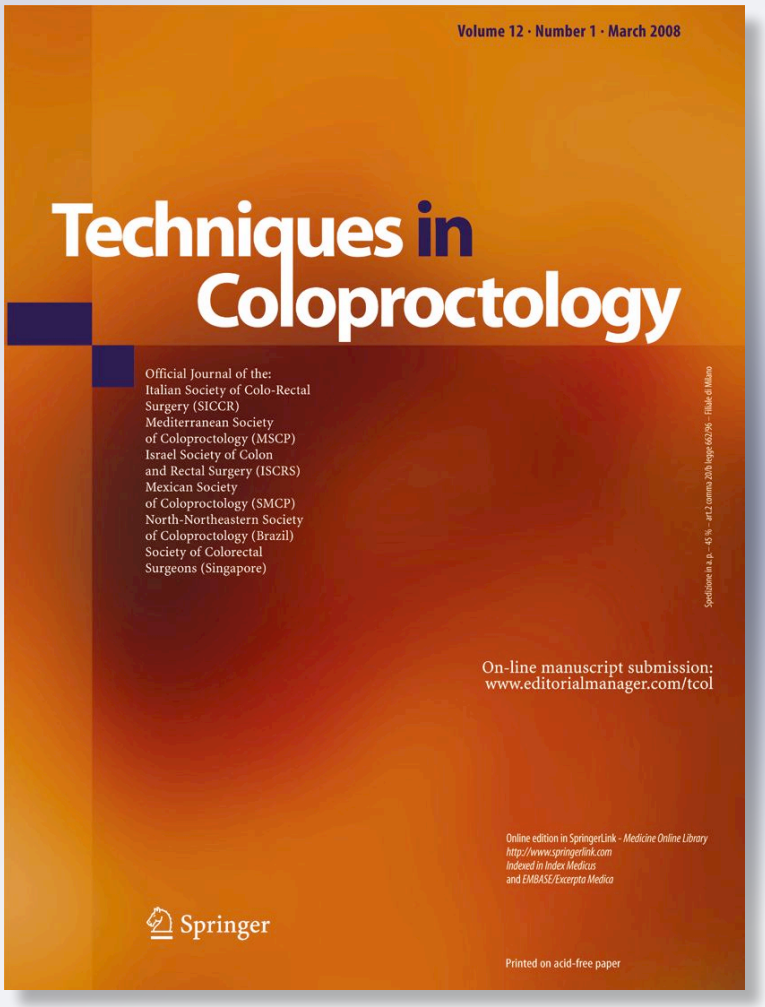
Laparoscopic intracorporeal distal rectal transection with the CONTOUR® device

L. Alevizos & M. M. Lirici

Techniques in Coloproctology
Official Journal of the Italian Soc of Colo-Rectal Surgery, Mediterranean Soc of Coloproctology, Israel Soc of Colon and Rectal Surgery, Eurasian Colorectal Technologies Association, Colorectal Anal Group of Surgical Section of Chinese Medical Association

ISSN 1123-6337

Tech Coloproctol
DOI 10.1007/s10151-012-0818-5



Springer

Tech Coloproctol
DOI 10.1007/s10151-012-0818-5

TECHNICAL NOTE

Laparoscopic intracorporeal distal rectal transection with the CONTOUR® device

L. Alevizos · M. M. Lirici

Received: 20 May 2011 / Accepted: 20 February 2012

Abstract Laparoscopic rectal resection is considered technically more demanding than laparoscopic colectomy. Rectal transection is a challenging part of laparoscopic low anterior rectal resection and restorative proctocolectomy. We describe our technique for laparoscopic rectal transection with a curved cutter, a device initially designed for open surgery, combined with the use of a ring-mounted sterile drape that allows maintenance of sufficient intra-abdominal gas pressure in a series of 34 patients.

