The Lettsomian Lectures

ON ASEPTIC SURGERY IN THEORY AND PRACTICE.

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By CHARLES BARRETT LOCKWOOD, F.R.C.S.ENG.,
Surgeon, St. Bartholomew's Hospital.

LECTURE II.

DISINFECTION OF THE SKIN.

THE literature of skin disinfection has already reached large proportions. One author has published an excellent volume of two hundred and odd pages upon the subject.¹ So far as can be judged no one can yet claim that his method is perfect. Much depends upon the stringency of the test applied. It seems clear that the use of soap and mechanical means cannot disinfect the skin.² It merely diminishes the amount of infection.³ This is an important point, because some surgeons seem to rely solely upon mechanical methods and soap and water for the disinfection of their hands. There is no room for doubt that when the mechanical scrubbing with brushes and pumice stone and abundant soap and water is followed by absolute alcohol or rectified spirit the chances of sterility are greatly increased. Next when, as in Fürbringer's method, these are followed by immersion in sublimate lotion, 1 in 500, a still further improvement ensues. However, both of these are forbidden to the consistent aseptician.

Fürbringer's method consists in:

1. Cleansing the nails.
2. One minute, scrubbing with soap.
3. One minute, alcohol.
4. One minute, 1 in 500 sublimate lotion.

I find, personally, that sublimate makes the hands rough and inflamed. Alcohol is undoubtedly one of the most valuable aids to disinfecting the skin. After the work of Fürbringer, Ahlfeld, Schaeffer, Leedham-Green,⁴ and of many others, its most valuable qualities, when used as an adjunct, are fully established. Alcohol has the great virtue of overcoming the fatty matter which impermeates the skin. The alcohol may be used by itself, or in a solution with soap, or in conjunction with chemical disinfectants.

In order to simplify the process and render disinfection easier, I have for some years used a mixture of alcohol, water, and biniodide of mercury for disinfecting the skin; presently the results will be given. I have always been accustomed to test the disinfection of the hands by snipping off a scrap of skin down to the dermis and placing the scrap in broth. Several other methods can be used such as (1) scraping with bits of wood, bone, or toothpick; (2) rubbing upon sterilized material such as silk; (3) dabbling upon culture media.⁵ My own way seems quickest and easiest. A small quantity disinfectant clings to the skin, and this I hope in the future to be able to get neutralized.

I have tried to get this done with the help of Mr. Rose, and so far our attempts at neutralization have not revealed any serious error in the past.

We assume at present that skin which does not infect culture media will not infect wounds. But as asepsis is our aim we ought some day to learn how to disinfect the skin with absolute certainty. Sometimes the question is asked whether, when a scrap of the skin of the hand is sterile, the whole hand is sterile. Here we are face to face with a much-debated point, the possibility of a perfect induction. Personally I cannot conceive a perfect induction when bacteriological problems are concerned, and it is to be doubted whether any one will be so self-sacrificing as to offer the whole of the skin of the whole of both of his hands for bacteriological examination. Fürbringer's is perhaps the most stringent test. He scrapes the backs and palms of the hands, the fingers, and about the nails with pieces of sterilized wood. These are then put into the culture media. I myself could not afford the time which this method demands. Thus absolute certainty being out of the question, we must content ourselves with relative certainty. The method of hand disinfection by the spirit and biniodide of mercury

method has of late given a proportion of 3 septic tests in a total of 111.⁶

It is interesting to note that in each case it was the surgeon's own skin which was septic. Once it was some form of micrococcus, once staphylococcus pyogenes albus, once the exact nature of the growth was unknown. This marks an advance upon previous results. In 1898 the skin of the hands was septic 7 times in 70. In 1900 it was septic twice in 30.⁷ So that there has been a continuous and marked improvement from 1 in 10 to 1 in 15, and then to 1 in 37. I attributed this improvement to the efficiency of the spirit and biniodide of mercury lotion, and also to the additional care and precision with which it is applied. This continuous improvement in results may also be advanced as evidence in favour of the method of testing. It is most difficult to get any human being to keep looking at the clock, but, nevertheless, the hands must be soaked in the lotion for not less than two minutes by the clock. Also, it is not at all easy to get the hands properly prepared for disinfection. Some are reluctant to trim their nails quite close. Hot soap and water and a soft scrubbing brush should be used for at least three minutes before the spirit and biniodide.

There seems to be some misconception abroad as to the composition of spirit lotion. For instance, my colleague, Dr. F. W. Andrewes, says: "It is a common practice to use the perchloride or biniodide of mercury dissolved in spirit instead of in water, as, for example, in the sterilization of the skin, or of ligatures." But at his own hospital the lotion consists of biniodide of mercury in methylated spirit (1 part in 500), 75 per cent.; and water 25 per cent.⁸ The latter has to be added because, as we all know and have known for years, disinfectants are inert in solution in pure alcohol. Some of the methods of hand disinfection are so elaborate and take so long that they are impracticable for ordinary surgical work. If the short and simple spirit and biniodide method proves the best, after extended trials, surgical work will be simplified.

