

**Further report on aseptic and septic surgical cases : with special reference to the disinfection of materials and the skin / by C. B. Lockwood.**

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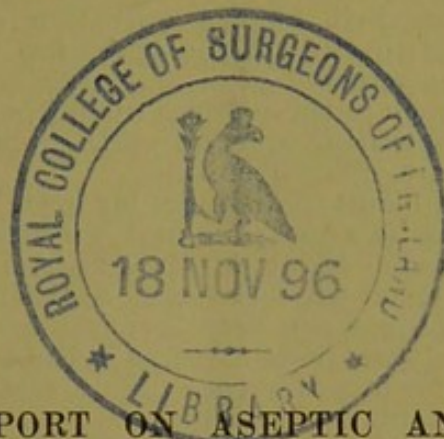
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FURTHER REPORT ON ASEPTIC AND SEPTIC  
SURGICAL CASES, WITH SPECIAL REFERENCE  
TO THE DISINFECTION OF MATERIALS  
AND THE SKIN.

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[THE following is a continuation of the reports which have already appeared in the BRITISH MEDICAL JOURNAL (October 25th, 1890; May 28th, 1892; and January 27th, 1894). Again our standard of perfection is the absence of bacteria from the skin of the patient, from the hands of the surgeon and of his assistants, from everything which came in contact with the wound, and, finally, from the wound itself. The test adopted is a simple one. A scrap of skin, towel, sponge, and so forth is cut off and dropped into nutrient broth, which is afterwards kept at a temperature of either 20° C. or 36° C.; and a final opinion was not arrived at until the higher temperature had been used. If the broth remained clear at the end of a fortnight, it was assumed that what had been put into it was sterile. In the last report some experiments were cited to show that the minute quantity of the chemical which was always conveyed into the broth with the material did not mar the result. These experiments have been continued. A number of the broth tubes which had remained clear after skin, towel, sponge, and so forth had been put into them, were inoculated with bacteria. An abundant and rapid growth always took place, thus proving that the amount of chemical conveyed into the broth upon the material was quite innocuous.]

I propose to begin this report with the experiments made upon materials. These are a useful control over those done with skin, with tissues, or with fluids from the wounds. Most of these experiments were done by Dr. Black Jones and Mr. J. Preston Maxwell under my superintendence. I am greatly indebted to those gentlemen for all their care and trouble. It is hardly necessary to point out the value of prolonged and numerous tests as evidence of the efficiency or inefficiency of the methods which we employ.

DISINFECTION OF SILK AND FISHING GUT.

Various sizes of twisted silk are used for buried sutures and ligatures. The silk is wound upon a reel or upon a microscopical slide, and boiled in water for twenty minutes or half an hour. When the silk is thick, or much has been wound upon the reel the longer period is required. After having been boiled the silk is put into a bowl of carbolic acid lotion (1 in 40). None but the operator touches the silk, ligatures, or instruments. The silk was tested twelve times

before use by cutting a scrap of it off and dropping it into broth. On each occasion it was sterile. Also, silk which had been much handled in the operation of laparotomy for tuberculous peritonitis, in the operation for varicocele, and in that for the removal of a large patellar bursa was sterile at the end of each of these three operations. Silk which had been used in operating upon an epithelioma of the neck was septic at the end of the operation.

I find it so difficult to disinfect my own hands that the silk is handled as little as possible, but the atmosphere cannot be entirely ignored. Many of the experiments given in this report were done at the new Great Northern Hospital, where all the surroundings are very favourable. Dr. Black Jones exposed six gelatine plate cultures in the operation theatre of that hospital for five minutes. Four plates were put upon the operation table and two upon that used for instruments. The exposure was made half an hour before the operations were begun, and when the theatre was quiet. Six days afterwards one plate had grown 10 colonies, one 11, three 15, and one 21. Many of the colonies were black or white moulds, but various cocci and bacilli also grew; and some of them liquefied gelatine.

This sterile silk behaves well when buried in wounds, even in considerable quantity, as for the radical cure of hernia or for the closure of wounds in the abdominal wall. Out of forty-five operations for the cure of inguinal, femoral, or umbilical hernia done since January, 1895, one case parted with one suture, and one parted with several; the rest healed by first intention.

Silkworm gut, or fishing gut as it is often called, is excellent material for closing skin wounds, and, I might add, those in mucous membranes. I have tested silkworm gut six times. On each occasion the broth remained clear. This gut had been boiled for twenty minutes and then put into 1 in 40 carbolic lotion, the same as the silk. I cannot recall a case of stitch-hole suppuration after the use of this disinfected gut, the skin having also been disinfected as described below.

