Impact of Previous Abdominal Surgery on Colorectal Laparoscopy Results: A Comparative Clinical Study

Iván Arteaga González, MD, Antonio Martín Malagón, MD, Eudaldo M. López-Tomassetti Fernández, MD, Javier Arranz Durán, MD, Hermógenes Díaz Luis, MD, and Ángel Carrillo Pallares, MD, PhD

Abstract: To assess the results of laparoscopic colorectal surgery in patients who have previously undergone abdominal surgery. Between November 2002 and June 2004, 86 patients underwent laparoscopic surgery for colorectal disease at our hospital. Patients were divided into 2 groups depending on whether they had previously undergone abdominal surgery (previous surgery group, n = 27) or not (nonprevious surgery group, n = 59). Data were prospectively collected for statistical analyses of demographic, clinical, and histologic variables. Groups were comparable in age, body mass index, American Society of Anesthesiologists score, diagnosis, technique performed, and tumor size and distance to anal verge. There was no difference in perioperative complication rates. A higher conversion rate was found in the previous surgery group (26.1% vs. 5.1%, $P = 0.02$). In patients with tumor diseases, resection evaluations were no different regarding specimen length, distal and radial resection margins, or number of lymph nodes harvested. Laparoscopic colorectal surgery has proved to be a reliable technique for patients who have previously undergone abdominal surgery, its results comparable to those obtained with patients who have not.

Key Words: colorectal laparoscopy, previous abdominal surgery

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The reliability of laparoscopic surgery for treatment of colorectal disease has been proved, for both benign conditions and colorectal carcinoma.[1,2] A number of factors have, however, been related to poorer results of laparoscopic surgery.[3] In this sense, previous abdominal surgery was initially considered to be a contraindication for laparoscopic approaches, because of the difficulty it posed for exposure of the surgical field. Nowadays, thanks to technological breakthroughs and technical expertise acquired, in most groups it is not considered an excluding factor in patient selection.

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From the Department of Gastrointestinal Surgery, Hospital Universitario de Canarias (HUC), Canary Islands, Spain.
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Reprints: Dr Iván Arteaga González, Department of Surgery, Hospital Universitario de Canarias, Ofra, s/n. La Cuesta, 38320 La Laguna, Santa Cruz de Tenerife (e-mail: ivanhuc@hispavista.com/drtomassetti@wanadoo.es).

MATERIALS AND METHODS

A team established in November 2002 to implement laparoscopic colorectal cancer surgery in our department carried out operations. This team comprised 3 surgeons, 2 of whom were experienced in advanced laparoscopic surgery and open colorectal surgery and the third specifically trained at health centers of excellence for laparoscopic colorectal surgery (LCRS). All laparoscopic procedures were performed with 2 team members acting as the primary surgeon and first assistant.

Between November 2002 and June 2004, 86 patients undergoing laparoscopic surgery for both malignant and benign colorectal disease were included in a prospective database. Patients were divided into 2 groups: a previous surgery group (PSG) (n = 27), and a nonprevious surgery group (NPSG) (n = 59), according to whether or not they had a record of abdominal surgery before colorectal resection. Patients with perforation or obstruction symptoms, tumors and inflammatory masses larger than 8 cm by computed tomography scan, preoperative Dukes stage D, as well as those with early-stage rectal tumors requiring local surgery, were excluded from LCRS. Patients whose only surgical precedent was an appendectomy were also excluded.

Demographic, clinical, and pathoanatomical data variables for both groups were prospectively collected into a database. Variables regarding patient characteristics included age, sex, American Society of Anesthesiologists (ASA) score and body mass index. Clinical variables comprised operative data, operative time, blood loss and conversion rates, as well as data regarding return of peristalsis, introduction of oral intake, average hospital stay, and perioperative transfusion.

Data regarding perioperative morbidity, as well as readmission and re-operation were also collected. Pathoanatomical data such as specimen length, number of lymph nodes harvested, and radial and distal margins were analyzed in patients with tumor pathology.

Quantitative variable results are expressed in mean/standard deviation. Categorical variable results are expressed as percentages. Age, tumor size and location,

body mass index, ASA score, and previous abdominal surgery were controlled to avoid confounding factors.

Group comparisons (PSG/NPSG) for quantitative variables were carried out using Student *t*-test. Group comparisons (PSG/NPSG) for categorical variables were carried out with χ^2 or Fisher exact test.

