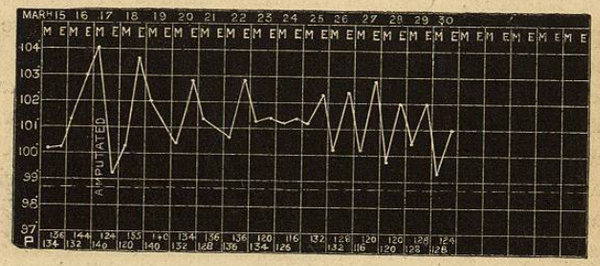
XVIII



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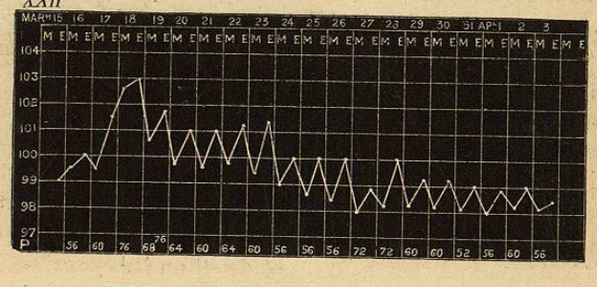

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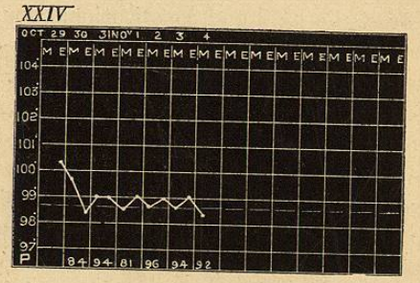

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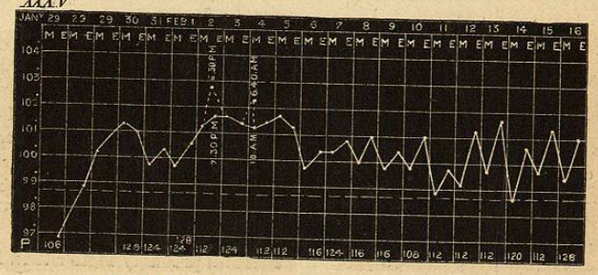
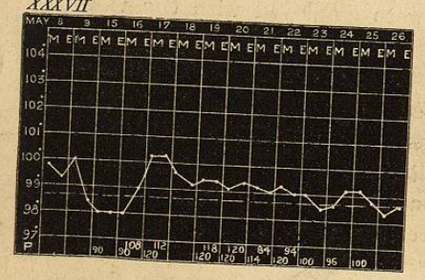


Temperature Charts of Septic Cases.

XXXVII



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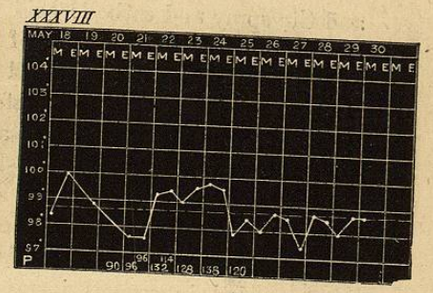

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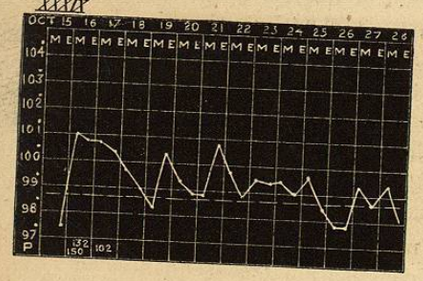

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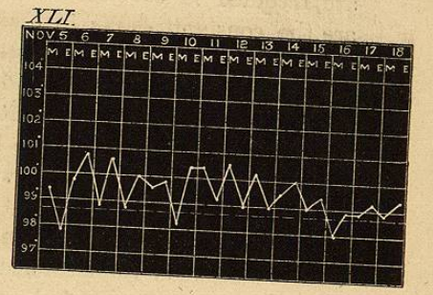