#### THE DISINFECTION OF TOWELS.

After the experiments given in the last reports the towels which are used to surround the field of operation were boiled or steamed for thirty minutes, and then put into carbolic acid lotion (1 in 40). The surgeon or his assistant, after having sterilised the hands, picks these towels out of the lotion, squeezes them as dry as possible, and then distributes them around the field of operation.

Nineteen towels were tested at the beginning of the operation, and of these seventeen were aseptic and two were septic. One of these infected the broth with bacillus subtilis, which is very hard to kill, even with boiling water. Another towel was also septic, but we found out that it had only been boiled for a few minutes. Two of the towels around the field of operation were tested at the end of the operation, and both were septic. They had been exposed to the atmosphere for from half to three-quarters of an hour. This result is not to be wondered at after what happened when gelatine plate cultures were exposed. Clearly it is better not to place instruments on the towels, and also not to drag silk across them.

DISINFECTION OF SPONGES.<sup>1</sup>

In the previous report, eleven sponges out of twelve were aseptic. Since then, twenty-five sponges have been tested before use. Twenty-two were aseptic and three were septic; two others were tested after use, and both were septic.

The proportion of septic sponges in the tests done before the operation seems to me to be very high. The results do not equal those of the previous report. But the tests of the skin of my own hands show that it was septic in seven times out of twenty-one. Inasmuch as the hands are used to squeeze out the sponges, so it is possible that the method of disinfection may not be always at fault. Here again the atmospheric bacteria have also to be reckoned with.

Of the three septic sponges the kind of sepsis of one was not ascertained; another was infected with a micrococcus almost invariably found in the skin, and which is very like *staphylococcus pyogenes albus*, but does not liquefy gelatine in the same way. It has been called *staphylococcus epidermidis albus*. The third sponge contained a bacillus with rather unusual characters. It grew in gelatine near the surface as a delicate white cloud. The gelatine was liquefied at summer temperature. On agar-agar it grew in minute white colonies on the surface and in the depths. The growth was slow, and consisted of slender bacilli of varying length, usually solitary, but occasionally forming short chains. Some of these bacilli were slightly curved; no spores were seen; the culture had no odour; the bacilli were probably motionless. The disinfection of sponges is a serious problem. They do their work so well that I should be reluctant to abandon them for substances which can be sterilised with heat. Moreover, the surgeons who use wool disinfected by heat in place of marine sponges have not yet given us the results of their tests. My own efforts to disinfect wool for bacteriological purposes with dry heat sometimes failed. Moreover, I have seen moulds growing from wool which had been disinfected by others.

On two occasions I tested wool which had been prepared in Lautenschlager's steam steriliser, and on both it was aseptic. When sponges have been in solution of sublimate the sulphurous acid method of sterilisation is apt to make them black and dingy. This can be obviated by using chlorine water, instead of sulphurous acid solution. A sponge which had been prepared in this way was aseptic. The chlorine however, seems to make the sponges red and friable. One of the sponges which was aseptic after the sulphurous acid method of preparation is known to have previously been used for a septic case.

## WATER AND SOLUTIONS.

A few tests of other things have been made incidentally. The hot water from the theatre tap was tested on two occasions by placing 15 m. into 10 c.cm. of broth. Each time it was aseptic, as it was when tested for a previous report. The same water was septic after having been exposed to the air of the operation theatre for an hour and a half.

The biniodide of mercury lotion which is used for cleansing sponges was tested three times. A 1 in 2,000 lotion was

<sup>1</sup> For mode of preparation, see BRITISH MEDICAL JOURNAL, January 27th, 1894.

sterile after it had been used for about ten minutes for the sponges, which were full of blood. Twice the 1 in 4,000 was sterile. It contained much blood, and had been exposed to the air for five minutes; the hands, too, had been put into it to wring out sponges.

Carbolic gauze (5 per cent.) soaked in biniodide of mercury lotion (1 in 2,000) was sterile on the only occasion upon which it was tested. This gauze is placed next to the wound to serve as an aseptic dressing and as a protective against the alembroth wool, which forms the next layer beneath the eight-fold outside dressing.

#### THE DISINFECTION OF THE SKIN OF THE HANDS.

Before an operation the nails are trimmed as close as possible with the scissors, and any tags of skin are removed. At first those who have worn their nails long find it uncomfortable to cut them off, but the discomfort soon disappears. The nail itself may be made aseptic. A bit which was cut off did not infect broth. But it is highly improbable that the crevices beneath the nails can ever be disinfected.