Statistical analyses were carried out using the SPSS 11.0.1 statistical package.

Surgical Technique

All patients were prepared with a lavage solution the day before surgery and received antibiotic prophylaxis during anesthetic induction.

All surgical procedures were performed under general anesthesia. Patients were placed in the supine position when disease affected the right colon and in the Lloyd Davis position (with the legs spread but not angled too steeply to provide unlimited access to the anus while avoiding interference with the insertion and handling of the laparoscopic instruments) for left colon diseases.[4] Pneumoperitoneum to a pressure of 14 mm Hg was achieved through the umbilicus with a Veress needle. In the PSG, when the patient had a midline laparotomy, the Veress needle was inserted at the inferior edge of the left thoracic side. Four trocars were placed for right hemicolectomy and sigmoidectomy. Two additional trocars, 1 subxiphoid and 1 suprapubic, were used for rectal procedures. The surgical technique was identical for benign and malignant disease colectomies, initial vascular control being carried out with a linear vascular stapler, and followed by a medial-to-lateral dissection with an ultrasound scalpel. Specimens were extracted for extracorporeal resection in all cases and, whereas left-side colectomies had intracorporeal anastomoses, for right-sided colectomies they were extracorporeal.

Patients in both groups received identical perioperative care.

RESULTS

Ninety-eight patients were assessed for study inclusion. Five patients were excluded from the study: 2 with tumors larger than 8 cm, 1 of them with a very large inflammatory mass owing to complicated Crohn disease, 1 because of invasion of the bladder, and 1 as a local surgery candidate because of an early stage rectal tumor. Seven patients whose only abdominal surgery precedent was a McBurney incision were also excluded.

In the PSG, 19 patients had undergone midline laparotomies by different procedures. A further 4 had more than 1 laparotomy incision. Twenty-five patients (92.6%) had abdominal wall adhesions complicating surgical access and 19 had visceral adhesions (70%) hindering dissection (Table 1).

The proportion of women was greater in the PSG (63.0% vs. 33.9%, $P = 0.01$). Both groups were comparable in age, ASA score, surgical difficulty of the technique performed, and proportion of patients with malignant diseases, tumor size and distance to anal verge in rectal tumors (Table 2).

TABLE 1. Incision Distribution in PSG Patients

Incision Type	No. Patients (%)
Midline	19 (70.4)
Supraumbilical	6 (22.2)
Infraumbilical	10 (37.0)
Suprainfraumbilical	3 (11.1)
Mc Burney*	4 (14.8)
Laparoscopy	2 (7.4)
Pararectal	1 (3.7)
Subcostal	3 (11.1)
Pfannenstiel	2 (7.4)

*Patients with a McBurney incision as a second incision.

There was no difference between groups regarding operative time, blood loss, proportion of patients who required transfusions, return of peristalsis, introduction of oral intake, or hospital stay (Table 3).

There were also no differences in mortality, intraoperative (Table 4), and postoperative complication rates. The conversion rate was higher in the PSG (Table 5).

The causes for patient conversion in both groups are shown in Table 6.

A series of histologic parameters were studied to assess the adequacy of oncologic resection in cancer cases (Table 7). In cases with malignant disease, there were no differences in colectomy length or number of lymph nodes harvested, or in the distal and radial resection margins in rectal carcinoma cases.

DISCUSSION

The reliability of laparoscopy for the treatment of colorectal disease has been proved by various prospective studies, offering the postoperative clinical advantages, which had already been proven in laparoscopic cholecystectomy,[5] while also achieving oncologic results for

TABLE 2. Group Comparison

	PSG (n = 27) (%)	NPSG (n = 59) (%)	Difference (*P* Value)
Age (yr)	63.2 ± 15.6	65.3 ± 13.9	NS
BMI (kg/m^2)	24.5 ± 3.3	26.0 ± 2.9	NS
ASA score	2.1 ± 0.8	2.1 ± 0.9	NS
Technique			
Sigmoidectomy	4 (14.8)	14 (23.7)	NS
Right colectomy	10 (37.0)	9 (15.3)	0.02
Left colectomy	1 (3.7)	4 (6.7)	NS
TME†	6 (22.2)	15 (25.4)	NS
HAR†	1 (3.7)	8 (13.6)	NS
Total abdominal colectomies	2 (7.4)	4 (6.8)	NS
Others	3 (11.1)	5 (8.5)	NS
Tumor size (cm)*	3.7 ± 1.5	3.5 ± 1.4	NS
Distance to anal verge (cm)†	7.2 ± 4.4	9.2 ± 4.6	NS
Adenocarcinoma	16 (59.3)	44 (74.6)	NS

BMI indicates body mass index; TME, total mesorectal excision; HAR, high anterior resection.

