

extent, though imperfectly, been introduced.<sup>1</sup> On the other hand, it had been found that, by the addition of various substances, hence termed 'antiseptics,' to the discharges of wounds, decomposition could be markedly interfered with, and, at the time to which we refer, in France more especially this idea was the most prominent in the treatment of wounds. One surgeon, indeed, Lemaire, had announced the view that antiseptics acted by destroying 'the vegetables and lower animals' found in these discharges, and which appeared from recent researches to be the active agents in producing decomposition. Lemaire, however, failed to follow out his views, and thus missed the discovery which was very shortly afterwards announced by Mr. Lister.

Such was the state of matters when Mr. LISTER, who had been working for more than two years independently of any knowledge of Lemaire's experiments, published his first papers on aseptic surgery, which at once threw a flood of light on the confused subject of the treatment of wounds. The development of his system in his own hands has already been traced. Mr. Lister's writings have stimulated surgeons to the study of the whole subject, and have led to the introduction of improvements in every detail of wound treatment. These improvements, acting on better principles, have brought even the older methods to a high state of perfection, and numerous researches have since been made which have enabled us to reduce to order and show the true principles underlying the various attempts at wound treatment which had been previously carried out.

It would be hopeless to attempt to follow out all that has been said and written on this subject since that time, and it would not only be hopeless but also profitless, for the greater part of the statements rest on imperfect understanding or knowledge of Mr. Lister's writings, and imperfect acquaintance with the scientific advances of the present day. In Germany, where science is more advanced than in other countries at the present time, this method has been almost universally accepted and introduced, and some of the leading German surgeons are amongst the most enthusiastic supporters of it. In our own

<sup>1</sup> Chassaignac: *Traité pratique de la Suppuration et du Drainage Chirurgicale*. 1859.

country on the other hand, the necessity for a protection against infective disease has not been so much felt, on account of the much better hygienic conditions of our hospitals; while, owing to our so called practical nature, the scientific problems involved have been allowed to fall out of notice and have been imperfectly appreciated when noticed. Perhaps the greatest obstacle to the acceptance of the principles of antiseptic surgery is the confusion which has somehow or other arisen between the germ theory of fermentation and that of infective disease. Indeed at the present time nine surgeons out of ten, if questioned, would give the germ theory of infective disease as the foundation of the principles of antiseptic surgery, while, as we have seen, it in reality has no necessary connection with these principles at all. The common argument brought against the aseptic theory is, 'How is it that after such an operation as removal of a finger, or excision of the mamma, not performed aseptically, the patient does not as often die of infective disease as after amputation of the thigh?' Now such a question shows the confusion between the two germ theories. The real question to put is 'How is it that putrefaction does not occur in all wounds not treated with aseptic precautions?' This I have already explained in considering the principles of antiseptic surgery, but I have nothing to do, in looking at these principles, with the former question. In considering the results, I shall demonstrate that the exclusion of bacteria from wounds is followed by the avoidance of infective disease, but I do not care whether any one believes that bacteria are or are not the cause of the infective disease. All I would ask is that bacteria be excluded, because they cause fermentations; and if this be done, as I shall presently show, the causes of infective disease will also be excluded. If one prefers to go out of one's way to suppose that not the bacteria, but something else, excluded at the same time, are the causes of infective disease, well and good; it does not matter for the *principles* of antiseptic surgery.

There are, however, one or two phases in the history of this subject to which I must briefly allude.

Firstly, attempts have been made to show that Mr. Lister has no claim as introducer of aseptic surgery. Such statements

rest on misappreciation of the meaning of that term. Most of these writers look on aseptic surgery, and the treatment of wounds by carbolic acid as one and the same thing, and then they point out that Lemaire and others used carbolic acid before Lister.

The first attempt of this kind was made by Sir JAMES SIMPSON, in the 'Lancet' for 1867. He says: 'Mr. Lister in his letter to the 'Lancet,' October 5, states that all his recent visitors to the Glasgow Royal Infirmary had viewed his treatment of wounds, abscesses, compound fractures, &c., and "not one," he adds, "had ever expressed the slightest doubt that the system in question was *entirely new* . . .!" While I regret the strange and almost incomprehensible want of knowledge with which Mr. Lister charges his professional visitors, I am fortunately not answerable for it, and if Mr. Lister had taken the slightest trouble to search English medical literature alone, he would have easily convinced himself of his own grave error in this respect.' He then proceeds to point out that carbolic acid had been extensively used in surgical treatment before Mr. Lister published, and that Lemaire and Déclat had also understood the principles on which it acted. Had Sir James Simpson underlined the word *system*, and not the words *entirely new*, and had he continued the quotation which runs as follows, 'the novelty, I may remark, being not the surgical use of carbolic acid (which I have never claimed), but the methods of its employment with the view of protecting the reparatory processes from disturbance by external agency,' he could hardly have fallen into such a gross blunder. I need not waste time in refuting Sir James Simpson's accusations.

