

facture. It should invariably be freshly made, but if it is desired to keep it a short period for the treatment of septic wounds, as laid down in the Circular issued by the D.M.S., General Headquarters, Egyptian Expeditionary Force, it should be kept in dark brown (non-actinic) stoppered bottles, which should be completely filled with the eusol, thereby preventing oxidization by air.

It is essential that eusol should contain at least 5 per cent of available hypochlorous acid, and providing that the eusol is made according to the prescribed method, and that the bleaching powder is of good quality (not less than 22 per cent of free chlorine), the eusol should be of the requisite strength, but it loses considerably during the first twenty-four hours. The quantitative estimation of chlorine in bleaching powder is a laboratory operation, and even then does not guarantee the strength of the final product.

The following test for eusol, kindly worked out by A. Lucas, Esq., F.I.C. (Egyptian Government Analyst), is calculated to meet all necessary requirements. No special apparatus is needed, a fact which will commend the test for rapid work in hospital or the field.

Apparatus required.—A bottle containing eusol-testing solution, test papers, and a measure glass or similar vessel.

Eusol-testing Solution.

Arsenious oxide	..	..	3.86	grm.
Sodium bicarbonate	..	..	15.6	„
Water	..	..	1,000	c.c. (= 1 litre).

Test Paper.—Unglazed white paper is soaked in the following solution, dried, and cut into strips:—

Potassium iodide	..	..	0.1	grm.
Starch	..	..	1	„
Water	..	..	100	c.c.

The paper should be dried at a temperature of 40° to 50° C.

To test.—To Eusol add slowly, with constant stirring, an equal volume of eusol testing solution. A slight cloudy precipitate will form, which disappears on stirring. Moisten a piece of dry test paper. Dip a pencil or glass rod in the mixture, and lightly touch the test paper. If the eusol is 0.5 per cent in strength or over, a blue colouration will be produced on the test paper. No colouration will be produced if the eusol is under 0.5 per cent.

PROPHYLACTIC OR TEMPORARY CÆCOSTOMY IN RESECTION OF THE DISTAL PORTION OF THE COLON FOR NON-OBSTRUCTIVE CONDITIONS.

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THE following brief note has been written with the object of drawing attention to a little surgical manœuvre, which has been of service to me in cases of resection of portions of the distal half of the large intestine. This step in the surgical technique of excision of any portion of the large bowel between the splenic flexure and the sigmoid colon I learnt in the course of conversation with a very distinguished Scottish surgeon who employed it, but in France I have met with

very few surgeons who appeared to be familiar with the procedure, either in theory or in practice. It is of course established now that excision of portions of the large intestine for gunshot injury in the "forward area" is only rarely indicated, and indeed, in the few papers upon gunshot wounds of the abdomen which have been sent to me by my surgical friends or to which I happen at present to have access, there is scarcely any record of resections of the large bowel, and hardly a note of a successful case.

(a) I have employed temporary cæcostomy in the United Kingdom in cases of resection of the large intestine for carcinoma originating in any part from the splenic flexure to the pelvic colon. I am not referring to cases of intestinal obstruction above an operable cancerous growth, where of course the obstruction must be relieved by operation before any idea be entertained of extirpating the tumour, but I am advocating temporary or provisional cæcostomy in cases of excision of a carcinomatous splenic flexure, descending, iliac or pelvic colon, where no obstruction exists. The opening acts as a vent for gases generated in the colon above and near the suture line, and acts as a safety valve in preventing any strain on the junction.

I am aware of the brilliant results obtained in excisions of cancerous segments of the large lower bowel by distinguished operators, but I submit that this little point of technique may be of value to surgeons of ordinary dexterity; it has certainly added to my mental comfort in the treatment of these cases, and it has as certainly promoted the convalescence of the patients.

(b) I have also on several occasions made use of temporary cæcostomy when operating in the United Kingdom to close a proximal inguinal colostomy performed in France for some severe gunshot injury of the rectum. Opinion is not yet finally settled as to the best means of closing an inguinal colostomy, but I have personally usually performed an intraperitoneal operation, excising the "spur" and practising end-to-end union of the bowel. In such cases as in those of excision of a carcinoma, I have found temporary cæcostomy to be a measure of safety. It might appear to be a retrograde step to substitute a stoma in the right iliac fossa for one of the left side, but if the cæcum is simply anchored to the parietal peritoneum, the opening closes readily enough, especially if the drainage tube in the cæcum be inserted after the manner of a Senn's gastrostomy. I have never had to undertake any operation to close a cæcostomy performed in this way, and the stoma generally closes in ten days to a fortnight.