*Adenocarcinoma cases.

†Rectal carcinoma cases.

TABLE 3. Perioperative Clinical Results

	PSG (n = 23)	NPSG (n = 47)	Difference (*P* Value)
Operative time (min)	222.9 ± 75.4	199.0 ± 71.8	NS
Blood loss (mL)	212.9 ± 151.6	180.6 ± 136.6	NS
Peristalsis (h)	37.9 ± 21.6	37.1 ± 15.1	NS
Perioperative transfusion (n) (%)	3 (13.0)	7 (14.9)	NS
Introduction oral intake (h)	55.9 ± 31.0	52.0 ± 17.5	NS
Hospital stay (d)	6.3 ± 3.4	7.6 ± 4.2	NS

cancer resections comparable to those of conventional surgery.[1,2] However, pregnancy, obesity, cirrhosis, and previous abdominal surgery had initially been considered to be absolute contraindications for performing laparoscopic techniques.[6] These contraindications have become more relative thanks to the improvement of surgical instruments and the expertise gained with other complicated procedures such as colorectal surgery.

After previous laparotomy, 75% of patients develop adhesions. Of these, 96% involve the omentum and in 29% they are found between the intestinal loops.[7] These are most frequent with midline laparotomies. In a retrospective analysis of 406 patients, closed access, using a Veress needle and a first trocar placed at the umbilicus, was related to a greater number of vascular and visceral events, owing to abdominal wall adhesions.[8]

Although in some randomized studies[1,2] on LCRS the proportion of patients with a record for previous abdominal surgery was significant, this factor had not been independently analyzed. Some studies have assessed the impact of previous abdominal surgery on laparoscopic surgery results. Recent comparative research has related previous upper abdominal surgery with an increase in conversion rates, operative time, wound infection, and hospital stay for laparoscopic cholecystectomy.[9] However, other authors have not found such differences.[10]

The impact of previous surgery on LCRS has not been researched, although various factors, related to the team's experience on the one hand and patient characteristics on the other, have been related to poorer short-term results of LCRS.

The surgical team's experience is an important factor in LCRS results, because of the need of a learning curve, that is yet to be properly defined and which

TABLE 4. Intraoperative Complication Rates

	PSG (n = 23) (%)	NPSG (n = 59) (%)	Difference (*P* Value)
Intraoperative complications	3 (11.1)	4 (6.8)	NS
Vascular injury	1 (4.3)	0 (0.0)	—
Tumor not located	1 (4.3)	0 (0.0)	—
Rectal perforation	1 (4.3)	1 (1.7)	—
Intestinal perforation	0 (0.0)	1 (1.7)	—
Bleeding	0 (0.0)	1 (1.7)	—
Inadequate margin	0 (0.0)	1 (1.7)	—

TABLE 5. Postoperative Complication Rates

	PSG (n = 23) (%)	NPSG (n = 59) (%)	Difference (*P* Value)
Postoperative complications*	9 (39.1)	23 (38.9)	NS
Wound infection	2 (8.7)	9 (15.2)	—
Ileus	2 (8.7)	3 (5.1)	—
Urodynamic problems	1 (4.3)	3 (5.1)	—
Anastomotic leakage	1 (4.3)†	3 (5.1)†	—
Intestinal occlusion	0 (0.0)	1 (1.7)	—
Diarrhea	0 (0.0)	1 (1.7)	—
Hernia	0 (0.0)	1 (1.7)	—
DVT	1 (4.3)	0 (0.0)	—
Others	2 (8.7)	2 (3.4)	—
Reoperation	1 (4.3)	4 (6.8)	NS
Readmission	2 (8.7)	3 (5.1)	NS
Mortality	1 (4.3)	0 (0.0)	NS
Conversion	6 (26.1)	3 (5.1)	0.02‡

DVT indicates deep venous thrombosis.
*Proportion of patients with postoperative complications.
†Reoperation cases.
‡Equal variances assumed.