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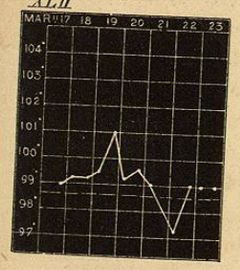

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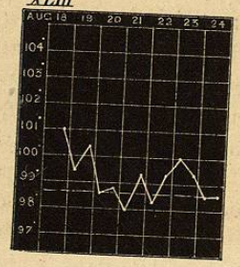

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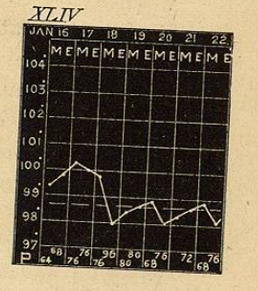

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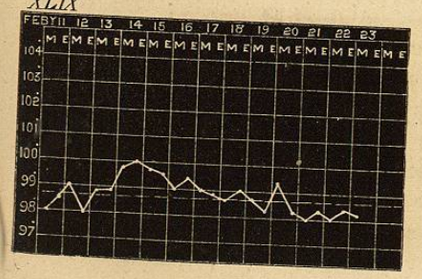

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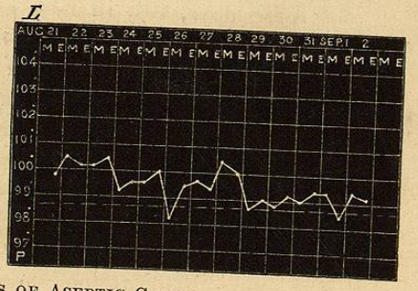

Temperature Charts of Aseptic Cases.

and the spray and carbolic acid were employed with the view of preventing the entrance of other mischievous particles.) In this case inflammation and fever occurred. Contrast the progress of these two cases treated with antiseptics with that of the others which were treated aseptically. The same marked difference will be seen if we look at compound fractures in which fermentation was not avoided. The constitutional results in these cases have been considered in a preceding paragraph, while locally necrosis, inflammation, and suppuration are recorded in several instances. I do not say that these are the constant results in cases treated with antiseptics, but they are the results in the series of severe operations which we have been considering, and if they occur in these severe operations there is no security whatever that they will be absent from others which are less severe. That these results often follow simpler wounds, will be evident from a perusal of the foregoing chapters.

If, again, we take the open method, we find also a marked contrast between the local and constitutional consequences of wounds so treated and of those treated aseptically. Burow, as we have seen at page 334, speaks of the great swelling of the edges of the wounds, and Krönlein also tells us of the inflammation and necrosis which so frequently occur. The pain which must accompany this inflammation, and the exhaustion produced by the prolonged suppuration, are very marked features of the open method. Krönlein,[1] in his report of Rose's practice, states that it was found best not to seek primary union after amputations. He further states, that the first effect of the wound is great swelling of the flaps, which goes on increasing for some days, till, in fact, granulation is complete; this is inflammatory swelling. Krönlein also points out, that in Burow's, or any other method in which the edges of the flaps are brought together by stitches or plasters, the result of this swelling is frequently gangrene of portions of the flaps. Indeed, he says that in 58 cases of amputation treated by the method before described (no attempt being made to bring the flaps into contact) gangrene—not hospital gangrene—occurred in six instances, or in 10·3 per cent of the cases,

[1] *Loc. cit.*

simply as the result of the swelling of the flaps, combined in one or two instances with injury to them. Krönlein also states that necrosis of the end of the divided bone occurred very frequently—in 19 out of the 58 cases, *i.e.* in 32·7 per cent. This happens less often in the cases where the edges of the wound are brought together, but Krönlein tries to make out that this is chiefly because many of the patients in whom it would have occurred die before it has time to take place. This explanation is, however, to a great extent, incorrect; for the true explanation of the absence of necrosis in many cases where primary union is aimed at is that primary union has occurred over the bone, and hence the acute suppurative inflammation of the bone due to the contact of irritating materials, which results in acute necrosis, does not take place. The aseptic method, by preventing this inflammation, renders it a matter of indifference, from this point of view (the chance of necrosis), whether primary union occurs or not.

