THE HEALING OF WOUNDS: ASEPTIC *VERSUS* ANTISEPTIC METHODS.

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THE healing of wounds, whether inflicted accidentally or designed by the surgeon, is a subject of vital importance to us all, and one which engages the earnest attention of every member of the medical profession.

Every thinking surgeon must regard the name of Lister with feelings of unbounded admiration and respect, for to him is due the greatest discovery of the century, if greatness be measured by the amount of relief from pain, suffering, and death which he has conferred on mankind. And, further, by the enormous extension of possible and successful fields of surgery which he has opened up, with corresponding benefits to our patients. It is, therefore, with the greatest satisfaction that one seeks to realise more fully the first principles for success laid down by Lister by making a study of the habits of pathogenic germs, and how best they may be defeated.

For this reason it is necessary to examine the most recent methods advocated for the healing of wounds, and to compare them with older ones, with a view of adopting only those which the tests of practical experience prove to be the best.

With this object in view, during the past six years I have made a very careful comparison of the relative merits of various forms of antiseptics in the healing of wounds and disinfection of skin, and compared these

results with those which may be obtained by a more purely aseptic technique.

From the results of these investigations in my own surgical practice I am convinced there is a very considerable difference in the behaviour of wounds according to the technique employed in their treatment.

Considerable attention has been directed to wound treatment during the past eighteen months by British surgeons, and none too soon, seeing that our Continental brethren are leading the way in this as in many other matters, and so much confusion seems to exist in the use of the terms antiseptic and asepsis, and also in their various applications, whether separately or combined, that it becomes necessary to define what I mean by the terms in their more modern and restricted acceptation.

Of course all surgery is antiseptic in the sense that it takes preventive measures against blood-poisoning due to pathogenic germs. Further, all surgery aims at being aseptic when we operate through unbroken skin in a region believed to be not previously infected. But the methods adopted to attain these ends vary considerably.

Antiseptics, as generally understood, are chemical poisons introduced into a wound or applied to the skin or other things for the purpose of killing or rendering innocuous those pathogenic germs believed to be introduced into the wound, or which exist on the skin or elsewhere.

Aseptic technique, on the other hand, is generally interpreted as meaning, in the first place, the boiling or steaming of everything which can be so treated for sterilisation purposes, and, for the remainder, a scrupulous attention to mechanical cleanliness in its most exact and exacting sense.

There is really no antagonism in the principles underlying these two methods when properly used—namely, to

reinforce each other where circumstances require. But there is considerable antagonism between the so-called "Antiseptic" and "Aseptic Schools" at the present moment. This arises from the different value which each "school" sets on the power of chemical poisons, as used in surgery, and of simple mechanical cleanliness, respectively.

In my opinion the distinguishing features of the aseptic surgeon are:—

1. His appreciation of the meaning of real cleanliness in the surroundings of an operation;

2. His capacity for thorough cleansing of himself and his operation environment, recognising that the weakest link in the chain of asepsis is the skin, which requires something more than simple cleanliness, and tolerates something less than immersion in strong antiseptic lotions of standard bactericidal strength for the prescribed germicidal periods;

3. (This is, perhaps, the most important, and certainly is the most difficult.) His ability to maintain unbroken the aseptic chain by never allowing himself to touch "dirt," even under the trying strain of mental and physical exertion, during a prolonged operation; and

4. His "abstinence" (to use Professor Kocher's own word) from touching sepsis during the intervals between operations.

One would expect from purely theoretical considerations that the average results of these two methods would differ somewhat widely; and this is fully borne out by the practical experience of those who have given them a fair trial.

In my own experience a purely antiseptic treatment of operation wounds is usually followed by some pain, some inflammation, and a tendency to slow healing. There is

usually no rise of temperature, but there are occasional stitch abscesses.

But purely aseptic technique is generally followed by no pain, no inflammation, more rapid and more firm healing with a marked diminution of fibrous tissue in the scar, and no rise of temperature, while the occurrence of stitch abscesses reaches a vanishing point.