It is probable that some skins are much harder to disinfect than others. The roughness which is caused by the use of certain chemicals is a serious bar to disinfection, and assistants are occasionally obliged to use chemicals which do not agree with their skin. The following method, however, does less harm to our own hands than any which we have hitherto tried:

After the scissors have been used the hands and arms are first scrubbed for three minutes in hot water and soap to remove all dirt and grease. The scrubbing brush ought to be steamed or boiled before use, and kept in 1 in 1,000 biniodide of mercury solution. When the soapsuds have been thoroughly washed away with plenty of clean water the hands and arms are thoroughly soaked and rubbed for not less than two minutes with a solution of biniodide of mercury in methylated spirit, 1 part of biniodide in 500 parts of spirit. Hands which cannot endure 5 per cent. carbolic acid lotion, or 1 in 1,000 sublimate, bear frequent treatment with the spirit and biniodide. After the spirit and biniodide has been used for not less than two minutes it is washed off with a biniodide of mercury lotion, 1 in 2,000 or 1 in 4,000.

A scrap of skin snipped off and dropped into broth gave the following results: Surgeon's hands.—Eight tests were made before September, 1895. The spirit and biniodide were used for about a minute. The skin was septic five times in eight tests. When the immersion in spirit was increased to at least two minutes the unsatisfactory results improved, and the skin was septic twice out of thirteen tests. It is wise to increase the time of immersion in spirit and biniodide when the skin is rough. Almost invariably the scrap of skin to be used for the test was taken before the operation. Once it was taken at the end, and proved to be aseptic. In preparing the skin everything depends upon the care and efficiency with which the processes are carried out. Mr. Ernest Bridges, the House-Surgeon at the Great Northern Hospital, has achieved the highly creditable feat of having sterilised his own hand five times in succession, and the patient's skin five times in succession.

The house-surgeons who assist at operations have all taken the keenest interest in these tests. It is, therefore, interesting to see the success which has attended their efforts to disinfect their hands. Out of twenty-four tests, twenty-one were aseptic, and three were septic. Once the skin of a casual house-surgeon was septic, and twice the skin of the dresser was septic. These were the only occasions on which the skin of the dresser was tested; but it is improbable that good results can be obtained except by those who have realised the extreme difficulty of the task.

The sisters and nurses are devoted in their efforts to obtain good results. The skin of their hands is often rough from frequent washing and immersion in various kinds of lotion during their work in the wards. The skin of the sisters' hands was tested seven times, and was aseptic five times, and septic twice. The skin of the nurses was tested six times, and was aseptic five times, and septic once.

Thus, the skin of various hands was tested sixty-one times, and was aseptic in forty-five, and septic in sixteen. I have no doubt that as the difficulty of the task is realised, the proportion of septic skin will diminish, as it has done in the case of the surgeon.

It would be interesting to try to learn whether contact with septic materials increases the difficulties of disinfection. Once the skin of the surgeon and of the nurse were aseptic, although both had just been engaged in a case in which the intestine was ruptured. The value of vigorous scrubbing with soap and water is very great. On one occasion the skin of the hands was aseptic after it alone.<sup>2</sup> It is right to say, however, that the same hands had a short time before been much immersed in lotions. On another occasion the skin of the unprepared hand infected the broth with a variety of bacteria, including the colon bacillus. Once the unprepared skin of the hand failed to infect broth. Here, again, the hands had been immersed in lotion for some time prior to, but not just before, the test. When working at the bacteria of the skin I constantly used scrapings of it for the inoculation of broth, and in no instance failed to start a mixed culture of moulds, cocci, and bacilli. Welch<sup>3</sup> says that traces of sublimate can be found in the skin of the hands of surgeons who are in the habit of using that drug six weeks after it had been discontinued.

Seeing how hard it is to disinfect the hands, we allow as few as possible to touch the instruments and appliances used for operations. The sister or nurse has merely to hand fresh basins of lotion; they do not touch the towels or sponges except in emergencies, when, to save time, they may have to cleanse the latter of blood. Otherwise the assistant or surgeon alone touch the sponges, which are handed to them in biniodide of mercury lotion. As biniodide does not form an insoluble compound with albumen, it is quite easy for the assistant to wring out the sponges. Moreover, no one but the surgeon touches the instruments or ligatures.