Keywords Laparoscopy · Low anterior rectal resection · Restorative proctocolectomy · Rectal transection · Curved cutter

Introduction

Laparoscopic colorectal surgery has been increasingly practiced during the last 20 years, after the first successful attempt in 1991 [1], and has been associated with a more favorable short-term outcome, decreased pain and less wound-related complications than open colectomy. Furthermore, the laparoscopic approach has also been characterized as a new and promising alternative for low rectal cancer management, with many advantages like better visualization of the pelvis, more precise and delicate dissection and better preservation of the hypogastric plexus and erigent nerves, leading to an improved functional and oncological outcome and reduced complication rate [1]. However, due to its complexity and the steep learning curve, laparoscopic rectal resection is not spreading at a pace similar to that of laparoscopic colectomy. The transection of the lower rectum must be precise, requiring clear dissection, and is often challenging [2]. We herein describe our laparoscopic technique of rectal transection by curved cutter in a series of 34 patients with cancer or ulcerative colitis and present data concerning their demographic characteristics and outcomes.

L. Alevizos · M. M. Lirici (✉)
Department of Surgery, San Giovanni Hospital,
9, Via Amba Aradam, 00184 Rome, Italy
e-mail: marcomlirici@tiscali.it

Patients

A total of 34 patients underwent laparoscopic curved cutter rectal cancer transection in the period from June 2007 to March 2011, 28 patients after low anterior rectal resection (LARR) with total mesorectal excision (TME), 3 after restorative proctocolectomy (2 with J-pouch-anal anastomosis and 1 with ileorectal anastomosis), 1 after subtotal proctocolectomy with ileorectal anastomosis, 1 after left colectomy and 1 after Hartmann's procedure. The patients who underwent rectal transection by curved cutter were not selected, and the procedure was performed depending on the availability of the device.

All demographics, clinicopathological characteristics and surgical data are shown in Tables 1 and 2. There was no conversion to open surgery. Rectal transection by curved cutter was accomplished successfully in all cases. No alternative technique for rectal division was required in this series of patients. Postoperative complications were observed in 4 patients (12.5%). Two patients had subclinical anastomotic leaks that were demonstrated at the postoperative contrast enema but remained asymptomatic. Therefore, they were managed conventionally but the ileostomy closure was postponed. One patient developed a partial dehiscence of the suture line and fever resulting in an anastomotic stenosis identified at the endoscopy

Published online: 17 March 2012

Table 1 Demographics of a consecutive series of 34 patients who underwent laparoscopic surgery for rectal cancer or ulcerative colitis

Characteristic	Frequency	Percentage (%)
Age (years)	Mean: 65.9, range: 32–85	
Gender		
Male	18	53
Female	16	47
BMI		
<35 kg/m^2	30	88.2
>35 kg/m^2	4	11.8
ASA Score		
I	0	0
II	16	47
III	18	53
Diagnosis		
Rectal cancer	30	88.4
Sigmoid cancer	1	2.9
Ulcerative colitis	2	5.8
Ulcerative colitis with rectal cancer	1	2.9
Histologic Grade[a]		
Grade I	0	0
Grade II	30	93.8
Grade III	2	6.2
T[a]		
1	0	
2	10	31.3
3	20	62.6
4	2	6.1
N[a]		
0	15	46.9
1	13	40.6
2	4	12.5
TNM stage[a]		
I	8	25
II	7	21.9
III	17	53.1
IV	0	0
Postoperative complications		
Total	4	12.5
Subclinical anastomotic leak	2	6.25
Stenosis	1	3.1
Cardiovascular complications	1	3.1
Mortality	1	3.1

[a] Only for the patients with rectal cancer

Table 2 Surgical data of a consecutive series of 34 patients who underwent laparoscopic surgery for rectal cancer or ulcerative colitis

