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SOME NOTES ON ABDOMINAL INJURIES

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Recent discussions on problems connected with abdominal injuries, and the paper by Ambrose Lockwood in the *British Medical Journal* of March 9, have all stressed the importance of keeping resection of the injured intestine in reserve, and the young surgeon, without much experience of abdominal work, is urged to look upon repair by suture rather than resection as the first line of defence. Yet little has been said about this matter of repair, and of the diagrams which I have recently seen Fig. 1 portrays

FIG. 1.—Small wounds in bowel suitable for closure by simple suture (A. L. Lockwood).

only the very simple injuries in which no one could have any doubt as to the wisdom of employing the purse-string method or a simple through-and-through continuous stitch.

Repair by Suture

The inexperienced man, however, may well be in grave doubt as to the possibility of repair when confronted with the much more serious injuries that are not uncommon in warfare. In the further diagrams here reproduced I have depicted some of these injuries, all of which can be dealt with by suture, although at the completion of the operation the piece of intestine involved may look much more like the caecum or some other part of the large bowel than the small intestine. Fortunately this is a matter of no moment, for the old adage applies, "Handsome is as handsome does," and the strangest-looking piece of patched-up small bowel will function naturally. There are only two things which must be avoided at all costs: one is the formation of a stricture, and the other the construction of a diverticulum. The former can be avoided by taking care to suture longitudinal or oblique wounds in a direction transverse to the axis of the gut, and the latter by starting the suture of any considerable wound at the extremities and working

towards the centre. If such a wound as is shown in Fig. 2 is stitched from one end to the other it is quite likely that a pocket will be formed where the suture finishes, and this pocket may pout out and distend until it is like a wide-mouthed diverticulum. Such pockets are dangerous, and I have seen them give way, with secondary

FIG. 2.—Suture of oblique wound in transverse axis of bowel.

leakage into the peritoneum. I have heard it urged that intestinal wounds will do better if the edges are trimmed, but that is really very seldom necessary. Of course, should they be very much frayed there is no objection whatever to trimming them up to some extent with a pair of scissors, but there is no real need for any formal excision of the torn edges or to be sure that the edges are one straight line. It is indeed essential that the mucous membrane should be in excess, for it is the best protection for the vulnerable submucous layer, where haematomas form and sepsis is apt to spread. When there are two small holes close to one another it is sometimes very much better to divide the intervening bridge between them and to suture the resulting rent in the transverse axis of the bowel, as is illustrated in Fig. 3.

Sometimes the edges of the bowel wall near a laceration which can well be closed are friable and bruised, and in these circumstances it may be felt that some additional support would be wise. If there is only one such area

then it may be comfortably wrapped in the edge of the omentum, which should be attached to the bowel at one or two points by catgut sutures. But there is just a little risk in using the omentum, for it may be elongated into the form of a band, which may subsequently be the cause of a serious obstruction. There is also the difficulty that if more than one area has to be dealt with it is not easy to employ the omentum in several different situations. When only a small graft is required a piece of omentum may be completely detached and used as a patch. Another plan which can be recommended is to fold two repaired but bruised portions of intestine together and to suture them face to face, so to speak, so

FIG. 3.—Two small tears converted into one wound for suture in transverse axis.

that the one supports the other (Fig. 4). This may appear to be tempting Providence by producing what may look rather like a serious kink; but the small intestine is wonderful in the way it can function despite numerous kinks and corners, and in the course of time the repara-

FIG. 4.—(a) Two lacerations with much-bruised margins. (b) After suture the bowel is turned side to side and fixed by a few points of suture.

tive processes of Nature have great power in gradually undoing kinks that are not required.

When the bowel is completely or almost completely divided, as shown in Fig. 5, formal resection is not required. It is only necessary to trim away any redundant mucous membrane or much-lacerated edge and to proceed with the suturing as if the tear had been deliberate. When the mesenteric border has been spared, all anxiety about the boggy of the mesenteric angle is at an end. Difficulties will arise when the small bowel has been separated from its mesentery (Fig. 6). A short separation, perhaps an inch or an inch and a half, will probably be quite without evil effect, but a longer separation from its blood supply may be followed by necrosis starting along the anti-mesenteric border. Careful inspection of the bowel may indicate a dusky area which does not

respond to warm sponging and in which the colour tends to get worse the longer it is under observation, even with the patient fully oxygenated. In these circumstances the doubtful area may be tucked in by a few Lembert sutures, just as one would tuck in a small area on the summit of a loop released from the sac of a strangulated

FIG. 5.

