

drawings represent practically normal circulatory conditions, whereas in complete cleft palate cases the fissures extend through both hard and soft palates and, if single, are usually deflected to the right or left of the median line and pass through the alveolar structures. In the so-called double cleft palates the premaxilla projects forward and is separated from the lateral segments of the upper jaw as the fissure bifurcates anteriorly. Therefore direct anastomosis of the vessels from the anterior and posterior palatine foramina is exceedingly doubtful. Fortunately for us, nature in her effort to support these parts appears to give an unusual supplementary blood supply; at least I like to think so when operating. The question as to the advisability of lateral incisions in palatal flap operations is after all a simple surgical problem. If there be sufficient tissue to permit accurate approximation when periosteal flaps are formed, then there will be no need of lateral incisions. When this cannot be accomplished without tension, lateral incisions

relating especially to phonation. It has leaked out here that several gentlemen have done the Langenbeck operation in the same case several times. It may be stated as a fact that the most skilful palate surgeons in the world not infrequently do more than one operation on a single cleft palate. Many surgeons do them over and over again without satisfactory results. Technic in this field may, I think, still be studied with profit.

The difference between omitting lateral incisions and making them is the difference between pleasure and pain. If you make them liberally and cut muscles and blood vessels it will be your painful experience to see, in not a few instances, failure of union because of inadequate blood supply. There may be no infection, still the ischemic wound margins fall apart. If you omit the lateral incision it will be your pleasure as a rule to observe after you have finished the operation a mucosa red and viable. However, because it was said that lateral incisions are to be avoided when possible or to be made as small as possible, that does not imply that they are to be entirely abandoned. One does not often need to make a big incision. A small incision made in a line of tension is often of great service; then, too, a large lateral flap may be raised through an incision only big enough to admit the narrow knife blade, the separation being accomplished by moving the blade pendulum-like, the point traversing a wide arc. As to the possibility of bringing the lateral flaps together, Mr. James Berry has said he would be grateful to any one who would bring him a case of cleft palate that could not be so corrected. It is well to recall our elementary principles of histology and physiology. Do not we want all the blood available in any plastic flap anywhere? Before I began to avoid long lateral incisions and injury to arteries I felt very much discouraged about my cleft palate surgery, but since I have learned to conserve the blood supply, my results are improved to such a degree that I can undertake such work with pleasure and confidence.

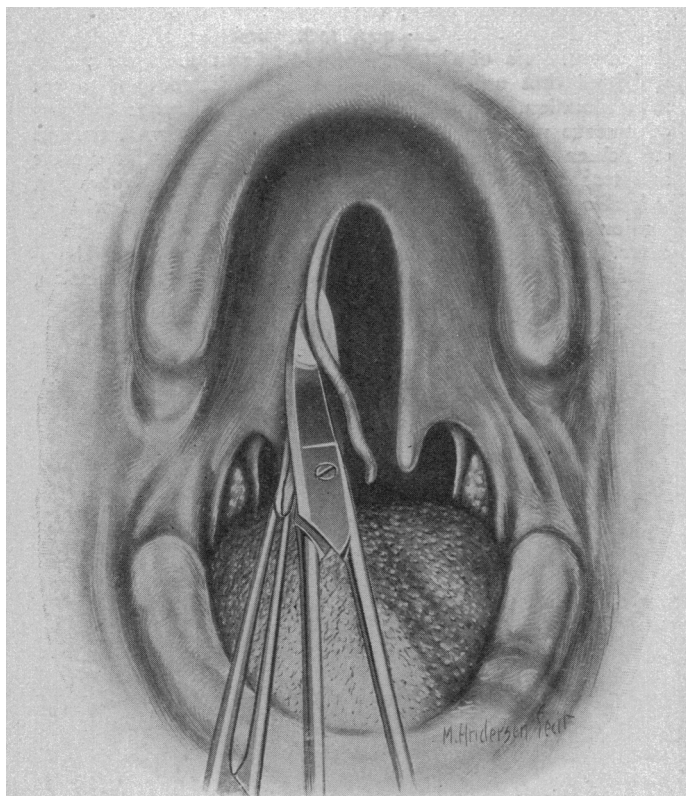


Fig. 9.—Paring edge of cleft with curved scissors. Grasping forceps at uvular half, render margin taut and roll it toward oral side.

must be made to give the necessary relief; otherwise the parts will slough or pull apart.

