The operation proposed by Dr. Ochsner,¹¹ consisting in a resection of the vasa deferentia, does not mutilate the person; it does not destroy his sexual power, but it does prevent his power of propagation, and it is an operation attended with very little risk to life, and in my judgment it may be made a most useful agent in preventing an increase in criminals. Castration has been proposed by some, but the operation is vastly more dangerous. It is a great mutilation, and destroys sexual power, and for these several reasons is by no means as useful an operation as the one proposed above.

The children of these degenerates should be taken in charge by the courts and placed at the very earliest possible age, certainly not later than seven years, in a favorable environment, and by this means the great bulk of them might be made useful citizens. Alcoholism is a very important and exceedingly difficult etiologic factor to dispose of. The saloon is such a powerful factor in our political system that it seems to be impossible to have legislators enact laws that will properly regulate this great traffic. We see no way to accomplish any positive results except as physicians spreading information among the people as to the baneful influence of intemperance, and so educating the old and the young that the powerful influence of the great factor in politics may be neutralized. We need to-day legislation for inebriates; authority to place them in prolonged confinement during which they may undergo such treatment as may be necessary for their cure, and we certainly need some legislation by which the traffic in alcoholics may be diminished, and by which the quality of the liquor furnished may be improved. But the best way out of it is not by prohibition at this time, surely, but it may be by a high-license system. There should be some remedy provided against the constant increase in urban population. Some method should be provided for the restoration of the equilibrium, some way by which the unproductive citizen might be transported to the country and made productive.

The last etiologic factor—the laws and the unreasonable manner of their execution—demands such changes that those who are concerned in the sentencing of criminals should know something about their biologic condition, and surely the ordinary jurymen cannot possibly possess this knowledge. It would seem best, therefore, that the determination of this question should not rest with the ordinary jurymen; that all sentences should be indeterminate; that the criminal should be sent to a prison or reformatory not for any specific time, but until he is reformed or cured, precisely as the patient is sent to a hospital. A person who has committed his first offence should not be permitted to associate with hardened criminals; trials should be speedy and prompt. The pardoning power should be taken out of the hands of governors of States and placed under the control of a board of pardons, whose members shall be skilled in a criminal anthropology. For criminal minor children there should be reform schools, where, through a protracted period, these children should be educated by manual training, and taught some useful occupation that may be to them the means of earning an honorable livelihood, and when the time comes for their discharge, they should be furnished with the means by which

they may establish themselves in the occupation for which they have been trained. This is not an untried proposition, but is to-day in practice in Russia. There should be reformatories for the older criminals who are capable of reformation, and these also should be taught not only the rudiments of an English education, but useful arts, and their confinement should be until they are able to withstand temptation and earn an honest living, and when released from the care of the reformatory they, too, should be provided with a reasonable capital with which to take a start in life. And, lastly, for those who are incapable of reformation there should be penitentiaries for their life-long incarceration, and these should be made as near self-sustaining as possible by having the prisoners employed in useful occupation.

Original Article.

THE CARE OF THE HANDS FOR THOSE WHO PRACTISE SURGERY.¹

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By the aid of moist and dry heat we are able to obtain perfect sterilization of sheets, towels, dressings, instruments, gauze sponges, and suture materials. The hands, which come more closely in contact with the fresh wound than any of these except the suture materials, we have succeeded in completely sterilizing in only a certain proportion of cases. The most successful results obtained from experiments conducted by competent bacteriologists with nascent chlorine gas, alcohol and permanganate of potash and oxalic acid, the most approved sterilizing agents, show entire absence of germs from the finger tips in from 87 to 95 per cent. The less successful results show percentages much below these figures.

Keeping the fingers out of the wound as much as possible and the use of rubber gloves, now becoming more and more frequent, will, in a measure, do away with the danger of hand contamination of wounds, but there will always be very nice plastic operations, and operations requiring the most highly trained tactile sense, where the fingers must be put in the wound and gloves will be a handicap. Gloves are proving to be a boon to the surgeon in another way and that is in lessening the danger of inoculating himself. Who has not spent an anxious forty-eight hours wondering whether he was destined to see signs of septicemia from some needle prick or cut received at a septic operation? What wonder that many hospital surgeons are now wearing rubber gloves to operate upon all septic cases?