FIG. 6.

FIG. 5.—Suitable for repair by suture; resection not necessary.

FIG. 6.—An area of small bowel separated from its blood supply by laceration of the mesentery.

hernia. But if the involved portion of bowel is of considerable extent resection will certainly be wise, but it may be that there are multiple injuries and that the total intervention must be reduced to a minimum if the patient is to leave the table alive. It is in these circumstances that the omento-handkerchief wrapped round such a portion of bowel and attached at the margins by one or two sutures may be very valuable.

Short-circuiting

I would utter a word of caution against short-circuiting a much repaired and very much damaged piece of intestine unless it is done quite close to the injury—that is, just far enough away to ensure that healthy loops of intestine can be joined. There may be occasions when it may be wise, but it is a very serious thing to make such an anastomosis between a point which may ultimately prove to be high in the small bowel and one near the caecum or even into the large intestine itself. In the last war several patients suffered grave discomfort and some severe inanition because such short circuits had been established, and, although it is a method proper enough when it can be done after careful consideration, it is not very wise as a hasty emergency. If resection is to be carried out, then let the anastomosis be by the end-to-end method. It requires the minimum of suturing, saves a great deal of time, is physiologically sound, and there is no reason why it should not be entirely efficient. But it is most important that the margins of the bowel at the mesenteric

FIG. 7.—First stage of end-to-end anastomosis. Mattress sutures at mesenteric attachment.

border should be everted into the bowel lumen, and that the mucous membrane should not be allowed to protrude into the small area at the mesenteric angle where there is no peritoneum. The way to avoid this trouble is to approximate this part of the bowel with two or at most three mattress sutures passed from inside the bowel (Fig. 7). The rest of the anastomosis can be made by a

continuous through-and-through suture with the needle always passed from the mucous membrane side. By adopting this latter method there will be much less tendency for the mucous membrane to appear on the peritoneal aspect, and only a Lembert suture here and there will be necessary. If there is a gap in the mesentery it is certainly wise to draw the edges together, and this will be the concluding stage of the resection. Any suture that is used for drawing the margins together must studiously avoid vessels. In fact, the gap is best closed by taking hold of small portions of the mesentery with artery forceps on the opposite side of the cleft and then tying the bites of the forceps together; in this way the vessels are not in jeopardy. It has been suggested, and is often stated, that in the small intestine one layer of suture will suffice, but I would like to urge that it is much wiser to make at least an attempt to bury the first line to some extent—if not by a complete Lembert suture, at all events by one or two such sutures to convert the peritoneal aspect of the anastomosis into a ditch rather than a hillock.

Toilet of the Peritoneum

The toilet of the peritoneum may have to be hurried, but it must not be neglected. There is no need to endeavour to get rid of all blood, but it is much wiser to bale out masses of clot, and this is best done with the hand. The surgeon should remember that the pelvis, and to a much less extent the loin pouches, are the places into which not only blood but loose foreign bodies and debris are most likely to find their way. There are cases in which a portion of intestine has been completely separated as the result of trauma and has gravitated to the pelvis, and it is well to be on the look out for this rare but not unheard-of complication.

Much has been said about the use of a "sucker"—a horrid name for a useful instrument—but care must be taken that this is not too powerful and that damage is not done to pieces of intestine or omentum drawn into what may be its voracious mouth. Careful gentle swabbing can be very efficient. Those of us who began their apprenticeship in the antiseptic days will continue to yearn for the beautiful smooth soft marine sponges which were ideal for mopping up fluids from the peritoneum; now, alas! swabs of moist gauze, though a poor substitute, must take their place. Enterostomy should be studiously avoided, except in those circumstances when the patient will be under the continuous care of the person responsible for the original operation. In injuries I can scarcely imagine any condition in which it would be a primary indication, and it must never be looked upon as a simple and satisfactory method of temporarily short-circuiting a damaged area. If at any time it must be resorted to, then let me stress the wisdom of interposing the omentum between the parietes and the loop containing the tube. This is a modification which we owe to Charles Mayo, and it is valuable in diminishing the liability of the enterostomy's developing into a persistent fistula, and it certainly helps spontaneous closure. In the large bowel to convert a ragged wound into a temporary colostomy is good practice, and all that is necessary is either to tie in a Paul's tube, if and when available, or to stitch the edges of the torn bowel to the skin. In all circumstances the surgeon must have great respect for the omentum, and it should always be spared even if very considerably damaged. In gunshot wounds it may come under suspicion as a source of haemorrhage, but its large vessels may be safely tied without sacrificing any actual portion. The "apron" has many uses in