From my experience with many hundreds of these cases I have learned that the real test of the operative result usually comes some days after operation. These parts are wonderful in their ability to resist infection if treated with reasonable surgical care, but when the mucoperiosteal tissues have been lowered from the sloping sides of the palate walls and brought together in the central line there is necessarily a space between the bone and periosteal surfaces. If the flap borders unite promptly with sufficient strength and blood supply so that when the parts draw back again to be reunited to the denuded bone surfaces the tissue granulation through the central line can keep pace with it, then the result will be complete union; otherwise a partial or complete failure will result.

DR. JOSEPH RILUS EASTMAN, Indianapolis: We would benefit greatly if all operators would give us complete, truthful reports about cleft palate end-results. It is amazing how difficult it is to get reliable statistics as to the final results,

INTESTINAL ADHESIONS

BOWEL PROTECTION *

W. B. BRINSMADE, M.D.

BROOKLYN

It seems to be an accepted fact that intestinal adhesions may occur after any abdominal operation. We recognize bacterial invasion, trauma, blood clot and irritation of the peritoneum as the causes of intestinal adhesions. We are unable to control bacterial invasion due to disease. Modern operative technic is able to prevent the contact invasion of bacteria from stumps and diseased areas to a certain extent. Trauma to the intestines may be minimized by following the best possible technic. We have left, then, irritation to the peritoneal coats of the intestine, which so often accompanies operation, as the element of danger which should be eliminated. The prevention of injury to normal organs lying adjacent to the field of operation is the phase of the subject which I desire to bring before you.

EFFECTS

Intestinal adhesions may or may not cause serious symptoms. It is not always possible to draw positive conclusions from a fluoroscopic examination or from a roentgenogram of the intestines loaded with bismuth. What appears in the pictures as a mass of dense adhesions may not have caused very definite symptoms. The gallbladder and stomach may be adherent

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and give practically no distress in one case, while a similar condition may bring about chronic invalidism in another case. In many instances the small intestines have been found to be bound together and still functioning fairly well. So, too, we have incidentally recognized some cases of angulation of the sigmoid which have caused no symptoms. Therefore, as a general statement, we may say that intestinal adhesions are not of themselves necessarily productive of harm, at the same time acknowledging that very slight adhesions may lead to a condition of marked invalidism and danger. Certain individuals seem to create adhesions in the abdomen more readily than others.

PREVENTION

Admitting the frequency of intestinal adhesions after laparotomy, and recognizing that adhesions between the omentum and abdominal peritoneum follow many incisions through the abdominal wall, and that operations on all hollow viscera are followed by localized peritonitis, I was led to the consideration of methods of prevention and the question of protection to the intestines not in immediate contact with the site of operation.

It is interesting to note the diversity of methods employed by various operators. During a trip in Germany in the summer of 1912 I remarked that no moist pads or gauze were used. Everything was dry. Several surgeons were seen to use ten strips of gauze a yard wide. One surgeon would have the bowel packed off. Another, while he had one pack in the abdomen, left the bowel uncovered, not shielded from touch. In one instance the bowels were unprotected in a case of hysterectomy for cancer. In general, however, the incline of the table was so great that less packing off of the bowels was needed than is the custom with us. One operator I remember seeing, this time not a German, who became so enamored of the packing process that he used 25 yards of gauze before he finished his operation.