#### THE DISINFECTION OF THE SKIN OF THE PATIENT.

All the following experiments were done in hospitals.

<sup>2</sup> This skin was also aseptic when tested after the use of chemicals, and is included amongst the others.

<sup>3</sup> Conditions Underlying the Infection of Wounds, *The American Journal of the Medical Sciences*, November, 1891.

The skin which is met with there is often neglected and hard to disinfect; but not only is it found that the skin of the various patients differs very much, but, as I shall presently show, that of the different regions of the body presents great differences; some is easy to disinfect, and some almost impossible.

The ordinary routine in hospital practice is as follows: first the skin is prepared for disinfection; secondly, it is disinfected; and, thirdly, it is protected and kept aseptic until the operation.

To prepare the skin for disinfection it is shaved, scrubbed with soap and hot water, and defatted with ether or turpentine. It is disinfected by applying spirit and biniodide of mercury (1 in 500) for not less than two minutes. The latter is washed off with dilute lotion and the operation performed. If there be any delay the disinfected skin is protected with an antiseptic dressing. A little glycerine is added to the lotion in which the gauze next to the skin is soaked. The glycerine keeps the dressing moist and helps the chemical to penetrate the skin. A scrap of the whole thickness of the skin was cut off and dropped into broth. The results were as follows:

The skin of the breast was tested once, before an amputation, and was aseptic. The skin of the abdomen was tested twice, once at the end of a gastro-enterostomy and once before laparotomy for tuberculous peritonitis; each time it was aseptic, and both cases ran an aseptic course. The skin of the neck was tested once and was septic. The skin of the back of the hand was tested once and was aseptic. In the lower limb the skin of the dorsum of the great toe was tested once and was aseptic. The skin of the calf of the leg was tested four times before operating upon varicose veins; it was aseptic three times and septic once. Twice the skin of the front of the knee was aseptic, and three times that of the popliteal space. Thus the skin of the lower limb was only septic once in ten experiments.

We had a great many opportunities of testing the skin of the groin, and that of the scrotum—the former in operations for the radical cure of hernia, and the latter in operations for the radical cure of hydrocele and of varicocele. In both these regions the proportion of septic skin is much higher. The skin of the groin was aseptic five times and septic six times. In one case the skin was tested both before the operation and at the end, and each time it was septic. The skin of the scrotum gave slightly better results. Out of fourteen tests eight were aseptic and six were septic.

Thus the skin of the patient has been tested forty-one times, with the result that it was aseptic twenty-six times and septic fourteen, one of the latter having been tested twice. The limbs gave the best results; then the breast and abdomen; and the groin and scrotum the worst. The frequency with which the skin of the limbs can be disinfected helps, I have no doubt, to explain the greater certainty of the results of operations upon them. It is obvious, too, that hairy regions with numerous sebaceous glands, are particularly difficult to disinfect.

The micrococcus which has been called *staphylococcus epidermidis albus* was almost invariably grown from the septic skin; but as I have not had time to make plate cultures from the infected broth but only to inoculate a gelatine

and an agar tube from it, a definite diagnosis cannot be given. Any work of this kind which is not supported by plate cultures is of inferior value.

#### THE FINAL RESULTS AS SHOWN BY TESTING THE WOUNDS.

It is impossible to infer the absence of bacteria from the wound or its vicinity by merely noting its clinical characters. Our dressings are usually removed on the eighth day, and then the wound may be healed and absolutely dry, without any trace of inflammation, and, nevertheless, a culture experiment reveals the presence of bacteria along the scar of the recently healed wound or on the neighbouring skin. Some would say that their presence was of no consequence so long as the wound was healed. But it is to be remembered that we are now concerned with the investigation of methods of wound treatment which are intended to exclude all bacteria; thus the presence of any proves that the methods are defective. Further, it is often urged that the bacteria which are present are non-pathogenic, and, therefore, do not matter. But even if the assumption that the bacteria are non-pathogenic be true it is still a question of methods, and it is clear that one which is so defective as to admit one kind of bacteria cannot exclude another.

