

## DISRUPTION OF ABDOMINAL WOUNDS

J. F. BALDWIN, M.D.

COLUMBUS, OHIO

AT the November, 1933, meeting of the New York Surgical Society<sup>1</sup> there was presented under the foregoing caption a symposium of five papers by five leading surgeons of New York City. These surgeons all admit that by their technique they average 1, 2, or even 3 disruptions, with the exposure or extrusion of abdominal contents, in every 100 abdominal operations, with a resulting large immediate mortality and with a still larger following of postoperative hernias; while in contrast the technique of the writer shows over 16,000 such sections without a single disruption.

The first surgeon in his opening paragraph states that such disruption is an accident, but accompanied by such distressing symptoms and high mortality as to warrant grave consideration. (He refers to the statistics in 1932 of Sokolov who, after sending out 1000 questionnaires all over the world, concluded that the accident occurs in from 2 to 3 per cent of all abdominal operations.) In the last eight years they have had 55 of these cases in the Presbyterian Hospital, which, he says, is an incidence of about 1 per cent of their abdominal operations; but, because of uncertainty and their frequent omission from the files, he thinks that their "actual incidence may be 2 per cent." In his paper he analyzes 50 of these cases. At no point does he suggest the use of stay sutures; but attributes the disruption to causes entirely remote from the use of such sutures.

The whole problem, he says, "resolves itself down to three questions: How can the period of suture or tissue holding be prolonged? How can the reparative process

be hastened? And how can an increase of disruptive force be prevented?" It would seem, however, that the real practical question is the first, how to prolong the period of maintenance of the tissue holding. No way is known by which the reparative process can be hastened, and we must certainly assume that the surgeon is already doing his best to keep down disruptive forces, the dangers of which have always been recognized. He acknowledges that in practically all of the cases, whether the disruption occurred on the third or the thirteenth day, there was found "complete digestion of the chromic catgut" used for suturing, even in cases in which no evidence of wound infection appeared and the bacterial cultures were negative. He advises the use of No. 0 chromic catgut, and says positively that larger sizes need not be used as they "undoubtedly increase the postoperative exudation." His conclusion is that the operator should be sure of the "approximation of the peritoneum and posterior sheath by careful closure with fine sutures (reinforced, if necessary) and the intelligent use of drains and retention sutures." He makes no mention of bandages.

The paper of the second surgeon is based on 26 cases which occurred at Mt. Sinai Hospital, out of 2750 laparotomies, with 3 additional cases taken from private service, making 29 in all. He is very positive that while "the mechanical factor played an important role in almost all, the underlying disease with its tendency to poor and ineffectual healing constituted the basic element in the etiology of abdominal disruptions." He closes the incision almost entirely with chromic catgut (size not stated), which he uses

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both for the peritoneum and the fascia. He states that retention sutures of silk or silkworm gut were used "in less than a dozen of 2750 patients," and adds that their absence had greatly diminished the incidence of "liquefaction and deep stitch abscesses." He unhesitatingly states that "it is extremely dubious whether their routine use would cause fewer dehiscences," and that "the silk layer technique is never employed in laparotomies." The mortality of dehiscence he places at 28 per cent. He reports 1.5 per cent of disruptions in 401 gall-bladder cases, and 2.2 per cent in cases of fibroid tumors. Strange to say, the rectus muscle which has been split "is rarely sutured." The seventh postoperative day is the one in which disruption is most common, and this occurrence "appeared to follow in the wake of removal of the skin sutures." He evidently uses the postoperative binder, but its chief value he seems to feel is "as an additional barrier to the escape of abdominal contents in case of frank evisceration."

In his concluding summary we find that dehiscence occurred in almost exactly 1 per cent of his 2750 laparotomies. He calls attention to its increased frequency in operations for uterine fibroids, and feels that the main source of the trouble is "failure of regenerative powers of the tissues." His concluding sentence reads as follows: "Wound dehiscence will never be an avoidable surgical complication until methods are available to accurately differentiate those patients with poor reparative powers, and until means are at hand which will unfailingly promote the prompt healing of tissues in these specific cases."

The writer of the third paper is not able to give the number of abdominal sections made in the first surgical division of Bellevue, but reports 46 cases of disruption, in 36 of which there was protrusion of viscera. He states frankly that this accident has been so general that "every surgeon on the division doing abdominal

surgery had experienced one or more operations with this complication." He states very positively that "no retention sutures are used in sewing up the abdominal wounds," and that dehiscence "occurred solely in wounds in which the absorbable gut was used." He also states that the largest proportion of accidents "occur after the sixth day postoperative." This he suggests as "possibly explained by the fact that at this time the sutures have been removed in many of the cases." Of the 28 patients who recovered, a follow-up showed that "the usual result was one of postoperative ventral hernia."

In the 46 cases, he frankly states that chromic catgut (size not mentioned) was the suture material used in all, and that no silk or silkworm gut was used except for skin apposition; no retention sutures were used; but he states positively that this complication "occurred solely in wounds in which the absorbable gut was used." He assigns the causes of the disruption as chiefly infection and coughing (17 cases of each), but includes, as do most of the others, vomiting, hiccough, distention, etc.

