with his eyes bandaged, the contact of burning bodies without being aware of them, and permitted needles to be passed through the skin and muscles till their points were fixed in the bone without giving expression to the least sensation of pain. In this patient, moreover, the baric and stereognostic sensibilities were completely abolished. Six hours after the operation all the various profound disturbances of sensibility disappeared as if by enchantment.

I believe, therefore, that I am not mistaken when I maintain that this is the only case existing in the literature which clearly proves that the centre, at least for the superior extremity, for these various sensibilities is situated in the parietal lobe. In fact Déjerine and Madame Déjerine-Klumpke in their recent large and complete treatise on the anatomy of the nerve centres of man in relation to the sensory localizations of the cortex express themselves textually as follows:

Disturbances of the muscular sense are met with contemporaneously in lesions of the Rolandic region and in those of the anterior portion of the parietal lobe; but it has not yet been demonstrated that they can be observed in an isolated state, that is to say, without corresponding motor disturbances consecutive to lesions of the above-mentioned parietal lobe. In other words, there is nothing to show that the cortical sensory zone extends further back than the motor zone. This is a point which requires new researches, and, above all, necropsies made by modern methods, that is to say, by microscopic sections in series.

In my case, above mentioned, the muscular sense was profoundly altered, as is demonstrated by the baric and stereognostic disturbances, notwithstanding that the Rolandic zone was not in the least involved and acted normally.

From the summary exposition which I have given, I believe that I am justified in formulating the following conclusions:

1. That lesions, especially those determined by neoplasms, of the frontal lobes are nearly always accompanied by very grave phenomena of altered intelligence; which proves that the frontal lobes, and particularly the prefrontal, must be considered as the seat of the most elevated functions of the mind.

2. That the cortical centre for hearing is situated in the temporal lobes, that each centre is in relation with both the auditory nerves, and that the direct auditory bundle must be very much less active and smaller than the crossed auditory bundle.

3. That the site of the centre for general sensibility and for muscular sense is in the parietal lobes, and that disturbances of general sensibility and of the muscular sense may occur in the limbs independently of any disturbance of motility whatsoever.

4. That for the solution of various problems concerning the functions of the several regions of the human brain, operative surgery and pathological anatomy are more useful than experimental physiology, which has animals only at its disposal; the functional arrangement of the brains of such animals has some analogy with that of man, but certainly cannot be compared with it in every respect.

A Clinical Lecture

ON THE

ANTISEPTIC TREATMENT OF WOUNDS.

Delivered at the Kgl. Frederik's Hospital, Copenhagen.

By OSCAR BLOCH,

Professor of Clinical Surgery in the University of Copenhagen.

THE ANTISEPTIC SYSTEM IN DENMARK.

ON the occasion of Lord Lister's jubilee I am honoured by a request to write an article for the highly-esteemed BRITISH MEDICAL JOURNAL. I am delighted to have an opportunity of taking a part in honouring the man to whom the world is so much indebted. I am only afraid that I lack the power of doing full justice to such an opportunity.

As one who studied antiseptic surgery under Lister in Edinburgh some twenty-five years ago, and as one who has since become a professor in clinical surgery, and lectured to students at least once a year on the Listerian treatment of wounds, and who has always mentioned Lister's name when

in the clinic a suitable case occurred; as one who most frequently informed the patients that to Lister they owed their rapid and easy recovery from their illness; as one who has deeply felt the great responsibility Lister has put upon surgeons, inasmuch as they nowadays more than formerly are aware that the life or death of the patient lies to a great extent in their hands, but who, however, never would have been surgeons if Lister had not lived—in short, it is as one of Lister's admirers that I take up my pen to try to honour him.

I feel that I cannot do this in a better way than to repeat the lecture on the treatment of wounds which I was about to give when the request reached me.

