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ABDOMINAL AND PELVIC SURGERY.

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ASEPSIS IN INTRA-PERITONEAL SURGERY.*

I will not discuss the broad question of asepsis versus antisepsis by the use of chemical solutions in its application to general surgery. If the proper precautions as regards cleanliness in every detail before and during an operation are observed, we need no antiseptic germicides in intra-peritoneal surgery. If solutions of sublimate, carbolic acid, etc., are brought in contact with healthy peritoneum their action is harmful, and if they do not cause immediate bad results they will cause subsequent trouble by so irritating the membrane as to result in few or many adhesions of the abdominal and pelvic viscera. They may leave the patient as much or more of an invalid than before the laparotomy. Nor will I condemn the use of chemical solutions for the purpose of sterilizing the operator, assistants, nurses or patient, or the room, instruments, sutures, dressings or sponges, if used before the operation is begun, but they should be removed from everything that is brought in contact with the peritoneum. Unless everything is made practically clean, independent of the germicide, it will not make it aseptic. It is too often true that operators who are loudest in advocacy of germicide solutions are the least cleanly, and I have known them to forget to wash their hands before beginning an operation, or before examining a woman in labor. They wet the walls of the room and the hands that have not been cleansed in sublimate solutions, use carbolic spray, put dirty instruments, sponges, sutures and dressings in dirty vessels filled with unclean water, and expect the antiseptic to make all aseptic. Just here lies a great objection to the general use of chemical germicides, and women have died of septic infection because of reliance upon such means.

There are relatively few men who know how to be surgically clean in every detail connected with intra-peritoneal surgery, and if the time and labor that have been devoted to teaching the medical profession how to use antiseptic germicides had been directed to teaching the value of and means of accomplishing surgical cleanliness, septic peritonitis following laparotomy would be comparatively infrequent. Of course the above does not apply to all men who use chemical antiseptics, for some of them are the most cleanly I have seen operate, but I believe they would get as good or better results if they omitted the antiseptics. The peritoneum is usually infected by contact, and the danger of atmospheric infection is practically *nil*, as has been shown by the excellent results in laparotomies done in large and crowded amphitheatres.

The following order may be observed in describing the means of making and keeping everything aseptic in abdominal and pelvic surgery:

1. The operating room and the room in which the patient is to remain during convalescence; 2. The patient; 3. The operator and all assistants; 4. The kind of water to use; 5. (a) instruments; (b) sutures and ligatures; (c) sponges; (d) dressings and towels. 6. Irrigation. 7. Drainage.

The operating room should be so constructed that the floor, walls and furniture may be washed regularly and kept clean. If the operation is done in a private house it is well to remove the carpet and curtains some days be-

*From the Transactions of the American Association of Obstetricians and Gynecologists, 1891.

fore and wash everything in or about the room, but do not attempt to disturb the dust by brushing the day the laparotomy is to be done. If dirt has then accumulated that must be removed it should be done by wiping or washing with a towel, and this must also be done if we operate in emergency cases where we have no time to make extensive arrangements. I doubt if there is any advantage in using the spray or burning sulphur unless the room has been occupied by a patient with an infectious disease. Asepsis is more easily accomplished in well-regulated private or public hospitals or infirmaries; in private houses septic matter may more readily be introduced unless the operator or an experienced nurse rigorously superintends everything before and during the operation. But good results may be obtained in uncleanly rooms and surroundings if the wound and the peritoneum are protected from contact with anything septic. This, however, should not be an excuse for operating without preparing the room, for dangers of infection are multiplied many times; the hands, sponges, towels, etc., may unconsciously come in contact with poisonous matter and it requires unremitting watchfulness to prevent it. This danger is practically removed where we take the proper precautions when we have time to do so before operating. The room in which the patient is to remain after the operation should be made clean, as should also the mattress and bed covering; this is especially necessary where the drainage tube is used.

In operating rooms at hospitals or infirmaries the operating, nurse, and instrument tables are more easily kept clean if they have plate glass covers. The instrument trays and pans for sponges and dressings should be white china or white porcelain lined, so that we may readily see if they are unclean.