the abdomen, and these are best emphasized by Rutherford Morison's description of the omentum as "the abdominal policeman," with this difference—that it is always there when wanted!

Haemorrhage

In damage to solid viscera one must remember that the main indication is to arrest bleeding. Pieces of the liver or spleen that are merely attached to the main organ by a narrow strand or a portion of capsule are best removed, and fissures that are not bleeding and are occupied by firm clot can be left alone. But big fissures with free bleeding must receive treatment. When reasonably accessible the edges can easily be drawn together by thick (No. 3) catgut sutures, which take a wide deep bite and which are passed at a distance of not less than half an inch from the edge of the rent to be closed. I should like to urge the great value of a strand of catgut passed parallel to the rent as a support for these sutures and as a means for preventing their cutting out. The strand is passed either as a whole or in sections with a round, straight, or curved needle as may be available, and is nothing more than a splint to support the interrupted opposing sutures which are so valuable for haemostatic purposes (Fig. 8). If suture cannot be employed and

FIG. 8.—Suture of a wound of the liver over catgut supports.

gauze packing must be resorted to I would strongly advise that the packing be well dusted with boric powder. Gauze in the liver or spleen or even the kidney may have to be left *in situ* for perhaps as long as a week or even more, and is very apt to be associated with a low form of infection which delays healing and favours secondary haemorrhage. The mild antiseptic properties of boric acid are some little protection against this eventuality.

A word on the removal of the gauze may not be out of place. It should not merely be drawn out at a stated time, but should be loosened by gentle traction on the edges, and if this process can be accomplished and is not accompanied by bleeding it may be persevered with until the whole is removed. As a rule a big pack used for the control of haemorrhage can only be safely removed in two or three sittings, and it is much better to deal with it in that way than to have to attempt ineffectually to repack a wound which starts to bleed after the gauze has been taken out.

Closure of the Parietal Incision

The closure of the incision is important. Whenever possible the peritoneum should be drawn together by continuous suture. Once in apposition peritoneal edges quickly unite and thus seal off the rest of the wound, so that exudate, tags of omentum, or even loops of bowel do not escape or get forced through among the muscles or even outside. Whatever is done about the suture of the muscle and aponeurosis some general support must be

given, and that is best provided by a series of through-and-through sutures of stout silkworm-gut or silk. These must be passed through all the structures except the peritoneum; they should be inserted about every inch and a half and should enter the tissue about half an inch from the edge of the incision. They must be tied firmly to give sure support, but not as tightly as possible, or the tissues within their grasp will simply give way before the tension created. In the after-care do not worry the bowels. As soon as the patient can face it, probably about the third day, a daily dose of liquid paraffin may be useful as a lubricant. If vomiting or distension is troublesome the stomach tube, usually of the Ryle or Waggenstein type, is invaluable. For lower abdominal distension a glycerin enema, the least disturbing of all enemata, may work wonders, but should it belie the reputation I give it one can always resort to the other less comfortable but more drastic clysters.