I have been convinced for a long time that pads of gauze left in contact with the omentum or peritoneum for any period of time might lead to adhesions, and such a theory was strengthened by the following observations. Four years ago I operated on a young woman suffering from acute appendicitis. The intestines were greatly distended and she took the anesthetic badly. Two moist gauze sponges were placed about the ileum and coils of the small intestine to hold

them within the abdomen. The convalescence was normal, but was followed by increasing constipation with pain over the site of operation, which terminated a year later in an acute obstruction, with gangrene of the ileum necessitating resection. The patient finally recovered. About the same time I saw in consultation a young man who had been operated on five days previously for appendicitis. He had had several attacks and the operation was performed in the interval, a sound appendix being removed. Several gauze pads had been placed in the abdomen to facilitate operation. The lad was suffering from acute obstruction. The second operation disclosed the ileum firmly attached to the caput and colon for a distance of 3 inches corre-

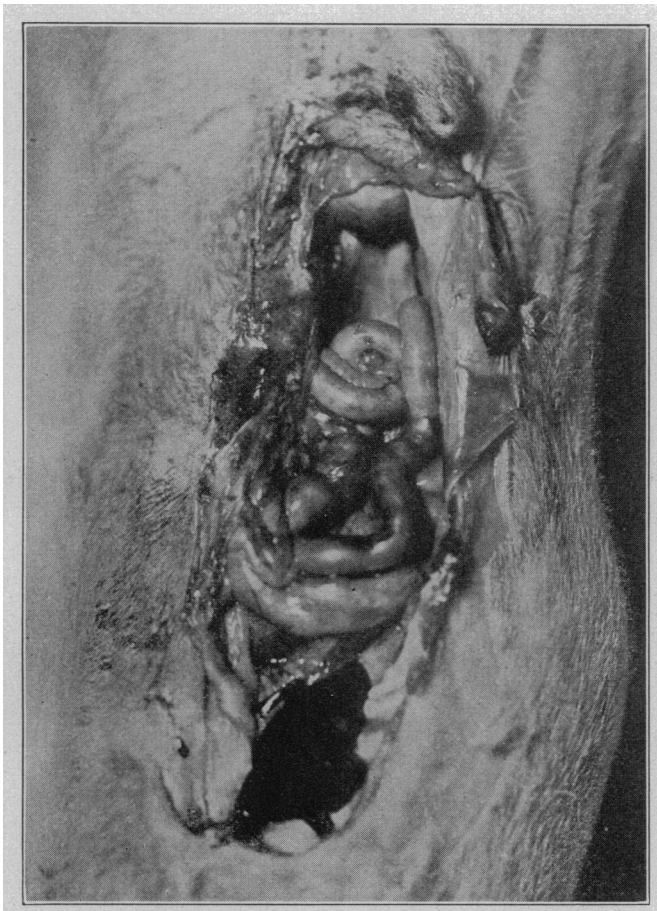


Fig. 1.—Intestinal anastomosis showing adhesions due to gauze sponges. This and the following illustrations show dog suspended by hind legs.

sponding to the area which had been in contact with the gauze pads. The third patient traced her illness to a period following an abdominal operation for retroversion. Pain and gastric symptoms developed one month after the operation and she had been invalided for a year. The roentgenogram showed an hour-glass stomach which at operation was found to be fixed and drawn down with the transverse colon by a tense omentum. Freeing the omentum from its broad attachments, well down, relieved the deformity in the stomach and the patient was cured of her symptoms. Inquiry developed that the first operation was performed with the patient flat on her back. The omentum had been pulled down around and covering the intestines and then wrapped around with several gauze pads which were in contact with the intestines and omentum about twenty-five min-

utes. It seems fair to hold the gauze pads responsible for the complications in these three illustrative cases, even admitting the possibility of local infection and biochemical changes.

With these cases in mind we have eliminated the use of laparotomy sponges as much as possible, never placing them in actual contact with the bowel. One or two large sheets of gum rubber are used next the intestine and the gauze pads placed on the rubber. The rubber slips out of place easily and is a nuisance to the operator but the protection afforded overbalances the disadvantages. To determine the value of this procedure several dogs were operated on, under ether anesthesia, with the same technic that was used on our patients. Moist gauze sponges or sheets of gum rubber were used. All the dogs recovered promptly. They received water the first day and were fed regu-

larly thereafter. A thick covering of collodion protected the external wounds, all of which healed kindly.