Type of surgery (%)	
Low anterior resection	28 (82.4)
Left colectomy	1 (2.9)
Total proctocolectomy	3 (8.9)
Subtotal proctocolectomy	1 (2.9)
Hartmann	1 (2.9)
Additional procedures	
Additional hysterectomy	2 (4.8)
Additional uretero–uretero anastomosis	2 (4.8)
Additional cholecystectomy	1 (2.9)
Duration of the procedure (min)	Mean: 221, range: 150–320
Low anterior resection	Mean: 218, range: 180–320
Left colectomy	150
Proctocolectomy	Mean: 267, range: 240–300
Hartmann	185
Lymph nodes retrieved	Mean: 13.7, range: 6–28
Lymph nodes positive	Mean: 1.7, range: 0–14
Distance of anastomosis from anal verge (cm)	Mean: 4.6, range: 3–6
Distance of tumor from distal margin (cm)	Mean: 4.1, range: 1–7

performed 1 month later, before ileostomy closure. The patient was treated with dilations resulting in almost complete recovery, and the ileostomy closure was performed in the 3rd postoperative month. One patient with a history of cardiovascular disease died in the intensive care unit on the fifth postoperative day due to acute myocardial infarction. Follow-up ranged from 50 days to 46 months. Two patients (5.8%) are alive with liver metastases that occured 4 months and 3 years after surgery, respectively. No other recurrence or death occurred.

Surgical technique

We routinely use a 3-port approach (three 10/12-mm trocars) for LARR, left colectomy or Hartmann's procedure and a 4-port approach (four 10/12-mm trocars) for restorative or subtotal proctocolectomy.

LARR starts with the mobilization of the splenic flexure by a combined medial-to-lateral and lateral-to-medial dissection. The gastrocolic ligament and the lateral attachments of the proximal third of the descending colon are divided. The dissection is continued bluntly along the avascular plane between Toldt's and Gerota's fascia. Hence, the inferior mesenteric vein is approached and divided at the Treitz level, right below the inferior margin of pancreas. Then the dissection is continued, mostly bluntly, following the vein's plane. The peritoneum over the right iliac vessels is opened and the retroperitoneal fat dissected upward to the inferior mesenteric artery. The artery is dissected free in a subadventitial fashion with a nerve sparing technique and is divided at 1 cm from its

origin. The mobilization of the descending and sigmoid colon is completed by continuing the posterior dissection along the plane of the embryonic attachment between Toldt's and Gerota's fascia. The posterior dissection of the rectum is carried on along the Heald's plane down to the pelvic floor and the rectum is carefully dissected free with TME. The anterior peritoneal reflection is opened and the seminal vesicles are visualized in male patients. The dissection is continued downward to the levator plane and the distal cylinder carefully dissected free.

The 10-mm trocar incision on the right inguinal region is extended medially up to 5 cm, and through this mini-laparotomy, a curved cutter (Contour™—Johnson & Johnson—New Brunswick, NJ, USA) is inserted according to a technique described by the authors in 2008 [3]: a ring-mounted sterile drape (Steri-Drape—3 M—USA) is introduced through the mini-laparotomy to protect the abdominal wall (Fig. 1). Then, the stapling device is inserted and the sterile drape is wrapped around its shaft and pulled up. Such a maneuver makes it possible to maintain enough pressure inside the peritoneal cavity to drive the curved cutter into the pelvis under laparoscopic guidance (Fig. 2). In this space, high-pressure pneumoperitoneum is not required for surgical maneuvers. The low rectum is encircled by the curved cutter that is slid down to the level of section, closed and fired. Once the rectum is divided, the large bowel is withdrawn through the mini-laparotomy, the resection completed and a laparoscopic-assisted double-stapled anastomosis is fashioned.

In restorative proctocolectomy, the trocars are inserted in the 4 abdominal quadrants right at the corners of an imaginary square. The first step is the dissection of the right colon up to the duodenum and the right flexure is mobilized. Then mobilization of the splenic flexure and division of the inferior mesenteric vessels is performed as previously described, but the artery is not divided flush the aorta to prevent a possible nerve injury. Right afterward, the mid-colic vessels are divided. The rectal dissection and transection by the curved cutter continue as described above. Finally, either a double-stapled J-pouch-anal canal anastomosis or an ileorectal anastomosis is performed.

After both procedures, a diverting ileostomy is fashioned to protect the anastomosis and/or the pouch.

