Double stapler technique in colorectal surgery


Abstract

Background: Colorectal surgery has evolved significantly during the last 35 years. The circular stapler and the double stapler techniques have favored the development of very low rectal anastomoses with reduction in anastomotic leakage. The objective of this study is to evaluate the functional results and complication rate of this surgical technique in the Department of Colorectal Surgery at the Hospital de Especialidades, Centro Médico Nacional Siglo XXI and at the Hospital Ángeles del Pedregal, both located in Mexico City.

Methods: Clinical records of patients who underwent surgery from May 1995 to December 2005 using the double stapler technique and performed by the authors were reviewed.

Results: The study included 142 patients, 55 of whom had rectosigmoid cancer resections. Average age was 60.1 years (male predominance 52.05%). The circular stapler most frequently used was CDH 33 (Johnson & Johnson). Average distance between the anal margin and the anastomoses for extended low anastomoses was 3.21 cm (low 7.8 cm and high 13.7 cm), and the rate of anastomoses leak was 3.52%.

Conclusions: Double stapler technique used to treat rectosigmoid pathology is safe, secure and assures intestinal continuity in low anterior as well as extended low anterior resections with primary anastomoses. In those patients with associated risk factors and low extended low anterior resection with primary anastomoses, we recommend performing a protective stoma (ileostomy).

Key words: anastomoses, double stapler, anastomotic leak.

Introduction

Colorectal surgery has evolved significantly in the last 35 years. The introduction in 1975 in Russia of surgical staplers (mechanical suture) mainly for low pelvic anastomosis has had a positive impact. The circular stapler has allowed surgeons to perform safer anastomoses at the level of the middle third and lower portion of the rectum without increasing the occurrence of leaks or anastomotic recurrence in resections due to rectal cancer. This decreases surgical time in comparison with manual anastomoses and improves quality of life with the possibility of sphincter preservation, mainly with cancer of the middle third and lower portion of the rectum as well as for intestinal inflammatory disease.
Other advantages associated with mechanical suture are a larger diameter of the anastomosis and less involvement and tension of the tissues, as well as inversion of the anastomotic margin, which decreases complications and, above all, dehiscence because it favors the scarring process.4-7

At present, the mechanism of the staple is better known. Tissues that remain around the anastomosis have better irrigation because the staples present a “B” configuration, allowing a better distribution of blood through the anastomosed tissues, thereby preventing ischemia and decreasing risk of dehiscence.1,4

The principal factor associated with complications and death after low resection of the rectum is anastomotic dehiscence. Pelvic contamination secondary to a leak may provoke a surgical site infection, pelvic abscess, peritonitis, stenosis of the anastomosis, creation of a permanent stoma, and even death.8-10

In a review by Fielding of the results of 23 centers in the UK, an incidence of anastomotic leak >20% was found, demonstrating that protective stoma did not decrease its incidence.8

In 1979, Goligher10 was able to decrease the incidence of anastomotic leak by use of the circular stapler; however, the incidence continued to be elevated (13%).

The technique of double stapling was described by Nance in 197911 when performing a gastroduodenal anastomosis. In 1983, Cohen12 significantly decreased the incidence of anastomotic leak in the low anterior resection procedure by using this technique. Knight and Griffen13 reported an index of clinical anastomotic leak of 0-4%, although in a small group of patients. The first report of mechanical suture in Mexico was performed in 1992 by Torres Valadéz et al. at the Hospital Central Militar with 82 patients subjected to anterior and low anterior resection, with good results.14

This technique has been generalized at present with few studies evaluating its use. Varma15 reported his experience in a series of 30 patients, with an incidence of anastomotic leak of 7%. In 1991, Moritz et al.16 compared the use of the single and double stapler on rectal anastomoses, reporting a rate of anastomotic leaks of 8.6% and 2.8%, respectively. In 1992, Baran et al.17 performed a review of 104 double stapling procedures, reporting an incidence of clinical anastomotic leak of 2.8%.

