vertically. A thin fibrous layer covered the peritoneal sac; this was also incised, and, the greater part of the sac having been removed, the aperture was closed by a ring catgut suture. The muscular defect was now discovered to be considerable, but closure without any tension was accomplished by the use of tendino-muscular strips cut from the semispinales muscles at the vertebral end of the incision. Some six such sutures were "darned" over the aperture without strain, using the well-known Gallie technique for fascial sutures. The oesophagus was slightly short, but the level of closure was carried somewhat upwards as the oesophagus was approached. The reflected pleura was now sutured over the fascial "raft," and the superficial wound shut in the usual manner, the pleural cavity being completely emptied of air by raising the intratracheal pressure and so expanding the lung before the last pleural suture was tied. The patient was turned again on his back and the stomach was anchored to the anterior abdominal wall, after the fashion of a Rovsing gastropexy, before the abdomen was closed. This, it was thought, would prevent for the time any tendency on the part of the stomach to force the diaphragmatic barrier during the period of its consolidation.

Post-operative Progress

A small left-sided pleural effusion formed with slight fever, and there were signs of pleurisy at the right base. Repeated attempts at aspiration failed, however, to remove more than a few drops of sterile fluid from the left side. Further convalescence was uneventful, and the patient left hospital forty days after admission, taking all food without discomfort. Three weeks after the operation the radiogram showed the stomach in normal position with a small effusion at the left base. Six months after operation there was some flattening of the left dome and a suggestion that the bolus had been caught up in the oesophagus for a moment before entering the stomach. The patient was quite well, but said that he could "just feel" the food entering the stomach. His general health is now (1933) excellent and all dysphagic symptoms have completely disappeared. The notes from which the above record was compiled were made after the operation in 1929, but publication was delayed in order to test the permanency of the result. Since that time several cases have been recorded in which Gallie sutures or more massive grafts cut from the fascia lata were successfully used to close the diaphragmatic aperture.

CONCLUSIONS

My experience of cases of diaphragmatic hernia is too small to enable me to make any worthy comparison of the abdominal and thoracic routes of approach. In previous cases performed entirely through the abdomen I have felt dissatisfied not only with the access provided but also with the closure of the aperture solely by sutures, applied with difficulty and usually under tension. As these cases were chiefly ones in which incarceration had occurred or were post-traumatic, it would, however, hardly be fair to make any comparison. Harrington advocates the abdominal route, perhaps accompanied by phrenicotomy, and has obtained a large number of cures by this method. W. Salisbury, in this country, has recently described a case of herniation, apparently through the foramen of Bochdalek, in which, operation being by the abdominal route, the aperture was closed "with eight mattress sutures of double catgut, and the parts came together without any tension or difficulty." He states that he found the abdominal approach very satisfactory in every way, and considers that the thoracic approach should be reserved for cases with intrathoracic adhesions. This was, however, a definite congenital case without a sac, so that the problem of the efficient removal of the sac from the abdominal aspect did not arise.

It is suggested that the method here described, while undoubtedly necessitating a more severe operation than the abdominal approach, allows a closer approximation to the ideal radical cure than the mere suture of the edges of the aperture.

ELECTRO-SURGICAL TREATMENT OF MINOR ANAL CONDITIONS

BY

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W. J. Morton, in 1881, was the first to apply oscillating currents to surgery. Since then many workers have enlarged the scope of this field of surgery.

There are at present three types of electro-surgical currents in surgical use: (1) the *monopolar*, or *Oudin*, current, which is one of highest voltage, as compared with (2) the *d'Arsonval*, or *bipolar*, current, of highest amperage, and (3) the *cutting* current, also a bipolar current. The difference in the effect on the tissues of these three currents is that the Oudin is a dehydrating current. The other two are coagulating currents. The difference between these latter two is one of damped and undamped oscillations, which in practice means depth of coagulation, the cutting current having a minimum of coagulation as small as 0.1 mm., whereas the other varies the depth of coagulation up to several centimetres. The cutting current, though sealing minute vessels and lymphatics, is not used for haemostasis. I have used all three currents in the treatment of ano-rectal conditions, and with one exception the operations have all been performed under local anaesthesia.