different authors situate between 10 and 60 colectomies to obtain optimum results in colon surgery. As such, intraoperative complication rates have been reported to be between 4% and 29% during the learning stage and below 10% thereafter, whereas conversion rates recorded are around 30% in the first case and below 15% thereafter.[11]

In this sense, Bennet et al[12] found that, over a total of 1194 patients, surgeons who had performed less than 40 procedures had a higher rate of intraoperative and postoperative complications, especially when the level of difficulty was higher. Operative time is also reduced with the acquisition of technique experience.[11]

Patient selection is also essential for LCRS results, and in certain randomized trials having undergone previous abdominal surgery has been a reason for exclusion, because it poses an added difficulty during exposure and dissection. Around 35% of patients with colorectal disease who are to undergo surgery have a history of abdominal surgery, the proportion being higher

TABLE 6. Summary of Reasons for Conversion to Open Surgery

	PSG (n = 6)	NPSG (n = 3)
Difficulties with exposure	0	1
Obesity		
Intraoperative complication	2	0
Vascular injury*	1 (cIMI)	
Rectal perforation*	1 (cIMI)	
Difficulties with dissection	4	2
Failed stapling	2 (cIMI)	2
Inflammatory mass	1 (cIMI)	0
Non-localized tumor*	1 (cS-IMI)	0

cIMI indicates conversion to infraumbilical incision; cS-IMI, conversion to suprainfraumbilical incision.
*Conversions related to the presence of adhesions.

TABLE 7. Histological Examination of Patients

	PSG (n)	NPSG (n)	Difference (*P* Value)
Specimen length (cm)	21.0 ± 4.7 (16)	20.9 ± 8.4 (44)	NS
No. lymph nodes	6.5 ± 6.3 (16)	4.5 ± 3.4 (44)	NS
Distal margin of resection (cm)*	2.4 ± 1.8 (7)	3.7 ± 1.2 (23)	NS
Radial margin (cm)*	0.6 ± 0.3 (7)	1.1 ± 1.0 (23)	NS

*Rectal carcinoma cases.

in women because of the incidence of gynecologic surgery.[1,2] Previous abdominal surgery, obesity, and bulky tumor masses are the most frequent reasons for LCRS contraindication. Adhesions, in 15% to 30% of cases according to references, are the main cause for conversion.[13,14] In cholecystectomy, this is considered to be a typical predictive factor.[3] In our research, previous abdominal surgery has been related to a higher conversion rate. A number of studies have related conversion to worsened LCRS results. Slim et al[15] reported morbidity rates of over 50% in converted cases against 21% in patients who underwent planned conventional surgery. Other authors, such as Marusch et al,[14] confirmed these results, encountering increased morbidity (47.7% vs. 26.1%) and mortality (3.5% vs. 1.5%) in 86 patients converted to open surgery, from a total of 1658 patients. In our study, conversions were not related to the learning curve. Despite an increased number of conversions in the PSG, perioperative results were not significantly affected when compared with the NPSG.

In none of the cases were adhesions complicating surgical field exposure the cause of conversion. They were, however, directly related to the cause for conversion in 3 patients with midline incisions: in 1 patient with an infraumbilical scar, the terminal ileum wall adhesions caused an injury to the iliac artery; in another patient with sigmoid cancer and an infraumbilical laparotomy, visceral adhesions prevented identification of the correct resection plane and contributed to the perforation of the rectum; finally, in a transverse colon tumor patient with a suprainfraumbilical scar, adhesions prevented tumor localization and we had to convert to a standard laparotomy. We think that midline incisions cause more difficult access for laparoscopic approach than others (Subcostal, Pfannestiel), because adhesions are usually located close to the camera and the instruments will not have adequate working space.

Many studies have compared various histologic parameters between laparoscopic and conventional colorectal cancer surgery, with comparable results for colon cancer[1,2] and differing results for rectal cancer.[16,17] Our pathoanatomic study of patients indicates that previous abdominal surgery, despite dissection difficulty, does not have an influence on oncologic adequacy of resection.

Our study has some disadvantages. The reduced number of patients does not allow valid conclusions to be drawn regarding some of the variables we believe may be influenced by adhesions, such as operative time and blood loss. However, the sample size is enough to assess the results of LCRS in patients who have previously undergone abdominal surgery.

To conclude, our research results suggest that laparoscopy is as safe and effective in the treatment of colorectal disease for patients with previous abdominal surgery as it is for those without surgical backgrounds.

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