Laparoscopic modified double stapling technique with transanal resection for low anterior resection of rectal cancer

Ann. Ital. Chir., 2019 90, 1: 78-82
pii: S0003469X1902949X

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BACKGROUND AND AIM: *Anterior resection of the rectum with a total mesorectal excision is the standard surgical technique for the treatment of rectal cancer. Laparoscopic low anterior resection (LALAR) is an alternative to open surgical approach and was validated in diverse randomized control trials to be as safe and oncologically effective. That said, confronting a low rectal tumor in an obese patient with a narrow pelvis can be technically challenging even for the most expert surgeon.*
METHODS: *We propose a modified double stapling technique with transanal eversion and staple resection of the rectal stump.*
RESULTS: *We applied the above technique in 3 patients with a dubious distal resection margin due to patient/tumor characteristics. The mean length of operation was 272 minutes and a R0 resection with a mean number of 16 nodes could be obtained in all the patients. No recurrence occurred during a follow-up of 28 months.*
CONCLUSIONS: *We conclude that this technique is a feasible, safe and valid adjunct to the double staple technique whenever intraabdominal application of the linear staple is difficult or unsafe.*

KEY WORDS: Colorectal cancer, Laparoscopic anterior resection, Double, Low colorectal anastomosis, Stapling technique

Introduction

Anterior resection of the rectum followed by a complete excision of the mesorectum is the standard technique for surgical treatment of rectal cancer [1-3]. It can be performed either by open or laparoscopic approach. Laparoscopic low anterior resection (LALAR) is a valid alternative to open surgical approach, especially in terms of postoperative recovery and outcome [5-7]. During open surgery, when performing very low colorectal or coloanal anastomoses (LAR) with the double staple technique [8], staple closure of the rectal stump from the abdomen can be challenging, especially when dealing with obese patients or with a narrow pelvis [1]. In superposable instances during LALAR, considering that Endo GIA can be locked at either 22 or 45 degree, a narrow pelvis can be considered at risk of inadequate and non-homogeneous clearance margin from the tumor. Furthermore, this condition may lead to an asymmetric resection, dog ear or need of use of more than one stapler, carrying a higher risk of anastomotic leakage or strictures [9]. Anastomotic leakage may impair short and long term outcome and survival [10]: in LALAR, distal rectal cancer and use of more than one stapler are both associated with a higher risk of anastomotic leakage [11].
In order to overcome the difficulties of performing the double staple technique during open surgery in obese patients and in a narrow pelvis, we previously proposed to modify this technique by pulling the tumor bearing rectal stump through the anus, performing an extra-anal

Pervenuto in Redazione Settembre 2018.Accettato per la pubblicazione Ottobre 2018
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resection of the tumor and a closure of the recto-anal stump by means of a linear stapler, then pushing the stump back in the peritoneum and finally performing a stapled colorectal or coloanal anastomosis [1,12], with satisfactory results. We applied this method in patients at high risk of conversion for technical difficulties related to obesity or narrow pelvis undergoing LALAR, with the assumption that this technique could be safe and feasible also in this setting.
The purpose of this study was to evaluate the preliminary results of this technical adjunct to LALAR.

Material and Methods

From January 2014 to December 2016, a total of 22 patients (5 females, 17 males), of a mean age of 66 years (range, 35-84 years), underwent laparoscopic anterior resection for rectal cancer at our institution. Informed consent for laparoscopic resection, conversion to open, stoma and eventual intraoperative modifications of standard technique was obtained from all the patients. Given the retrospective nature of the study, based on surgical adjuncts intraoperatively and not prospectively applied, institutional ethical approval was not required. In 3 patients, with cancer at 4 to 10 cm from the anal verge, upon exploration of the abdominal cavity, due to obesity, narrow and deep pelvis, it appeared immediately difficult to perform a correct application of Endo-GIA and obtain a safe distal clearance for an anastomosis using a LALAR with a mere abdominal approach. For this reason we decided to perform the low colorectal/coloanal anastomosis after eversion through the anus and stapled closure of the anorectal or anal remnant, as previously described for open LAR [1,12].

Surgical Technique

The technique for LALAR is standard. After introducing the first 10 mm trocar 10 cm above the umbilicus with open technique, a 10-12 mm trocar is introduced in right iliac fossa, a 10 mm trocar 10 cm right from the umbilicus on the transverse umbilical line and a 5 mm trocar 10 cm left from the umbilicus on the transverse umbilical line. Then the complete mobilization of left colic flexure, left colon, sigmoid colon and rectum, ligation of the mesenteric vessels and dissection of the mesorectum preserving the hypogastric plexus and nerves are performed. Care is taken to dissect the rectum correctly right above the levator muscles plane. The rectum is then divided at least two centimetres above the neoplasm on the proximal side, with the help of an EndoGIA, and "en bloc" with the mesorectum, completely dissected down to its lower edge. At this point the correct mobilization of the rectum allows for a complete extra-anal eversion of the tumour-bearing rectal stump. With the help of a Klemmer clamp the rectal stump is pulled out (Fig. 1, A-B). The evagination allows to precisely identify the extension of the cancer: it is