TECHNIQUE

Local Anaesthesia.—Two to three ounces of 1/2 per cent. anaesthetic solution are used. Commencing at the right anterior aspect of the anus, half an inch from the muco-cutaneous junction, a zone of fluid is injected round the anus subcutaneously, sufficient solution being used to raise the skin above the surrounding tissues. On the completion of the ring the tissues are massaged in order to disperse the solution into the subcutaneous tissues. With the left index finger in the anus the operator injects another deep zone into the sphincter muscle, which can be felt to relax as the injection takes effect. Operative proceedings should not be commenced until the finger in the rectum is swept round and meets no area of resistance. The actual procedure is practically painless, and occupies about five minutes. A useful adjunct is 1/4 grain of morphine and 1/150 grain of scopolamine between one and one and a half hours before operation.

Pre-operative Aperient.—The usual pre-operative treatment for this region is carried out—that is, bowels are well opened three to four days before by some aperient, and then the lower bowel is washed out until clear. The patient is then given 10 minims of nepenthe three times a day, and a fluid diet.

Post-operative Treatment.—Nepenthe is continued as before operation, and the bowels are not allowed to act for anything up to seven days. This, of course, varies with individual patients, the criterion being the tolerance of the patient. On the sixth night cascara is given, and half an hour before the bowels act the following day four to six ounces of warm olive oil are slowly injected into the rectum and retained. The evacuation is then free and painless. All patients are advised to finish their toilet with cotton-wool moistened with some mild antiseptic.

FISSURE, POLYPUS, AND FISTULA

Anal Fissure.—The current I use here is the monopolar, or Oudin, current. After anaesthesia a rectal speculum is introduced, and the fissure located and "sprayed" with this current. The result is a dehydrated eschar, which is left *in situ*. The immediate result is cessation of pain, due to the sealing of the exposed nerve endings. Three to four days after the operation the anus is gently swabbed out with a mild antiseptic. The patient is allowed up on the day after the operation.

One patient, C. C., a man aged 27, was suffering from tuberculous anal fissure, following several operations for fistula-in-ano, in 1929. A diathermy operation was performed in May, 1931, and by August of the same year the fissure had healed soundly.

Anal Polypi.—Perianal anaesthesia is administered, and the polypus is brought down. The base, if higher than the line of perianal anaesthesia, is injected with local anaesthetic. A pair of curved artery forceps are applied to the base of the pedicle, it being remembered that the pedicle has been stretched. Allowance should therefore be made for this when applying the forceps, otherwise they will be applied too closely. The polypus distal to the forceps is severed with the cutting current. The electrode is then applied to the point of the forceps, and the coagulating current turned on until a zone appears proximal to the forceps. If the base is very broad I usually apply a catgut ligature, but in the case of small polypi this may well be dispensed with. I should like here to sound a note of warning. If the polypus is above the line of peritoneal reflection the operator should remember that the ultimate slough will extend beyond the coagulated area visible at the time of operation. If too heavy or too prolonged a current is used a perforation into the peritoneal cavity may result, with disastrous consequences. In most cases the patient can be discharged in a week or ten days. The subsequent scar at the end of six to eight weeks is soft and pliable, and hardly discernible. I have had no recurrences up to date.

Fistula-in-Ano.—The results in these cases have been particularly gratifying. The technique I adopt here is, as far as I know, entirely my own. Local anaesthesia is administered as usual. A soft phosphor bronze wire about three inches in length is used as the positive electrode. The wire is introduced down the sinus in its entire length until a finger in the rectum feels the end of the wire just under the rectal mucous membrane. The wire is then withdrawn about a quarter of an inch. A medium coagulation current is then passed until the skin shows signs of coagulation. With the current still on the wire is withdrawn, and a dry dressing is applied. The patient is allowed up on the following day, the bowels being kept constipated in the usual manner. The almost instantaneous cessation of pain is the most gratifying feature of this operation. There is a slight amount of discharge from the sinus for about three days, but within a week this has entirely ceased.

A. B., a male, gave a history of tuberculous fistula-in-ano for eighteen months. He had had various operations without any success. Examination showed a perianal fistula. A diathermy operation was performed. Three months afterwards the patient stated, in reply to a "follow-up" letter, that he had had no recurrence of any symptoms, and that all discharge had ceased.