Further, in cases treated by the open method there is generally more or less fever, showing that absorption is occurring from the wound in spite of the free escape of discharge, or indicating the presence of inflammation in the wound. Krönlein does not enter into details on this subject, but he mentions the fact, that in only six, or 8·7 per cent., of the amputation wounds treated (67 in number) was there no rise of temperature; the temperature in these six cases hardly ever went above 100° F. This small proportion of cases in which there was no fever contrasts markedly with the results after aseptic operations.

The open method also possesses other disadvantages which make the contrast with the results of the aseptic method still more marked. Thus there is a constant tendency to the formation of crusts, which are apt to lead to retention of fluids and their fermentation beneath the crust; thus the wound loses the advantages of the open method. Other disadvantages have been previously alluded to.

The local results of treatment by irrigation and the water-bath are also not so good as those after aseptic treatment, and these methods possess several disadvantages. These disadvantages have been previously mentioned, and I need now only allude to one or two. Thus the water is apt to run into the

bed and wet the patient; in order to avoid this, in the case more especially of local baths, the apparatus must be so firmly fixed to the limb that swelling is apt to occur. Further, the maceration of the epidermis and the sodden state of the granulations are great inconveniences. Also where the water used is cold or where ice is too long applied there is great danger of gangrene in weak parts. Then, in the case of the water bath more especially, where the wound is deep the swelling of the granulations from imbibition of water is apt to block up the orifice and confine the discharge; and also pus coagulates in contact with the water and frequently forms a thick layer over the wound.

I need not dwell further on the points in which the other forms of antiseptic surgery are inferior to the aseptic method. Many of them are self-evident and have been already alluded to. The results, both local and general, of all methods which do not bring about an aseptic state of the wound are uncertain, and the results of these cases being uncertain the surgeon must always have a feeling of anxiety corresponding in degree to the severity of the operation and the interest which he takes in his patient.

I have previously said, that on account of the various benefits which are obtainable by the use of the aseptic method, it ought to be employed wherever possible, unless, indeed, special drawbacks attend its use. Several disadvantages, to which I must now allude, have been attributed to this method.

Firstly, it is said that there is a risk of carbolic acid poisoning. This, however, is not an objection against the *method*; it is an objection against the *antiseptic* employed, and is equally valid when a wound is treated with carbolic acid, though not aseptically. Indeed, the risk of carbolic acid poisoning is greater where wounds are not treated aseptically, for it is then employed in large quantities to wash out the wound. Where the aseptic method is carried out as formerly described, the wound not being deluged with carbolic acid either at the time of the operation or by injecting it afterwards, the risk of poisoning is very slight. The occurrence of dark coloured urine due to

absorption of carbolic acid is not very rare, but this is not poisoning. Unless a remedy is taken in such quantities that the patient's health or life are jeopardised by it, we do not say that the patient has been poisoned. In the same way, unless the absorption of carbolic acid has been so great as to produce serious symptoms, we have no right to say that the patient is suffering from carbolic acid *poisoning*.

The subject of carbolic acid poisoning has been worked out by Kuster, and Nussbaum,[1] who has had some experience of it, has written a very interesting chapter on the subject. According to them, carbolic acid kills by causing paralysis of the respiratory centre. The heart continues to beat even after the respiration is arrested, and the temperature also falls. In severe cases all the symptoms of collapse are present, low temperature, 'at first superficial and stertorous respiration, later great pallor and, finally, sudden death by arrest of respiration.' In less severe cases the following are the symptoms according to Nussbaum:—'They present at first gastric symptoms, which must really be looked on as cerebral symptoms. These are loss of appetite, frequent nausea or incessant vomiting; there is also an increase, often enormous, in the secretion of saliva, which is very frothy. The urine diminishes in quantity; indeed, it has been said that it sometimes contains albumen, but I have never observed this.[2] There may also be dysphagia, immobility of the pupil, and the patient may have a certain feeling of oppression or anxiety. The patients often lie absolutely tranquil in their bed, as if they were prohibited from moving, and they have difficulty in spitting out the saliva secreted. Fever is never absent till, in serious cases, the temperature falls just before collapse sets in.' In addition to these symptoms the urine on standing acquires a dark olive green colour, though it may have been of normal appearance when it was passed. This is due to the presence of indican.