Of course it is folly to imagine there is only one way of doing anything. There may even be several good ways, suited to the individual peculiarities and habits of each surgeon. But I maintain it is our duty to seek for and abscesses reaches a vanishing point.

Many, perhaps most, careful surgeons employ a combination of these two methods, and obtain excellent results. But how far this success is due to the merits of one or other system can never be determined exactly, in the physical sense, so long as they are confused by combination.

It will be my endeavour to show that as one comes to rely less on the help of antiseptic poisons, and more on ordinary mechanical cleanliness in its exact and laborious sense, the more gratifying will be the results to patient and surgeon.

Now let us consider the channels through which infection of an operation wound may take place, and which indeed have been proved, both bacteriologically and clinically, to be sources of real danger.

There is no finer classification of this part of my subject than Professor Kocher's—that great master of aseptic technique—repeated visits to whose Klinik have taught me the value of thoroughness in every detail pertaining to operative work. His classification is:—

Infection of a wound with pathogenic germs may take place from—(1) air; (2) contact; (3) inoculation;

- (4) implantation; (5) necrosis ("wound necrosis"); (6) incubation.

1. *Air-borne Germs* come from dust; dried material from mouth, nose, and clothes of everyone around operation, including patient himself.

These are obviously diminished by ordinary cleanliness of the parts mentioned, especially the nose and mouth of patient—a matter frequently overlooked. The operator and assistant should also be very particular in their own cases, and avoid all unnecessary talking over a wound. The amount of infective material projected from a mouth containing a single carious tooth during ordinary conversation is astonishing, and capable of infecting a sterile nutrient plate several yards away from the speaker (Flügge).

Spectators should, as much as possible, be covered in sterilised, or at least clean, overalls.

The theatre walls, ceiling, and floor should be as smooth as possible, the walls and ceiling preferably white, to show up dirt and reflect light. Ordinary white enamel paint probably yields the best surface, with the exception of glass.

There should be a very liberal proportion of window space, a large top light, one-third or one-half of ceiling area, fitted with outside blinds to stop direct sunshine when necessary. Windows also should be on two or three sides of room. This arrangement avoids shadows when stooping over wound or assistants stand around.

In our theatre in Steevens' Hospital we have the entire place hosed down regularly, and, while the walls are still wet, formalin tabloids are burnt, with the object of getting the vapour into solution on the walls.

It is needless to add that the furniture of the operating room should be as simple as possible—with every part

accessible for cleaning—and that there should be no “dust traps” in the shape of projections from the walls or hanging arrangements from the ceiling.

It is, further, a great advantage to keep the floor of the theatre wet all through an operation, as this prevents dust from one very undesirable source from rising at all. Masks for the face and caps are worthy of consideration.

Face masks undoubtedly absorb many germs projected from the mouth and nose of the operator and assistants over the wound. But if not changed occasionally may, like cotton gloves, become a source of danger.

Caps are also undoubtedly good—preventing germs from the head, especially when your assistant knocks his head against yours, or drops of sweat from falling into wound. In all prolonged operations it is my practice to wear a small towel twisted into the shape of a cap and secured by a forceps.

2. *Contact Infection* from germs introduced by anything which may touch the wound, such as instruments, dressings, lotions, parts of the patient's or surgeon's body, or objects which may be touched by any of these things—*i.e.*, the operating and instrument tables, bowls, and trays—immediately around the operation.

Instruments, dressings, and lotions are perfectly sterilised by boiling for 20 minutes—the instruments being boiled in 1 per cent. soda solution to prevent rusting. Or the instruments and dressings may be perfectly sterilised by circulating high-pressure steam for 15 minutes at 125° C. (Tavel).

The surgeon, assistants, and nurses should wear a sterilised overall, reaching from neck to feet, with long sleeves buttoning round wrist.

My friend Major Holt, of the R. A. M. C., has suggested an extra sleeve, fastening with tape above the elbow, and

buttoning round wrist, which I have adopted, as it can be readily replaced by another if accidentally soiled. This covers the forearm completely—a part seldom effectively disinfected, and one which frequently comes in contact with the wound in making deep manual exploration during a laparotomy.