HAEMORRHOIDS

Anaesthesia is given as usual. Some gauze is then rolled into a pear-shaped mass and inserted up the anus beyond the pile-bearing area. Traction is then made on it. This has the effect of everting the pile-bearing area. A needle, bent to form a small arc of a large circle, is used as the electrode. Each pile is punctured at the distal end, and the electrode is inserted for a distance of about half an inch. Coagulation current is then turned on until an area of coagulation appears at the entrance. About the same time the haemorrhoid proceeds to "boil." The electrode is removed with the current still on. In cases of thrombosed piles the technique is somewhat different. The ordinary straight needle is used. The pile is opened with a cutting current, and the clot evacuated by sponging. A ball electrode is then used, and the interior of the pile is thoroughly sprayed with the coagulating current. I do not now insert any sutures into the wound at all. Any anal tags are excised with the cutting current. No morphine suppositories are used, and the wound is dressed with a pyramidal dressing. The time occupied for each pile is approximately ten seconds. With this method there is practically no post-operative oedema, while subsequent pain is in most cases absent.

I now allow patients to get up on the fifth day, and they are discharged on the seventh day, though I consider this is erring on the generous side. About a month afterwards the site of the operation shows practically no indication of any scarring to the naked eye. The amount of haemorrhage, except in one case of a "bleeder" (reported below), was about half a teaspoonful of blood, in some instances even less.

Case Record.—The following case, for the notes of which I am indebted to Dr. Storrs, is of some interest, and is therefore reported in full.

J. S., aged 37, gave no family history of bleeding. He served in the Army in 1916, and apparently had a post-traumatic haemarthrosis of the knee, which was tapped. Three and a half years ago he had a dental extraction, and bleeding was so severe that the patient nearly died. Two years ago he again had haemarthrosis, this time for no apparent reason; the knee was not tapped. A year ago the same knee was affected, and also the left shoulder. Nine months ago the right wrist became swollen while he was sawing some wood. Since the operation for haemorrhoids the right elbow became swollen in the absence of any history of injury—typical haemarthrosis. As regards the history of haemorrhoids, the patient stated that he had had bleeding per rectum for four years, and had lost about three-quarters of a pint a day. For some time he had been on intramuscular injections of collosol calcium. In view of the history of bleeding I was rather chary about risking a blood examination. When I saw him the patient was so anaemic, the bleeding having now become practically a continuous ooze, that it was obvious that unless something was attempted a fatal termination was inevitable.

On July 22nd, 1932, under general anaesthesia, a proctoscopy was introduced. A pile on the posterior and lateral rectal surface, about half an inch from the anus, was seen to be continually oozing. This was coagulated with a strong current. Even then great difficulty was experienced in stopping the oozing. A large mass of piles on the right side was punctured, and a heavy coagulation current turned on. Once again extreme difficulty was experienced in stopping the bleeding. On the left side one puncture was made, which, however, did not result in bleeding. At the beginning of the operation the patient was given 1/2 c.cm. of collosol calcium intramuscularly. Bleeding being uncontrollable by this means, 2 c.cm. of haemoplastin was given intramuscularly, but blood was still seen to be clotting feebly. After about one and a half hours haemostasis was at last obtained; 2 c.cm. of haemoplastin was mixed with some vaseline, and the prolapsed mass was freely painted over with this. A small piece of gauze was also covered with it. A pyramidal dressing was applied, together with firm pressure. Although a full coagulating current was used, the operation took one and a half hours, and necessitated the measures indicated above. I felt some anxiety until the sloughs had separated, as I feared that haemorrhage might recur violently; but apart from a few streaks of blood there was no haemorrhage. The patient was discharged after a fortnight. He allowed his bowels to become constipated for three days after discharge, with the result that on evacuation he lost about a teaspoonful of blood. I have examined him since, expecting that, with the heavy coagulation and the consequent destruction of tissues, a considerable amount of scarring would result, but it was gratifying to see that the amount of scarring was no more than occurs in an ordinary case of haemorrhoids after excision and ligature. Up to date the patient has had no more haemorrhage.

CONCLUSION

I have been so struck with the ease of operation, and the painless and shortened convalescence of these various conditions treated by diathermy, that I am emboldened to write this short preliminary paper. In this region of the body I now never consider using the older scalpel method. It must be realized, however, as Wyeth points out, that the surgeon using diathermy has to learn a new technique, and that each patient must be considered separately—the operator must understand his machine and his own limitations.