Fig. 1 The ring-mounted sterile drape is wrapped around the curved cutter shaft and pull up to keep enough CO_2 pressure in the abdominal cavity

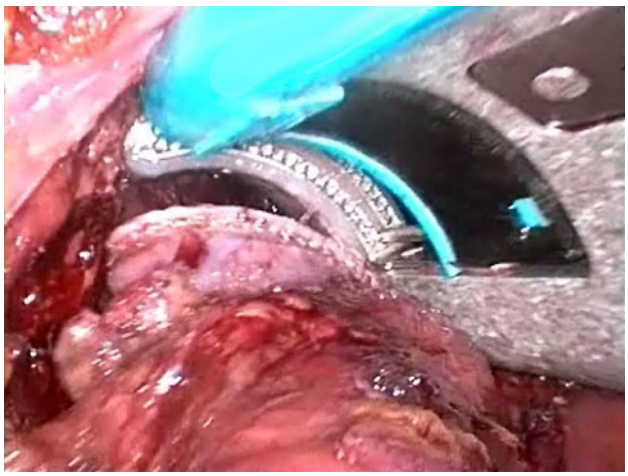


Fig. 2 A single-shot simultaneous rectal suture division with a uniform, horizontal stapling line and a symmetric rectum section is performed

Discussion

Rectal transection is a crucial step in LARR and in restorative proctocolectomy. Optimizing the rectal transection requires the following:

1. Leaving suitable margin of clearance
2. Having minimal or no staple line intersection as often occurs after multiple linear stapler applications leading to increased leak rates [4]
3. Having a sharp and clean suture line, perpendicular to the long axis of the rectum, avoiding approaching it at an oblique angle
4. Often applying the stapling device at the lowest level possible.

Stapling devices are usually used to perform visceral division in laparoscopic procedures. Laparoscopic low rectal division with endolinear staplers is often performed and was already been described in 1997 [5]. Nevertheless, laparoscopic linear staplers do not allow the surgeon to fully adhere to the principles mentioned above, due to the physical constraints of the laparoscopic approach.

The device used in our series of patients, a curved cutter originally designed for open surgery, can be also used in laparoscopic surgery with our technique to perform safer low rectal transection and double-stapled anastomosis ensuring a single-shot simultaneous rectal suture/division, a uniform horizontal stapling line and a symmetric rectum section [6, 7]. The device is inserted through a mini-laparotomy, which facilitates movements by providing a much higher number of degrees of freedom and preventing the fulcrum effect typical of the use of endolinear staplers inserted through a cannula, which is an important limiting factor in laparoscopic low rectal transection [8].

The ring-mounted sterile drape is an inexpensive devise that makes possible easy introduction of the curved cutter, when wrapped around the stapler shaft, maintains an adequate gas pressure for a sufficient exposure of the pelvis and does not hamper the movements of the stapler during the transection. Apart from the significantly lower cost, it presents further advantages compared to hand-assisted devices that may also be employed to introduce the curved cutter during laparoscopic procedures [6]:

1. The stapler shaft has a rectangular section, not compatible with most closure systems of the hand-assisted devices, which works better when instruments with a circular section are introduced, unless the disk is maximally tightened leading to a possible break.
2. Tightening the hand-assisted device too much to avoid gas leakage makes it difficult to drive the stapler because of friction.
3. Gel port devices are not compatible with the insertion of a curved cutter. The large slit required for inserting the loaded distal component of the device causes an high-flow air leak with consequent impairment of the endoscopic view.

We have also used flexible endolinear staplers that are the preferred devices in case of high rectal transection. These devices have the great advantage of an easier introduction during laparoscopic procedures but articulation may not be so useful in the deep pelvis caused due to the length of the articulating component in a narrow pelvis.

An alternative option to curved cutter rectal transection may be rectal division by a right angle linear cutter (RALC). This is a disposable device, which today is also available as a powered stapling system. We do not have a direct experience with these devices; nevertheless, their distal component is similar to that of standard TA staplers, the shape of which is not anatomical like that of curved cutters. The latter seem to have the theoretical advantage of following the contours of the low pelvis, thus ensuring an easier sliding of the instrument down to the level of rectal transection.