Assuming that gloves will not come into general use for all sorts of surgery for some time to come, if they ever do, and bearing in mind that the practice of surgery, and more especially of the major operations of surgery, is no longer limited to specialists or the few, it may not be out of place to say something as to the care of the hands.

The general practitioner must of necessity soil his hands many times a day and oftentimes with infective pus. He may be called upon to attend a woman in labor or to do an abdominal operation at any time.

¹ Read before the Obstetrical Society of Boston, March 21, 1899.

¹¹ Ochsner: *Surgical Treatment of Habitual Criminals*, Journal of the American Medical Association, April 22, 1899.

Can he render his hands aseptic by immersing them in the solutions of permanganate of potash and oxalic acid commonly used hereabouts? The bacteriological tests would seem to prove conclusively that he cannot be sure of asepsis unless his hands are relatively free from septic matter before using the solutions. To avoid danger to his patients three courses are open to him: He may wear gloves when handling septic cases, wear gloves when operating, or, lastly, keep his hands all the time relatively aseptic by cleansing them thoroughly as soon as they are contaminated. It is chiefly to urge the desirability of adopting the last course of procedure and to call attention anew to the chlorine process of disinfection that this paper is written.

In my early operative experience, before the days of rigid asepsis, I often had occasion to note that when blood was allowed to dry into the skin of the hands in the course of a prolonged plastic operation, that after a very considerable washing at the close of the operation it was possible to detect specks of blood around and under the nails and in the creases of the skin of the fingers. These specks could often be seen for as long a period as three days, in spite of repeated washings. What are we to think as to the probable number of bacteria that may lurk about such hands if the unaided eye can detect abundant traces of their culture media? It would seem to be advisable then to rinse the hands frequently in the course of an operation to prevent the drying on of the blood or septic matter.

If one bears in mind that washing soda (caustic soda, carbonate of soda) destroys all animal matter extremely readily, and that if used in moderation it will not injure the skin, it is plain that all blood or septic matter may be removed from the hands immediately after they are soiled. A few crystals of soda in warm water in a basin with a not too stiff nail-brush will cleanse the hands in five minutes, at all events so that there is no visible contamination, and will do many times more towards removing septic material than many washings with soap, water and antiseptics after the septic material has dried in.

Therefore, I say, it is nearly as important to wash well after operating as it is before. In the liberation of the germs dried into the skin of the fingers of the surgeon and his assistant by soaking and manipulation we see a partial explanation of the greater liability to sepsis in prolonged operations. We have all seen the busy surgeon at the close of a tedious operation, his lunch hour long gone by, patients awaiting him, make a very hurried washing of the hands, draw on his gloves and be off. He does not stop to think that those gloves are from that moment a source of sepsis, nor how difficult it will be for him to get his hands clean when he has the leisure to wash them carefully.

If it is necessary for the surgeon to soak his hands in septic matter for a long period of time he should scrub them for a correspondingly long period after he is through operating, and, on the other hand, if he barely touches something septic his washing need not be as thorough, for it seems reasonable to suppose that unless the material is especially adhesive it will come off as easily as it was put on.

It goes without saying that the nails should be carefully trimmed daily and the ends smoothed with a file.

Small wounds in the skin of the hands are best treated by covering the wound as soon as possible after the injury is received with flexible collodion. To do this successfully the skin about the wound is sponged

with alcohol on a piece of absorbent cotton as soon as the bleeding has stopped. This serves to dry the surface and to partially sterilize it. A drop of collodion is allowed to fall on the cut, and on top of it is put a bit of absorbent cotton a little larger than the wound to be covered. Several coats of collodion are necessary. A dressing of this sort will go through several days of hard washing without coming off and the wound, not being irritated and infected by constant contact with foreign substances, heals by first intention.

If, on the contrary, a cut is neglected until it has suppurated its management is much more difficult. It cannot be rendered relatively aseptic, and we must bear in mind the possibility of a collodion dressing coming off during an operation. Collodion will not adhere to wet skin, and even with the use of alcohol and ether a scratch received after the hands are thoroughly wet cannot be successfully covered with collodion. Therefore, in the case of suppurating wounds, even if as small as a hangnail, in the case of scratches, cuts and needle pricks received in the course of an operation, and when the wound is a large one, a rubber glove should be worn while operating.