Gentlemen,—The patient you now see is a miller, aged 42 years, who was admitted to hospital at 1 a.m. three days ago. He rode home in the electric tram, and on alighting near his home, fell, and sustained a lesion of the right upper extremity. On admission he was somewhat collapsed, but fully conscious. The policemen who brought him here had not applied any temporary bandages. We found that he had a comminuted fracture of the upper arm and a fracture of the ulna. But this was not the worst, for the fractures were complicated—that is to say, there were several, in all, four lacerated wounds which put the fractures into open communication with the air, and besides, the skin was considerably undermined.

It appeared as if the skin had been torn away from the underlying tissues; the deeper portions of the wound were filled with blood and street dirt. We convinced ourselves that there was no lesion of the great vessels, and so decided not to amputate. We cleaned the arm, we rinsed the wound very carefully with 3 per cent. carbolic acid; we were compelled to dilate the wound and make counter openings to thoroughly clean it; we then put in five drainage tubes, and covered the whole with sterile "hydrophil" gauze previously treated with 3 per cent. carbolic acid; this was made fast, and bound over with sterile "hydrophil" gauze; over this thick layers of "hydrophob" cotton wool, which entirely covered the edges of the underlying gauze, were placed, so that the gauze was entirely covered up by the cotton wool. The entire dressing was fixed with an ordinary gauze bandage, and by means of cardboard the upper extremity was immobilized in an extended position, and then elevated at a proper angle.

He soon recovered from the effects of this extensive treatment, and now, when three and a-half days have elapsed since admission, the highest temperature he has had was yesterday evening (38.7° C.).

As we are now about to change his bandages, and to see if we have acted aright in endeavouring to save his arm, I have thought that it would be well to take this opportunity of showing you the patient, and to add some observations on wound treatment, for, as you know, it is such treatment that, before everything, dominates the surgeon's practical occupation.

You have often heard me say that it is much more difficult to be a good antiseptic surgeon than a good operator. Now we take off the bandages. You see that the outer bandage is in several places soaked with wound secretions, mostly blood. It does not smell sweet. You will observe that this secretion has come from underneath the cotton wool and therefrom has diffused through the "hydrophil" gauze. The wool itself is entirely free from secretion. We now remove it. It does not show, at any point, that it has absorbed any secretion. It is because it is "hydrophob," namely, water turning. From the wool the fat has not been removed; it is brown, because the fatty substances have become darkened by the sterilization at 120° C. Under this wool we note the thick dressings, the "hydrophil" gauze (and the layers are certainly thick); all this gauze is filled with the wound secretions, mostly blood, but it is so dry that it is rather stiff. However, it can easily be removed from the skin. We now see a little uncongealed blood issuing from the drainage tubes. It looks quite healthy, and does not smell at all. We take out one of the drainage tubes, and in a sterilized glass examine a little of its contents which appear to consist of freshly coagulated blood. It will later be submitted to bacteriological examination. Now we have the whole arm before us. What we feared—and this was the cause of the redressing so early as to-day—that gan-

grene should have set in—we do not find. There is only one place in the external aspect of the humerus, about the size of the flat hand, that is of dark-blue colour, rather cold and insensitive. Otherwise, with the exception of slight ecchymoses, the skin is normal, and well united to the subcutaneous tissues, and there is no sign of inflammation, pus formation, or retention of secretions. In fact, one could not hope for a better result, at least, not under the circumstances.

To those of you who have seen many surgical cases such a result is not particularly remarkable: you are accustomed to observe that wounds usually heal without complications. You have seen several complicated fractures, perhaps not so bad as this, which have made uninterrupted recoveries. But to us older surgeons, who have lived through the pre-Listerian epoch, the matter appears quite otherwise. When I came here as a student, thirty-five years ago, things were very different from what they are now. Several of my comrades fainted from the fearful stench of the wounds, or from their unsightly appearance, and we were told that this was quite the order of the day, so that there was no need to be ashamed of our weakness.