The alleged presence of fever in cases of supposed carbolic acid poisoning is a very puzzling circumstance; for the evidence derived from experiments on the lower animals does not,

[1] *Leitfäden zur antiseptischen Wundbehandlung.* 1881.

[2] Dr. Keith stated, at the recent meeting of the International Medical Congress, that the urine in some of his cases contained albumen.

so far as I am aware, lead to the conclusion that fever is one of the results of poisoning with carbolic acid; on the contrary, it seems to be followed by depression of temperature. Under the impression that fever was one of the symptoms of carbolic acid poisoning, and wishing to produce fever in rabbits, I at one time injected carbolic acid subcutaneously at frequent intervals into a series of rabbits, but without obtaining the wished-for result. So satisfied have some physicians become of the power of lowering temperature possessed by carbolic acid that it has been employed as an antipyretic in place of salicylate of soda. These facts throw grave doubt on the view that elevation of temperature is a symptom of carbolic acid poisoning, and lead us to question whether many of the alleged cases of carbolic acid poisoning are so in reality.

Many of the cases which have been published as cases of carbolic acid poisoning are undoubtedly instances of septicæmia occurring in patients who have been treated with spray, gauze, and carbolic acid, but not by the Listerian method, *i.e.* aseptically. In these cases there is a high temperature, and it is said that carbolic acid has been found in the urine. The temperature is often distinctly septicæmic in character, while the presence of carbolic acid in the urine does not prove that these are cases of carbolic acid poisoning. On the contrary, Brieger,[1] who has investigated the subject of the formation and excretion of carbolic acid in the living body, states that carbolic acid is constantly present in the urine of septicæmic patients, often in considerable quantities, even though no carbolic acid has been brought in contact with them.

I do not wish to deny that this fever may be sometimes due to carbolic acid, but, as far as I can judge, such a view is against the evidence, though more facts are required before we can come to a decision. That there is something different in the result of administering carbolic acid internally and applying it to a wound is evident from the fact which Nussbaum mentions, that olive-coloured urine only occurs after the external use of carbolic acid, and not when it is administered by the stomach or inhaled into the lungs. Surgeons ought, however, to be

[1] 'Ueber Phenol-Ausscheidung bei Krankheiten,' *Centralblatt f. d. Med. Wissensch.* 1878, No. 30.

very careful in attributing elevation of temperature in their cases to carbolic acid poisoning.

In Mr. Lister's practice, and in that of many other surgeons who use carbolic acid freely, but who operate aseptically, carbolic acid poisoning is a thing of very rare occurrence, indeed I only know of two cases treated by Mr. Lister in which serious symptoms were present.[1] The reason of this is that Mr. Lister brings carbolic acid as little as possible in contact with wounds, but acts strictly in accordance with the aseptic principle, and *applies it freely to everything which may come in contact with the wound rather than to the wound itself.* He does not irrigate wounds, nor inject them, nor even wash away the blood and dirt from the line of incision. The surgeons who see the most numerous examples of carbolic acid poisoning are those who, led away by the dogmatic statements of eminent men to the effect that the good results of Listerism are solely due to cleanliness, apply this view to the treatment of their cases, irrigating and washing wounds freely with carbolic acid, to the great detriment of the wounds and the patients.

In the treatment of carbolic acid poisoning the first thing is of course to remove the carbolic acid. This may be done without at the same time abandoning the aseptic method. By the use of eucalyptus gauze,[2] or by the use of salicylic or iodoform dressings, the patient may have the benefit of the exclusion of organisms without the risks of poisoning. In severe cases Nussbaum advises the subcutaneous injection of three milligrammes of sulphate of atropia, which he says has a beneficial effect on the vomiting and salivation; he also advises

[1] In both of these cases there was elevation of temperature, but it does not necessarily follow that it was due to carbolic acid. The discussion of this subject, and the speculations in which one might indulge with regard to it, are, however, not suited for the present work.