During the course of an operation the hands are frequently rinsed with biniodide of mercury lotion to free them from blood and atmospheric germs. The usual strength of the lotion is now 1 in 4,000. For operations about the face and eyes the strength is usually 1 in 10,000, for if it were stronger the eyes might suffer, and I am inclined to think that keloid is likelier to grow after strong lotions have been used. Doubtless in the near future an isosmotic antiseptic lotion will be found to take the place of biniodide. In addition, the hands of the surgeon and of his assistant are continually bathed in lotion whilst the sponges are being rinsed out. For no one is allowed to touch them except the surgeon or his assistant.

It is probable that these measures are efficacious because the skin of the hands was tested eight times at the end of the operation, and was sterile on each occasion. I am anxious to use sterilized salt solution instead of the dilute antiseptic solution, but I am doubtful whether the experiment is justifiable amidst the present surroundings and organization.

GLOVES.

Those who are distrustful of the disinfection of the hands advocate the use of cotton, leather, or indiarubber gloves. I suppose we may dismiss cotton and leather gloves from the question; of leather gloves I have no experience. Whilst assisting I have had experience of sterilized cotton gloves. It seems very difficult to see how they can be expected to protect the wound from contaminated hands; but thin rubber gloves come in a different category and I have given them a fair trial, and, to begin with, found, as might have been expected, that rubber gloves are easily sterilized with heat. They were tested on seven occasions and were always sterile. No chemicals were used before this test. But, like Mr. Lynn Thomas¹⁰ and others, I have found it practically impossible to complete an operation without tearing or puncturing the fingers of the gloves. This, of course, entirely vitiates the experiment, but in our case it did not matter much so far as any danger to the wound was concerned. Before the gloves were put on the hands were sterilized with the usual precautions, and on five occasions the skin was sterile when the gloves were taken off at the end of the operation in spite of numerous holes in the thin rubber. But, in addition to their vulnerability, the gloves seriously impair the sense of touch. Indeed this, to my mind, is one of the chief objections to their use. Probably we all place a varying degree of reliance upon our sense of touch, but I myself am accustomed to place great reliance upon the sense of touch, especially in the

performance of abdominal operations, such as those for the removal of the vermiform appendix or uterine appendages. These I could not do to my own satisfaction if the sense of touch were hampered with gloves. For radical cure of hernia, or removal of the breast, and such like, they can be worn without any real inconvenience, but for operations upon septic cases gloves ought to be worn, especially if other operations are impending. I have seen very severe cellulitis follow an operation when a few hours before the surgeon had had to operate upon a very septic case. He did not wear gloves but took every precaution to disinfect his hands. There were other circumstances in the case which suggested that the cellulitis might have been a coincidence, as before the operation the patient had had an occasional rise of temperature. Had the operator worn gloves at the septic operation he could, at all events, have claimed to have taken every possible precaution. If some one could invent gloves which (1) could be sterilized by heat, (2) which did not tear, and (3) which did not impair the sense of touch, the objections to their use would fall to the ground.

THE DISINFECTION OF THE PATIENT'S SKIN.

During the operation a piece of the skin of the patient is snipped off and dropped into broth. The piece includes the whole depth of the skin, and in most regions has in it many hair follicles and also sudoriferous and sebaceous glands. These, together with the epidermis, as is now well known, harbour all sorts of bacteria, and in considerable numbers. Some of these bacteria have very peculiar characters and give rise to pigments and bodies with strange and penetrating odours. I ascertained some years ago that they had lethal effects on mice and rabbits,¹¹ and without any doubt some of them are the cause of the slighter forms of sepsis and suppuration, not always of the kind to make the patient ill, but almost certain to lead to the extrusion of buried sutures. Now, it is to be imagined that the skin bacteria must be most difficult to dislodge from their hiding places in the ducts of the sweat glands, in the sebaceous glands, and in the hair follicles. But their removal and destruction are rendered still more difficult by the presence of the cutaneous grease and oil. Any method of skin disinfection must aim at the removal and penetration of the cutaneous grease. We have attempted to accomplish this by mechanical efforts, aided by soap, turpentine, ether, and alcohol, and by using spirit and biniodide of mercury lotion. I wish to say at once that I am exceedingly dissatisfied with the result of our efforts. The skin was tested 55 times, and infected the broth on 14 occasions. But two of the infections were due to bacillus subtilis, and may have been accidental. In one of these tests the skin was from the abdomen, in the other from the pubes.

The degree of certainty with which the skin of the patient can be disinfected depends upon the region. I would put them in the following order, beginning with that which is most certain: (1) Limbs, (2) abdomen, (3) breast, (4) neck, (5) the back, (6) the groin and axilla, (7) scrotum, and (8) scalp.