The patient's body and operating table should be entirely covered with sterilised sheets (two or three layers thick), arranged so as to leave only the smallest necessary aperture through which the operation may be performed with ease. These sheets are held in position by clip forceps, and a smaller sheet, with a hole corresponding to operation wound, is further applied over all.

I have used these Kocher's sheets for more than four years, and the comfort of them is enormous, preventing contact infection, and permitting wipes and instruments to be laid down at will anywhere, on patient or table, with safety. They save a great deal of mental anxiety in trying to remember the right place to lay down each instrument. They are vastly superior to towels, so generally used, which are too small to be efficient, and, further, slip about and open up chinks, which expose unsterilised areas.

All the instrument tables around operation should be similarly covered with sterilised sheets, three to four ply thick, and all bowls, trays, bottles, and nail brushes thereon boiled for twenty minutes beforehand and placed there with long sterilised tongs.

The instruments are best used dry, and sterilised in trays with perforated bottoms, which trays are lifted bodily out of boiler with special sterilised lifter, and placed, still containing the instruments, on these sterilised table-cloths. Thus they are never handled till the surgeon uses them. When lotions are necessary the best to use

is sterilised normal saline at body temperature. This is specially the case in laparotomies. The anæsthetic is best administered under a sort of tent, made by prolonging a sterilised sheet over patient's face and pinned to anæsthetist's shoulder. Other advantages of this manœuvre will occur to the thoughtful surgeon!

When the operation area approaches mouth and nose of patient, as in neck and chest operations, it is best to use a wire frame, over which is stretched a sterilised sheet (which I will demonstrate later by lantern slides).

The question of operation nurses is a very serious one. The theatre sister should be permanent as far as possible, and have under her at least one other nurse whose duties lie solely in the theatre.

For success it is absolutely necessary to define and separate the duties of these two nurses—one of whom is called the aseptic nurse and the other the septic nurse.

The aseptic nurse prepares her hands exactly like the surgeon and assistants, and handles only those objects in the sterilised area, which may be termed the inner circle—*i.e.*, instruments, bowls, lotions, ligatures, &c. She alone may hand or clean these things.

The duties of the septic nurse lie in the outer circle, and include the handling of everything outside the sterilised area which may be required. She boils any fresh instrument wanted, or any one in use which may become soiled, and returns it to the sterilised area with a long sterilised tongs. The same applies to fresh supplies of wipes or lotion.

The drill of this system very soon becomes efficient, as the duties of the nurses are distinct, and not allowed to overlap.

3. *Inoculation infection*, which is conveyed to the wound by germs on or in the skin. It has two sources—

A. skin of patient; B. skin of hands of surgeon, assistants, and nurses.

This focuses our attention on the weakest link of the aseptic chain—namely, disinfection of the skin.

The subject is full of interest and worthy of exhaustive experimental study. It is impossible, in the scope of my paper to-night, to detail my own experiments, or those of other workers, which I hope to do on another occasion. I can merely outline the results of my investigations, which corroborated those of other workers.

Sterilisation of the skin is impossible, according to the most accurate and consistent observers. It may be temporarily disinfected just before operation, but its surface does not very long remain so. Whether this be due to the sweat floating up germs from deeper layers, or that the epidermal scales become macerated from contact with blood and lotions, and so more easily detached with the germs they contain, matters little. The real question is what method will make skin safest and preserve it so for the longest time?

Kocher, Ahlfeld, Mikulicz, Fürbringer, Leedham-Green, and others, agree that soap and hot water, followed by alcohol, furnish the best results.

Mikulicz combines the method and shortens the time by a spirit soap.

Fürbringer uses the hot-water-alcohol method, and adds an aqueous solution of sublimate.

Leedham-Green, after very exhaustive work, is satisfied that the hot-water-alcohol method is best of all, after trying every kind of antiseptic lotion usually advocated.

Kocher and Ahlfeld are agreed also on this point, as the method yields the most consistent results.