[2] I have examined, by means of Koch's method of staining bacteria, a number of wounds treated with eucalyptus gauze, and in a very considerable proportion of them bacilli were found. I therefore cannot recommend the eucalyptus dressings as being equal to those with carbolic acid. As we have already seen, micro-organisms are not found in wounds treated with carbolic acid, or, if present, they are only micrococci. I have not found bacilli under carbolic dressings. On the contrary, with eucalyptus oil, though sometimes no organisms are present, yet in a considerable number of cases bacilli may be found; micrococci are but seldom seen.

that the patient should be packed. Where collapse is present Nussbaum has derived benefit from the use of the following means: friction of the chest, of the hands, and of the soles of the feet with a brush, and the subcutaneous injection of ether and camphor. In milder cases, besides the removal of the carbolic dressings, he advises the use of sulphate of soda as follows:—

Sulphate of Soda	5 parts.
Distilled Water	100 parts.
Syrup of Raspberries	25 parts.

Two tablespoonfuls of this mixture are given every two hours. This method of treatment was proposed by Baumann, who found that carbolic acid was not excreted by the kidneys as carbolic acid, but in the form of a non-poisonous compound with sulphuric acid. It is with the view of obtaining this non-poisonous compound that the sulphate of soda is administered. It is said not to do much good. I have myself had no experience of it.

The so-called 'carbolic eczema' has been brought forward by some writers. I have already referred to it, and mentioned the use of salicylic acid cream as a preventive. It has been attributed alternately to carbolic acid, to the paraffin and to the resin in the gauze, but as I have already explained, it seems to me in some cases more probably due to a fermentation of the discharges caused by micrococci (see p. 232).

In two cases I have known a carbolic acid dressing blister the skin in a few hours and have to be abandoned. Here, however, as I have before said, it was merely carbolic acid, not the aseptic method, which was abandoned; another antiseptic was used in its stead.

Another argument has been brought forward against the aseptic method, viz., that it distracts the attention of the surgeon from the constitutional state of his patient. Such an argument has no foundation in fact. Are the precautions necessary to attain the single object of the exclusion of micro-organisms from wounds more likely to divert the surgeon's attention from the constitutional state of his patient than the numerous cares as to ventilation, nursing, and so forth, with which the surgeon who trusts to cleanliness alone is harassed?

In the great majority of simple fractures no attention is paid to the constitutional state of the patient; the limb is placed in splints, full diet is ordered, and the patient is left till the bones unite. Why is it thought necessary to attend to the constitution of the patient when the bone is divided by an incision through the skin? Because under ordinary circumstances inflammation, suppuration, fever, and other hurtful consequences are apt to occur. But, as we have seen, the aseptic method avoids all these dangers and makes the wound practically subcutaneous. Where, then, is the necessity for attending to the constitution more than in the case of simple fracture?[1] But further, as Mr. Lister himself has pointed out, such an argument is of no weight in presence of the facts; for, if Mr. Lister gets such avowedly good results (better than those obtained by surgeons who pay great attention also to the constitution), and at the same time, as is however wrongly alleged, neglects the constitutional state of his patients, such a fact would be an additional argument in favour of aseptic treatment, and only prove the great efficiency of the method.