The patient's skin is much more difficult to disinfect than the hands of the surgeon or of his assistants. Many of the regions upon which we have to operate are furnished with sebaceous and sweat glands both large and numerous. Moreover, the piece of skin which is cut off the patient and put into the broth is larger than that from the hand, and includes the whole depth of the skin. It affords, therefore, a more stringent test. In previous years the skin of the limbs has shown very high proportion of sterility. Recently we have only tested it twice, and found it sterile both times. The skin of the abdomen was tested twenty-one times, and was septic thrice; the skin of the breast six times, and was septic once; the skin of the groin twenty-two times, and was septic eight times; the skin of the neck and of the axilla were each sterile when tested once; and the skin of the pubes and of the scrotum were each septic when tested once.

Perhaps when more stringent tests are tried the proportion of sepsis may be greater, but the results of skin testing throughout all these years have been so uniform and consistent that I do not think the above order will need revision. Certainly wounds made in the extremities heal remarkably well, and better at a distance from the groin and axilla than near to those localities. The high proportion of sterile abdominal skin is also reassuring. Working with sterile skin and upon peritoneum which fraternizes with silk the abdominal surgeon ought to get good results.

Now, taking these results as a whole, they show that the methods of skin disinfection are still far from perfect. Probably, as much depends upon the application of the methods

as upon the methods themselves. This is clearly shown by the records of the different house-surgeons by whom the skin was prepared. One gentleman had five septic out of eight; another five septic out of fourteen; whilst another had only one septic in ten.

In hospital practice, the skin of the patient is usually prepared the night before the operation. This is now mainly done for convenience, and the spirit and biniodide of mercury methods probably give the same results when efficiently applied immediately before the operation. This is a great advantage, especially when children and nervous women are concerned. We tested the patient's skin after it had been prepared on the table on three occasions and on each it was sterile. The skin was taken twice from the groin and once from the abdomen. It seems reasonable to suppose that if one can disinfect the skin of the hands one hundred and eight times out of one hundred and eleven, the same methods ought to give good results with the skin of other regions. Outside the hospital I always prepare the skin myself after the patient has been anaesthetised and, judged from a clinical point of view, the results are better than in hospital practice.

SILK.

On the whole there is no better material than twisted silk for buried sutures and ligatures. Twisted silk is very tough and does not break at the knot. Formerly it was used too thick, but most of us have now learned that oo is sufficient for ordinary ligatures, and that No. 3 or 4 is seldom necessary.

The boldness with which a surgeon buries silk is a very good indication of his proficiency in asepsis. Those who are distrustful fall back on catgut and kangaroo tendon, both of which are most difficult to sterilize and do not hold long enough for the security of some wounds. For instance, when laparotomy has to be done upon a very stout person the wound is nearly always extensive. Owing to the thick layer of subcutaneous fat it is almost impossible to close the abdomen with a single row of sutures, and absorbent ones might disappear prematurely. In such a case buried silk is an invaluable aid, and is, in my experience, tolerated exceedingly well by the tissues of the very stout. And here I would interject that the very stout do not always get such prompt and satisfactory surgical aid as the spare. Although healthy stout patients bear operations well, and recover quickly, some surgeons seem rather afraid of operating upon them. Provided that diabetes is not present the stoutness adds to the difficulties, but not to the immediate dangers. But even the difficulties disappear when the incision is a large one. A large incision is made without hesitation when it can be securely closed again with rows of buried silk. Fine silk, too, is the best material I know for peritoneal sutures. Indeed, the peritoneum tolerates silk in a remarkable way. The behaviour of the different tissues to suture materials, such as silk, is almost an unwritten page in surgical literature. Judged from the clinical standpoint, I should say that the peritoneum tolerates silk sutures better than any other tissue; that tendon, aponeurosis, ligament, and the fibrous tissues come next in tolerance, but with nerve as good, if not better; whilst muscle is most intolerant.

The tolerance of the peritoneum for silk is shown by the behaviour of the omentum. For in 25 consecutive cases of inguinal and femoral epiplocele¹² the omentum was ligatured with from one to nine silk ligatures. None of them had the slightest trouble from the presence of the silk, and I cannot recall any instance, out of a very large number, in which there has ever been the slightest trouble. In the earlier days of antiseptic surgery the possibility of sepsis about omental ligatures had to be taken into consideration.¹³ Minute precautions are necessary in both the preparation and the application of the silk. To begin with, it is to be wished that manufacturers would wind their silk upon plain, uncoloured bobbins. They are addicted to the use of black bobbins, which impart their colour to the silk after a few hours' soaking in lotion.

The processes of manufacture tend to render the silk sterile, but, before use, the reel is boiled in water for half an hour. After this it is either used forthwith or preserved in 2.5 per cent. carbolic acid lotion. Now, I have noticed that this carbolic-acid silk has a very irritating effect upon the skin. When it is used for skin sutures, each needle hole is surrounded by a ring of inflammation, and it is to be supposed that, when used for buried sutures, it has the same effect upon deeper structures. This effect is explained by the experiments of von Zeignek,¹⁴ who discovered that when

silk was kept in sublimate solution it attracted to itself nearly all the chemical, so that at last the lotion contained nothing but a faint trace of mercury. Rubber drainage tube and catgut had similar effects upon sublimate solution. But I have found that after immersion in carbolic acid lotion the sterile silk must be boiled in water for not less than fifteen minutes, otherwise it still inflames the skin. Generally it is easy to have the silk boiled just before use, and I carry about with me for this purpose a small metal vessel and spirit lamp.