My own experiments from time to time corroborate these views, and the most recent of them, for which I am deeply

indebted to Dr. Earl, and for the great assistance and advice he has given me in the matter, prove, so far as we have gone, that the alcohol method is equal to, if not better than, antiseptic methods. Experiments, however, must be conducted in a larger series before speaking conclusively on the matter.

The method of preparing the hands is as follows:—

After cleaning and trimming the nails very short, the skin is scrubbed thoroughly for 15 to 20 minutes in a stream of very hot water, with plain soap and a nail brush, all over hands and forearms. The nail brush must be boiled for 20 minutes before and after use, and stored in a boiled tray, containing 1-1000 sublimate solution. All soap is rinsed off in a stream of water, and, without drying, the hands are carefully rubbed all over with dilute alcohol (Kocher approves 85 per cent., Leedham-Green 70 per cent. alcohol) from 2 to 5 minutes.

The advantages of this method are:—

(a.) Prolonged washing removes an enormous amount of dirt containing germs.

(b.) The dilute alcohol (70 to 85 per cent.) dries and hardens the epidermal scales, and thus prevents the detachment of germs for a considerable time. This hardening effect of alcohol locking up the germs was first pointed out to me by the present Master of the Rotunda, Dr. Tweedy, while my colleague at Steevens' Hospital, to whom I am also much indebted for many suggestions and much assistance in working out the details of the aseptic method.

Kocher, Ahlfeld, and most workers are agreed on this point, and do not attribute the success of this method to any germicidal property of the alcohol (though dilute alcohol undoubtedly possesses this property also). The

most rigorous antiseptic methods approach, but do not surpass, the hot-water-alcohol method of Ahlfeld.

Dr. Earl's experiments in my own technique confirm this view, as tested on three different pairs of hands prepared by different methods. We got complete disinfection with soap, water, and sublimate (1-1000), and also with soap, water, and alcohol. But in one test with sublimate (1-1000) on my own hands a non-pathogenic spore-forming bacillus was isolated under the nails. Plain soap and water, for 20 minutes, in another test, not followed by alcohol or any antiseptic, produced *Staphylococcus pyogenes albus* from the hands, and a non-pathogenic spore-bacillus from nails.

Dr. Earl's further tests of my technique proved boiled rubber gloves, saline lotion, catgut and silk ligatures and dressings to be absolutely sterilised, also the inside of patient's wound and skin margin. But in the case of patient's skin—a knee case—a non-pathogenic coccus was isolated. This patient's skin was prepared by an elaborate antiseptic method.

Grouping the results of all careful workers it seems established that certain sterilisation of skin is not possible, and when obtained is not permanent.

Further, the use of strong antiseptic lotions on hands engaged in daily operations sooner or later will crack and fissure the epidermis. This produces recesses in the skin, which harbour dirt and germs, and render its disinfection still more difficult.

These considerations seem to me a very strong argument for the use of a non-permeable, non-punctured, sterilisable glove—which conditions are all satisfied by rubber gloves.

Sterilised cotton gloves were first advocated, and are still used by many leading surgeons, whose excellent

results justify the means, notably Kocher. But they appear only to be justified where purely aseptic cases are handled, and where "abstinence" from touching sepsis is rigorously practised between operations.

Further, they must be changed frequently, as cultures of *Staphylococcus pyogenes albus* and other germs frequently appear in gloves worn more than half an hour. The personal factor of each surgeon still further affects this point, the rate of sweating being very important.

Rubber gloves, on the other hand, need never be changed, even during the longest operation, if not punctured or torn—which accidents become much less frequent with practice; and air infection of the gloves is met by frequent washing in sublimate (1-1000), followed by normal saline, to prevent access of any antiseptic to the wound.

The objections to rubber gloves are:—1. Loss of tactile sense; 2. danger of puncture; 3. expense. Practice will soon convince anyone that the loss of tactile sense is more imaginary than real, and in the two and a half years I have used them I have only once or twice, in early days, felt inclined to remove them for this reason. Their puncture by a needle or instrument is always felt at once. The instrument or needle is at once discarded for re-sterilisation, the puncture treated with strong sublimate, and a fresh rubber finger-stall applied, or an entirely new glove substituted.