The patient should be given one or more hot baths with soap and brush before the operation, and every part of the body, including the hairs on the head, under the arms and over the vulva, should be carefully cleansed. The pubes should be shaved, and it is well to scrape away with the razor the epidermal scales from the anterior surface of the abdominal wall. Before making the abdominal incision the abdomen should again be washed and wiped dry with a clean towel. A hot enema and a copious vaginal injection should be given before the operation. Dry sterilized towels should be placed over the pubes and upper part and sides of the abdomen over which there should be spread a large piece of several thicknesses of dry sterilized gauze with an opening cut for some inches over the point where the incision into the cavity is to be made. This prevents the hands, instruments or sponges coming in contact with septic matter about the clothing or the operating table.

The same care in preparing for an operation that is required of the operator should also be enjoined upon the assistants and the nurses, otherwise it is impossible to know if septic matter has been introduced. Visitors should not be permitted to come near the patient or anything that is to be used in the operation, nor should they touch the hands of any one who is to assist in any capacity in the operation. The operator should prepare himself, as carefully as he has had the patient prepared and should put on clean linen before each operation. His nails should be closely trimmed and scraped, and *just before* he begins an operation his hands and arms should again be carefully washed in hot water with soap and brush. He should then put on a clean white apron, reaching from the neck to below the knees and extending entirely around the body, so as to prevent the hands coming in contact with his clothing. He should have a pan of hot sterilized water on his instrument table to dip his hands into when soiled with blood or other matter.

All water used in the operation should be sterilized by boiling not less than thirty minutes, and if we can not get water that is relatively clear and clean it should be distilled or filtered through a Pasteur filter before it is boiled. The vessels in which the water is boiled should be washed in hot water with soap, and should be used for no other purpose. The water for the sponges and irrigation should be boiled some hours before the operation so that it gets cool enough

to use, but the water to be put in the instrument and suture trays and the pan for the irrigation and drainage tubes and needles should be boiling when the operation is begun.

The instruments and needles should be washed with great care in hot water with sapolio. It removes the oil from new instruments and the blood or other secretions from instruments that have been used, better than any soap I have tried. The hairs of the brush should be pushed into the irregularities and holes in the instruments, and through the eyes of the needles, otherwise all the dirt will not be removed. Instruments should be washed after being used before the blood has hardened on them, and should be wrapped in a sterilized towel until they are needed. When any of the plating is worn off they should be replated. They should be kept in boiling water with a little carbonate of soda to prevent rust a few minutes immediately before using.

The best suture or ligature for general use, and it will serve nearly all purposes in intra-peritoneal surgery, is the Chinese hard twist silk of different sizes. It should be selected from unbroken packages and never handled with hands that have not been washed; nor should it ever come in contact with anything not clean. This suture may be sterilized in several ways, but the most reliable method is to wrap three sizes on three separate small glass spools and put them in a test tube and stopper it with a piece of absorbent cotton. This should be kept for an hour for three consecutive days in a Koch's, or some approved, sterilizer, at a heat of 212° F. Each tube holds enough silk for a laparotomy and may be kept indefinitely in an aseptic condition if the cotton is not removed. Or the silk may be sterilized on large glass spools which may immediately be put on reels in glass suture boxes and kept covered with alcohol. These sutures may, however, be made practically sterile by putting them in an iron porcelain-lined pan of boiling water and keep the water boiling for thirty minutes before and during the operation. The glass drainage and the irrigation tubes and the needles may be kept in the same pan. Silk worm gut may be carefully washed and made sterile by boiling. This may be done during the operation, or, if done previously, they should be put in long glass sterilized tubes and absorbent cotton tightly introduced into the ends, or they may be kept in hermetically-sealed glass jars, or in alcohol. Silver wire should be cut into pieces twelve inches long, then washed and made bright with sapolio, and when boiled kept also in glass tubes, or they may be washed and boiled when we want to use them. They may also be sterilized and kept on large spools in the glass suture box filled with alcohol. I will not speak of the preparation of the cat gut or the kangaroo tendon. Soft and well-shaped sponges should be selected and prepared after the following fashion: They should be hammered on a marble slab with a wooden mallet as long as any sand, lime or dirt can be gotten out of them. They should then be washed in cold water and put for twelve hours in water made disagreeably sour with hydro-chloric acid. The acid is washed out of the sponges, and when they are dry they are again hammered with the mallet to see if any more sand or lime can be gotten out of them. They are now carefully washed in cold water and kept for six hours in a mixture of sulphurous acid one part, and water five parts. This is washed out in clean water and the sponges wrung dry and immediately put into a large glass stoppered jar or bottle filled with alcohol. Sponges that have been used may again be made clean if they have not come in contact with septic pus. Immediately after the operation have them washed and then put for twelve hours in a strong solution of carbonate of soda. This will dissolve all organic matter so that the sponges will be relatively clean when the soda is washed out of them. They are then put in the sulphurous acid and water as above and kept in alcohol. There are other ways of preparing sponges, but this is the simplest and most perfect. The sponges should be prepared by the operator, or under his immediate supervision, otherwise the process may be imperfectly observed. It is best for each operator to prepare