My own attempts to bury silk in the abdominal wall are not without instruction. The last time that I gave the results¹⁵ ten appendectomy wounds had been closed with silk, and three of these had suppurated with extrusion of some if not all of the buried sutures. Rather disconcerted by 30 per cent. of failure, I ceased for a time to use buried silk. But to my mind there is something thoroughly unsatisfactory in the closure of the oblique appendectomy wound with a single row of silkworm-gut sutures. Inasmuch as the muscles are all split in the direction of their fibres a single row cannot bring them properly together. The only accurate way is by a row of sutures in the peritoneum, another in the internal oblique and transversalis, another in the external oblique, and another in the skin.

A great deal depends upon the way in which the silk is tied. I can remember being taught to tie sutures with enough tightness to bring the cut together without strangulating the tissues. This was in the early days of antiseptics. Now we oftentimes see sutures pulled very tight, without harm of any kind. Theoretically one would suppose that the tightness of the ligature could not matter in an aseptic wound. But when we consider the atmosphere of rooms and operating theatres and the ever-present risk of skin infection, it is difficult to believe that no bacteria enter; and, if this be conceded, one cannot imagine that all that enter are killed by the antiseptics. So that the tightly-tied suture and the tissues which it strangulates are a suitable soil for the germs to grow in. But this is not all. As I have already said, the different tissues behave differently to silk sutures. However tightly a sterile silk suture is tied in the peritoneum, it will be tolerated; but this is not the case with muscular tissues. I am quite sure that my ill-results in my early cases of buried silk suture after appendectomy were mainly attributable to the tightness with which I pulled the sutures that held together the muscular fibres of the internal oblique and transversalis. It is probable that these tight sutures not only strangulated and killed some of the muscle, but were also constantly pulled upon by the contracting fibres.

Now in the operation of appendectomy, by selecting the cases and by rejecting those in which pus was seen or in which septic appendix contents came in contact with the wound, 52 consecutive cases healed by first intention. But one of these, which was tuberculous, afterwards had suppuration and parted with some sutures; and another subsequently parted with some sutures weeks after a small haematoma had subsided. In this case the wound was, as I suspected at the time, probably infected by appendicular contents. Each of those 52 wounds was closed with four sets of silk sutures; in (1) the peritoneum, (2) the internal oblique and transversalis, (3) the aponeurosis of the external oblique, (4) the skin. The skin suture was continuous, and so oftentimes was that in the peritoneum; the rest were interrupted.

A great deal of silk is buried in the radical cure of hernia. In fact, the repair of the abdominal wall in the radical cure of hernia is guided by the same principle as in other abdominal wounds—namely, the closure of the wound in layers. Thus the peritoneal sac is first tied, then the arching fibres of the internal oblique and transversalis are fastened to Poupart's ligament; then the aponeurosis of the external oblique is sewn together; and lastly, the skin. Out of 89 cases of inguinal hernia, inguinal varicocele (a similar proceeding), and of femoral hernia, 84 healed by first intention and 5 had suppuration. In 4 cases the suppuration was of the most mild type, and only led to the extrusion of one or two pieces of silk. Once (for case see Lecture III) the suppuration caused anxiety, but oddly enough none of the silk sutures were ever seen in the pus. I propose hereafter to refer to these cases again when the question of environment is discussed.

Now it will be conceded that about 5 per cent. of mild suppuration is not very high, but it ought to be less. The septicity of the silk, of the hands, of the skin, of the sponges, and the germ-laden atmosphere are more than enough to

account for it. It is quite clear to my mind in what direction improvement can be looked for.

In my own very limited experience silk ligatures and buried silk sutures are well tolerated by the thyroid body. In 9 cases the cavity left by the enucleation of an adeno-cystoma was closed with from three to six buried silk sutures, and all healed by first intention. Another was closed with catgut and healed in the same way, as did also 2 cases of excision of parenchymatous goitre in which a very large number of silk ligatures were applied. The tissues of the mammary glands likewise tolerate buried sutures of fine silk, for I habitually use them for the obliteration of the cavity left after the removal of cysts and adenomata, and have never seen them reappear.

The tests of the silk can hardly be said to be vitiated by the presence of chemicals. The silk is boiled in water for at least half an hour and then a bit is cut off and put into nutrient broth. At times the silk may have been immersed for a few minutes in carbolic lotion 1 part in 60. On a previous occasion the silk was sterile eighteen times before and ten times after use. I have now to report that it was sterile forty-four times out of fifty. Three out of the six septic pieces of silk had been prepared by the same house-surgeon. Some of the tests—I know not exactly how many—were made at the end of the operation. Once the infection was due to moulds and cocci, and probably came from the air. In the others some variety of white staphylococcus grew in subcultures, some of these cocci without doubt came from the skin of the surgeons or of the patient. I am not here to throw a gloss over our results and therefore confess that these are extremely bad.