In Mexico there are no studies in which the results with the use of this technique have been reported. For this reason, we performed a review of our results during a 10-year period.9

**Materials and Methods**

Medical records of patients subjected to surgery by the authors using the double stapling technique were reviewed from the Servicio de Cirugía de Colon y Recto del Hospital de Especialidades Centro Médico Nacional Siglo XXI and in the Hospital Ángeles del Pedregal from May 1995 to December 2005, analyzing the following data: age, sex, time of surgery, transoperative hemorrhage, level of anastomosis in relation to anal margin, postoperative complications, devices used, anastomosis stenosis and surgical indication. The method used is descriptive and retrospective.

**Description of Technique**

In order to adequately understand the double stapling technique, we will carry out a brief description of the mechanical suture instruments (staplers) that are used in this procedure.

The curved circular stapler (CDH Ethicon, Johnson & Johnson, Mexico) has four diameters (CDH 25, 27, 29 and 33 mm) and has a double ring of staples and a circular knife incorporated in the cartridge, which produces circular stapling and cutting of intestinal borders with inversion at the time of performing the anastomosis.

The linear staplers (TL Ethicon, Johnson & Johnson)) apply two rows of titanium staples to approximate the internal tissues, with lengths of 30, 60 and 90 mm, requiring intestinal division distal to the line of staples. At present there is a new device (Contour, Ethicon, Johnson & Johnson) with two rows of double staples and a curved knife that cuts between them (30 mm) but a stapling length of 45 mm (due to curved design), which allows better access to the pelvic cavity. This permits lower resections,

**Figure 1.** Proctectomy or resection of the distal segment of the colon using an endostapler.
facilitating the procedure by not having to perform the intestinal cut manually and avoiding contamination on the distal and proximal mouths that remain closed.

The patient is placed in the Lloyd-Davies position to gain access to the abdominal cavity (surgeon) and perineum (assistant) simultaneously. After performing a correct dissection of the extraperitoneal rectum and perirectal fat (incorrectly called mesorectum), rectal dissection is performed at the level of the pelvic cavity using a linear endostapler that, depending on the characteristics of the pelvis and height of the anastomosis, may be 30 or 60 mm, suggesting using the Contour device18 (Figure 1).

The proximal circumferential colonic border or intestine to be Anastomosed is freed completely of pericolic fat for a distance of 1.0 to 1.5 cm, an anchoring stitch with 2-0 Prolene with a distance of 4-5 mm of its margin is made, the anvil is introduced and retracted in the stump of the proximal colon, knotting the anchoring stitch. The circular endostapler is then introduced (CDH 29 or 33) through the anus, lubricated with hydrosoluble jelly, in the closed position with the handle facing upwards. The instrument is advanced in the rectal remnant until reaching the previously placed staple line, being careful not to break this line. The trocar integrated to the endostapler is opened (assistant), obtaining it through the staple line with the assistance of an angle clamp by the surgeon. Once the anus is perforated, the anvil is articulated with the integrated trocar of the endostapler12,18 (Figure 2).

Once the anvil is articulated to the trocar of the circular endostapler, it is closed by turning the adjusting knob clockwise facing the two extremes. The surgeon should verify that on closing the device it is free of mesentery, vagina, bladder or any foreign structure. Once the device is closed completely and the pointer is found inside the control zone of tissue compression (green), the endostapler is fired, accomplishing the end-to-end double stapling anastomosis18 (Figure 3).

Once the firing is accomplished, the device is opened two and half turns (counterclockwise) and is completely extracted with gentle semicircular movements. Two distal and proximal “donuts” are immediately inspected and their integrity verified. Finally, a pneumatic test is carried out, which consists of placement of a Glassman clamp on the proximal portion of the anastomosis, filling the pelvic cavity with physiological solution insufflating air through the anus by means of rectosigmoidoscope or colonoscope in order to confirm permeability of the anastomosis as well as to identify leakage sites on performing pneumatic pressure. In case of leak the invaginating suture points should be repaired with 3-0 silk (needle RB-1) and the negative pressure test repeated.18,19

Results

One hundred forty two medical records were reviewed of patients who were subjected to rectosigmoid surgery and in whom the double stapling technique was performed. Average age was 60.1 years (minimum, 28 years; maximum, 82 years). There were 76 males and 70 females.