his own gauze. It can be purchased in rolls of 25 to 100 yards, free of oil, and ready to be sterilized. This is best done by putting it in loose folds in a sterilizer for an hour for one or more days. It may then be put into aseptic glass jars with ground stoppers, or in small jars with glass tops that fit so tightly upon gum bands that air can not be admitted. Enough may be put in one jar for a laparotomy, and it will remain sterile. If any antiseptic is preferred it may be used on the gauze when preparing for an operation, but as gauze, properly sterilized, is free of pathogenic germs, why use the antiseptic? It can not make it more aseptic. If there is any doubt as to perfect sterilization the germicide may be used.

If it is not convenient to sterilize the gauze as above, it may be made practically sterile by boiling it for thirty minutes before and during an operation, but dry gauze should, if possible, be used, especially over the abdomen and the wound.

If towels are carefully washed and boiled in clean water for thirty minutes they are usually sufficiently aseptic, if they have not been used except in the operating room. They may be sterilized as carefully as the gauze, but this is a troublesome process and is probably not necessary.

In suturing the abdominal wound the edges should be evenly coapted, but if the sutures are tied too tightly stitch abscesses will follow in the practice of the cleanest operator, because it furnishes necrosed tissue in which pathogenic germs may develop. The abdominal wall should be made clean and dry before the dressings are applied, and well dusted with boric acid, an excellent means to keep the wound dry. The several layers of gauze and the thick layer of absorbent cotton should be strapped tightly to the abdomen by three inch wide gum adhesive plaster. If the glass tube is used the dressings should be perfectly fitted around it.

If the peritoneum has become soiled with blood, pus, or the contents of cysts, the cavity should be thoroughly irrigated with water from 100° to 110° F. This is best done with a long glass tube, with holes at the end and on the sides, attached to a gum hose. An iron granite or glass funnel is introduced into the other end of the hose and the water poured from a pitcher is forced into all parts of the peritoneal cavity by hydraulic pressure.

THE DRAINAGE TUBE IN LAPAROTOMY.*

Supra-pubic drainage is the method usually adopted by successful laparotomists to drain the peritoneal cavity, but there are good operators who use vaginal drainage, or combine each method. The most conspicuous advocate of vaginal drainage is August Martin, but as I believe it offers no special advantages and adds largely to the dangers of drainage infection, I will speak only of supra-pubic drainage with the glass tube. It will accomplish all that vaginal drainage can do, and if correctly practiced, the dangers of tube infection of the peritoneum are so minimized as to be practically *nil*. This can never be accomplished by vaginal drainage, even in the practice of such an experienced operator as Martin.