CATGUT AND SILKWORM GUT.

In spite of the efforts of numerous investigators and inventors catgut still remains an object of suspicion. This is to be deplored, because it is an admirable substance for a variety of surgical purposes. I invariably use catgut for septic wounds. To my mind it is invaluable for operations about the rectum and perineum. Likewise it is best to use catgut when there is reason to suppose that the wound is tuberculous. When tuberculous pus or caseous material escapes into the wound silk ligatures are apt to become infected and keep open the wound until withdrawn or extruded. In operations for the removal of growths from the urinary bladder catgut can be safely applied to bleeding vessels and for the closure of wounds in the mucous coat. I habitually use it in cases of appendectomy when pus is met with or the wound is obviously septic. For certain wounds in infants and children—such as circumcision—it makes excellent material for ligatures and sutures. The removal of cutaneous sutures from a nervous frightened child is a troublesome business.

Speaking generally it is advisable to use catgut for the control of haemorrhage in all septic wounds in preference to materials which do not speedily soften and disappear. Who has not seen a sinus persist for months because it had a septic silk ligature in its depths? A scrap of silk has not infrequently formed the nucleus of a vesical calculus. One would hardly think it necessary to lay any stress upon the propriety of using catgut for septic wounds and silk for aseptic if one did not occasionally see the reverse put into practice.

But there are probably other reasons why catgut is looked at askance. Although some specimens may contain no infective organisms, they may contain ptomaines which set up a localized suppuration. Besides, catgut is not particularly good material to work with. It may have irregularities upon it which render it difficult to thread through the eyes of small needles; next, it is sometimes rather brittle; and, lastly, when tied upon a bleeding point is apt to slip off. This last difficulty can be overcome by the usual simple device of encircling the bleeding vessel with a stitch, or by transfixing the pedicle if there be one; the others can probably be overcome in the process of preparation. Mr. Scott kindly made xylol catgut for me to use. Our tests showed that it did not infect culture media, but it was decidedly brittle, and the strong odour of the xylol was most unpleasant.

We have a simple method of preparing raw catgut. First, it is well scrubbed with soap and water; next, it is soaked for forty-eight hours in methylated ether; and, lastly, it is put into a solution of biniodide of mercury in water—1 part in 250. It may remain for months in this solution without any apparent alteration, but it is not used until it has soaked for seventy-two hours. The methylated ether removes quite a quantity of oil and fat from the catgut. Pieces of the cat-

gut were put into broth on fourteen occasions, and did not infect. Obviously this catgut was full of a potent antiseptic when it was placed in the broth; but are we to assume that catgut which does not infect the broth does not infect the wound? It is possible that spores or bacteria do actually pass from the catgut into the broth, but are unable to grow in the presence of the minute trace of biniodide which the catgut has given up to the broth. But, if this be so, the same process must go on in wounds with possibly this difference, that the antiseptic which escapes from the catgut does not stop in its vicinity but passes away into the lymph spaces and vessels. All this is quite speculative, but, judged from the clinical standpoint, this biniodide catgut is excellent and reliable material for ligatures and for some kinds of sutures. I should doubt whether ordinary raw catgut can be relied upon to hold much longer than five days; at all events, that is about the time when skin sutures begin to loosen, therefore, it has to be used with circumspection in places where the strain of sudden and violent muscular contraction has to be met. I sometimes insert catgut sutures after laparotomies in which pus is encountered, but care is taken to put in reinforcing sutures of silkworm gut.

Mr. Moullin has recently published the results of a brilliant series of operations upon the stomach. His remarkably low mortality would have been lower had not the xylol catgut failed to hold one of the abdominal incisions.¹⁸ I also used xylol catgut for a case of appendectomy which was done during the acute stage. The appendix and the omentum which enveloped it were acutely inflamed and septic. There was slight suppuration of the wound. This case is omitted from the St. Bartholomew's statistics because it was known to be septic at the operation, and because it was being used as a test for xylol catgut.

The more frequent use of buried silk sutures has led to the partial abandonment of silkworm gut. This smooth, supple, strong material has very great advantages for abdominal wounds which have to be brought together with a single row of removable sutures. I have occasionally seen silkworm gut used for buried sutures. For this purpose it has certain disadvantages; owing to its thinness it probably cuts through the tissues in its grasp; next, the ends of the suture stick out, and being rather bristly can be felt by the patient who complains that they prick; and lastly, silkworm gut is not very easy material to sterilize, in spite of the fact that it bears boiling well. On more than one occasion I have been called upon to remove buried fishing-gut sutures because they were painful. Some time ago¹⁷ silkworm gut which had been boiled for over twenty minutes was sterile thirty-five times out of thirty-seven. This is rather a high proportion of sepsis for a material which bears boiling so well. Latterly nineteen pieces which had been boiled for not less than half an hour were all sterile. It is obviously very important to recognize that silkworm gut is difficult to sterilize, and ought to be boiled for at least half an hour.