The fourth surgeon reports 30 cases at the Roosevelt Hospital. He is unable to state percentages; but 53 per cent died. Their usual method of closing incisions is by layers with plain or chromicized catgut (size not given), but with tension sutures of silkworm gut or dermal through the skin and anterior fascia, and fine silk for the skin. He adds, however, "some of our staff have placed their trust entirely in catgut without any tension sutures." He advises that because of the usual date of disruption the tension sutures should be left in "until the twelfth day." He emphasizes what he calls the "early dissolution of catgut" as being responsible for the accident, and speaks, apparently with some little criticism, of those of his staff who trust completely in catgut "without any tension sutures." As a preventive of the accident he promptly states that "too much faith must not be placed in

catgut," and that the chief protection "lies in nonsoluble tension sutures . . . placed at short intervals." These tension sutures he leaves in until the twelfth day. In common with most of the others, he says nothing about bandages.

In the fifth and last paper, the surgeon reports from the Post-Graduate Medical School. He quotes from Starr and Nason, who, out of 2455 laparotomies, had 15 cases of disruption, 0.61 per cent. Forty per cent of these ruptures followed cancer operations, and out of 135 such operations there was disruption in 4.4 per cent. At this hospital in 1932, out of 1000 laparotomies there were 4 cases of disruption with one death. He speaks of the promptness with which eventration takes place "shortly after the removal of the retention sutures," and of the frequency with which the accident takes place even when the stitches are not removed until the twelfth day. It seems that practically all the operators use nonsoluble retention sutures; but these are removed "any time from the tenth to the fourteenth day." In his final paragraph he directs the application of six surgical procedures, but for some reason fails to mention the introduction of stay sutures, but speaks very positively as to the necessity of "accurate coaptation of the peritoneum."

In the general discussion which followed, the first speaker seems to be firmly of the opinion that "the stage has been reached in which those who use catgut for abdominal wall closure must prove it is as adequate as closure with silk"; and he is quite positive that a fair trial of "closure with nonabsorbable material should be given." He speaks very positively of the appearance of disruption in cases in which stay sutures are not inserted or are removed too early, and calls for an acceptance of the evidence and the practice of "closure with nonabsorbable material." He does not call for the maintenance of this form of support for any distinct minimum of time, nor does he mention bandages.

Another member also speaks highly of tension sutures, and seems to be quite convinced that "with increased use of these, putting them more closely together than was usually done, disruption would be less frequent." He fails to specify a minimum period of retention. Some of the other speakers also mention the use of tension sutures.

The third speaker differs very materially from the first, in that he thinks silk should not be used in the Clinic, except by men who have had considerable training and experience in its use.

A visiting surgeon from Yale Medical College calls attention to the failure of many operators to close the posterior rectus sheath, and this failure he thinks responsible for some of the disruptions. He speaks of "inaccurate apposition and the presence of hematoma" as a possible cause of early digestion of catgut, but suggests the importance of the stay suture; he says nothing about bandages.

From a careful study of these papers and discussion it seems very evident that many of the surgeons when using stay sutures remove them as early as the seventh day, and none of them seem to leave them beyond the twelfth day, i.e., eleven full days. I can find no reference in any of the papers to the further protection of the abdominal incision by means of a properly adjusted abdominal bandage, although it would seem to be self-evident that such a support would be highly conducive to materially reducing the trauma inflicted by the sutures and diminishing the risk of postoperative infection and hernia. The directions given by R. F. Kieffer, in the first volume of Lewis' "Practice of Surgery," seem to be quite generally ignored: "In any abdominal case the dressings should be reinforced by a scultetus or many-tailed bandage applied snugly around the abdomen."

Since the appearance of this symposium I have discussed the matter with several of our local surgeons, and have corresponded with others in various cities.

Nearly all admit the occurrence of disruptions in their practice. Most of them, if they use retention sutures, remove them at about seven to ten days, few if any allowing them to remain beyond the ten. (It is a little surprising that Dr. Kieffer, in his article referred to in the previous paragraph, gives specific directions that the silkworm gut retention stitches should be removed in "ten days.") Practically all who report no disruptions are followers of the technique I practice.

My first abdominal operation, an ovariectomy on a young girl, was made June 11, 1886. Recovery was prompt, and she enjoyed perfect health for many years. At that time the custom among surgeons was to remove the stitches in one week; but it was the additional custom, at least among Ohio surgeons, to support the abdomen for some time afterwards by a snugly applied bandage. In my thirty-sixth case I again removed the stitches at the end of a week, healing having apparently taken place in a most satisfactory manner. Later in the day the incision burst open; but the hospital intern ignored it and when I saw the patient the next morning peritonitis had begun, with fatal result. I then extended the removal to ten days. This answered satisfactorily for a considerable time, when again a case of disruption took place; but I was at once notified, closed the incision and with perfect and prompt recovery. The removal was then extended to twelve days, and for more than a year there was no trouble; then in a very fleshy patient, apparently in perfect health, from whom I had removed the uterus for cancer and who had apparently made a perfect recovery, the accident occurred after the stitches were removed. Again I was promptly notified, repaired the opening, and she too made an uneventful recovery. The minimum of removal was then extended to *fourteen full days*.