It has been urged against the drainage tube that it does not drain, and that it is a frequent cause of septic infection; that if the cavity is made aseptic drainage is not needed, and if it is not aseptic drainage will not make it so. There is enough truth in these objections to satisfy some operators, but they do not look at the question in its broadest sense, and, I fancy, have had patients to die whose lives could have been saved by the use of a drainage tube. They can not appreciate what the tube is capable of doing; they under-estimate its value, magnify its dangers, and are misled by too much confidence in their

* From the Transactions of the American Gynecological Society, 1891.

ability to make all peritoneal cavities aseptic. A peritoneal cavity may be made so clean that a culture could not be made from its contents, but there are many cases where this is impossible, and while the peritoneum may digest and dispose of septic matter, pus, blood, or serum, there are instances where it will not do so, and just here is where the utility of drainage is most manifest. It is not necessary to contend that the drainage tube will drain. It positively, in most cases, does remove the blood and serum and takes away the pabulum in which pathogenic germs might otherwise develop and probably destroy life. If we keep the cavity relatively dry the condition favorable to the growth of pathogenic germs has been removed, and they are not propagated in numbers sufficient to cause infection; they finally lose all power of propagation and their vitality or power to do harm is destroyed. Streptococci may remain in the cavity, but we remove the soil on which they live.

It is true that the drainage tube, placed at the bottom of Douglass' pouch, will not always drain secretions that are given off high up in the abdomen, but in most cases the secretions are from pelvic structure where the fluid immediately gravitates to the lowest part of the cavity and enters directly into the tube. I have had a case where the tube was placed at the bottom of the retro-uterine pouch and did not drain but little for sixteen hours. It was then withdrawn for two inches before any fluid could be removed by suction. It now filled rapidly and I drew out a pint. This convinced me that it is the correct thing to have the fine holes on the side of the tube extend up nearly to the abdominal wall, so that it may drain from the abdomen as well as the pelvis. I now have these tubes specially manufactured. The objections that the tube is a foreign body, a source of irritation, and a cause of hernia, are not sustained by facts correctly observed in the practice of experienced and clean operators, and there are fewer sequelæ in cases carefully irrigated and drained. Of course a tube may cause trouble if used by an operator who does not know how to place it, or to properly care for it, and does not appreciate the value of asepsis in every detail connected with its use. The peritoneum will usually absorb and dispose of copious secretions, but it will not always do so, and this is especially true where it is much diseased, or in old and feeble people. These fluids may become infected by septic matter in the peritoneum, by the introduction of septic matter by neglect of cleanliness during the operation, or by bowel infection.

While the indications for drainage are usually well marked, there are many instances in which we must be in doubt as to its necessity, but in these cases it is safe to drain, for it will do no harm and may save life.

Indications for drainage—

1. To diagnosticate internal hemorrhage in time to stop bleeding by the injection of an hemostatic, or by re-opening the cavity before fatal shock. The tube quickly shows hemorrhage, but without it a patient may die because we do not detect internal bleeding.
2. To prevent hemorrhage by keeping the cavity dry and allowing the vessels to contract and the blood to coagulate.
3. Where there are extensive adhesions or continued oozing of blood or transudation of serum; it is especially indicated in operations on old and feeble people, where either of the above conditions are present if only in a limited degree.
4. When in doubt as to the necessity of drainage it is best to use it.
5. Where the peritoneum has been soiled with pus or other matter that is probably septic, or where portions of cysts or other structures that may become devitalized, are left in the cavity.

Koeberlé, of Strassburg, first used the glass tube of Hegar and Kehrer for capillary drainage, and he probably gave to the medical profession the glass drainage tube generally used.

While the tube is invaluable in the practice of operators familiar with the

principles and practical details of its use, it may do harm if used by persons who do not know the kind of a tube that is indicated, or how to place it, or to care for it. The tube should be made of thin glass, never exceeding one-half inch in diameter, open at both ends, with *fine* holes on the sides extending within two or three inches of the mouth, and long enough to reach to the deepest part of the pelvis. The small tube will drain as well as the large one, is less painful, and does not subject the patient to so many dangers. Most of the tubes in general use are too large, too heavy, holes in the sides too big, and often otherwise defective. Many of them are too short to be of any service in pelvic drainage, for they will not reach the point where the secretions lodge by gravitation. The tube should be made aseptic by washing inside and outside, and before it is used should be kept in boiling water for ten minutes. It should usually be placed at the lower end of the abdominal wound, below the small intestines, and the point should rest at the bottom of the retro-uterine pouch or in the deepest part of the cavity to be drained. The abdominal incision should be closed tightly around it and the several layers of sterilized gauze placed over the wound should fit closely to the tube, as should also the thick layer of aseptic cotton. This dressing should be firmly fixed against the abdomen by adhesive plaster, with the mouth of the tube protruding. Over this should be placed a twelve-inch square piece of gum-dam, fitted tightly around the neck of the tube, so as to prevent discharges soiling the dressing beneath it. A piece of absorbent cotton should be kept over the mouth of the tube and, when soiled, a new piece substituted. The gum-dam should be carefully washed and made sterile by keeping it in boiling water ten minutes before using it. The tube should be cared for by the operator, or by an experienced and honest nurse, who recognizes the importance of attending religiously to every detail, and of being in every particular aseptic.