SILVER WIRE.

Allured by the account given by Dr. Jos. C. Bloodgood¹⁸ of the use of silver wire and silver foil in the radical cure of hernia, I tried those substances in 15 cases. Metallic substances had already been tried by others and found wanting, but they had not been tried in quite the same way. The following is Dr. Bloodgood's succinct statement.¹⁹

Clinically, the results in the healing of the wounds have been much better since the introduction of silver wire and silver foil. Before the introduction of silver wire 116 cases of hernia had been closed with silk; in 28 of these cases (24 per cent.) there was more or less suppuration. Since silver wire was first used (June 2nd, 1894, Case LXXIV. Group 1) there have been 330 operations, with 14 suppurations (4.2 per cent.).

Since the wearing of rubber gloves in hernia operations by both operator and assistants, in February, 1897 (over two years) there have been 226 cases of hernia (including recent cases), with only 4 suppurations (1.8 per cent.).

Clearly methods which gave these results were worth a trial.

I myself could hardly look for such a striking alteration because, although working with silk, I had had about 4 per cent. of suppuration.²⁰ The 15 cases which I did with silver wire and silver foil were in no sense considered a test of any particular kind of operation, but only of the materials. Thin rubber gloves were worn throughout the operations by both surgeon and assistant. The inguinal canal was opened, and the neck of the sac secured with a

piece of twisted wire; then the back of the inguinal canal was restored by fastening the arciform fibres of the internal oblique and transversalis to the inner edge of Poupart's ligament, after the manner of Bassini; and, next, the aponeurosis of the external oblique was sewn together again, so as to close the canal, leaving the external abdominal ring the right size. By this time about nine pieces of silver wire had been buried. The skin was closed by a silver suture, which began at one end and then ran subcutaneously from one side of the wound to the other. This suture gave a great deal of trouble. If the two ends were left exposed, we found the pain was considerable when it had to be pulled out. Then we buried the wire altogether, to see whether or not the tissues would retain it. The silver leaf or foil is the kind which is used for gilding things like picture frames. It is put into a flat metal box and sterilized with dry heat until the thin paper between the leaves is slightly charred. We ceased the use of silver wire after fifteen cases of inguinal hernia had been done with it, because it proved to be troublesome and inconvenient. Whatever pains we took to cut the ends of the wire short, and turn them down, nevertheless they altered their position and hurt the patient.

The first case was that of a youth who had an inguinal hernia of the right side, complicated with retention of the testis in the inguinal canal. Two pairs of rubber gloves were spoilt over the operation by the wire and needles piercing the fingers. This was a real aseptic operation, for our tests showed that every thing brought in contact with the wound was sterile, and likewise the wound itself when dressed on the ninth day. Close upon a year afterwards the youth returned with a small superficial abscess, and the house-surgeon opened it, and pulled out the skin suture. In four others the wire is known to have caused trouble, and had to be removed.

The results as regards immediate union were fair, but one youth had slight suppuration, which was caused by necrosis of the skin edge. The suppuration, however, was slight, for my note says that the wound was healed on the fourteenth day.

The trouble taken to make this essay with silver was not thrown away. I was much impressed with the character of the wounds, which were singularly devoid of any trace of inflammation, and their course was with difficulty traced. It seemed clear that this was attributable to the layer of silver foil. According to Bloodgood the silver foil has germicidal properties, although not to the same degree as copper or brass. But however this may be it seemed an ideal substance for the exclusion of air, and for protecting the wound from the layers of dry antiseptic gauze which I was then in the habit of using. Hence I have continued to use the silver foil in conjunction with silk and have been most gratified with the dryness of the wounds and the entire absence of any trace of redness or of oedema.

THE SPONGE QUESTION.

Ought we to continue to use sponges? Many have already answered this question in the negative, and resort to sterilized swabs of cotton wool. But swabs are not very satisfactory for cleansing the wound of blood. Besides one hears of cases in which they have been left in the abdomen. Clearly there is more danger of losing one swab out of many, than one sponge out of three or four. No one seems to dispute the superiority of marine sponges in all respects save that of asepticity. This is a fundamental objection, and if marine sponges cannot be sterilized they must be discarded.

I have hitherto thought that because our sponges did not seem to infect broth that therefore they could be relied upon. But here again what Lord Bacon would have called the "idol of the chemical" has to be reckoned with. It is probable that in each test enough chemical is conveyed into the broth to render it antiseptic; but when we treated sponge with sulphide of ammonium we still saw nothing grow. I am by no means convinced that sponges prepared by the sulphurous acid method²¹ are infective.

Our last series of fifty sponges treated in this way were all sterile with the exception of one which grew some moulds and bacilli, supposed to have originated from the atmosphere. A sponge tested at the end of an operation was infected with skin bacteria. These results are the same as those which have gone before. We greatly need a thorough investigation of disinfected sponges by the most rigorous and recent bacteriological methods. The sponges which we use are either new ones recently prepared or sponges which have been used for aseptic cases. A sponge which has touched anything in-

fective is at once destroyed. Attempts have been made to obtain artificial sponges which could be sterilized by heat. But those which have been tried have been hard and harsh and deficient in absorptive properties.