But in the same year a new treatment of wounds was introduced. We Danes are very much indebted to my highly esteemed teacher and predecessor, the late Professor Saxtorph, who quickly perceived the full significance of Lister's principles. Each year he travelled to Edinburgh, and always returned with the latest modifications. We learned to use lint dipped in carbolic water as a safeguard for wounds; we learned to use carbolic oil, carbolic plaster, and all the necessary precautions in a definite manner; we learned to admire the use of catgut; we trembled at the thought of our inability to use the spray properly, because we were taught that the patient's weal or woe depended upon the continuous application of carbolic lotion to the operation wound. And later when the eight layers of prepared carbolic gauze, with red mackintosh under the upper layer, together with all the other antiseptic details were brought into use, when Lister's typical antiseptic dressings were introduced in 1874, we were fully aware of the change in surgical procedures which had occurred during Saxtorph's days. No more smells! No more horrid wounds to view! Hardly any complaining by the patients! And what we could scarcely understand, hardly any complications!

All this we learned from Saxtorph, who closely followed the developmental changes in antiseptic surgery. I can add, and I am glad to be able to do so, that Saxtorph was the first surgeon to introduce antiseptic principles into a country outside the one in which they were first enunciated. You now know how rapidly the news of Lister's discovery spread throughout the world. In France, Lucas Championnière, who visited Lister at the same time as I in 1875, became the "apostle" of antiseptics. In Germany it was Volkmann who more particularly demonstrated the value of the discovery, and it was not only that it benefited the patients so much, but it gave fresh impetus to bacteriological studies; and when later the indications for operative interference became more and more numerous by reason of the results of antiseptics, pathological anatomy made great strides through necropsies *in vivo* which provided "preparations" that could not be viewed under ordinary circumstances. In truth, one can scarcely conceive of a more valuable addition to surgical knowledge.

But to return to our patient. He illustrates far better than my words the value of Lister's methods. Before Lister's time a complicated fracture was regarded as a very serious lesion. You can see in this book of Bondesen's on the *Treatment of Complicated Fractures* that (apart from those cases in which amputation was necessary, and of which of course many died) a fatal issue was to be expected in two-thirds of such fractures, generally from septicaemia and pyaemia. Nowadays death rarely occurs in those cases in which amputation is not at once resorted to. You will perhaps now be better able to understand what I have said to you, "that it is more difficult to be a good antiseptic surgeon than a good operator," and you will better appreciate the great responsibility Lister has placed upon the surgeon's shoulders.

The man I have shown you would have had his arm amputated directly after admission before Lister's days. Yea, even in the early days of antiseptics many limbs were

amputated that might have been saved. I have myself had to deal with such cases. Soon after my appointment here in 1886 a man was brought in who had sustained similar injuries to those of this patient, only he was not so much collapsed. The patient was also a workman, and the fracture was of the right arm. I had been taught that lacerated and dirty wounds, especially where there was *décollement traumatique*, meant certain death. One could not disinfect them. They appeared all right perhaps for a few days, but then "foudroyant gangrene" supervened, and it was too late! The patient was beyond saving. Septicaemia killed him, even if the limb was then removed. I therefore at once amputated this man's right arm, and he recovered. But I could not forget it, and later, when I more fully understood what the Listerian antiseptic treatment could do, I became more inclined towards conservative treatment. A great triumph for Lister was that man, who some of you may remember having seen, a railway guard with a crushed foot who was hurriedly brought in for amputation. I disinfected and disinfected, and made counter openings and put in drainage tubes. I believe there were twenty drainage tubes in all. I watched carefully the man's general and local condition. I allowed those tissues to die that were quite beyond recovery, and removed them by degrees. The result was, in fact, that the man had certainly only a portion of his foot left, but still he had a foot that he could use, and he was able to resume his old occupation, by which he earned his livelihood. I have had several of these cases. It is one of the incomparable benefits of antiseptic treatment that it keeps even gangrene aseptic, yea not infrequently makes septic gangrene aseptic. You will agree with me that these patients owe a great debt of gratitude to Lister.

