has a feeling of *certainty* that in spite of the condition of the surrounding air, or the receptivity of the patient, the latter is safe so long as the means employed to exclude the causes of infective disease prove effectual. On the other hand, aim merely at rendering the causes of infective disease inert by a number of isolated precautions, and the failure of any one of these from causes overlooked or unknown renders the patient liable to be attacked. There is no certainty, no security, in such a method.

That a patient is liable to be attacked by pyæmia and other infective diseases, even under the most favourable circumstances, when he is not treated aseptically, is most beautifully shown by Mr. Holmes' experience at the Wimbledon Hospital, and I do not think that I need apologise for quoting his words in detail.<sup>1</sup> In order to test whether operations would succeed better in the country than in the town, Mr. Holmes operated on two patients at Wimbledon. 'I commenced,' says he, 'with two cases which seemed to me to be very appropriate for the experiment. One was a middle-aged man suffering from chronic disease of the tarsal bones, a perfectly healthy individual who had never, as far as I could find, had any serious disease in his life, and certainly never suffered from erysipelas. The other was a man broken down by all kinds of dissipation, and, no doubt, to a certain extent a bad subject for an amputation, but otherwise there was nothing very remarkable about the case. I sent these two men down to Wimbledon, and performed amputation on both on the same day, a few days after their admission into the hospital. They were treated in separate rooms, neither room having been used before; one was in one of the wards of the hospital, the other in one of the private rooms. They were separate from each other, but attended by the same nurse; otherwise they were in exactly the same conditions as a man would be in private practice. The rooms were entirely free from all possibility of contamination. They were not attended by medical students at all, but by the resident

<sup>1</sup> See the debate on Pyæmia. *Transactions of the Clinical Society*, 1874.

medical officer of the hospital. There were no other cases in connection with them whatever, and all the other cases in the hospital were simply convalescent cases. I never saw two cases more likely to do well. One of them was certainly a case of amputation which anyone would have expected to recover, merely Syme's amputation for chronic disease. Both of these people died, one of pyæmia, the other of erysipelas. The erysipelas did not attack the stump at all, but simply the head. This appeared on the fourth or fifth day, and was followed shortly afterwards by sloughing of the skin of the back to an enormous extent, a piece as large as a soup-plate sloughing a few hours before his death. The patient died on the fifth day after amputation. The other man died on the seventh day from pyæmia.' Argue over these cases as you like, they simply shew that the contention that cleanliness, isolation, and so on, are sufficiently protective against infective disease is incorrect, for by these methods some unknown factor may be overlooked and the patient become infected.

During the debate at the Clinical Society, evidence to the same effect was brought forward by a number of speakers. Thus the president, Mr. Prescott Hewitt, mentioned the occurrence of pyæmia in his private practice in twenty-three cases. Mr. Hutchinson also brought forward evidence to show 'that pyæmia is extremely common amongst the lower animals, and it occurs amongst them when they are not crowded in the least, but when they are placed under the most perfect hygienic conditions.' Mr. Charles Hawkins mentioned that an outbreak of phagedæna occurred in St. George's Hospital in the ward at the top of the house, 'in the best ventilated and best placed ward in the hospital.' Sir James Paget stated that pyæmia was as common in private as in good hospital practice. He says, after enumerating several cases:—'I therefore come to the very clear conclusion that there is really nothing, I will not say in any hospital, but nothing in a well-managed hospital, which contributes to the production of pyæmia.' Dr. Barnes, who had been for some time physician to the 'Dreadnought,' referred to a great improvement which had followed the abandonment of sponges, and the substitution of fresh tow for the cleansing of each wound, and the avoidance as far as possible of

the transference of any contaminating material from one patient to another. Mr. Croft, who had been surgeon to the 'Dreadnought,' said with regard to the permanent effect of these improvements:—'I know that after some alterations had been made in the state of the hospital, an improvement took place in the number of cases of erysipelas, pyæmia, and phagedæna, but, after a time, while Mr. Tudor was there—I am sure if he were here he would bear out what I say—both pyæmia, erysipelas, and hospital gangrene were rife.'

I need not quote other facts mentioned there and elsewhere to shew that cleanliness, free ventilation, &c., are not by any means perfect protectors against pyæmia, but are liable to become ineffective from a variety of causes. I do not of course mean to deny or detract from the value of cleanliness and good hygienic conditions.<sup>1</sup> On the contrary, they are most excellent and do much to abolish infective diseases, more especially if they are associated with free drainage, and chiefly, I believe, with the open method and antiseptic irrigation. My argument merely is, in the first place, that however well carried out, they do not even in the most favourable cases protect the patients *entirely* from risk, more especially in operations, such as on the bones, which are particularly liable to be followed by pyæmia; and in the second place, their success is so much at the mercy of numerous disturbing causes, many of them unknown and therefore to a great extent unavoidable, that they cannot form anything like a guarantee against the occurrence of infective disease. No one could say of any individual case so treated: 'I have no fear that you will die of infective disease, unless you are one of those rare individuals who apparently get pyæmia spontaneously: indeed you need not take the danger of infective disease into consideration.' On the other hand, with the aseptic method, whether the operation be conducted in an 'infected' hospital, or performed on parts particularly liable to be followed by blood-poisoning, there is practically, as the evidence

<sup>1</sup> I do not of course mean to deny that good ventilation is useful even where aseptic treatment is carried out. Good ventilation has been shown to be essential for health, and it therefore ought to be carried out as far as possible in every case. I speak here of ventilation, &c., as *substitutes* for aseptic treatment.