Dog 1: Splenectomy and enterotomy. The abdomen was open for one hour and five minutes. Three sponges were in the abdomen at one time. The spleen was removed, the mesentery being ligated in two sections. A wound was made in the intestine near the junction at the ileocecal valve, and repaired with linen Lembert sutures. The laparotomy sponges were in the abdomen thirty-five minutes. The omentum was brought down and spread around the abdomen and the wound closed in layers. Necropsy was performed on the ninth day. The abdominal wound had healed and no sign of peritonitis was present. The omentum was adherent to the parietal peritoneum and to the intestines over the entire abdomen. The site of splenectomy was marked by a mass the size of a hazelnut; no adhesions were around the mass. The coils of intestines which had been packed off were adherent to the adjacent coils. The site of the enterotomy was covered by dense adhesions plastering the neighboring intestine.

Dog 2: Splenectomy and enterotomy. The abdomen was open forty minutes. No laparotomy sponges were used, a sheet of pure rubber gum being substituted. The operation on the first dog was repeated as nearly as possible in the second dog. The necropsy, performed on the ninth day, revealed the abdominal wound healed; no sign of peritonitis; the omentum free. The site of splenectomy appeared as in Dog 1. There were no adhesions along the coils of intestine. The site of the enterotomy was marked by adhesions to one adjacent coil or intestine which was also attached to the omentum. Both of these dogs had been well and active following the operation.

Dog 3: Intestinal anastomosis. Three inches of the small intestine were resected; the ends of the intestine were inverted and covered with continuous linen sutures. A lateral anastomosis was then made. The coils or intestine not concerned in the operation were packed away with gauze pads. The abdomen was open for thirty minutes. Necropsy, performed on the ninth day, showed the abdominal wound healed and no peritonitis. The omentum was firmly adherent to the parietal peritoneum not only at the site of incision but throughout the belly. The coils of small and large intestine were found matted together. Figure 1 shows the animal suspended by the hind legs. The intestines

are adherent and do not drop up against the diaphragm, being held in place by adhesions. The omentum is seen adherent to the peritoneal wall. Parts of three ribs have been excised in order to show the liver. In spite of the dense adhesions this dog showed no symptoms after operation. He was running around just like any happy well-fed dog and without interference with his appetite. The bowels had moved regularly.

Dog 4: Hysterectomy; double ovariectomy. The intestines and omentum were packed off from the pelvis with gauze sponges for twenty minutes, isolating the parts to be operated on. Both tubes and ovaries were removed, and supravaginal hysterectomy was performed, care being taken to cover the raw surface with peritoneum. Necropsy on the tenth day showed the

wound healed; no peritonitis; omentum adherent to the parietal peritoneum throughout the abdomen; strong adhesions between sigmoid and stump of uterus. Two coils of intestine in the neighborhood of the cecum were found bound together by adhesions covering an area of three-fourths inch (Fig. 2). There were no other adhesions.

Dog 5: Hysterectomy; double ovariectomy. The operation on Dog 4 was repeated on Dog 5 except that a sheet of gum rubber was used to isolate the intestine instead of gauze pads. The time of operation was the same, twenty minutes. Necropsy on the tenth day found the wound healed; no peritonitis, omentum adherent to the parietal peritoneum only at the suture line; no other adhesions except at one point where a catgut suture remained unabsorbed in the stump of the uterus. This dog

was suspended by the hind legs when photographed and the intestines fell into the upper abdomen, being perfectly free to move into the position governed by gravity (Fig. 3).

Dog 6: Gastrotomy. Incision 2 inches along the anterior wall of the stomach. Gauze sponges were placed to isolate the field of operation. The wound in the stomach was closed with catgut suture. Necropsy on the seventh day revealed adhesions of the omentum to the line of abdominal incision and a spread of omentum plastered to the wound in the stomach. A mass of strong adhesions was also present at the junction of the ileum and the caput. The entire colon and sigmoid flexure were loaded with feces, and there was a general injection of the peritoneal coats of the intestine.