Let me now shortly show you some other patients who illustrate the value of antiseptic treatment. Here you see a girl with "spondylitis dorsalis," who had an acute abscess. She is now going home. Her abscess has been evacuated and the wound is healed. Before Lister's time it was almost certain death when such an acute abscess was open to the air. Altogether one may say that it is the result of Lister's treatment of complicated fractures and acute abscesses that convinced the surgical world that here was a discovery which no surgeon could afford to leave unused. Look at these patients who have been operated upon for newgrowths. Here is a woman whose mamma was removed seventeen days ago, and upon whom an axillary operation was simultaneously performed; and here is another upon whom laparotomy was done fourteen days ago for the removal of a large uterine myoma. Both of them had only slight pain the day following the operation. Their temperature rose only during the first two nights to a few tenths over 38° C. In both cases the wounds healed by first intention, in the patient with the mamma operation after two dressings, and in the laparotomy patient after one dressing. We could show you a whole row of patients who illustrate the same ideal wound course. And yet we are, as you know, in a hospital that is one hundred and fifty years old, and that lacks all those things which one nowadays calls surgical comforts, and in an operation room where we are compelled to expose numerous things that can harbour particles of matter. Here are no rounded corners or smooth walls—and then—there is no danger in that picture hanging on the wall. For if it is Lister's portrait! Why such good results? Because Lister has introduced antiseptic treatment.

You will understand that all would not go so well as it does if Lister had not used the suggestions of other surgeons. Lister himself has certainly acknowledged this. Only to name one example which occurs to me; if Chassaignac had not pointed out the necessity for draining wounds, Lister would not perhaps have so early obtained such good results. I certainly advise you to always follow Lister in the rule to always drain the wounds well. Here we always do it, and we ascribe to such proceeding a great part of the good results, because retention of the secretion is dangerous.

You know that alterations are made in every invention, and this has occurred with that of Lister. As we have just mentioned "drainage," I will at once say that many believe that it may be dispensed with. Do not trust such statements! Follow Lister; drain freely! Many wound secretions which appear to be harmless; many blood coagulations which look quite healthy, as, for example that which you saw in the tube re-

moved from the patient with the complicated fracture, contain microbes. If these are retained then the conditions are suitable for bacterial growth, and pus with its dreaded consequences may follow. Such may be avoided by good drainage. As you know, we generally remove the drainage tube on the third or fourth day, and the wound heals by first intention under the second dressing, which we leave untouched for fourteen days. After laparotomy we rarely drain, so there is only one dressing applied in these cases.

Should you find micro-organisms in the drainage tubes, then do not remove the tubes too early. Similarly, as with dispensing with the drainage tubes, one has seen many other attempts made to modify Lister's methods. No long time elapsed before we heard the call "Away with the spray!" Now it is hardly ever used. Later it was said that carbolic acid was toxic, so one adopted other means. Especially corrosive sublimate and iodoform attracted attention. Lister himself modified! What however created the most surprise was the contention that antiseptics were unnecessary—it was only necessary to be aseptic. Against this last proposition, which emanated from Germany, I warn you. I can speak on this point from experience (although I do so in humility), for I was the first to treat a whole series of major operation wounds with sterile dressings alone (hydrophil and hydrophob cotton-wool). The results were splendid. But I finished my report on these cases with the words "that it was logical to dress wounds aseptically, but that I desired to advise against it," because there are greater risks when one employs asepsis only than when one practises antiseptics. It is especially unsuitable in hospitals where many changes of assistants occur. One must prescribe greater precautions for others than are necessary for one's own procedure. Antisepsis in this regard means precaution added to safety.

Therefore I adhere to the antiseptic treatment with carbolic acid. At home, here, Iversen introduced the sublimate dressings with great energy and ability, but it was not long before there was a cry "*en garde*." Our countrymen, Stadfeldt and Dahl, in the case of a patient who died after intrauterine injections of mercuric chloride solution, attributed the death to poisoning, and Dahl indicated sublimate as the cause. I then collected the various papers which had been written on the disadvantages and dangers of the use of mercuric chloride solutions, and corrected an angry attack upon its use, whilst I at the same time showed that Lister's carbolic acid was not so poisonous as was thought, if it was employed in a proper manner and in the right strength (3 per cent.). As regards iodoform, you know this has also formed a ground for controversy. To Rovsing belongs the honour of first showing that iodoform is not an antiseptic in the fullest sense of the word. Iodoform is not bactericidal, but in spite of this it is a good dressing in certain cases. So you see that in this country since Saxtorph's day a considerable amount of work has been done on the treatment of wounds, and the same went on everywhere.