Several similar mistakes have been committed by other writers; but the only other one which I need mention, as it is also the most virulent attack of all, is that by IGNAZ NEUDÖRFER in 1877.<sup>1</sup> His work is a very strange one indeed. He rejects the germ theory of putrefaction and supposes that the bodies which fall into wounds and cause fermentation are not bacteria, but ferments coming from previously fermenting substances. Strange to say, though holding this view, he rejects also the Listerian method, which one would think would be as natural a

<sup>1</sup> *Die chirurgische Behandlung der Wunden*, 1877.

sequence of such a view as of the germ theory. He also attempts to show that Lemaire had anticipated Lister in all particulars, but his statements rest on the same fallacious foundation as Sir James Simpson's. He falls into the common error of supposing that Mr. Lister teaches that catgut becomes revived, instead of, as Mr. Lister has shown, being eaten away and disappearing under the action of the neighbouring living tissues; and he is very severe on this subject. Indeed here his bitterness against Lister and his teaching crops up in an unwarrantable and most offensive way; and I will quote his statement here as an example of Neudörfer's writings. He says: 'Es ist auch hier, wie bei der Wundbehandlung, nur die Darstellung Lister's welche ganz einfache und klar zu Tage liegende Verhältnisse in ein mysteriöses Dunkel hüllt, so wie das Bestreben Lister's an die Stelle der wissenschaftlichen Erörterung inspirirte Dogmen als Orakel hinzusetzen, welches die Fachgenossen blenden soll, die seinen sonstigen Verdiensten nicht wenig Abbruch thut.'

Mr. Lister's merit in this respect is well stated by Bardeleben in his lectures 'Ueber die Theorie der Wunden.'<sup>1</sup> He says: 'Lange schon wusste man dass ein Magnet Eisen anzieht, lange genug auch, dass ein Eisenstab magnetisch wird, wenn durch einen denselben umkreisenden, aber nicht berührenden Draht ein galvanischer Strom geleitet wird, aber die Anziehung des Eisens durch den vermittelst des galvanischen Stromes magnetisch gemachten Eisenstab für die Telegraphie zu benutzen war doch eine Entdeckung.'—'So steht es auch mit dem segensreichen Fortschritte welchen wir Lister zu danken haben. Joseph Lister hat weder die Bakterien entdeckt, noch die Karbolsäure; aber er hat mit eiserner Konsequenz die Thatsache dass Fäulniss nicht entsteht ohne Einwirkung von Bakterien, oder wie, er um botanischen Spitzfindigkeiten zu entgehen, lieber sagt, von Keimen (und dass solche Keime in der Luft schweben) er hat diese Thatsache angewandt auf den lebenden und namentlich auf den verwundeten menschlichen Körper. Und das Ergebniss dieser Anwendung war *auch eine Entdeckung*, eine Entdeckung wohl werth den grössten Fortschritten der ärztlichen Kunst angereicht zu werden.'

<sup>1</sup> The passage would lose by translation.

Another phase in the history of this subject to which we must allude is the introduction of various modifications.

I have already described the modifications and improvements introduced by Mr. Lister. I have also mentioned the newer methods of *drainage*, more especially the use of absorbable drains introduced by Mr. Chiene, and carried out by him by means of catgut, and by Neuber by decalcified bone tubes.

Neuber has made several attempts to obtain a dressing which may be left on for a long time. The advantage of such a dressing is, of course, evident, more especially in the case of compound fractures, &c., and in country practice. He uses bone tubes as drains, and catgut for stitches. The drains in three or four days become soft, and in about ten days have generally entirely disappeared. Large quantities of gauze (Krüllgaze) are applied next the wound and fastened with a gauze bandage. Outside this comes a mass of salicylic wool soaked in the lotion, also fastened with a gauze bandage, and then outside this the regular carbolised gauze dressing. The first dressing is left on in the case of large wounds for about two days. Then the gauze and the salicylic wool are removed, the deeper gauze dressing soaked with the lotion, and a fresh dressing applied. This may be left on for ten days or a fortnight, provided no discharge appears at the edge. This is one of many ways in which a similar result may be obtained. Of late Neuber has treated several cases with one dressing alone.

With the view of cheapening the materials, various modifications have been introduced: thus BRUN'S gauze, mentioned before, and also a gauze introduced by Münnich are outcomes of these attempts. MÜNNICH uses glycerine and spirit instead of paraffin. He also in some cases adds stearin. He uses jute instead of gauze. This carbolised jute is much cheaper than carbolised gauze, and has been extensively introduced. Bardeleben has used with great success jute soaked with carbolic lotion and kept moist by frequent addition of lotion. This is covered with impermeable tissue.

Modifications of the method have been made with the view of applying it in *war*, and I have described previously the suggestions of Mr. LISTER and Professor ESMARCH. A paper will also

be found on this subject by Dr. BURCHARDT in the 'Deutsche militairärztliche Zeitschrift.'