Their expense in private work is trifling compared with results obtained. In hospital work care saves many accidents, and small holes can be very well mended after the method of a puncture in a bicycle tyre. Altogether, they satisfy almost ideal conditions, as regards sterilisation and protection of patient and surgeon mutually. They must be used absolutely wet, or quite dry. In the wet

method they are sterilised by boiling for 5 to 20 minutes. In the dry by superheated steam, like dressings. This latter method I have frequently used and find it perfectly satisfactory.

It seems to me worthy of attention as to whether we may prolong the period of safe disinfection of the skin by using dry gloves and avoiding maceration of epidermis following on the soap, hot-water-alcohol method of disinfection, which locks up germs from free dissipation.

Professor Kocher suggests that the highest virtue in a surgeon is "abstinence" from touching sepsis between operations. It is good to disinfect hands which have touched sepsis; it is better never to touch sepsis at all.

This requires constant watchfulness on the part of the surgeon, and the condition can be very fully realised by using rubber gloves in all septic dressings or examination of septic and mucous surfaces.

Kocher remarks on this point:—"It is certain that he who cannot conform to "abstinence" as above defined, can never know the ideal meaning of a purely aseptic treatment of wounds. He remains condemned to the use of antiseptics."

Apart from the protection to the patient provided by rubber gloves, it is, perhaps, needless to remind you of the personal immunity from sepsis which they materially increase for the surgeon.

In one very faulty point of technique rubber gloves score off all other methods—namely, the tying of ligatures towards the middle or end of an operation—more especially stout ligatures. Here very considerable force is used, pressing the ligature, usually silk, deeply into skin of operator's fingers, and obtaining while there a full dose of whatever germs his skin is capable of providing, which

are further implanted in wound. This is believed to be the true source of the trouble which has led to many unfair attacks made on silk as a suture material. Rubber gloves of course furnish absolute protection from this source.

The skin of the patient is quite another matter, and cannot be covered with rubber gloves, as its exposure is necessary. We should, however, cover it up as much as possible, and, further, prepare it very carefully, exactly like the skin of operator's hands, only this should be done twelve hours before operation and again just before. In the interval it is best covered with an impermeable sterilised dressing to maintain the first cleansing from air and contact infection. The question of leaving an antiseptic like carbolic, 1-40 or weaker, on the skin overnight is one which requires qualification. If the skin of patient is rough, and obviously difficult to clean, we had better use strong antiseptics in cleansing, and leave one on for twelve hours to assist the process. But this method always exposes the patient to the risks of a chemical dermatitis, which nearly always becomes septic by infection from skin-germs. And many times local sepsis of the wound arises from this source.

Pimples, acne spots, sinuses, or ulcers near an operation wound enormously increase the risks of sepsis, and require very special treatment, the best being the application of the thermo-cautery.

4. *Implantation Infection.*—This arises from germs included in the ligature or suture material, implanted permanently or temporarily in the wound. Its avoidance is very simple if the following technique be adopted, always using rubber gloves:—

(a.) Use very fine silk, No. 1 or No. 2. Fine silk is more easily sterilised by boiling, and permeated better by

antiseptics. It also leaves less foreign bodies in wound. If required strong, simply multiply the strands to required strength. I have more than a dozen times ligatured the femoral and axillary arteries with two to four strands of No. 1 silk without trouble.

Kocher's preparation is:—1. 12 hours in ether; 2. 12 hours in alcohol; 3. boil 10 minutes in 1-1000 sublimate; 4. wind on reels with clean or gloved hands; 5. boil for 10 minutes again in 1-1000 sublimate just before operation; 6. use direct from sublimate.

I have used this silk exclusively for nearly three years with perfect results. Sometimes, in very extensive operations, such as Halsted's full operation for breast cancer, I have buried 150 ligatures of this silk and have never seen any trouble arise.

The boiling on two occasions insures complete sterilisation, which is maintained by the sublimate. Further, the inclusion of a small quantity of active germicide effectively deals with germs accidentally lodged in the silk, which otherwise would use it as a *modus* for development before attacking the wound.