The long nozzle syringe, or a syringe with a small gum tubing attached, affords the best means of emptying the tube. It should be emptied as often as every ten to twenty minutes at first, but as the secretions become less the interval may be made longer. Before using the exhausting syringe clean towels should be placed over the abdomen and closely fitted around the tube, and the hands washed. The syringe should be made clean and kept so by washing immediately after using it, and should be kept in a strong bichloride solution.

The practice of trying to drain the peritoneal cavity by introducing strips of gauze or wick into the tube to its bottom, or allowing shreds to enter the cavity, as practiced by German laparotomists and a few good men in this country, may be the means of introducing septic matter. While aseptic gauze may drain efficiently, it sometimes prevents drainage and causes the blood to coagulate in the tube. This is especially true where capillary drainage is attempted by the use of the wick. I have never seen coagulation where the syringe was used. Probably the most correct exposition of the methods of drainage in Germany will be found in the paper, "Drainage in Laparotomy," by Saenger, of Leipsic, at the recent meeting of the Tenth International Medical Congress at Berlin. No mention is made of protecting the dressings from the discharges by the use of gum-dam, or of removing the secretions with the syringe. Aseptic gauze may aid in draining a septic cavity in the abdomen or pelvis, but it should be introduced around the tube and not in it.

The dorsal position should be enjoined until the tube is removed which should be done by degrees, as soon as the conditions will admit, and when bleeding has practically ceased and there is only a small quantity of clear, inodorous liquid removed, it is no longer needed. If it has to be retained more than twenty-four hours it should be rotated a little twice daily so as to facilitate drainage by preventing obstruction in the small openings. The dressings need not necessarily be disturbed to remove the tube, and in a few days the opening will be closed, and hernia will not occur at this point more easily than at other points of the incision.

SUGGESTIONS ABOUT ABDOMINAL AND PELVIC SURGERY.*

The recent contributions upon abdominal and pelvic surgery are probably more numerous and practical than upon any other department of general or special surgery; still, there is a variety of opinion as to the best methods of treating pathological conditions within the peritoneum, or as to the immediate or permanent results of the many procedures that have been practiced. This is especially true of pelvic surgery, where we find, in the practice of the most experienced and successful operators, accidents during the operation and complications following it, for the prevention of which, there is no united opinion as to the correct technique to adopt; nor is it always possible to explain why troublesome complications occur in one case, and do not occur in another apparently similar case. Careful observation and experience may finally teach us much wisdom in these matters, and I will ask your kind indulgence while I briefly allude to a few things that may be of value, if carefully discussed by the fellows.

There is too much laparotomy done and too many men are doing it; men who know too little about the diagnosis and pathology of abdominal or pelvic diseases, or about the best technique in operating, and have few facilities for doing such work. Continuously good laparotomy work can not be done except by men who largely devote themselves to this department of special surgery, and with such men some cases are operated on where the indications do not justify it. The appendages are sometimes removed for vague nervous troubles, where there is no disease of the ovaries or tubes, or peritoneal adhesions. Such cases are made worse, and are mutilated in a way that can not be corrected.

The pendulum has swung too far, but many of our best operators are earnestly urging upon the medical profession that the operation is not indicated except in cases where there is well-defined disease that has resisted, or will resist, other more conservative means.

