

Restoration of Intestinal Continuity after Rectal Excision by Electrostimulated Smooth and Striated Muscles

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Abstract

An operative technique is shown to re-establish intestinal continuity in patients who had an abdomino-perineal excision of the rectum for carcinoma in a previous operation and who cannot tolerate a permanent stoma.

A new anal sphincter is constructed using a cylinder of colonic smooth muscle and a transplanted gracilis muscle, in order to restore both resting tone and voluntary contraction. A rehabilitation program consisting of nerve and muscle electrostimulation is carried out after surgery to improve anal continence.

Key words: rectal excision, gracilis muscle, stoma prevention.

BAM 1 (3): 259-262, 1991

The restoration of intestinal continuity after abdomino-perineal excision of the rectum for carcinoma has not become popular among surgeons mainly because a large number of sphinctersaving procedures, now easily performed by means of stapling devices, are followed by good results. Nevertheless the opportunity to avoid a permanent colostomy following Miles operation should be considered, provided that a satisfactory degree of anal continence is achieved postoperatively.

The present article deals with an operative technique which is indicated in the late restoration of intestinal continuity after rectal excision by means of a new sphincter apparatus consisting of both smooth and striated muscles.

Operative Technique

The operation is illustrated in Figure 1, A, B and C.

The colostomy is closed to minimize contamination of the operative field.

A midline xifo-pubic laparotomy is then performed. The liver and the other viscera are carefully examined to exclude recurrences and metastases. The splenic flexure of the colon is mobilized and the sigmoid pulled through a tunnel behind the seminal vesicles and before the coccyx in the midline at the peritoneal floor, carefully avoiding any damage to vascular and nervous structures of the pelvis. A star-shaped new anal orifice is created from below and, by blunt dissection, conjuncted to the tunnel in the pelvic floor previously opened through the peritoneal cavity. It should be two-three fingers in diameter in order to allow an easy passage of the colon. From the perineal

aspect a circular channel is then created around the colon via two skin incisions, anteriorly and posteriorly to the neo-anus. The channel should be wide enough to allow the passage of the gracilis muscle, which is then displaced from the leg as described by Pickrell [1], taking care to avoid damaging its vascular and nervous supply. The muscle encircles the pulled-through colon and its tendon is sutured to the contralateral ischiatic tuberosity using non-adsorbable sutures.

Prior to tightening the gracilis muscle a 4 cm cylinder of the distal colonic wall is everted and denuded of its mucosa using adrenaline in saline, 1 : 200,000, to facilitate the dissection. The cylinder is then divided anteriorly and an overlapping suture of the smooth muscle is performed to create a high pressure zone at the distal outlet of the colon. Its extremity is sutured to underskin and derma by interrupted slowly adsorbable sutures. The gracileplasty is then completed as described above. The degree of tension of the gracileplasty around the bowel and the resting tone of the colonic outlet are tested by introducing a finger into the newly constructed anal orifice. A wire electrode is sutured close to the nerve supplying the transplanted gracilis muscle and connected to an external electrostimulator, which is tested prior to ending the operation.

A "J" colonic reservoir may be also carried out above the perineal anastomosis to increase the capacity of the "neo-rectum" and prevent fecal urgency, provided that sufficient space is achieved during the pelvic and perineal dissection to allocate a duplicated segment of large bowel. A covering loop ileostomy is finally carried out which is closed after