The gloves made of pure gum, quite thin and fitting the hands snugly, are the ones I prefer. They may be boiled in a one-per-cent solution of washing soda for five minutes, or in plain water for half an hour before and after using, without injuring the rubber. White cotton gloves such as waiters wear, or thin silk or lisle-thread gloves paraffined, are a partial protection against sepsis in hospital operating and whenever there is doubt as to the previous condition of cleanliness of an assistant's hands. They are not reliable, however, and I prefer rubber gloves. One of the great benefits conferred by the rubber glove is the protection it affords from sepsis from the hands of the assistant. The operator having the responsibility knows of the relative cleanliness of his own hands, but of his assistant, unless carefully trained over a long period of time, he has reason to be skeptical. On this account many operators have limited the number of assistants, so that they work short-handed. With rubber gloves one may have as many assistants as may be necessary without fear of danger.

It is of the greatest importance for the surgeon to avoid any occupation which tends to blister or injure the skin of his hands. A thick skin, which comes from hard manual labor, is not only more difficult to sterilize because of its deeper furrows and wrinkles but it has less tactile sense. To protect against scratches and bruises and general infection the surgeon should wear street gloves as much as possible.

When it comes to preparing the hands for an operation whether gloves are to be worn or not my plan is as follows: After a preliminary washing with soap and water the nails are cleaned with a sterilized steel nail-file. The hands and forearms are scrubbed for five minutes with Ivory Soap and hot water and a nail-brush, the water being changed several times. Green soap is too strong for my skin. It is well to remember that the skin of the hands is much tougher than the skin of the forearms, and that the skin of the inside of the forearm is very delicate. Also that the danger in the form of germs lurks in the hands, more particularly about the nails, and not, as a rule, in the skin of the forearms, which is seldom exposed to infection. Therefore the scrubbing should be mostly of the hands and finger tips. It is a common occurrence

to see the house officers in the hospitals with dermatitis of the forearms and hands from too vigorous scrubbing with a too stiff nail-brush and from the effect on the skin of the strong solutions of permanganate and oxalic.

It is plain that one must adapt the nail-brush to the skin to be scrubbed, bearing in mind, however, that an absolutely soft brush is of no use whatever. A delicate skin needs a softer brush, and a delicate, thin skin has fewer and shallower wrinkles in it, lurking-places for septic germs. A dermatitis precludes all scrubbing and, besides, offers many foci for inoculation. If rubber gloves and a long-sleeved sterile gown are to be worn it is not necessary to prepare the forearms, but it is always safer to prepare the hands carefully because of the liability of pricking or tearing the gloves in the course of the operation.

In this connection it may be mentioned that Zweifel uses rubber gloves having no finger tips, each finger being covered by a separate cot of thin rubber. As the ends of the fingers of rubber gloves are especially liable to be pricked or torn by needles and instruments, a separate cot for each finger should prove to be a great saving in expense.

After rinsing the hands and forearms in warm water they are treated with chlorinated lime and washing soda as advocated and practised by Drs. Robert F. Weir and L. A. Stimson, of New York. Dr. Weir published an elaborate paper on this subject in the *Medical Record* for April 3, 1897, and many of the facts here given are from that paper.

The process depends on the germicidal action of nascent chlorine gas, which is liberated from the Labarraque's solution formed by the action of carbonate of soda and water on chlorinated lime. Labarraque's solution (*Liquor Sodæ Chloratæ* of the *Pharmacopœia*) is described as "An aqueous solution of several chlorine compounds of sodium containing at least 2.6 per cent., by weight, of available chlorine." It may be used instead of washing soda and chlorinated lime, but unless freshly made is uncertain in the amount of chlorine it contains. Weir experimented with a fortified Labarraque's solution containing ten per cent. of chlorine but found it too harsh for the hands, although he obtained sterile cultures in all his tests.

Chlorinated lime (called also bleaching powder, and, incorrectly, chloride of lime) is air-slaked lime impregnated with chlorine gas. It should contain thirty-five per cent. of available chlorine. The ordinary bleaching powder contains from twenty-five to forty per cent.