(c) Excisions of portions of the distal colon for gunshot injury. It is an axiom of military surgery that in the cases of gunshot wounds of the bowel the least possible should be done, and that suture should be preferred to resection, unless the latter is inevitable. The whole experience of the surgery of this war has demonstrated that suture suffices in the large majority of cases of injury to the colon; by reason of the size of this portion of the intestinal tract, its wounds are mostly of the nature of perforations or tears, and the bowel is rarely completely divided. Moreover the absence of numerous loops and coils makes multiplicity of wounds of the colon uncommon, when compared with their frequency in the small intestine. Nevertheless I do claim that there are certain cases of gunshot injury of the large intestine where a resection of the damaged portion is indicated, more especially when infarction of the bowel is present. Further, in some cases where the wound of the large intestine has been of such magnitude or difficulty

of approach as to suggest the formation of an artificial anus, recourse might well be made to excision and suture when the high mortality of the colon anus is borne in mind. The adoption of this procedure would of course be influenced by the general condition of the patient.

If excision is to be practised, let the removal be free, and let the bowel sections be planned in accordance with the dictates of general surgical experience. The wide removal of damaged bowel and of the adjacent damaged and devitalized retroperitoneal tissue which the resection facilitates finds justification not only in being in keeping with the ordinary rules for treatment of gunshot wounds by excision of the damaged area, but also by the end results in those cases in which this more drastic operation has been undertaken. With few exceptions, these have all been cases of gunshot injury to the distal portion of the large intestine, and in these the temporary or provisional cæcostomy performed at the time of resection has proved to be a measure of safety. The opening has been made into the cæcum at the end of the operation, while the suture is suturing the skin of the laparotomy incision. The "gridiron" method affords convenient access to the cæcum, and the drainage tube is inserted like a Senn's gastrostomy. If a collodion or mastisol dressing be applied to the laparotomy wound, there does not appear to be any extraordinary risk of infection of the latter.

Case 1.—Penetrating wound of abdomen, severe wound of cæcum and ascending colon; excision of cæcum, ascending colon and hepatic flexure; end-to-side union of ileum and transverse colon; suture of jejunum.

Private J. K., of the 1st Buffs, was admitted on November 20th, 1917, into a casualty clearing station with two penetrating wounds of the abdomen. Two fragments of shell had entered the abdominal cavity through the right flank, and the cæcum and ascending colon were both badly damaged and perforated, the latter being almost completely divided. There were four wounds of the jejunum, which were sutured. Operation was performed about ten hours after the man was hit, and at the time he was in rather poor condition. The wounds in the flank were widely excised and subsequently vigorously treated by "Carrel's" method: the terminal part of the ileum, the cæcum, ascending colon and hepatic flexure were excised, and an end-to-side junction performed between ileum and the transverse colon. The patient made a good recovery and was evacuated to the base, and I last heard of him in an unsolicited letter from the medical officer in charge of a Red Cross hospital in the South of England, telling me of the patient's complete recovery and congratulating me on the successful case.

Case 2.—Penetrating wound of the abdomen; resection of jejunum; end-to-end union; resection of distal part of transverse colon, splenic flexure and descending colon; end-to-end union; cæcostomy.

Lance-Corporal W., of the M.G.C., was admitted into a casualty clearing station in the early hours of a February morning with a penetrating wound of the abdomen, produced by a shell fragment. The piece of shell entered the left flank, completely dividing his descending colon, and shattering its adjacent edges. The upper jejunum was the site of several large perforations, and its mesentery was perforated and bleeding; three feet of jejunum were resected and an end-to-end junction performed. The missile had made a large rent on the posterior aspect of his transverse colon, and passing forwards and to the right half just penetrated the anterior surface of this portion of the bowel. It was deemed safer to excise the

damaged portion of the transverse colon, splenic flexure, descending and iliac colon, and an end-to-end junction was performed between the proximal portion of the transverse colon and the splenic flexure. The wound of entry was excised widely and "Carreled"; a temporary cæcostomy was then performed. Apart from passive collapse of the lower lobe of his left lung and some trouble with the laparotomy wound, the patient made a good recovery, and was evacuated to the base a month later and subsequently to England.