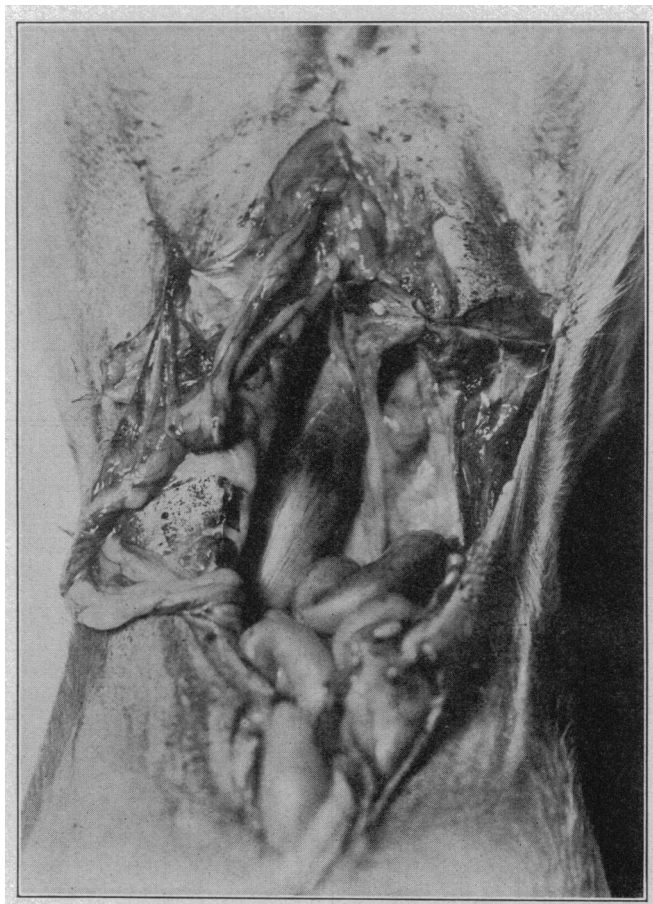


Fig. 2.—Double ovariectomy and hysterectomy done with rubber dam in place of gauze sponges. No adhesions. Intestines have fallen against diaphragm.

Dog 7: The same operation and the same procedure were followed in Dog 7 as in Dog 6 except that a sheet of gum rubber replaced the sponges. Necropsy on the seventh day showed the wound healed; no peritonitis; omentum adherent to line of incision with a small area of wound infection around one of the catgut sutures. The omentum was plastered over the wound in the stomach exactly as in the dog previously operated on. This dog showed at necropsy a decidedly more normal looking abdomen than did the previous one.

At my request the department of surgery of the New York University made experiments on six dogs. All the dogs were eviscerated. In three cases the intestines were protected by gauze sponges and in three cases by rubber dam. The abdomens were open about fifteen minutes. At necropsy adhesions were found in all the dogs, but the report is decidedly in favor of the rubber dam. Evisceration is about as severe a test for this method as one can find.

It would seem fair to conclude from these experiments that, in these dogs at least, sheets of gum rubber did less harm than gauze pads, and to conclude further that if the human peritoneum resembles that of the dog, sheets of gum rubber will do less damage to it than gauze pads. There is nothing original in the use of this material. I first saw it used in the late Dr. Charles Jewett's clinic twelve years ago.

In many instances we have found it possible to avoid putting anything in the way of either gauze or rubber into the abdomen during operation and this I believe to be the best technic of all.

To operate in all cases in which the diagnosis of intestinal adhesions has been made and in which the history points to that graphic picture of intestinal stasis, so well known to us all, will lead to many disappointments. I have seldom been successful in curing the symptoms of patients on whom I have operated for intestinal stasis due to adhesions. There is a class of adhesions, however, which demands operative relief. The adhesions occurring after appendectomy and which give the symptoms of intestinal obstruction, of course demand immediate operation. Whether active peristalsis after operation tends to prevent adhesions or whether stasis of the intestinal tract accomplishes this purpose better, I have not been able to decide. Much has been written on this subject on both sides of the question, ably and forcibly asserted and maintained.

Our greatest success in dealing with adhesions has been with those occurring in the upper abdomen. We have had a number of cases in which the gallbladder and pyloric area were found glued together with adhesions. In three instances this probably was due to cholecystitis occurring at the time of typhoid fever; in other instances it was due to duodenal ulcer. We have followed the plan of separating the organs which were attached and not making a dissection of the rest of the adhesions. In my most successful cases a piece of omentum or omental fat has been grafted between the organs. The cases in which extraneous substances were used as protection to the traumatized intestines were in general not successful. Aristol powder, because of its sticking quality, appeals to me more than any other substance.