NOTES AND REFERENCES.

¹ Carl S. Haegler, Basel, 1900. *Handreinigung, Handdesinfection und Handeschutz*, gives a complete bibliography up to date. ² See Haegler, p. 27. Also a valuable essay by Kronig and Blumberg, *Beiträge zur Handdesinfection*, Leipzig, 1900. Also Poter, *Die chirurgische Asepsis der Hände*, Berlin, 1907. ³ Sarwey and Paul, *Arch. f. klin. Chir.*, 1900, p. 463, etc. ⁴ This excellent paper is in the BRITISH MEDICAL JOURNAL, October 17th, 1895, p. 1109. See also Lauerstein, *Munch. med. Woch.*, July 20th, 1902. ⁵ ABST. EPITOME OF BRITISH MEDICAL JOURNAL, October 25th, 1902, par. 253. ⁶ See Stewey, p. 465. ⁷ The house-surgeons were Messrs. Jennings, Pinker, Scott, Farncombe, Rose, and Wenham. I am much indebted to these gentlemen for their help. ⁸ See reports in BRITISH MEDICAL JOURNAL. ⁹ *Lessons in Disinfection and Sterilization*, p. 93. ¹⁰ As given in *Aseptic Surgery* 2nd ed., p. 177. ¹¹ J. Lynn Thomas, On the Value of Gloves in Operative Work, BRITISH MEDICAL JOURNAL, January 21st, 1899, p. 140. ¹² BRITISH MEDICAL JOURNAL, May 28th, 1892. ¹³ From March, 1900, to December, 1903. ¹⁴ Lucas-Championnière, *Cure Radicale des Hernies*, Paris, 1892. ¹⁵ *Wien. klin. Woch.*, October 1st, 1896. ¹⁶ ABST., see EPITOME OF BRITISH MEDICAL JOURNAL, December 5th, 1896, par. 460. ¹⁷ An Address on the Organization of Aseptic Operations and some of the Causes of Failure, BRITISH MEDICAL JOURNAL, February 24th, 1900, p. 429. ¹⁸ *Lancet*, January 9th, 1904, case iv, p. 93. ¹⁹ BRITISH MEDICAL JOURNAL, September 17th, 1893, p. 802. ²⁰ *Johns Hopkins Hospital Reports*, vol. vii, Nos. 5-9, Baltimore, 1899. ²¹ *Loc. cit.*, p. 225. ²² *The Radical Cure of Hernia, Hydrocele, and Varicocele*, by C. B. Lockwood, Edinburgh and London, 1893, p. 153. ²³ New sponges are (1) shaken and beaten to get rid of sand; (2) soaked in solution of hydrochloric acid and water to remove shell and coral (1 drachm of strong hydrochloric acid to 1 pint of water); (3) washed out in alkaline water, and subsequently in sterile warm water (1 drachm of washing soda to 1 pint of water); (4) twelve hours in cold solution of sulphurous acid (1 in 5), which is washed out with sterile water.

THE TREATMENT OF APPENDIX-ABSCESS IN THE RECTO-VESICAL POUCH.

By EDMUND OWEN, F.R.C.S.,

Consulting Surgeon, St. Mary's Hospital and Hospital for Sick Children, Great Ormond Street, London.

IN the autumn of last year some interesting and valuable lectures were published upon inflammatory disease of the appendix, in the course of which special reference was made to the treatment of those cases which were complicated with intra-pelvic suppuration.

It was affirmed in one of the lectures that it was always better to drain a localized pelvic abscess from the rectum or vagina. That by either of these methods the patients were well in a fortnight, and never in the hospital more than three weeks; and, moreover, that they thus ran no risk of ventral hernia. But that if, on the other hand, the abscess were drained by a suprapubic incision the wound took six weeks at least to heal, and often much longer.

The object of this paper is to call into question the propriety of this teaching, and to affirm that the safest way of dealing with an intrapelvic appendicular abscess is by abdominal section. I will briefly cite an illustrative case which was lately under my care:

A gentleman, aged 45 years, was sent to me on August 17th, 1903, with a history of intermittent trouble with defaecation and of a feeling of fullness and weight about the neck of the bladder. His doctor, who is a most competent practitioner, wrote that last May the patient had been treated by some one else (he did not say where, or by whom) for obscure abdominal pains which were centred in the hypogastric region. At that time, he said, no rectal examination had been made, but when the practitioner had introduced his finger into the rectum he had found a tumour which felt like an enormously enlarged prostate gland. The patient told me that he had constant pain on micturition and defaecation, and that occasionally there was a "discharge" from the urethra. He denied all possibility of venereal infection. For several years he had had obscure abdominal pains, and he had become dyspeptic to such an extent that he was afraid to eat meat. Three months previously he had had severe pains in the hypogastric region, for which he was kept in bed. He told the doctor who was attending him that he thought he must have got "appendicitis," so great was his distress. But the doctor, finding that there was neither swelling nor tenderness in the right iliac fossa, put down the distress to the after-effects of influenza. He applied fomentations over the hypogastric region. In due course the acute attack passed off, and the patient was able to resume work. But he was very miserable and depressed, and was steadily losing weight. He also told me that he felt as if he had a cricket ball near the rectum, and that he could never obtain a proper faecal evacuation.