That last disruption occurred more than thirty-four years ago, and since then, with the adoption of the fifteenth day

removal, nothing of the kind whatever has occurred. I have, therefore, felt convinced of the correctness of my view of the accident, namely, that it is simply the result of merely a *delay* in firm union. The seriousness of the accident, however, more than justifies the unnecessary delay which undoubtedly occurs in many cases; but "safety first" should be the deciding dictum.

In closing the incision, if in the midline or close to it, I take pains to thoroughly expose, by incising its sheath, the rectus muscular tissue on each side. My assistant catches with hemostats the edges of the peritoneum and transversalis fascia and draws them up into the incision; with chromic catgut No. 2, and by an over-and-over stitch drawn snugly, I close that layer, but with the edges distinctly everted so that no raw surface is presented to the omentum. The sewing is usually commenced at the lower end of the incision. Having reached the upper end, with the same suture I whip together the recti muscular tissue, catching if necessary the everted edges of the peritoneum and transversalis fascia. Having reached the lower end of the incision my assistant catches the aponeurosis on each side, and with the same suture I close the opening by what is called a "chain stitch," so that while each stitch is tightened by itself and the aponeurosis brought together, there is no delay in the tying of knots and no knots to predispose to later trouble. Having reached the upper end, the suture is tied in the usual way, and the end cut short. Occasionally, when the patient has had numerous children or for other reason the abdominal walls are greatly relaxed, I overlap the peritoneum and transversalis fascia and also the aponeurosis, sometimes securing an overlapping of a couple of inches: under those circumstances I am careful to remove the fat from the adjacent surfaces of the aponeurosis, so that there will be no failure in securing strong union. The wall having been thus closed with three lines of continuous suture, silkworm

gut stay sutures are introduced, which include the skin, a pretty wide sweep of fat, the aponeurosis with its line of suture and a part of the underlying muscle. These stitches are inserted closely enough together to give firm and uniform support to the entire line. Care should be exercised that they are so tied as to give due support, but not so tight as to interfere with the blood supply or the vitality of the tissues. The edges of the skin are then whipped together by a continuous suture of chromic catgut No. 2. Occasionally, if there may be any doubt of the catgut, silk or fine annealed and enameled copper wire may be used. Over the incision is placed a pad of gauze, and the abdomen is then supported by a firm bandage with tails so that it can be properly adjusted and there will be no slipping.

If all goes well the wound is exposed at the end of a week, dilute iodine ( $\frac{1}{4}$  strength of the tincture) is applied along the suture line and a pad and bandage carefully reapplied. At the end of *two full weeks* I personally open the dressings, and if all is well remove the silkworm gut. The abdominal bandage is then reapplied and the patient allowed to move around the room and to go home at the end of another week, or a little sooner if she does not live too far away. If on thus opening the bandage any sign of infection or weakness is found, the dressings are replaced and removal delayed as long as necessary; but such delay is almost never indicated.

In going over my records I find notes of 17,028 abdominal sections, not including a number made since January first. These operations embrace over 7000 abdominal hysterectomies (more than the usual proportion of them for cancer because of my connection with the local Cancer Clinic), many thousands of appendectomies, many gall-bladder and stomach operations, intestinal resections, abdominal removal of the kidneys, herniotomies, etc. In the early part of my operative work there occurred the three disruptions referred to

above, but during the more than thirty-five years since adopting the present technique, during which period I have made 16,465 abdominal operations, there has not been a single one, or anything approaching it, while postoperative hernias are almost unknown.

Surgeons have for ages recognized that in certain patients, for unknown reasons, there may be quite a long delay in union of a fractured bone, although the apposition is perfect; so in abdominal incisions, I see no reason why we might not fully expect in certain patients, but without any assignable cause, that there should be a similar delay; and because of our inability to differentiate the cases in which the incision should be supported by stay sutures such sutures should be uniformly inserted and should remain until there has been ample time for sufficiently firm union.

Before the patient goes home I read to her my history, and thus inform her as to what was found and done, explaining each step of the operation in plain language. She is then directed as to wearing her going-home bandage day and night, for two full weeks. At the end of that time she may remove it at night, but should reapply it in the morning and should then wear it during the day for about a month, or if in winter until the possibility of slipping on the ice has passed. Undoubtedly much of this care is unnecessary, but it nevertheless constitutes a very important measure of safety.

Practically all of these patients were operated upon in Columbus hospitals and, without regard to their financial or social status, were my private patients and under my personal and daily supervision, none of them being entrusted to assistants or interns.

If any surgeon is especially interested, he will find that all of my histories are open to inspection, and my secretary will be at his service at any time.