Restoration of intestinal continuity

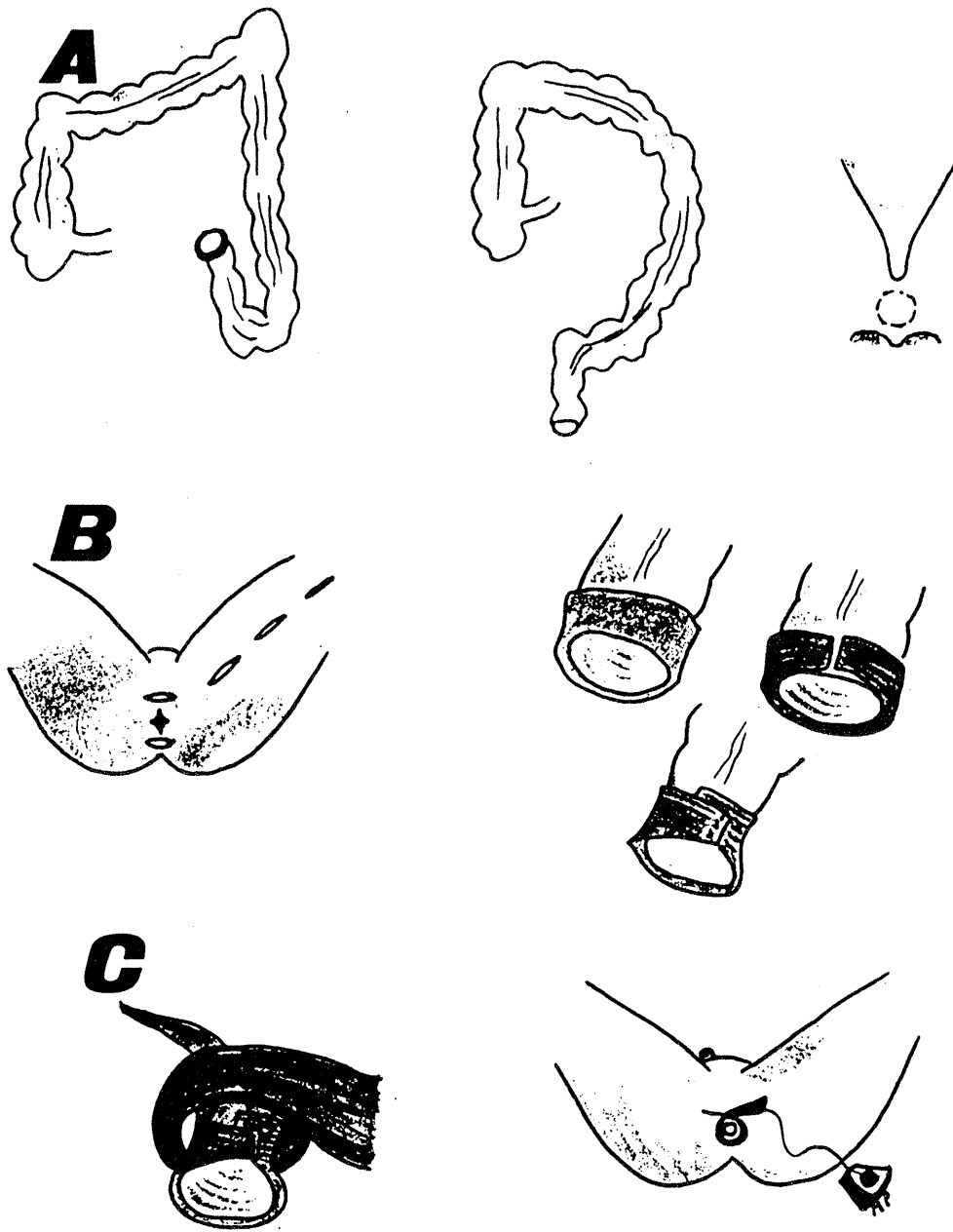


Figure 1. Operative Technique

A. Left: the splenic flexure is mobilized and the colon pulled through a tunnel created by blunt dissection behind the seminal vesicles and before the tip of the coccyx (right).

B. Left: a star-shaped incision is made in correspondence to the new anal orifice; further incisions are carried out anteriorly and posteriorly and an underskin circular tunnel is created around the anus for the transplanted gracilis muscle.

Right: a cylinder of smooth muscle is obtained by everting the distal end of the colon denuded of its mucosa; the cylinder is divided anteriorly and the two ends are overlapped and sutured creating a smooth neo-sphincter.

C. Left: the transplanted gracilis muscle is tightened around the colonic outlet and its tendon sutured to the ischiatic tuberosity. A striated neo-sphincter is therefore created.

Right: diagram of the final aspect of the perineum, showing the electrostimulator connected to the nervous supply of the gracilis muscle and the covering ileostomy.

two months. During this time electrostimulation of the transplanted gracilis muscle is carried out by means of both nerve electrode and transanal route. The patient is also encouraged to spontaneously contract his neosphincter several times a day.

