

REMARKS ON THE USE OF THE BURIED
PERMANENT SUTURE IN ABDOMINAL SURGERY.*

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What is the best method of closure of the wound in cœliotomy?
is a question which is of interest to all abdominal surgeons. What is

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desired is a method which will secure accurate coaptation of the wound, which will favor primary union, and which will prevent the subsequent occurrence of ventral hernia. The original and simple method of a through-and-through suture has been tried and found wanting. Both primary suppuration and subsequent hernias are of too frequent occurrence after this method to make it appeal to surgeons desiring to do the best possible work. I have no experience with the use of catgut or other absorbable material in the closure of the cœliotomy wound, but the results which are reported from Germany are not such as to induce me to make use of the method. Winter (*Bauchnaht und Bauchhernie*) gives eight per cent. of hernias as following the use of the buried-catgut suture (*Verhandlung der deutsch. Gesellschaft für Gynaecologie*, 1895, p. 581). The buried permanent suture has been employed for the closure of cœliotomy wounds since May, 1887, when Dr. Schede, of Hamburg, first used silver wire as a buried suture in the closure of an enormous umbilical hernia with wide diastasis of the recti muscles in the case of an eighteen-months-old child. Since that date Dr. Schede has continued to use silver wire as a buried suture, and reports very successful results, both as to primary union and as to the prevention of subsequent hernias (*Ueber den Gebrauch der versenkten Drahtnaht bei Laparotomien und bei Unterleibsbrüchen, Festschrift zur Feier des 70. Geburtstages Friedrich's v. Esmarch*, January 9, 1893).

The favorable opinion of Schede concerning silver wire is borne out in the experience of the general surgical and gynæcological departments of the Johns Hopkins Hospital, where for some years silver wire has been used as a buried suture. No statistics are available as to the exact results secured, but, in a personal interview with Dr. Clark, until recently resident gynæcologist, I have learned that the percentage of suppurations has been low, and that the number of sutures removed has been insignificant.

In June, 1891, Dr. George M. Edebohls, of New York, first employed silkworm gut as a buried suture in the closure of cœliotomy wounds, and, beginning with May, 1892, he used this method of suturing systematically in his abdominal work (*The Prevention of Hernia after Incision of the Abdominal Walls, New York Journal of Gynecology and Obstetrics*, January, 1893). In the same journal for May, 1896, under the title *What is the Best Method of making and closing the Cœliotomy Incision?* Dr. Edebohls reports that

his results with this method of suturing the cœliotomy wound were poor. He states that in his experience between five and ten per cent. of all sutures thus employed caused suppuration, and were either discharged spontaneously or required removal in order to secure closure of the wound or suppurating sinuses. He also states that in many cases when aseptic (*sic*) closure of the wound and primary union had been obtained, that suppuration followed, in some cases in a few weeks, in others after some months, and in one after two years and a half. This experience has led him to abandon silkworm gut as a suture material, and he now uses chromicized catgut instead. The number of cases operated upon by this method is not given, nor the exact number of those in which suppuration followed. Two hernias are reported in wounds which were closed with the buried silkworm-gut suture, but no statement as to the percentage of hernias is made. If no further evidence were available as to the value of silkworm gut as a buried suture in the closure of cœliotomy wounds, there would be good ground for abandoning it. My own experience, however, has been quite different from that reported.

In May, 1892, I began the use of silkworm gut as a buried permanent suture in the closure of cœliotomy wounds after seeing it used by Dr. Edebohls, and have used it from that time until the present (October 21, 1896) in all cases in which it was unnecessary to employ abdominal drainage, excepting a small number of cases in which the condition of the patient made it advisable to close the abdomen in the shortest possible period of time. During this period two hundred and ninety-seven cœliotomy wounds have been closed by this method, besides a considerable but unknown number of femoral and inguinal herniotomy wounds, and an additional number of Alexander operations. Of these cases suppuration occurred in seven, or 2.3 per cent. This percentage does not include the herniotomy wounds or the Alexander operations, which would considerably reduce it, as in not one of these operations has suppuration occurred. In these cases, when suppuration involved the deep sutures, it was necessary to remove them, and, as a matter of fact, when suppuration does occur after this method of suture, the best policy is to separate the line of union in the skin throughout the suppurating tract, so that the sutures can be promptly taken out. Of the remaining two hundred and ninety cases, and also in the cases of herniotomy and of Alexander's operation, it is interesting to

state that my experience is entirely different from that of Dr. Edebohls. So far as I know, in not a single case has a single stitch ever caused suppuration or been removed. Another interesting fact is that in only one of these cœliotomies have the sutures ever given rise to local irritation. In that case—a nurse who was a thin woman and who knew of the presence of the buried sutures—one of them gave rise to irritation, and I made preparations to cut down upon it in order to remove the supposed source of irritation. The patient demurred at this, and the stitch still remains, and has never since caused any irritation whatever.