Then it is said that the method is costly, and therefore not applicable in the case of poor patients. Now no doubt each individual dressing is costly—costing at the most 10*d.* or 1*s.*, though generally much less—but then these dressings, after the first two or three days, require to be changed only at rare intervals, and I have calculated that in most cases, with of course some exceptions, the dressings are really in the long run cheaper than water dressing changed once or twice daily. But further, the aseptic method saves expense in many other ways. As the patient has no pain nor fever, it is only in a few cases that a trained nurse is required; any sensible friend or servant can attend him quite well. And as he is not suffering from fever nor weakened by profuse discharges, he frequently does not require stimulants or tonics, indeed in Mr. Lister's practice these are seldom ordered; this advantage is no doubt to some

[1] It must not be supposed from this that I would advise the neglect of the constitutional state of the patient. On the contrary, every care ought to be taken to attend to hygienic conditions, and by means of good diet to support his strength, or by suitable drugs to attempt to remedy any constitutional defects.

extent counteracted by the fact that the patient has an excellent appetite. Further, wounds heal on an average more quickly than when treated by the ordinary methods, and as the patient is not weakened by the presence of fever or discharge, the period of convalescence is shorter. This is, of course, of the greatest importance to the bread-winner, for he is well and back at his work while the patient who has not been treated aseptically, and whose wound has not united by first intention, is still undergoing treatment or recruiting his powers in the country. Thus in numerous ways, of which these are a few examples, expense is saved, and on the whole this treatment is from this point of view the one most applicable to poor patients.

Lastly, it has been said that the aseptic method gives the surgeon a great deal of trouble. Now there is no doubt that at first each operation and each dressing requires care and thought, but then the dressings are unfrequent, and by-and-bye the method becomes more or less instinctive. This argument of trouble could not, however, be seriously upheld for a moment, for if a system is good it must be carried out in spite of the trouble involved. Why does one take so much trouble in perfecting one's anatomical, physiological, or practical knowledge but simply with the view of being able to treat his patients better? For the same reason the trouble ought to be ungrudgingly expended here. And if there were no other reason (such as the safety and well-doing of the patient), the relief from anxiety on the part of the surgeon, and the feeling of certainty as to the result, are of themselves a sufficient reward for all the trouble bestowed. The chief point which is laid stress on as giving rise to increased trouble is the use of the spray. I have already discussed this question at pp. 73, 120, and 364, and I have also pointed out the methods by which treatment without the spray may be carried out. As I have said, the spray is the least necessary of all the precautions, because fewer micro-organisms are present in the air than on surrounding objects, and, therefore, the purification of the air is the least important: further, if any particles do fall on the wound from the air, they may be readily destroyed by washing the surface of the wound with an antiseptic lotion.

I have already pointed out that the spray can be dispensed with, and that operations can be performed without it; it cannot, however, be safely abandoned without a substitute being provided in the shape of frequent irrigation of the wound. In proof that aseptic surgery may be carried on without the spray, we have Mr. Lister's work of several years—and very successful work it was too—before he introduced the spray; but then while he performed the operation he constantly poured carbolic oil or carbolic lotion into the wound, and in dressing the case he had a current of the oil or lotion flowing over the wound. Then further, we have Mr. Callender's experience. He practically employed, with some modifications, Mr. Lister's original method with carbolic oil, and his results were good. And, in 1879, Trendelenburg[1] published the results which he had obtained without the use of the spray. He employed the method of continually irrigating the wound with carbolic lotion while he performed the operation and while he dressed the wound. And his results are, in the main, as indeed was only to be expected, aseptic results. He mentions eighteen cases where hydroceles were opened and successfully drained; eight cases where the sheaths of tendons or ganglia were opened without local reaction; twelve cases in which joints were opened, in only one of which was there inflammation; and five osteotomies, of which one died of tetanus, the others doing well. The spray, however, has advantages which seem to me far to outweigh its disadvantages. In the first place, I think it is really less trouble to have a spray playing over a part than to be continually irrigating it with carbolic lotion. Further, there is a feeling of certainty attending an operation conducted under the spray (see p. 259), for if no spray is used septic particles may fall into the wound and escape the action of the lotion; this is most likely to be the case while the wound is being stitched up, and these particles may be protected by the blood clot from the action of the carbolic acid, and may not be destroyed by the clot or the living tissues, but may develop and cause fermentation in the wound. Lastly, the spray has this great advantage over irrigation, that less carbolic acid is applied to the wound, and thus there is less

[1] *Loc. cit.*