Since writing this paper Dr. W. H. Barber has, at my request, carried on further operations at the New York University. He has experimented on six dogs in pairs, doing the operations of splenectomy, gastro-enterostomy and nephrectomy and reports as follows:

The results of intra-abdominal operations and using gauze or rubber dam have not in our hands been as conclusive as in the first series. Indeed it is surprising that no adhesions were found any where in any dog excepting at the posterior abdominal wound or at the site of intra-abdominal operation.

In conclusion, then, I would say that dry sponges do more harm than moist sponges, and that the rubber dam does less harm than moist sponges, and that least damage of all is done to the intestines if packing can be avoided entirely.

117 Montague Street.



Fig. 3.—Double ovariectomy and hysterectomy showing adhesions due to gauze sponges.

ABSTRACT OF DISCUSSION

DR. A. S. LOBINGIER, Los Angeles: The speaker has told us intestinal adhesions may exist for a long time without the patient having any serious embarrassment. A certain number of adhesions will result after nearly every operation. These usually disappear in the course of two or three years. There are important points in the refinement of technic and in the method and system by which we proceed with an abdominal operation which seem to me should always be kept in mind. Intensifying the anesthesia as we open the abdomen and decreasing it after we have everything settled and the field exposed are of prime importance in abdominal operations. We must allow the anesthetist to help us in reducing the trauma. The surgeon should plan his operation with such system and method as to know what he is going to do and do it quickly and deftly and avoid unnecessary handling

of viscera. There are some cases in which the omentum is more involved and a larger serous surface is exposed than in others. Where we have to expose extensive surfaces of endothelium and it becomes necessary to put back large coils of intestine as in hysterectomy, it becomes a very much greater problem than in a simple appendicitis how we shall protect the endothelium and prevent adhesions. Since there has been a great reduction in neisserian infections, since we know how better to manage all pelvic, gastric and colonic infections, we may expect a decidedly decreasing number of adhesions in the abdomen. A number of months ago I wrote a letter to some twenty prominent American surgeons who had large clinics, as to what their experience had been in the use of iodine in the preparation of the skin and its effect in producing adhesions in the abdomen, brain and large joints. Practically all of them answered. A New York surgeon of large experience had abandoned its use because he thought three deaths in their clinic could be directly traced to adhesions resulting from its use. A representative surgeon in the West considered it a very effective and searching germicide which probably became a neutral iodide in its reaction with the blood. A majority of the surgeons favored its use, but all urged careful towelling off of the skin surface from the endothelial field. Several years ago in a visit including the principal clinics in Canada and the Eastern United States, I was astounded to see iodine used in almost every clinic I visited. It was used freely, with apparently little thought of the danger to the endothelium of the joints and intestines. I should like to emphasize the point Dr. Brinsmade has made that we should avoid needless trauma and antiseptics of any kind; but where we cannot avoid a certain amount of handling, in so far as possible we should minimize the trauma by handling viscera with fragile endothelial covering just as delicately and as little as is consistent with honest and thorough work.

DR. A. F. JONAS, Omaha: Peritoneal surfaces, visceral and parietal become adhered to one another with surprising rapidity and in varying degrees of firmness. The adhesions may be limited to single points or be universal, involving apparently all intestinal surfaces. They may be of a most disabling character, threatening life in the face of apparently moderate adhesions, and again they may be universal and yet intestinal functions may appear to be retarded to a very limited degree. We may be no more amazed at the most extensive and rapid intestinal and visceral agglutinations than at the rapid disappearance of the same. In the one case, very extensive adhesions may be beneficent, and in the other they may be fatal. The clinical manifestations bear no relation to the extent and degree of the adhesions. We have learned that they might be life saving or life destroying according to the mechanical obstacles.