Thus the typical Listerian dressing as it made its triumphal entry into the world in 1874 no longer exists as such; every country has its own modification, and we also have ours. When we compare the dressing which we removed from our patient with the complicated fracture with the typical Listerian dressing, you will perhaps say, "but it is not Lister's dressing," and yet it is Lister's dressing. I will briefly tell you how the change occurred and you will then more fully understand the invaluable properties of Lister's typical dressings.

When I first came here in 1886 I used Lister's typical dressings. We obtained the gauze from Edinburgh; I believe it was prepared in the hospital. But it rapidly became old and stiff, and did not readily absorb the wound secretions. We had thus to change the dressings so frequently that I decided to have all the carbolic gauze made in the hospital here by the head nurses after v. Bruns's formula. It soon, however, appeared that, from hygienic considerations, I could not compel our nurses to continue preparing it, and as I had been earlier convinced that Hippocrates was correct in his observation that wounds ought to be treated "dry," and that thus Lister's mackintosh which lay underneath the uppermost layer of the eight layers of gauze and causes the underlying layer to be damp, ought not to be employed, I cast about for another form of dressing. It was quite an easy matter, for in 1879 in some

experimental investigations upon the characteristic micro-organisms of acute infective osteomyelitis in rabbits, I dressed the wounds with sterile "hydrophil" wool, so that if the experiments did not give any positive results I should be certain that I had not killed my micro-organisms by antiseptic substances. I noticed that under the "hydrophil" wool the wounds healed very nicely by first intention. The "hydrophil" wool absorbed well and the wounds were kept dry. Besides, I had several flasks containing urine closed only by a small layer of cotton wool which had remained sterile for several years in spite of the air passing in and out with the changing temperature during the twenty-four hours. If one thinks of the urine as the wound and the cotton wool as a dressing, it is then clear that one may obtain an ideal course in a wound by treating it with sterile cotton wool alone. Instead of Lister's mackintosh I then used sterile "hydrophob" cotton wool (which still contains fat and is, therefore, not absorbent) which thoroughly covered the edges of the absorbent cotton wool. With this dressing, on January 5th, 1887, I commenced to treat a whole series of major wounds, and obtained very good clinical results. However, I found that micro-organisms could exist in the deeper parts of the dressings and healthy blood coagulum in the drainage tubes, even when the wound course was ideal, and I attributed such a condition to the absence of antiseptics in the proximity of the wound. But a number of comparative experiments in which iodoform and cotton-wool dressing and carbolic-gauze dressing were respectively employed showed that micro-organisms still existed in the deeper layers, and that their presence was quite consistent with a satisfactory healing of the wounds. I concluded, however, that to obtain ideal results under cotton-wool dressings one ought to use antiseptic material, because it is safer in hospitals where the staff is large and changing, and where one cannot always control the doings of assistants. Further, I arrived at the result that the best antiseptic dressing was Lister's carbolic dressing, but modified by the substitution of a large and thick layer of sterilized "hydrophob" cotton wool in place of the mackintosh as the uppermost impermeable layer, because this allows free passage of air, and at the same time filters off the bacteria. Thus, as the recognized hospital dressing, we adopted v. Bruns's carbolic gauze (specially prepared in the hospital) and "hydrophob" sterile cotton wool. Continued studies and investigations soon, however, convinced me that the v. Bruns's carbolic gauze had certain defects; the carbolic acid evaporated, and so the practitioner could not be sure that his "stored" carbolic gauze was antiseptic when he wished to use it; its preparation, as earlier mentioned, was tedious and difficult, and culture experiments made with three weeks' old prepared gauze kept in a clean, locked receptacle, provided with means for rapid opening and closing, showed that it contained staphylococcus pyogenes aureus. I therefore undertook further investigations, the results of which I shall demonstrate in the dressings of our patient with the complicated fractures.