No difference in driving the curved cutter down to the pelvis was found between obese and non-obese patients. In our series, only 4 patients had a body mass index (BMI) higher than 35 kg/m^2, with the highest BMI being 44 kg/m^2. Obviously, the view in obese patients is always somewhat hampered by the exceeding fat. But it is a matter of internal fat not of subcutaneous fat. Once the ring-mounted sterile drape is inserted through the abdominal wall, even in obese patients, there is nothing that may impede the introduction of the stapling device.

The curved cutter is used in open cases as well, when we perform them. No comparative evaluation has been made and no objective data are available. In laparoscopic procedures, as opposed to open procedures it may be difficult to encircle the rectum with the curved cutter, which makes the complete dissection of the rectal cylinder mandatory. Furthermore, when a TME is performed, the transection takes place in the very low rectum, which is not very wide. Even though we found it easier to drive the device down to the point of rectal transection and encircle the rectum in open procedures, in experienced hands this maneuver may be accomplished without any difficulty using the laparoscopic approach. In most of our patients, the level of the anastomosis was pretty low (mean: 4.6 cm, range 3–6 cm) for both LARRs and restorative proctocolectomies.

Our preliminary results are interesting and seem to be associated with a minimal overall complication rate (12.5%), a very low incidence of postoperative subclinical leaks (6.25%) and partial anastomotic dehiscence (3.1%) after distal rectal transection compared to other reports [2], suggesting that the described technique is both feasible and safe in terms of postoperative outcomes. Our policy in low rectal anastomosis is to always perform a diverting ileostomy. It is not possible to say how much the presence of the ileostomy may impact on the relative low leakage rate, but the diverting ileostomy definitely makes the clinical course of complicated patients less challenging.

Neoadjuvant radiation therapy was administered to only 4 out of 28 patients who underwent low anterior resection for rectal cancer. A subclinical anastomotic leak occurred in one of these patients.

The limits of the present study are the small number of patients in the reported series, the lack of comparative data (laparoscopic versus open, curved cutter versus linear stapler rectal division), especially regarding the leakage rate, the short follow-up and local recurrence after cancer procedures. Further analysis of larger series and comparative studies are required for a definitive evaluation of this technique.

Conclusions

Our standard for colorectal resection in elective patients is the laparoscopic approach. Low rectal transection with a curved cutter may allow surgeons to accomplish such a

challenging step not only in open but even in laparoscopic procedures, providing a close to optimal closure/division of the rectal stump. The leakage rate after laparoscopic and open curved cutter rectal transection seems to be similar; furthermore, preliminary postoperative results show that the use of a curved cutter for laparoscopic low rectal division in selected patients may offer advantages compared to other current techniques.

References

1. Cheung HY, Chung CC, Li MK (2010) Laparoscopic anterior resection. Tech Coloproctol 14:45–49
2. Zhu QL, Feng B, Lu AG et al (2010) Laparoscopic low anterior resection for rectal carcinoma: complications and management in 132 consecutive patients. World J Gastroenterol 16:4605–4610
3. Lirici M, Califano AD (2007) Low section of the rectum using the Contour device: an alternative technique (letter). Surg Endosc 21:327–329
4. Ito M, Sugito M, Kobayashi A, Nishizawa Y, Tsunoda Y, Saito N (2008) Relationship between multiple numbers of stapler firings during rectal division and anastomotic leakage after laparoscopic rectal resection. Int J Colorectal Dis 23:703–707
5. Lezoche E, Paganini AM, Feliciotti F (1997) A new technique to facilitate laparoscopic resection of low rectal tumors. Surg Laparosc Endosc 7:9–12
6. Targarona EM, Balague C, Berindoague R et al (2007) Low section of the rectum during laparoscopic total mesorectal excision using the Contour device. Surg Endosc 21:327–329
7. Ishii Y, Hasegawa H, Nishibori H, Endo T, Kitajima M (2006) The application of a new stapling device for open surgery (Contour curved cutter stapler) in the laparoscopic resection of rectal cancer. Surg Endosc 20:1329–1331
8. Bergamaschi R, Essani R (2009) Laparoscopic resection for rectal cancer: are we there yet? Colorectal Dis 11:1–2