Silk is only used in aseptic cases, (*b.*) catgut in septic or aseptic cases. For four years I have used the formalin method of preparation devised by Dr. Roy Dobbin while House Surgeon at Steevens' Hospital. I have tested it both bacteriologically and clinically in some hundreds of operations, and have never had any trouble from this source.

The tested strands of No. 0 gut are fixed in 4 per cent. formalin, washed and boiled for 5 to 10 minutes, then stored in glycerine and alcoholic biniodide of mercury (1-1000). For tensile strength and pliability I find it the best of all methods, and it is always perfectly sterile.

(*c.*) For skin suture I use worm gut only, as it is com-

pletely sterilised by boiling, and cannot in single threads introduce germs from skin by capillarity.

5. *Necrosis Infection*.—Under this heading Kocher includes mechanical, thermal, and chemical injury of tissues due to faulty technique, which reduce the vitality of the tissues, and render them an easier prey to pathogenic germs which may be introduced.

Mechanical injury of a wound is due to splitting, tearing, and crushing of tissues. A sharp scalpel and fine-pointed hæmostatic forceps of Kocher's own pattern obviate much of this.

Thermal injury is due to having air in theatre too cold, or scalding tissues by too hot lotions. The first is avoided by operating at a temperature of 70° to 80° F. The second by using a thermometer in the "normal saline" lotion.

Drying of the wound (Walthard) is also injurious, and may be avoided by covering with compresses wet with normal saline lotion—specially important in laparotomies.

Chemical injury is undesirable and preventible. It causes tissue-necrosis, which favours infective necrosis in the presence of germs.

In other words, antiseptic poisons should never be introduced into a wound at all, as they do more harm than good by lowering vitality of tissue, thus reducing its resisting power to germs, and that, too, in a more rapid ratio than the vitality of the germ is reduced by the germicide under "operation conditions."

I have frequently proved the same in accidental and septic wounds, which, as a rule, heal much more quickly when cleansed with normal saline. I find from other quarters this experience is not singular.

6. *Incubation Infection*.—This is due to providing any germs introduced with a nutrient medium accumulated in

the wound, such as blood or serum, which forms a sort of foreign body in the wound, in which there is no healthy circulation, and which keeps the two surfaces of the wound from accurate contact, and consequently delays union.

This is avoided by accurate hæmostasis, accurate approximation of wound surfaces, and, when this is impossible, by the use of glass drainage tubes and secondary sutures.

Accurate hæmostasis can only be obtained by the application of a pressure forceps to every bleeding point, picking up a vessel alone and not lumps of tissue. This is best accomplished by Kocher's own pressure forceps, now familiar to everyone. It is advantageous to postpone ligature to end of operation, as then many vessels will be stopped by simple pressure or torsion. For this purpose a considerable supply of these forceps is desirable. I personally never feel comfortable now starting a big operation with large section of muscle surface, such as Halsted's excision of breast, with less than fifty to seventy of these forceps, and I frequently have them all applied on two or three distinct occasions in such an operation, thus greatly reducing shock from hæmorrhage and seeing one's way much better, besides subsequent advantages of checking collection of blood and serum.

Professor Kocher starts work every day with a tray containing one hundred to two hundred of the forceps available. Halsted, I am told, occasionally uses a still larger number.

Finally, accurate apposition of wound surfaces is absolutely essential for success, and can only be acquired by long practice. When this is impossible it is best to use glass drainage tubes and secondary sutures.. The wound is best dressed in a typical case with xeroform gauze strips

covered by sterilised butter muslin and collodion, into which is rubbed sterilised subnitrate of bismuth while drying. This forms an impermeable and waterproof scab, or wound splint, under which primary union proceeds most satisfactorily. Further, this dressing, especially in movable skin, like the abdominal wall, provides a sort of splint which affords great support and fixation, so necessary for repair of a wounded tissue.