The most common irritants as they concern us are chemico-bacterial and mechanical. The first is usually preoperative and has to do with the primary pathologic process and the second usually depends on the surgical manipulations and is postoperative. Considering postoperative adhesions, assuming that we have aseptic, nonadherent surfaces to deal with, we must plan every abdominal operation so as to insure a minimum amount of handling and pulling on the organ or organs that may be the object of operation. The incision should, as nearly as possible, be immediately over it. It should be ample and, when indicated, the gentlest manual exploratory search for other pathology than the one of our primary attack should be quickly carried out. The surgeon must know his landmarks in order to insure unnecessary meddling and that he may quickly bring to the surface without undue traction the structures that he seeks. He must avoid evisceration. The prolonged exposure to the air of the intestines makes them soggy and soon dulls the peritoneal surfaces, producing one of the factors that we wish to avoid. Too many intra-abdominal pads compress and may contuse the intestinal walls, threatening endothelial injury. The repeated introduction and withdrawal of gauze packs during the intra-abdominal operation traumatizes peritoneal surfaces and visceral walls.

The method of protecting the intra-abdominal pads with large sheets of rubber is undoubtedly of value, and they no doubt produce less irritation than free gauze pads. If they can be so adjusted that they will hold all intestines out of the field of operation they certainly fulfil an important function. The smooth rubber surfaces will undoubtedly cause less peritoneal friction than other sponges. They certainly deserve an extended trial.

DR. L. S. PILCHER, Brooklyn: How often have we seen apparently an absolute forgetfulness on the part of an operator that it was possible to insult the peritoneum? It has been manipulated and pulled on and subjected to friction as if it was nothing more than a piece of smooth glass. Let us not forget, however, that it is one of the most sensitive of surfaces and that the amount of surface that is presented to us is such that our manipulations may do it most extensive damage. One of the cardinal principles in all surgical work is that to obtain an end the least amount of violence required to attain that end should be used. On the other hand, is it not true that to obtain an important end no amount of violence that is essential to accomplish this end shall be spared? These two principles, therefore, every surgeon must always have in mind. It may be best to use abdominal packs or do without them, but whether we shall do without or use many of them or a moderate amount must depend on the judgment of the individual operator and the particular case in hand. Are adhesions to be avoided? Not always. Often adhesions are that for which we seek and for which we are operating. Adhesions may be temporary and vanishing, due to small superficial endothelial abrasions, or they may be permanent, due to loss of the endothelial layer and exposure of the deeper strata. Added to this are the permanent adhesions due to bacterial invasion, which are the source of many extensive adhesions often encountered. As to the particular suggestion of Dr. Brinsmade to lessen the amount of irritation to which the peritoneum should be subjected when opened, such particular suggestions are not new to us. We have seen the peritoneal surface smeared with unguents and baptized with oils and various membranes spread on, and even powders scattered over the peritoneal surface to prevent adhesions, but as we know now, most certainly to produce adhesions. The use of the rubber sheet suggested by him certainly has the advantage of simplicity but it may add difficulty to the technic. The laboratory experiments which have been presented to us do not seem to be absolutely convincing.

DR. W. I. TERRY, San Francisco: For over two years we have been using Pope's solution of sodium citrate and sodium chlorid and we have been much pleased with the effect of it. We use a hypertonic solution in large quantities which appears to minimize adhesions, with most excellent results, as several relaparotomies have shown.

DR. JOHN WILLIAM DRAPER, New York: I assisted Dr. Barber in doing the work on the last series of dogs mentioned by Dr. Brinsmade, and wish to say that it served to emphasize in our minds very strongly the necessity for using the utmost gentleness, and the protective method described by him was particularly efficacious. We should not lose sight of the fact that there is an important biochemical element in this matter of adhesion formation, and it seems to us, and this Dr. Brinsmade has already said, that the ratio between the fibrolytic element and fibrogenetic element in the individual being operated on is the real, fundamental factor, and this, as yet, we have no means of measuring. This does not detract from the importance of handling the tissues with the greatest gentleness, but rather adds to it.

Prevention.—The prolongation of life by the suppression of preventable disease is of much greater value to the state than the cost of the means employed. To ward off the calamity of disease and to prevent the spread of a pestilence is to increase the sum of human happiness and to elevate the race.—*Illinois State Board of Health.*