As the experience of an honest surgeon widens, he operates relatively less frequently, and he can recall cases that he does not believe should have been operated on. An honest, intelligent and careful man may, when young in observation and practice, make mistakes in the selection of suitable cases for laparotomy, but this is less frequent than it was a few years ago. It is criminal to do dangerous or capital operations while ignorant of the best methods of doing such work, or for the purpose of adding a little cheap glory to our reputation; or to report cases that apparently recover from the immediate effects of the operation as permanently relieved before the final results can be appreciated. Such men usually have many bad results or deaths that they do not report so promptly, and the profession, or the people, seldom hear much about them.

I have reported but a small minority of my successful cases, but have promptly reported my bad results, because by a careful study of such cases, we finally do better work, by learning how to avoid or prevent complications or accidents that may cause the death of our patient. Reported recoveries in simple cases of laparotomy do not always indicate superior or unusual skill in the operator; and such reports are of little value to the medical profession, and may indirectly result in the death of many women, by influencing ignorant men, with no facilities for such work, to attempt it because of its apparent simplicity.

What I may say relative to the technique, etc., of laparotomy, refers to cases where the conditions are manifestly such as to positively indicate the necessity for the operation. In preparing for an operation, the physical and mental condition, and the hygienic and sanitary surroundings of the patient,

*Extracts from a paper read before the Section on Obstetrics and Gynecology of the American Medical Association, at Washington, D. C., May, 1891.

should be made as perfect as possible under existing circumstances; and unless absolute surgical cleanliness is observed in everything that may come in contact with the wound or peritoneum, septic infection may follow.

Some operators who talk a good deal about antisepsis, do not know how to be surgically clean, because they have not learned to appreciate the value of cleanliness in every detail before and during the operation. The infection often comes to the patient by the neglect of little things, without the strict observance of which no one can be a successful abdominal surgeon.

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Some men who use the spray, Don Quixote-like, while pursuing an imaginary foe allow the deadly enemy to enter through numerous neglected channels —the hands, sponges, sutures, instruments, etc. Every operator should of course observe the broad principles that make the foundation of all good surgery, but if he neglects the details, he will be disappointed in the results.

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I prefer not to operate in a room where the patient is afterward to stay, and when I am compelled to do so, if delay is admissible, I have the room thoroughly cleansed and ventilated for twenty-four hours before the operation, but use no spray or other means of disinfection. When it can be done, I operate in a specially prepared laparotomy room at St. Joseph's Infirmary, so arranged that everything in or about the apartment can be kept aseptic with but little care. The operating tables for the surgeon and nurses have plate glass covers, and the trays for instruments and pans for sponges and dressings are white porcelain-lined.

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I will refer to but a few points in the technique of the operation. Adhesions are carefully separated close to the tumor or structure to be removed, or the uterus, to prevent hæmorrhage or wounding the intestines or bladder. Adherent intestines should be separated if possible, otherwise the operation is incomplete, and the patient will not probably be permanently, if at all, relieved.

These patients sometimes suffer more after the operation than before it, because of the extensive adhesions induced by uncleanliness, antiseptics or traumatism committed by a careless operator. I believe adhesions will be fewer if antiseptics are absolutely excluded from the operating room, and are not even used for the instruments or the hands. This may seem heterodoxical to many, but I have arrived at this conclusion, after experience and careful observation. If the instruments and the hands are clean, we need no antiseptics, and if they are unclean, the solution will not cleanse them or prevent infection, but may so iritate the peritoneum as to cause few or many adhesions. It will require more experience to decide how much damage is done in this way. Blood, pus and all foreign matter should be removed, and great care should be practiced to prevent rupturing a pus sac or cavity in an operation for their removal.

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Hernia will seldom occur if we are careful to unite the ends of the abdominal fascia. This may be done by the deep suture if the fascia is drawn out and the needle correctly introduced, but the separate suturing of the fascia is more reliable.

Recognizing the fact that in laparotomy work death is too often caused by septic infection, and that this can nearly always be prevented, I am deeply in earnest in my desire to aid in impressing upon the medical profession what I conceive to be the best means of preventing the introduction of septic matter. As death occasionally follows prolonged anæsthesia in organic disease of the heart, lungs or kidneys, we should carefully examine these organs before we decide to operate.