Case 3.—Private G. W., of the T.M.B., was admitted into a casualty clearing station in the early hours of a January morning with a penetrating wound of the abdomen, due to a fragment of shell. After the patient had been warmed and resuscitated for a couple of hours, the abdomen was opened, and nine or ten perforations of the jejunum were sutured, and in addition a resection of eighteen inches of small intestine lower down was performed. Four wounds of the sigmoid were found, two of which were on the mesenteric border; as the bowel was in a state of infarction, the damaged portion was resected, and an end-to-end junction made. The foreign body was removed from the musculature of the left flank, and the damaged tissues widely excised; a temporary cæcostomy was performed. The patient's recovery was uneventful, the cæcostomy closed after ten days, by which time the rectum was acting satisfactorily, and he was evacuated to the base in three weeks, and subsequently went to England. Curiously enough this patient's father had undergone an abdominal operation at my hands in Middlesex Hospital some few years ago.

Case 4.—Penetrating wound of the abdomen; large tear of the iliac colon, limited resection, temporary cæcostomy.

Private D. L., K.L.E., was admitted into a casualty clearing station on November 21, 1917, with a shell wound penetrating the left side of the abdomen. The fragment had entered the left iliac fossa in front and had passed downwards and backwards, shattering the anterior part of the crest of the ilium and emerging over the left hip. There was at least a pint and a half of fluid in the lower part of the abdominal cavity consisting largely of blood, but also of extravasated intestinal contents. Some fourteen hours had elapsed since the patient was hit, and this fluid possessed a distinctively offensive odour; the damaged segment of the colon was resected—about two and a half inches in all—and an end-to-end union performed. The wounds of entry and exit were widely excised, the loose fragments of the damaged bone were removed, and Carrel's treatment carried out with vigour; a temporary cæcostomy was performed. The patient made a good recovery and by the time he was evacuated to the base his lower bowel was acting satisfactorily, and the cæcostomy had closed.

Two of these cases are of special interest inasmuch as they are resections, not only of portions of the large intestine, but also of the small. Satisfactory accounts of these two were obtained on April 23.

I would reiterate that the operation of excision of a damaged portion of large intestine is by no means advocated as an alternative to suture, but as an expedient to which it is sometimes justifiable to resort. The narration of the above cases will show that they have all been of a severe type, and that two indeed have been double resections. The purpose of the paper is merely to show that cæcostomy is a measure of safety in cases of resection and that the latter operation is justifiable in a certain few cases of gunshot injury. These cases have been operated

upon in an advanced clearing station; which in its operating theatre and in the heating arrangements of the wards bore the impress of the engineering and architectural abilities of its then Commanding Officer, but I have also been fortunate in enjoying the assistance of an anæsthetist and of operating theatre sisters of far more than ordinary skill.

Sir Harold Stiles has very kindly allowed me to make use of his name in connexion with this communication, and in a personal letter he writes: "Whenever I resect a carcinoma, an artificial anus or a fæcal fistula of the distal half of the large intestine, the last step in the operation consists, as a matter of routine, in stitching a small area of the cæcum to the abdominal wall, so that a small opening can be made into it at the end of twenty-four or forty-eight hours."

I very gratefully acknowledge my indebtedness to him for this valuable hint in surgical technique, for although I have usually made my opening in the cæcum at the same time as the resection was performed, and although the minutæ of the actual operative procedure may differ, the idea I learnt in visits to Sir Harold at the Chalmers Hospital, Edinburgh.

For permission to use the notes of the military cases included in this paper I am indebted to Lieutenant-Colonel E. F. L'Estrange, R.A.M.C.

Lecture.

WOUND SHOCK.¹

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THE usual immediate effect of a sudden injury is that the wounded man falls in a state of collapse. If the injury is not at once fatal, this state of "primary" shock is recovered from, more or less rapidly. It is evidently brought about through reflexes from the central nervous system, and resembles the condition of fainting. It may be regarded as beneficial in that it reduces the risk of hæmorrhage, allowing injured vessels to close up and clots to form. In any case, it does not require special treatment, as does the more serious "secondary" shock that frequently comes on later. This state, which was called "wound shock" by Cowell, is the subject of the following remarks.

Wound shock may vary in the mode of its onset. Occasionally the primary shock may completely disappear, and the wounded man arrive at the casualty clearing station without other signs than the actual injury itself. Again, it may disappear for a time, but be followed by a steadily increasing secondary shock, arrival being in a more or less moribund state. In other cases the primary shock may pass directly into wound shock without intermediate recovery.

The state of wound shock, although recognized without difficulty, is not easy to define. It may be said to be a general collapse, but obviously chiefly affecting the

¹ Lecture given at the Royal Army Medical College, on October 22, 1919.