Chlorine gas is a very active germicide. It has been proved by the concurrent results of numerous experimenters that chlorine, if present in the proportion of one part in one hundred in the atmosphere of a room, is able to destroy disease germs, provided that the air and the objects are moist, and that the exposure continues for upwards of an hour. The experiments of Duggan show that the hypochlorites as derived from chlorinated lime are also very active germicides, one part to four hundred being capable of destroying moist germs in two minutes, and six parts to ten thousand killing the spores of the anthrax bacillus in six hours. A half of one per cent. of the hypochlorites in solution is said to be sufficient to destroy the spores of most bacteria almost instantly.

In the formation of Labarraque's solution carbonate of soda and water act on chlorinated lime to form

sodium hypochlorite and sodium chloride with an excess of sodium carbonate, besides liberating chlorine gas. The excess of soda removes from the skin the fat and the superficial layers of epithelium with their bacteria, and the chlorine and the hypochlorites destroy the bacteria.

Chlorine was first used as a hand disinfectant in practical surgical work by Kümmel of Hamburg in 1885. He used chlorine water. Weir has used chlorine in some form, either chlorine water (U. S. P.), Labarraque's solution, or chlorinated lime and soda, since 1892 and it has been the recognized method of sterilizing the hands at the New York Hospital for several years and is now in pretty general use in New York.

I personally have used this method since May, 1897, and have found it much superior to the permanganate and oxalic acid solutions. The skin of the hands is left soft and not slippery, as it is after the treatment with the latter, and not rough, as it is after the use of alcohol or corrosive. The hands do not chap and the general comfort of having them in good condition is not to be lightly estimated. Chlorinated lime is also a deodorant as well as a disinfectant and will remove from the hands the odor of fetid pus, feces and iodoform.

Chlorinated lime and washing soda in crystals can be procured of any grocer and are cheap. The lime which comes in small, quarter of a pound pasteboard or zinc boxes is very convenient as one box furnishes sufficient for the sterilization of several pairs of hands. After a box has once been opened the lime quickly loses its chlorine, probably by taking oxygen from the air, and is useless. It is important to beware of the zinc boxes with perforated tops sold in many of the grocery stores, because in these the air having free access there is next to no chlorine in the lime. The commercial chlorinated lime put up in hermetically sealed pasteboard boxes has been assayed by a competent chemist and found to contain from 30 to 35 per cent. of available chlorine. Part of the outer layers were deficient in chlorine, to be sure, but some of the boxes assaying 30 per cent. were over a year old. In this connection it is to be mentioned that it is well to buy the chlorinated lime of the grocer rather than the druggist, as the latter is apt to have small sales, and to keep his goods a long time.

The soda crystals are more convenient for use if finely broken up—not powdered. Bicarbonate of soda, cooking soda, will not do, neither will effloresced carbonate of soda, that is, crystals which have been exposed to the air and have been reduced to a white powder by the loss of their water of crystallization.

The sterilization of the hands is effected as follows: A tablespoonful of the crystals of soda is placed in the hollow of one hand. It is covered with half a tablespoonful of chlorinated lime, and water enough added to make a thin paste. In the making of Labarraque's solution twice as much soda as of lime is used. In a recent communication from Dr. Weir he advises using soda two-thirds, and lime one-third. The paste is spread over the hands and rubbed well into the skin of the finger tips and worked under the nails with the nails of the other hand. Then it is spread over the forearms. When the water is first added the chemical reaction set up causes the evolution of heat, and a sensation of warmth is felt in the arms and hands. This is followed in a few minutes by a cooling sensa-

tion and when this is noticed, in from three to five minutes, the process is completed and the paste is rinsed off with warm water.

The efficacy of this method of treating the hands is attested by the bacteriological tests employed by Dr. Weir. Forty-two tests gave forty sterile results, or ninety-five per cent. of successful results. These figures are to be compared with a series of thirty-one tests made by the same observer under the same conditions with permanganate of potash (1 to 16) and oxalic acid. In these, twenty-two were sterile, or seventy per cent. Howard Kelly, in a series of fifty experiments with permanganate and oxalic got germ free results in forty-four, or eighty-eight per cent., a somewhat better showing, but still not as good as the results in the experiments with lime and soda.

Some operators object to the chlorine process because of the odor of the chlorinated lime, others because of a fear that caustic soda will affect the skin injuriously. One very soon gets accustomed to the odor of the lime, so that it is not disagreeable, and the fear as to the injurious effect of the soda on the skin can be quickly dispelled by making trial of the process. It is possible, to be sure, to make the skin very sore by prolonged scrubbing with washing soda, especially if a new and stiff nail-brush of vegetable fibre is used, but this is not the way in which it is advised to use the soda. I have repeatedly used the lime and soda three and four times in a day without in any way irritating my skin, which, by the way, is thinner than the average. Permanganate and oxalic used once a day for several days in succession are sure to set up a dermatitis.