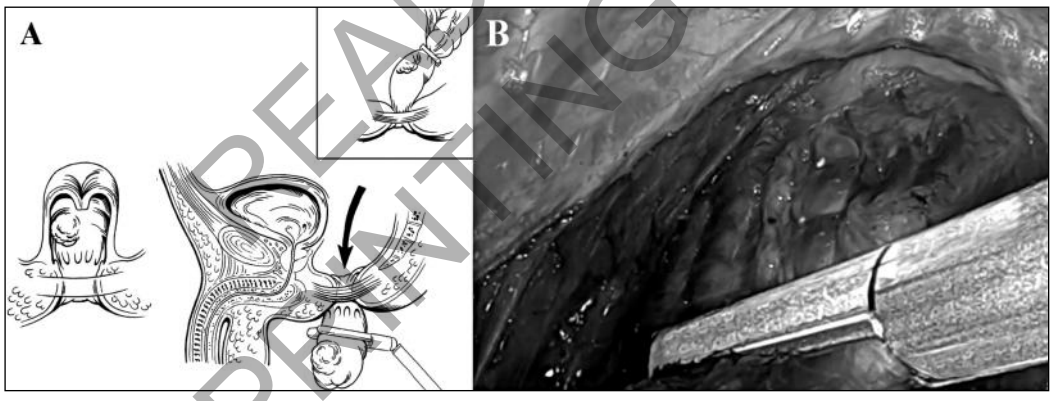

Fig. 1: The closed rectal rectal stump bearing the tumor is everted through the anus (A). Intraoperative view of abdominal closure of the rectum before eversion (B).

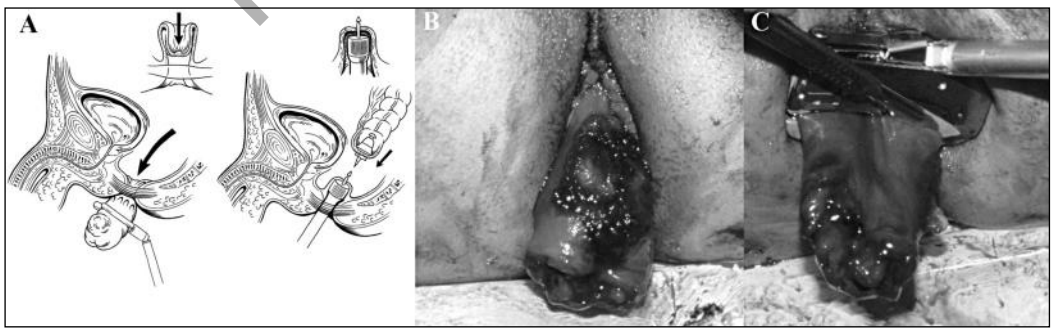

Fig. 2: The tumor is resected. The rectal stump is gently pushed back in the perineum and stapled low colorectal anastomosis is performed (A). Intraoperative view of the everted anal stump (B) and its closure with linear stapler at a safe clearance distance from the tumor (C).

TABLE I - *Essential clinical and baseline characteristics of the patients.*

Pt #	Sex (M,F)	Age (yrs)	Height (mt)	Weight (Kg)	BMI (Kg/)	BP (mmHg)	HR	RR	ASA Score
1	F	74	1.62	57	21.7	92	82	16	2
2	M	59	1.77	80	25.5	88	69	14	1
3	M	68	1.69	88	30.8	99	78	13	1

BMI, Body Mass Index; BP, Blood Pressure; HR, Heart Rate; RR, Respiratory Rate; ASA, American Society of Anesthesiologists.

then resected with the help of a linear TA stapler. Finally, the sigmoid colon can be divided completely using an EndoGIA. With the help of a 3-4 cm pararectal incision the head of a circular stapler is introduced in the proximal end of the colon while the stapler is introduced through the anus pushing back the rectal stump into the perineum; systematic splenic flexure dissection and mobilization is essential to allow a correct tension-free anastomosis to be performed (Fig. 2 A-B).
Ileostomy creation completed the procedure in all the patients.

PATIENTS' SERIES

Three patients, two men and 1 woman, of a mean age of 67 years (range, 59-74 years) were treated with this method. The essential clinical and baseline characteristics are resumed in Table I. Median height was 1.69 m, weight 75 Kg, BMI 26 Kg/m^2, mean arterial pressure 93 mmHg, heart rate 76 bpm, respiratory rate 14.3 breaths per minute. Preoperative patients' workup included standard laboratory blood exams, EKG and Echocardiogram, spirometry and ABG test, CT-scan of the chest, abdomen and pelvis, colonoscopy, and ASA score evaluation. One patient underwent neoadjuvant treatment with chemotherapy and effective clinical downstaging. The mean distance of the tumor from the anal verge was 6.6 cm (range 4-10 cm). All the patients were followed-up according to standard oncologic protocols. The mean length of follow-up was 28 months (range, 21-36 months).
As main outcome measures, postoperative mortality, morbidity and local recurrence were considered.