You will understand that an assistant whose hands do not require to be clean in a surgical sense—the practitioner can thus employ any person as an assistant—takes the outer layer of filter paper off the package that he holds in his hands; he does not touch the inner part of the package. I, the surgeon with the surgically clean hands, take the contents of the packet. There is an inner layer of filter paper which I remove. The contents of the packet consist of compresses of "hydrophil" gauze and a bandage. I direct the assistant to pour 3 per cent. carbolic acid solution over the compresses, I squeeze out the surplus liquid, and then spread the compress over the wound, and fix it in position with a sterile gauze bandage. Thus I have applied the thick dressing which shall absorb the secretions. It is sterile, and I made it antiseptic at the moment I placed it on the wound. Now the assistant takes another packet, and removes the outer filter paper as before. I myself take off the inner layer of filter paper and spread the contents—the "hydrophob" sterile cotton wool—over the "hydrophil" gauze, so that the gauze cannot be seen. The cotton wool reaches far out over the edges of the gauze. Next, the wool is fixed in position with an ordinary gauze binder, and the "dressing" is completed. It is the "sterile gauze carbolic acid solution cotton wool dressing."

Its value stands or falls with the question of the sterility of

the contents of the packets; and on whether the two layers of filter paper are sufficient to prevent the entrance of micro-organisms. These packages are sterilized by superheated steam in the disinfecting oven of the hospital, dried in the same oven, and kept in a large dry box (the practitioner keeps his gauze in a dry box or chest). The outer filter paper may be quite dark from dust; it matters not; so long as no water comes in contact with the outer layer of the filter paper, it is absolutely certain that the inner layer of the filter paper and the contents of the packet—gauze and wool—are sterile.

You see here a number of cultures obtained by the usual methods. In each tube you will observe the same growth. They consist of fungi and micro-organisms, and the tubes were inoculated from the outer layer of the filter paper. The tubes in which I have placed portions of the inner layer of filter paper and of gauze and of cotton wool are quite sterile. Thus we can be sure that the contents of the package are sterile. How long do they remain sterile? This is important for the country practitioner to know, who perhaps one night might have to undertake an amputation and take his packages with him. He then cannot waste time by boiling his dressings. The oldest package I have tested was nine years old. Its contents were sterile. Can one then travel with the packages without risking their sterile properties? I have often done so, and on my return home have found their contents sterile, even though they had lain together in my handbag with the usual travelling requisites. The longest journeys have been from Copenhagen to the Equator, and back again. The contents were still sterile. So the packages can be employed with safety, and when the thick layer of dressing is wetted with carbolic solution, it is also antiseptic.

Gentlemen, our patient is now dressed, and thanks to Lister one has good reason to hope for a useful arm, because the dressing which is applied, and which gives him the hope of recovery, is Lister's. When I first made a communication as to this dressing and these packages, at the Fourth Surgical Congress, in Paris, in 1889, I called it "a safe and practical modification of Lister's dressing." And although one can name Hippocrates because he has said that wounds should be treated dry, and although one can name Chassaignac because he has taught us how important it is to drain well, you will not for a moment doubt that had Lister not existed neither would there have been such good prospects for our patient.

Lister's invention is the greatest that has been made within the domain of surgery. Lister's only fault is that he has created so many operators who are not surgeons, because it is quite clear since one can do a great deal unpunished, thanks to antiseptics, that it does not certainly follow that there are indications to do it.

Look at our patient again. As I have said to you, before Lister's day this working man would have lost his right arm after such an accident. Now he keeps it. Thanks to conservatism! Thanks to antisepticism! Thanks to Lister!

A Contribution

TO THE

TREATMENT OF FRACTURED PATELLA.

BY PROFESSOR VON MIKULICZ-RADECKI,

Professor of Surgery at the University of Breslau.

A TRIBUTE TO LORD LISTER.