The permanganate and oxalic method has one advantage over all other methods of disinfecting the hands and that is, that it cannot well be slighted. When the hands are once dyed a deep brown color they must be decolorized, and in the process sterilized, and thus the patient is protected from the surgeon who hasn't an aseptic conscience. But as such surgeons have no just right to operate and, fortunately, are becoming scarcer every day, this property of the permanganate and oxalic will soon cease to be an advantage.

I have no bacteriological tests of my own to present in support of the lime and soda method but from a clinical experience of its use of over a year and a half I am unqualifiedly in favor of it.

In closing I should like to say once more that the hands should be always kept clean, relatively aseptic, and that it is nearly as important to wash the hands after an operation as it is before.

Clinical Department.

TWO CASES OF INFANTILE BLADDER TREATED BY GRADUAL DISTENTION.¹

BY GEORGE HAVEN, M.D., BOSTON.

INCONTINENCE of urine is very frequent in children, but usually does not persist after the latter part of childhood. Little is known regarding the cause in the earlier years, but it is commonly attributed to over-acidity of the urine, habit, debility, etc.

The treatment of incontinence in the early years of

¹ Read before the Obstetrical Society of Boston, March 21, 1899.

childhood is unsatisfactory, and is directed, as a rule, to reducing irritation at the neck of the bladder, and to general hygienic principles. The few cases which persist after puberty have been the opprobria of the physicians, for the reason that in few of these cases has the size of the bladder been taken into account. It is very fair to suppose that in a majority of these cases where the health of the patient is all that can be desired, and where the urine is normal, a contracted bladder space is responsible for the unpleasant condition. The normal capacity of the bladder is hard to determine, but various observers place the amount which the bladder should hold at between twelve and sixteen ounces, and under pressure at from fifteen to twenty ounces. Bladders have ruptured in the cadaver under a pressure exerted by from a quart to three pints of water.

The two cases which I have to report occurred in girls of eighteen years of age. Incontinence had been present from birth, and the bed had been wet almost every night. Their condition was pitiful, as they were unable to visit, go to the theatre, or spend a night in a bed unprotected by a rubber blanket.

CASE I. Miss R., age seventeen and a half years, had passed urine in bed every night from birth, and was unable to retain it longer than one hour during the day. Treatment was begun the 29th of March, 1890, and was continued until August 30th of the same year. She was seen every other day, and the bladder was distended by injecting into it a four-per-cent. solution of boracic acid to the point of great physical discomfort. The bladder at first held eight ounces under pressure. On May 8th nineteen ounces were injected, and on May 21st twenty ounces were introduced. This treatment was continued, and on the fourth of June, 1892, she reported that she could hold her urine from five to six hours during the day, and almost always during the night. A later report from her is most satisfactory, as she is perfectly well, having no trouble by day or night.

CASE II. Miss C., eighteen years old, was referred to me by Dr. T. M. Rotch on the 19th of November, 1898. She had wet her bed constantly from her earliest years, and was somewhat depressed by her condition. The bladder held about three and a half ounces of water, and six ounces caused distinct pain and discomfort. The treatment consisted of injecting a four-per-cent. solution of boracic acid into the bladder until the discomfort was so great that no more could be held. It was retained in the beginning from ten to fifteen minutes, and later from twenty to thirty minutes. At first the maximum amount was not over eight ounces. The bladder was distended every other day, and at the time of writing the patient has had sixteen days of immunity from incontinence, and the bladder holds about twenty ounces under pressure.

The only instruments needed are a male catheter cut down to about five inches, a piece of rubber tubing to connect it with the end of a Davidson syringe, and a solution of boracic acid. The resistance of the bulb to pressure is a very good guide to the pressure in the bladder.

The treatment of contracted or infantile bladders by gradual distention was, I believe, first spoken of by Dr. Sims the younger, and he has reported one or two cases in the *American Journal of Obstetrics* with very favorable results. Cases of infantile bladder are rare, possibly because they are very often overlooked, and