Fifty five cases (37.6%) were intervened for rectosigmoid cancer, 33 cases for complicated diverticular disease (22.6%), 20 cases of unspecified chronic ulcerative colitis (13.69%), 18 (12.32%) cases of colostomy closure (16 diverticular disease and 2 cancer of the middle third of the rectum), 9 cases for complete rectal prolapse (6.16%), ileorectal anastomosis due to colonic internia in two cases (1.36%), and one case, respectively, of rectovaginal fistula, rectal trauma, solitary rectal ulcer, multiple colonic polyposis, and sigmoid volvulus (0.68%).

Level of the anastomosis was divided into three groups: low extended (0-5 cm) in 47 cases with an average distance of 3.21 cm...
of the anal margin; low (6-10 cm) in 41 cases with an average of 7.8 cm of the anal margin; high (10-14 cm) in 58 cases and average distance of 13.7 cm.

With regard to surgical time, on average each surgery was 265 min (minimum, 106 min and maximum, 472 min). Transoperative hemorrhage was 429 mL (minimum, 100 mL and maximum, 1750 mL).

The caliber of the endostapler most frequently used was 33 mm in 79 cases (55.6%), 31 mm in 25 cases (17.6%), 29 mm in 31 cases (21.8%), 28 mm in 4 cases (2.8%) and 34 mm in 3 cases (2.1%).

Post-surgical complications were surgical site infection (8.5%), intestinal adhesions (4.8%) and with one patient requiring lysis of adhesions, 4.8% of the cases presented intraabdominal sepsis related to anastomotic leak in five patients (3.52%). Leaks were presented in low and high anastomoses because all anastomoses classified as low extended had protective bowel loop ileostomy performed.

Three patients presented hemorrhage at the level of the suture line (anastomosis) managed conservatively, with one patient requiring transfusion of two units of blood. One patient presented impotence secondary to injury of the sacral plexus nerve (rectal prolapse).

Among the late complications, there were nine cases of stenosis of the anastomosis (6.3%) of which four were managed with hydropneumatic dilation, two low extended with Hagar dilators, and two required surgical remediation due to failure of endoscopic management, one more was managed with fiber because it was asymptomatic. In this series we did not have failure of the stapling devices. In only one case the extractable anvil had to be obtained by rectosigmoidoscope because the device was opened too far at the time of extraction and remained above the anastomosis.

Discussion

The double stapling technique improves extraperitoneal approach of the rectum on facilitating performance of an anastomosis of the pelvic cavity (middle third and inferior of the rectum or at the level of the anus), if and when the anatomic planes are preserved at the time of performing dissection of the endopelvic fascia.

The largest series until now was published by Laxamana et al in 1990 with 28 cases. Both authors used the technique on patients with rectosigmoid neoplasia.

The principal parameter to evaluate with this technique is the incidence of anastomotic leak that has significantly decreased with the correct application of the technique, initial reports of 15% to present values of 3%. In this series we had an index of leaks of 3.52%, which was similar to that reported in the literature (Table 1).

Another important aspect to consider is stenosis of the anastomosis defined as the inability of passing a 19-mm diameter sigmoidoscope through the anastomosis, which has been reported in between 4.2 and 20% of the cases. In our study we had a frequency of stenosis of the anastomosis of 6.3% (9 patients), and two required surgical remodeling. This result may be because we did not perform an excessive cleansing of the mesentery adjacent to the anastomosis (>1.5 cm distal to the border) as well as performance of colorectal anastomosis with CDH 33 device and ileo-anal anastomosis, colo-anal and ileorectal with CDH 29 device in the majority of the cases.