It is, therefore, of interest to see what the final results of our methods are when tested by culture media, with so many fallacies in the atmosphere, in the skin of the hands, in the patient's own skin, and possibly in the sponges, it might be expected that infection would be frequent. But it is to be remembered that during the operation the wound is kept covered as much as possible with sponges or a layer of gauze, that it is frequently sluiced with biniodide of mercury lotion (1 part in 2,000), and that, finally, it is closed, dusted with iodoform,<sup>4</sup> and covered with dressings impregnated with chemical disinfectants and antiseptics. In spite of all this it will be seen that we attain but a moderate measure of success when delicate and scientific tests are applied. Indeed, as this work has proceeded our ideas of an aseptic operation have considerably altered. Not only ought the final result to be aseptic, but also everything which may have been brought in contact with the wound. No surgeon has yet published such a result. We have, however, almost reached our ideal of perfection on more than one occasion. For instance,

On February 22nd, 1896, I removed a semimembranous cyst from the popliteal space of a boy. At the operation, the skin of the surgeon, the skin of the assistant, the skin of the patient, the silk, the silkworm gut, the towels, and the sponge were all aseptic.

On May 2nd the wound was dressed. It was healed, and the skin was perfectly natural. A gelatine and an agar-agar tube were inoculated from the line of the wound, and placed in the incubators, the former at 20° C., and the latter at 36° C. They both remained sterile.

On March 14th, 1896, a similar case was operated on, but not with such a perfect result. In this the semimembranous cysts were excised from both popliteal spaces. Before the operation the skin of the surgeon, of the assistant, and of both popliteal spaces of the patient, the towel and the sponge were all sterile.

On March 23rd both wounds were healed. Gelatine and agar agar tubes inoculated from the right side remained sterile, whilst similar tubes inoculated from the left grew the so-called staphylococcus epidermidis albus.

<sup>4</sup> In conjunction with Dr. Black Jones I propose shortly to give the results of our fresh experiments with iodoform. They show, as did the former ones (*vide* BRITISH MEDICAL JOURNAL, May 28th, 1892), that iodoform only contains an occasional mould.



An operation for the removal by ligature of varicose veins in the leg of a young woman almost came up to our ideal of perfection. The skin of the assistant and of the patient were sterile, also the towel, sponge, and silk-ligature. When the first dressing was done, ten days after the operation, an agar-agar tube inoculated from one of the wounds remained sterile.

The difficulties of aseptic surgery were shown in a case of radical cure of right and left inguinal herniæ. At the operation the skin of the surgeon, the assistant, the sister, and of the patient were all sterile, as well as the towel and the sponge. When the wound was dressed on the ninth day the right side was aseptic when tested with culture tubes, but the left was septic. However both had healed by first intention. Some lotion had been applied to the septic side (left) before it was tested.

The wound made for the removal of a large lipoma from between the muscles of the abdominal wall failed to infect gelatine and agar-agar tubes when it was dressed on the thirteenth day. A good many silk sutures were buried in this wound, which was quite dry and perfectly healed.

The following operation wounds were also sterile when tested with culture media. A case of radical cure of an inguinal hernia was done on November 30th, 1895. When it was dressed on December 6th one of the fishing-gut sutures was taken out and put into broth, and another broth tube was inoculated from the line of the incision. Both were sterile. The wound was absolutely dry, with quite normal skin. No tests had been made at the operation.

Another case of radical cure of femoral hernia was also aseptic, and also a case of herniotomy for strangulated femoral hernia, followed by a radical cure. The last is interesting because it was an emergency operation, and tends to show that our methods are successful in that class of cases as well as in those done with deliberation. From the first case gelatine and agar-agar tubes were inoculated, and from the second gelatine and broth.

Finally, the punctures made for the division of the palmar fascia in a case of Dupuytren's contraction did not infect an agar-agar tube when the dressings were removed on the sixteenth day. Also the wound of an osteotomy of the femur did not infect either gelatine or agar-agar.

The kind of culture medium used for the foregoing cases has been mentioned because it may ultimately be found that some kinds are more sensitive than others. For instance, I am inclined to think that broth and gelatine are a little more sensitive than agar-agar, unless the latter is very fresh and moist.

The following cases were tested with culture media, and gave septic results:

A youth was operated upon for retained testis. An inguinal incision was made, and the gland easily transferred to the scrotum. The wound was dressed on the ninth day and was perfectly healed. It infected gelatine with a white staphylococcus which liquefied gelatine. A scrap of this boy's skin was tested at the end of the operation, and was septic. The silk and sponge were sterile. I regret I cannot say that the infection of the skin and wound were proved to have been the same; but I believe that they were. A similar wound in the groin, made for the radical cure of an inguinal hernia, was healed by first intention, and without a trace of redness about the scar. However, it infected gelatine, and agar-agar. At the operation the skin of the surgeon and of the assistant, and the towel and sponge were all sterile, but the skin of the patient himself was septic.