Results

Postoperative mortality and morbidity were absent. During follow-up, no patient presented either local or distant recurrence of the disease.
Prior to operation, one patient underwent chemotherapy as neoadjuvant treatment, followed by an effective clinical downstaging. One patient, whose preoperative haemoglobin concentration was 10.3 mg/dl, received postoperative transfusion (1 unit). Postoperatively, all the patients received total parenteral nutrition for 5 days, resuming oral food intake thereafter.
The mean length of operation was 272 minutes compared to 253 minutes of standard low anterior resection. An R0 resection could be obtained in all the patients, with a mean number of 16 nodes in the resected specimen. The average length of stay in the hospital was 9 days (range, 8-10 days). Postoperative pathological staging of the disease was T1-N0-M0 (Stage I, Dukes A) in two patients and T2-N1b-M0 (Stage IIIa, Dukes C) in one patient.
All the patients were alive and free from disease throughout the length of follow-up.

Discussion

The preliminary results of this study show that stapled low colorectal or coloanal anastomosis, after eversion and stapled closure of the anorectal remnant, as already reported in previous series during open surgery [12-14], can be safely performed also during LALAR. The extension and usefulness of this technique to laparoscopic resections has been recently reported during LALAR for inflammatory bowel disease and large rectal adenomas [15-16]. The present, short series suggests that it can be successfully extended also to LALAR performed for cancer. When dealing with narrow pelvis and difficult intraabdominal application of the linear stapler for closure of the lower rectum, this technical adjunct can be of valuable help in order to avoid a suboptimal closure of the anorectal remnant or an insufficient distal resection margin. This especially applies to laparoscopic resections, where, due to inability to assess the real distal extension of cancer growth with tactile proof and the sometimes unreliable endoscopic tattooing, there is a difficulty in obtaining a complete 1.5-2 cm distal resection margin in hostile pelvis. Applying to LALAR this technical adjunct, first described more than 20 years ago [12], enables to overcome such difficulties. In particular, eversion of the anorectal remnant allows the tactile feedback of distal extension of the neoplasm, especially when dealing with circumferential tumors or tumors located in the lateral wall of the bowel, for which an abdominal application of the stapler will not keep a homogeneous distance from the mass in most instances. Additional factors enhancing the risk of

anastomotic leak in these settings consist of the "flute beak" firing of the linear stapler or the formation of a "cul the sac" at the firing level, which would require additional stapler application(s) with a consequent higher risk of leakage [10-11, 17-20].

The described technical adjunct arises two major concerns. The first one is that the excision of the mesorectum can be incomplete with this technique. However, a full dissection of the mesorectum down to its lower edge and its full resection before sectioning the specimen was always performed in the here reported patients. The pathological examination of the resected specimen, together with the number of resected nodes and the absence of local recurrence of the tumor in all the reported cases allows to overcome this first concern. The second one is that eversion through the anus may induce a devascularization of the specimen with a consequent higher risk of anastomotic leakage. Such concern induced us to perform an ileostomy systematically, but was overcome by the clinical course of the patients without any leak or fistula formation. The integrity of anorectal remnant vascularization has been already confirmed by previous reports [3] and the assumption of the need for a systematic ileostomy, completing low colorectal anastomoses [21], when performing this technique may probably be re-considered.

This study has three major limitations: the small number of included patients, the short length of follow-up, and the limited quality of intraoperative pictures. This report, however, is intended as preliminary and, hopefully, future studies, based on larger patients' series with longer follow-up, will validate these encouraging, although initial, results. Technical steps of this technical adjunct, although not fully available as intraoperative pictures should be fairly clear to colorectal surgeons.

In conclusion, this study has shown that LALAR with eversion through the anus of the anorectal remnant, extra-anal resection of the tumor and linear suture of the rectal stump, before performing a stapled low colorectal anastomosis, is a feasible, safe and valid adjunct to the double staple technique whenever intraabdominal application of the linear staple is difficult or unsafe.

Riassunto

La resezione anteriore del retto con l'escissione totale del mesoretto è la tecnica standard per il trattamento del cancro del retto. La resezione anteriore per via laparoscopica costituisce un'alternativa all'accesso laparotomico convenzionale e la sua validità oncologica è stata confermata da numerosi studi randomizzati. In pazienti obesi o dalla pelvi molto stretta l'applicazione dellatecnica del doppio "stapler" può essere tecnicamente difficoltosa. In queste circostanze tale tecnica può essere modificata con la resezione del tumore ela chiusura del moncone rettale previa eversione del moncone stesso. Questa modifica tecnica è stata applicate in 3 pazienti. La durata media dell'intervento è stata di 272 minuti ed una resezione R0 con un numero medio di 16 linfonodi è stata ottenuta in tutti i pazienti. Nessuna recidiva di malattia è stata riscontrata durante un follow-up medio di 28 mesi. In conclusione, questa modifica tecnica può essere considerata un valido apporto tecnico aggiuntivo in ogni condizione che renda difficoltosa l'applicazione della suturatrice lineare per via addominale.

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