These results are so radically different from those reported by Dr. Edebohls as to throw doubt upon his explanation of his own results. It seems to me that the explanation of the suppuration in his cases is the same as that of suppuration in general—namely, that the wounds were infected. It is contrary to general experience that an aseptic foreign body when encapsulated in the tissues should give rise to suppuration.

From the standpoint of the prevention of hernia the results have been extremely satisfactory. In one case in which suppuration occurred, and in which it was necessary to remove the deep sutures, a hernia eventually made its appearance. This patient was operated upon for tubercular pyosalpinx and tubercular peritonitis. As primary union was not obtained in this case, and as the sutures were all removed, it is scarcely necessary to point out that it has only a relative bearing upon the value of the method in preventing hernia. In a case of umbilical hernia, in a large and stout woman operated upon by this method, sound healing was obtained. About a year after the operation, during an attack of grip, as the result of violent fits of coughing, a new hernia appeared to one side of the line of union. In this case also the conditions were different from those which obtain in abdominal surgery in general. The sides of the hernial ring of an umbilical hernia do not come naturally in apposition, and must be drawn together under more or less tension, and, as a rule, the same factors which cause umbilical hernia in the first place are more or less operative to favor its recurrence after operation. These conditions are essentially different from those in cases in which the incision is made in a normal abdominal wall and immediately closed after operation. If we choose to exclude these cases as atypical, there have been no hernias in the typical cases operated upon by this method; and if, on the other hand, we do

not exclude them, although considering them atypical, the proportion of hernias is less than one per cent. It seems to me unreasonable, however, to expect an absolute prevention of hernia in all cases. A small percentage of wounds will suppurate. Many operations are done upon very stout patients having marked tension in the abdominal walls, and many more are done upon poor women whose circumstances are such that they must perform manual labor shortly after their operation. On account of these factors, which no technic can obviate, I think it reasonable to expect a definite though very small percentage of hernias.

My experience with silkworm gut as a buried suture leads me to lay stress upon the following points in the use of it: The silkworm gut should be carefully selected, and should be light in weight rather than heavy. A fine suture is more easily encapsulated than a coarse one, and in tying, the knot secured is much less bulky. The most important point in the technic is to secure absolute asepsis of everything coming in contact with the wound. This is the *sine qua non* of success, and any operator who is in the habit of having supuration follow ordinary clean operations should not make use of silkworm gut as a buried suture, as his results will surely be disappointing. The method which has been used for securing asepsis in the silkworm gut itself is to boil it for half an hour before each operation. If the bundle of sutures is not used up in one day, it is put away in a dry towel, and when again used is boiled as before. To secure the best results the abdominal incision should not be made exactly in the middle line, but to one or the other side, so that the incision goes through one rectus muscle instead of through the *linea alba*. The sutures are passed by means of a needle and carrier. The needle is introduced at the level of the aponeurosis of the abdominal muscles, passes through this, through the rectus muscle and peritonæum upon one side, and in a reverse way upon the opposite side of the wound. Three sutures to the inch should be used. In closing the incision the sutures should be tied snugly but not tightly. The ordinary square knot should be used instead of the surgeon's knot, and an additional tie should be made, and then the ends cut off as short as possible. Should the last tie become loose because the ends are cut off close, the same result is obtained as though a square knot were used and the ends cut off in the usual way. The knot secured in this way is compact, and becomes encapsulated more easily than the knot with free ends of the usual length.

The subcutaneous fat and skin may be closed either with interrupted silkworm-gut sutures, or preferably with aseptic catgut, in two or more layers, one or more of which should approximate the fatty tissues by a running suture, and another close the skin by means of the intracuticular stitch. Especial attention must be paid to arresting all bleeding points, as the success of the method depends upon obtaining primary union, which is greatly promoted by securing a dry wound.

The method of closing the peritonæum with a running catgut suture, closing the recti muscles with a second running suture, and then suturing the aponeurotic layer by means of mattress sutures of silkworm gut, has certain advantages. The peritoneal cavity is more quickly shut off, thereby lessening the chances of shock from exposure and handling of the bowels. The peritoneal surface of the wound probably is more nearly normal than when sutured by the single buried layer of silkworm gut. On the other hand, the method requires a longer time than that which has been detailed, and on this account I have used it but seldom.

In conclusion, I wish to insist upon the great satisfaction which this method of closing the abdominal wound has given to myself, and more especially to my patients. The very small percentage of suppuration, the avoidance of the necessity for removing sutures, and the reduction of the occurrence of hernias to a minimum, are factors in one's work which can be properly appreciated only when experienced.