Another groin wound made for the radical cure of an inguinal hernia was healed by first intention when dressed on the tenth day, but it infected gelatine and agar-agar with white and golden-yellow colonies. At the operation the patient's own skin and the skin of the assistant's hands were septic, also the towel. The surgeon's hands and the sponge were sterile.

Three times culture tests were applied to operations for the radical cure of hydrocele. This was done when the drainage tube was taken out forty-eight hours after the operation. All infected gelatine and agar-agar tubes. One case also infected culture media at the final dressing on the ninth day. All healed by first intention. Indeed, we have only had one slight suppuration in thirty-three operations for the radical cure of hydrocele, and that was in a patient who passed urine several times into his dressing.<sup>5</sup>

It is not unlikely that the infection entered these hydrocele

<sup>5</sup> See also *Lancet*, October 10th, 1895, The Operation for the Radical Cure of Hydrocele by Excision of the Sac, etc., by C. B. Lockwood.

wounds during the operation. Once a scrap of cellular tissue was cut from the wound during the operation, and once at the end. Both bits infected broth with staphylococcus albus. On each occasion the surgeon's hands also infected broth when tested before the operation.

It is exceedingly difficult to obtain sterile tissues from a wound. We failed with portions of varicose vein, but here again the surgeon's hands were septic before the operation. Once, however, a portion of hernial sac was sterile. It was obtained during an operation for the radical cure of non-strangulated hernia. At this operation the skin of the patient, of the surgeon, and of the assistant were all aseptic before the operation.

A castration wound was also tested when the drainage tube was taken out forty-eight hours after the operation. Although the result was septic, the wound healed by first intention.

A fishing-gut suture was taken on the seventh day from a wound on the back of the hand, after the removal of a ganglion. The broth in which it had been placed was found by subcultures to contain staphylococcus epidermidis albus. The wound had healed by first intention. At the operation the patient's skin and the ligature was aseptic, but the skin of the house-surgeon, sister, and nurse were all septic.

On another occasion a limb wound was septic. A nævus was removed from the inner side of the knee of a child aged 8 years. When dressed on the seventh day it infected an agar-agar tube. The wound was soundly healed, but the skin around was raised in vesicles containing clear serous fluid.

Lastly, a wound of the neck, made for the removal of cancerous glands, was also septic. At the operation the patient's skin was septic, but that of the surgeon, together with fishing-gut ligature, after having been used, and wool sponge were all aseptic.

A wound for the removal of a cancerous breast and axillary lymphatic glands was dressed at the end of forty-eight hours for the removal of a drainage tube inserted to let out blood, which continued to ooze. The clot in the drainage tube and serum, which ran from the aperture were both septic. The depths of this wound healed perfectly, but owing to the tension needed to bring the enormous wound together the skin sloughed a very little in places, and a minute quantity of pus formed about the sloughs.

These are all the wounds tested with culture media. They were taken as they came without selection. They comprise 22 operation wounds, of which 10 were aseptic and 12 were septic. This is, I believe, a higher proportion of asepsis than has yet been recorded. Of the septic cases 1 had slight suppuration. This proportion of 1 in 22 marks about the proportion of suppuration which I have of late had in hospital practice in cases in which there was no pre-existing septic focus.

As the house-surgeons are often changing, and likewise the nurses who prepare the sponges, bowls, and towels, this proportion cannot be easily diminished. With such a small proportion of suppuration it is particularly galling to have to report that one occurred after the wiring of a fractured patella. The operation was done because it was clear that the prepatellar aponeurosis had got betwixt the fragments. The patient, too, was anxious to be operated on, although the risk was clearly explained. The suppuration was very subacute, as is usually the case when asepsis is so nearly attained. The patient was never ill or in much pain, and she promises to have a movable joint. The patella itself is united and movable from side to side. At the operation the skin of the surgeon, of the house-surgeon, and of the patient were aseptic; the skin of the nurse was septic. During the operation the 1 in 4,000 biniodide of mercury lotion was aseptic after an hour and a half's exposure to air, and

also the same lotion mixed with blood clot. An inexperienced sister introduced an undisinfected bowl into the field of operation before we were aware of the error. No iodoform was dusted on the skin. Also it may seem wise after the event, to remark that before the operation the patient's temperature was raised and rather irregular, suggesting auto-inoculation. But my own belief is that some bleeding took place into the joint and wound, and thus the clot became infected with bacteria of inconsiderable pathogenic properties, but enough, however, to disintegrate the clot. On another occasion I shall drain and use iodoform.