Such are the details of the technique which I have gradually pieced together during the last five or six years, and which I have practised in their entirety as far as possible during the past three years with increasingly satisfactory results. The method is based on my personal observations during repeated visits to Kocher's Klinik, where the aseptic system is more thoroughly carried out than in any other place with which I am familiar.

In my earlier days of antiseptic zeal I obtained good results—to me surprisingly good results—but they were expensive, both in the bill for drugs and epidermis of hands, which suffered a good deal in the struggle. There was a certain set of characters about these wounds which I recognise the meaning of more clearly now. In my practice of this antiseptic method, primary union (so-called) was the rule, and there was no fever, and little, if any, pain. But sometimes the skin edges of the wound and suture holes were red and a little swollen, and if sutures were removed under seven to ten days there was a tendency towards delayed union. Stitch abscesses were very rare, but did occur. No serious trouble, however, followed these conditions in any of my cases.

When I adopted more purely aseptic technique the above-mentioned characters disappeared. Primary union without fever was still the rule. But an entire absence of pain, even in the most extensive operations, became the

rule also. Redness became still more rare, as did also stitch abscess.

But, apart from the disappearance of pain, what struck me as most remarkable was the rapidity of union, its firmness, and the small amount of fibrous tissue developed in a scar. It came more to resemble what has been described as "primary adhesion" of tissue to like tissue, and forms the ideal method of healing wounds according to our present knowledge.

It was with feelings of doubt I began to apply aseptic technique to accidental and septic wounds, but my experience now in the accident room and other septic cases convinces me that even such wounds will heal more rapidly with douching of warm normal saline, provided real mechanical cleanliness is insisted on in and around the wound. This experience is corroborated by other workers who have given the method a fair trial amongst septic cases, of which I could recite many instances which have come under my notice here and abroad.

Many papers have appeared on the subject of my communication to-night, and much discussion has taken place thereon lately in England, and it is interesting to read the difficulties which have been raised. Mr. Watson Cheyne draws a harrowing picture of the state to which the surgical nurse is reduced while trying to do two things at the same time. All his objections to the aseptic method can be at once simplified and dismissed by making two nurses do the work, and defining their separate duties as I have described.

In conclusion, I must record here my sincere thanks to the resident and nursing staffs of my hospital for their loyalty and diligence in carrying out all the details of this system, any success which may have attended it being chiefly dependent on their intelligence and zealous

work. On my house surgeons fell the chief responsibility of superintending these arrangements in my absence, and I feel my special thanks are due to them, amongst whom I would mention Dr. Roy Dobbin, Dr. Robert Halahan, and Dr. Fred. Blackley.

MR. LENTAIGNE said that, as to the definition of aseptic and antiseptic surgery, he understood aseptic surgery to mean where nothing went into the wound in the shape of an antiseptic, chemical or otherwise, and antiseptic surgery, where septic processes in wounds had to be fought by the aid of chemical antiseptics. He considered it a matter of impossibility in general surgical practice to avoid occasional contact with sepsis, and accordingly he did not consider one could rely solely on aseptic measures.

MR. TOBIN thought the ideal condition of things would be that in which all surgeons used the same methods. It would be well, too, if surgical nurses were all trained on similar lines. He did not think the danger likely to follow from puncture of rubber gloves during an operation very great.

PROFESSOR BENNETT agreed with Mr. Haughton as to the advantage of using alcohol as a final disinfectant in cleansing one's hands and the surroundings of a wound. He had found, however, that alcohol applied to the skin of his arms produced severe urticaria; he had found no unpleasant consequences, however, from employing it for his hands.

In reply, MR. HAUGHTON thought that abstinence from sepsis should be the constant aim of the aseptic surgeon, and the best way to do this was by wearing rubber gloves when dealing with septic cases of all kinds. In the treatment of actually septic wounds he thought weak antiseptics were better than those of greater strength, as the latter acted injuriously upon the tissues. He considered alcohol at a strength of 70 per cent. was better than full strength when employed for the hands. He thought silk was an absolutely satisfactory ligature material for burying in wounds, if No. 1 were used.

[At the conclusion of his paper Mr. Haughton showed a series of lantern slides illustrating various points in aseptic technique.]