The most important complication is anastomotic leak and the following risk factors should be taken into account in order to prevent it: low extended anastomosis (lower third of the rectum), inadequate blood supply and tension of the suture line principally associated with failure of splenic angle mobilization, preoperative radiotherapy, Hinchey IIB, III, IV, use of steroids for prolonged periods of time before surgery, age, nutritional status of the patient, pre- or postoperative shock, alcohol intoxication, liver failure and smoking.

With these risk factors, it will be necessary to evaluate performing a protection loop ileostomy. There are also factors inherent to the technique of double stapling itself such as not knowing how to use the instrument, mucosa and muscular injury caused by the anvil on introduction and extraction of the endostapler or on activation of its integrated trocar, and failure of the suture mechanism or cut of the endostapler, with this being less frequent. A point that needs to be kept in mind is the formation the so-called “dog ears,” which are located at the extremes of the suture line once the technique of double stapling has been carried out. Experimental studies carried out on dogs confirmed, after the application of determined intraluminal pressures, that this site may be a weak point of the anastomosis. We suggest they be invaginated with 3-0 silk whenever possible or to try to involve one of them with the circular endostapler. Another risk site of the anastomosis is its posterior face; however, we do not recommend routine reinforcement with silk sutures of the staple line, especially if there is a negative pneumatic test.14

Table 1. Index of anastomotic leaks

<table>
<thead>
<tr>
<th>Year</th>
<th>Author</th>
<th>Patients</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>1986</td>
<td>Cohen</td>
<td>79</td>
<td>8.0</td>
</tr>
<tr>
<td>1990</td>
<td>Varma</td>
<td>28</td>
<td>7.0</td>
</tr>
<tr>
<td>1991</td>
<td>Moritz</td>
<td>35</td>
<td>4.0</td>
</tr>
<tr>
<td>1992</td>
<td>Baran</td>
<td>104</td>
<td>3.5</td>
</tr>
<tr>
<td>1993</td>
<td>Redmond</td>
<td>111</td>
<td>3.0</td>
</tr>
<tr>
<td>1995</td>
<td>Laxamana</td>
<td>148</td>
<td>7.6</td>
</tr>
<tr>
<td>1995-2005</td>
<td>HECMNSXXI</td>
<td>142</td>
<td>3.52</td>
</tr>
</tbody>
</table>

HECMNSXXI, Hospital de Especialidades, Centro Médico Nacional Siglo XXI.
The remaining complications are the usual ones related to any surgical procedure. In this series, 7.9% of the patients presented intestinal occlusion and only one required intervention. Of the five cases of anastomotic leak, three were present in patients operated on for cancer of the middle third of the rectum and in whom dehiscence was radiologically corroborated. It was necessary to dismantle the anastomosis and perform a terminal stoma in all cases.

Although it is reported worldwide that, in diverticular disease of the colon, rectal resection is not necessary, a third of our patients required resection of the upper third and in some cases the mid-rectum, mainly due to stenosis and fibrosis of the rectal wall, which favored this technique for this type of pathology.

In conclusion, the double stapling technique for rectosigmoid pathology is safe and facilitates performance of low and extended low anastomoses by adequately trained surgeons on the pelvic cavity and familiar with mechanical suture.

In some patients, diverticular disease requires a resection of the superior third and even middle third of the rectum.

For anastomoses classified as extended low and in those that are low with associated risk factors (patient condition and/or stapling technique), a protective loop ileostomy should be performed.

We suggest that colorectal anastomoses be performed with CDH 33 device and ileo-anal anastomosis with CDH 29 device in an attempt to prevent stenosis.

Stenosis of the anastomosis is a complication that could be decreased by avoiding performing a cleansing of the mesentery above 1.5 cm of the margin to the anastomosis. Contamination of the pelvic cavity is minimal due because closed anastomosis is performed. Our results are similar to those reported in the literature.

References