Locating the Injury

Whatever may be said for the various incisions which are employed for opening the abdomen, when confronted with a severe emergency, there can be no doubt about the superiority of the middle-line approach. It may start above or below the umbilicus as the indication of location suggests, but unless the injury is limited to the lower small intestine it must be of ample length. The patient will not die from a big incision, but may very likely succumb if some important injury is overlooked. From half-way between the ensiform and umbilicus to just above the pubes will allow an opening wide enough for most purposes, but a further extension upwards may be most helpful in high abdominal injury. If damage to liver or spleen or colon demands a more lateral exposure the surgeon must not hesitate to make a cross-incision dividing the rectus and extending from the mid-line towards either flank. Once the peritoneal cavity is opened it is first necessary to determine the source of any considerable haemorrhage and to deal with it either finally or temporarily. Then a systematic search must be made for injury to the hollow viscera. There is usually some indication in the way of haemorrhage or bruising as to where to begin. Intestine which has been wounded, whether by firearms or otherwise, is usually more bulky and quiescent than other parts. But gunshot injuries are usually multiple, so the intestine must be examined either from some injured spot up and down or, in the absence of some hint as to the location of the injury, from below up. But, wherever begun, the search must be systematic so that it need not be repeated. The colon also must be inspected from caecum to lower sigmoid. When the large bowel is in question the nose of the surgeon often provides the first hint. In retroperitoneal tears a definite haematoma or at least blood-staining may be tell-tale. A wounded stomach is usually flaccid and a missile generally injures both walls. Discoloration or bulging of the gastro-colic or small omentum usually means injury to the posterior surface of the stomach or the pancreas.

The first injury discovered may be temporarily repaired, but only if what is done is part of what will be ultimately required. In such serious lesions, where time may be all-important, nothing must have to be done over again. A good plan is to clamp a piece of gauze over each lesion as found, using a short bowel clamp or a ring sponge handle, so that there is some guide to each area that must be subsequently repaired. It is unwise to try to decide what must be done in the way of repair until the

whole extent of the damage has been determined. To make a nice resection or a pleasing suture of damaged bowel only to discover later that the aorta has been torn or the pancreas lacerated is poor recompense for the time expended. Retroperitoneal ruptures of the large bowel are among the most serious of all the injuries, and will probably demand an independent posterior incision through the muscles right down to the lesion; no mere "stab wound"—a horrid device in any circumstances—will suffice. The incision should be at least three or four inches long and must freely open up the cellular tissue. If the laceration can be easily repaired it is worth while even though the suture does break down or the bowel sloughs later. It may help to detain infection until the cellular tissue is somewhat prepared, but no great time and care must be spent in this suturing, for in any case the wound should be lightly packed with antiseptic gauze and left completely open. To suture the wound partially and to leave in a rubber tube is fallacious.

While time should not be spent in searching for foreign bodies, those that are discovered should certainly be removed, for they are potential sources of danger, though retribution may be long delayed.

DENTAL HYPOPLASIA AND CARIES AMONG THE CHILDREN OF FINNISH LAPPS

BY

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This investigation was undertaken at the suggestion of Lady Mellanby, while I was on a month's tour of Finnish Lapland in June, 1939. The visit was primarily in connexion with other scientific work. Rather unfavourable weather conditions, combined with the extremely scattered nature of the Lapp population, resulted in the number of children examined being much smaller than was originally anticipated. The results, on the other hand, are so comparatively uniform that it is reasonable to assume that these children were a representative sample.

There are about 30,000 Lapps living in the northernmost areas in Norway, Sweden, and Finland; of these some 2,000 inhabit the area of Finland north of the Arctic Circle. The Finnish Lapps are not uniform in their culture: they speak three separate languages and provide a miniature colonial problem for the Finnish Government. Those living towards the western borders (the Fell Lapps) are mostly nomadic and exist principally by reindeer husbandry; no Fell Lapps were examined during this investigation. The second group, the Skoltje Lapps, live in the Petsamo area, in the extreme north-east of Finland; this area was ceded by Russia in 1920. Some Skoltje Lapps keep reindeer, but those living near the sea seem to have lost most of their original habits and to have adopted a mode of life similar to but on a lower level than that of the poorest Finns.

The third group are the Inari Lapps; they number about 900 and form the main subject of this investigation. They live in the central part of Finnish Lapland, which is well forested, and have for many years inhabited log houses. They keep reindeer, but also practise mixed farming on a small scale; they fish in the lakes and rivers in summer. The houses are often ten miles or more apart in a country which is not easy to traverse, since there are no roads, the rivers have fairly frequent rapids, and the forest paths are often swampy and mosquito-infested during summer. In comparison winter-time travelling with reindeer is simple. Even when a house was reached after a long walk