Electrostimulation

Two types of electrostimulation were carried out postoperatively for two months: external and transanal. We used an electrical stimulator IT System^R (distributed by Rehamed) which is a battery operated device. An individual pulse has two components, a rectangular-like and an exponential current. The amplitude is 40-80 mA, the frequency 20 Hz, the stimulus duration 15 sec and the interval between two stimuli 30 sec. A MYO-WIRE teflon coated steel wire electrode, implanted on the gracilis muscle or beside its nerve, is used for the external electrostimulation, whereas a plug inserted into the anal canal is used for the transanal stimulation, a flat electrode being affixed to the patient's flank in both cases.

Clinical results

The above described surgical and rehabilitative procedure has been performed in two male patients, aged 68 and 72. The follow-up duration was 18 months for the first case and 6 for the second. Both patients are able to contract the neo-sphincters and their continence is satisfactory. A marked decrease of perineal-neorectal sensation has been reported by both of them. Therefore the use of enemas has also been prescribed to improve the function.

Discussion

Schmidt [2] suggested the use of a smooth muscle graft, free, i.e. completely excised from the distal end of the retained colon; the possible disadvantage was the deterioration of the graft, due to a deficient vascular supply, which might lead to a colonic stricture. The technique has been then modified by using a 10 cm long pedunculated graft. Shafik suggested reconstructing the puborectalis muscle around the pulled through colon. The criticism of this procedure is that an oncologically correct abdominoperineal excision of the rectum requires an almost complete removal of the puborectalis sling; Shafik reports no increase of local recurrence [3]. More recently, Cavina and associates [4] reported a technique of postoperative electrostimulation of both gracilis muscles placed around and behind the pulled through colon. This rehabilitation procedure seems to markedly improve anal continence as the patient may achieve a better feeling of the contracting neosphincter. However Cavina's patients had the rectal excision and the gracileplasty performed at the same stage. By means of our procedure, we try to provide the patient, whose rectum has been excised in a previous operation, with both a smooth and a striated sphincter, which seems more physiological, in an attempt to combine the advantages of Schmidt's and Cavina's operations.

Williams et al (5) recently developed a neo-anal sphincter by using permanently implanted electrodes chronically stimulating the transposed gracilis muscles.

In our technique a short smooth muscle segment is sufficient, as continence is mainly supported by the surrounding gracilis. This avoids the need of preserving the vascular supply to the smooth muscle graft. Years after the excision of the rectum, the narrow space between the peritoneal reflection and the perineum is unlikely to be sufficient for two gracilis muscles; therefore we prefer to use only one of them, which is also simpler in term of surgical manoeuvres and operative time. As far as the smooth component of the neo-sphincter, the continuity between the colonic wall and the muscular graft is likely to ensure a satisfactory vascular supply and postoperative function. Contractions of the neo-sphincters are elicited after surgery both by direct stimulation of the implanted electrode and by transanal electrostimulation using an external device. The rehabilitation program is likely to improve the trophism of the transplanted gracilis and the attitude of the patient to effectively contract it. The suture of the colon to the underskin and the derma of the perineum prevents mucosal ectropion and subsequent soiling; anal stricture at the site of the anastomosis is avoided by postoperative gentle dilatations. Bowel prolapse is prevented by suturing the colon to the surrounding tissues above the anal orifice and in the pelvis.

The patient is encouraged to periodically perform water irrigations in order to re-establish a satisfactory "rectal" sensation and to correlate it to spontaneous contractions of the neo-sphincters.

In conclusion, the present procedure may be effective in the late restoration of intestinal continuity after rectal excision for carcinoma. Being a complex staged operation, it requires strict indications to be carried out: a patient in good general conditions, strongly motivated to return to a life without a permanent colostomy and free of either recurrence or metastases. The postoperative rehabilitation is of great relevance for the functional outcome.

Acknowledgments

The authors thank Mrs Livia Azzoni who kindly typed the manuscript.

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Restoration of intestinal continuity

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