Various other antiseptics have been introduced as *substitutes for carbolic acid*. Among these I may mention the use of *salicylic acid* by THIERSCH. This I have already described. *Thymol* was introduced in 1878 by Dr. RANKE of Halle, and he speaks very highly of its usefulness. It has, however, been tried by several surgeons, among others by Mr. Lister, and has not been found to be a trustworthy antiseptic. Quite recently H. FISCHER and Professor MAAS have advocated the use of acetate of alumina. Maas uses a 2.5 p. c. spray, and after applying protective to the wound, he covers it with compresses soaked in this solution, and covered with an impermeable tissue. He says that the cases follow an aseptic course, and that, as the antiseptic causes no irritation, the discharge is very slight and the dressings only require to be changed at rare intervals.

Then of late objections have been made to the necessity for the spray in aseptic work, and TRENDELENBURG<sup>1</sup> has recently published a paper giving the results of some operations performed without the spray. Indeed for four years he has performed all operations strictly aseptically, but in none has he used a spray. The mode in which this has been carried out is that indicated before. During and after the operation the wound is washed out with carbolic lotion and, while the wound contains this lotion, it is closed. During the changing of the dressing Trendelenburg adopts Mr. Lister's former method of allowing fluid to flow more or less constantly over the wound, and more especially over the orifice of the drainage tube. I shall discuss this question at a later period.

Some years ago Mr. CALLENDER published results obtained by a slight modification of Mr. Lister's method, or rather by the use of Mr. Lister's carbolic oil dressings. I shall also allude to these later.

With regard to these attempts, we have already seen that the spray is the least essential detail of the system; and I have described how its use may be done away with with safety. And this brings me to the last point in connection with the history of

<sup>1</sup> *Archiv für Klinische Chirurgie.*

this subject, viz.: that the method has been objected to on various grounds, but chiefly because those who have failed in their attempts have looked on the spray as the essential element, and on aseptic surgery as the performance of operations or dressings in a spray of carbolic acid. There cannot be a more fatal error than this, for the spray is in the great majority of cases merely a convenience, and not a necessity, and those who look on it as a necessity are apt to forget the really essential details, and to trust too much to the spray. I say it is not essential, for if the wound be easily accessible, and be thoroughly washed out during and after the operation, the great probability is that an aseptic result will be obtained. Only it must be remembered that if the spray is not used, this washing out must not be neglected. But to deluge the wound with carbolic lotion is an undesirable thing; and it is for this reason, and also because the feeling of certainty as to the result must be greater when the spray is used than when it is not, that I would advocate its continuance.

Other surgeons look on the gauze as an essential element, and that this is equally an error is evident from a consideration of Mr. Lister's earlier methods, and also from the results at present obtained by the use of other materials. One surgeon has indeed gone so far as to use the term 'spray and gauze method' as synonymous with Listerian or aseptic surgery; in other words, to define aseptic surgery by two of its least or even non-essential elements. Aseptic surgery is not treatment by spray, nor by gauze, nor by spray and gauze, nor by carbolic acid, but is any method of treatment which aims at and succeeds in *excluding* the causes of fermentations from wounds.

## CHAPTER XVII.

## RESULTS OF ANTISEPTIC SURGERY.

Chief points for consideration. How far do the various methods prevent fermentations in wounds? How to ascertain the true value of any individual method. The value of the various methods in guarding against infective disease: meaning of the term 'infective disease.' Relations of aseptic surgery to infective disease. *Mr. Lister's results in Glasgow. The recent Glasgow statistics. Mr. Lister's results in Edinburgh; results in septic and aseptic cases—Mr. Spence's practice—Mr. Syme's results—Mr. Lister's results at King's College Hospital:—Volkman—Nussbaum—Socin—Sawtorph—Esmarch—Hueter—Czerny—Lucas-Championnière—Gross—Létiévant—Panas—Schede—Reyher—Spencer Wells—Keith—Thornton. Thiersch's results with salicylic acid. Thymol. The relations of other forms of Antiseptic Surgery to these diseases—Treatment by Antiseptics—Reyher—Lister—Nélaton—Hutchinson. Occlusion—Jules Guérin—Alphonse Guérin. Treatment by irrigation and water bath—Langenbeck—Valette. Open Method—Bartscher and Vezin—Burov—Krönlein. Results where no antiseptic measures were adopted—Billroth—Malgaigne—Paul—Holmes—Erichsen. Results of cleanliness—Savory—McVail—Bardenheuer.*

In looking at the results of the various methods of treatment, the following are the chief points which present themselves for consideration.

1. Results of the various methods as to saving life
  - (a) by preventing infective disease.
  - (b) by preventing profuse suppurations and consequent exhaustion.
  - (c) in other ways, such as by rendering operations on weak or diseased individuals possible, or by enabling the surgeon to undertake with safety by one method operations which by other methods would be unjustifiable.
2. Results according as one or other method enables the surgeon to render the patient a more useful member of society.