WHEN I was invited by the editorial staff of the BRITISH MEDICAL JOURNAL to take part in the celebration in honour of Lord Lister by a contribution, I accepted the invitation with great pleasure, for it was not only an honourable task to show my esteem in this way for a universally revered master, but it procured for me the great satisfaction of expressing my personal thanks to the man who had first given surgeons a joy in their profession. When, however, I set out to write an article with this end in view in accordance with the wish of the Editor, I fell into no inconsiderable difficulties. What sort of a subject should I choose? Where should I begin and where end? The whole development of surgery in the last twenty-five years is one long hymn in honour of Joseph Lister, and can a page of the history of modern

surgery exist without reference to the inventor of the present method of the treatment of wounds? He who would worthily celebrate Lister to-day must write a whole book taking into consideration gynaecology, obstetrics, pathological anatomy, and bacteriology; in short, most of the disciplines of medicine as well as surgery. So I must confine myself to taking one little leaf from Lister's laurel wreath as the point of departure of my essay.

And yet the temptation to go beyond it was for me very great. Have I not from the outset risen up and fought for the development of modern surgery? For it was, indeed, a battle for young surgeons twenty-five years ago to bring into acceptance the variously assailed teachings of Lister. I still have a lively recollection of my student days in which the various kinds of wound infection in the shape of the so called accidental traumatic diseases—erysipelas, pyaemia, and wound diphtheria—filled the surgical wards with horror. Often for months all surgical operations were deferred because wound infections could not be subdued. At the same time I saw with my own eyes surgical operations practised a few hours later on the cadaver on the same table on which a living person had been operated on in the morning, and the same sponges and instruments not at all or only imperfectly cleaned, used for both purposes. At that time they washed well after the operation in order to clean the blood-stained hands, but before the operation this was a superfluous luxury. This I saw as a student.

When, in the year 1875, I became assistant to Billroth, the open treatment of wounds still prevailed at his hospital, by which, considering the circumstances at the time, relatively good results were obtained—that is, better than with many other surgeons, and these were certainly few enough. He was delighted if the wound left by an amputation of the breast healed by granulation in two to three months. Every operation in which the wound had to be closed was dangerous; even with a simple so-called subcutaneous osteotomy fever and pyaemia occasionally occurred. My teacher, Billroth, who, as was well known, had occupied himself for years with the problem of the treatment of wounds, and had contributed many important explanations of the question, was strongly urged by his friend, Volkmann, to accept Lister's principles. It was not easy for Billroth to give way absolutely to this compulsion. Any one who was acquainted with this able man would easily understand how difficult it was for him to adopt a procedure which only promised good results to a most painstaking, almost slavish, imitation, and the principles of which were not in agreement with his views on traumatic diseases at that time.

In spite of this inward opposition Billroth was eagerly bent on introducing the Listerian treatment of wounds into his hospital. With this object he sent one assistant after another to learn about the new procedure at the source; so first Gussenbauer, then Wölfler, and lastly I (in the year 1879) had the opportunity of learning to know through our own observations Lister's technique and method. The stay at King's College Hospital is one of the happiest recollections of my travelling days as a student at that time. Lister was never tired of showing and giving reasons for his procedure to the surgeons eager for instruction, who streamed to him from all sides, and answering clearly all their questions. So certainly no one left King's College Hospital at that time without being a grateful and enthusiastic adherent of Lister's. What I however specially learnt beside the procedure, only carried out in its entirety by Lister, was that a special quality was necessary to the accomplishment of great things besides a fine intellect. People often call this quality pedantry—a designation which has a somewhat disdainful savour about it. I should rather describe it as precision and consistency. This purely personal trait was not only requisite for the discovery of the antiseptic treatment of wounds; it is to-day indispensable for every surgeon in his method of wound treatment, whether he calls it aseptic or antiseptic. If this quality is wanting to any one he will remain, in spite of all ability, a bungler in the treatment of wounds.

Yet I have already let myself venture too far on the subject which space forbids my treating of to-day. It would be tempting to trace the wider development and transformation of the Listerian antiseptics to the still more finished asepsis