The finger introduced into the bowel at once came upon a hard, tender swelling at the base of the bladder. It was about the size of a small hen's egg. It was not prostatic, but it was so close to the prostate gland, and so intimately attached to it, that there was little wonder that it had recently been likened to an enlarged prostate. No lymphatic glandular invasion was anywhere discoverable, but I was afraid lest the tumour might prove to be malignant. In the course of a consultation

a surgeon hazarded the speculation that the tumour might be hydatid, but we agreed that it was impossible to be sure of its nature without operation, and that the case most certainly needed operation.

I therefore opened the abdomen in the middle line, and, working cautiously amongst coils of closely-adherent intestine, found at the very bottom of the recto-vesical pouch a tightly-filled abscess, the walls of which were composed of the rectum behind, the prostate below, and the bladder in front, whilst a kinked piece of the colon formed its roof. To the right side of the abscess, and firmly glued to the base of the bladder, was the end of the appendix, inflamed and ulcerated. Having removed the appendix, and having thoroughly wiped out the abscess cavity with dry swabs of absorbent wool, I passed a very large drainage tube down into the recto-vesical pouch and brought the other end out a little below the umbilicus. Though the peritoneum showed itself proof against infection by the bacilli coli, the surface-wound became infected about a fortnight after the operation, and so severe was the attack of cellulitis caused thereby that some large branches of artery in the epigastric region burst out bleeding on two occasions, and the patient was near dying from secondary hæmorrhage. As it is, however, he is now in the North of Africa completing his convalescence.

He was fully apprised of the fact that we had been throughout in uncertainty as to the diagnosis, and was entirely in agreement with us that he had better be operated on. After the operation, when we told him that the outlook was quite cheerful as the tumour had proved to be an abscess in connexion with a diseased appendix, which we had also removed, he said, "Ah, when I was so bad I told the doctor that I believed I had appendicitis!" But, inasmuch at the present time everybody—lay and professional—talks familiarly about "appendicitis," I am afraid that I cannot award this patient full credit for the correctness of his diagnosis. Nor would I blame his doctor who apparently had declined to accept it, for, so far as I can ascertain, the pain and tenderness had never been in the right iliac fossa, but always in the pelvic and hypogastric region. My explanation of the case is that, some indefinite time ago, he had probably had a milk attack of inflammation, which fixed the tip of a long and wandering appendix in the depths of the pelvis, and that a few months ago there was recrudescence of the inflammation with severe hypogastric pains, and with the formation of the abscess. Had he been operated on just after his first attack (whenever that was), he would, I feel sure, have been spared a large amount of suffering, and would have avoided the very serious risks which were inseparable from the more serious operation.

In the case of suppuration in connexion with an inflamed appendix there is no telling in what direction the exigencies of the operation may not lead the surgeon. He may explore the iliac fossa and be disappointed at finding that it contains neither appendix nor caecum, and it may take him some time to discover any part of the large intestine. Eventually, maybe, he comes across a piece of large intestine which he takes to be the right colon, and, guided by one of its muscular bands, he looks onwards for the appendix, which he may discover in due course but after much delay. Sometimes he finds the appendix—as in this case—in the depths of the pelvis. Not infrequently he has to continue the abdominal wound up to the costal region, and may then discover it hidden away behind the liver with which it had formed an illicit connexion. There is no organ in the body which is so regardless of anatomical proprieties as the appendix. Man ought to be for ever grateful that it is not one of a pair!

There are two grave objections to opening an appendicular abscess through the vagina or rectum. The first is that the operator cannot tell exactly what he is doing. He is operating in the dark, as it were, and for aught he knows the instrument which he is using in his attempt to reach the pus may be traversing a piece of small intestine which has been emptied by pressure, softened by inflammation, and glued by adhesions in a faulty position. The second objection is that his operation may be followed by a faecal fistula which absolutely refuses to close. It would be a real calamity if by chance a wounded piece of small intestine persisted in draining its contents off into the rectum or vagina, or if, the large intestine being implicated, faecal evacuations continued to take place through the vagina. Of course there is a risk of faecal fistula following a straightforward suprapubic opening of a pelvic abscess. But in this case the surgeon would probably see exactly what was amiss when he had the abdomen open and the piece of bowel between his fingers, and he could deal with the condition then or later on. Supposing that he thought it advisable to defer attempting to close the intestinal perforation, he could at least bring it up to the abdominal wound and fix it in a position where it would at any time be readily accessible.

Another strong argument in favour of the abdominal route