

Outcomes of 4744 patients from the Laparoscopic Colorectal Surgery Brazilian Registry

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ABSTRACT

Background: Since its introduction, laparoscopic colorectal surgery has raised intense debate and controversies regarding its safety and effectiveness. **Methods:** This multicentric registry reports the experience of 28 Brazilian surgical teams specialized in laparoscopic colorectal surgery. **Results:** Between 1992 and 2007, 4744 patients (1994 men – 42% and 2751 women – 58%) were operated on, with ages ranging from 13 to 94 years (average 57,5 years). Benign diseases were diagnosed in 2356 patients (49,6%). Most diseases (50,7%) were located in the left and sigmoid colon, 28,2% in the rectum and anal canal, 8,0% in the right colon and diffuse 7,0%. There were 181 (3,8%) intraoperative complications (0% to 14%). There were reported 261 (5,5 %) conversions to laparotomy (0 to 16,5%), mainly during the early experience (n=119 –59,8%). Postoperative complications were registered in 683 (14,5 %) patients (5,0% to 50,%). Mortality occurred in 43 patients (0,8%). Surgeons who performed less than 50 cases reported similar rates of intraoperative (4,2% vs. 3,8%; p=0,7), postoperative complications (20,8% vs. 14,3%; p=0,07) and mortality (1,0% vs. 0,9%; p=0,5), but the conversion rate was higher (10,4% vs. 5,4%; p=0,04). Two thousand, three hundred and eight nine (50,4%) malignant tumors were operated on, and histological classification showed 2347 (98%) adenocarcinomas, 30 (0,6%) spinocellular carcinomas and 12 (0,2%) other histological types. Tumor recurrence rate was in 16,3% among patients followed more than one year. After an average follow-up of 52 months, there were reported 19 (0,8%) parietal recurrences, eighteen of which in port sites and one in a patient with disseminated disease. There was no incisional recurrence in the ports used to withdraw the pathologic specimen. Comparing to other registries, there was a 75% increase of number of groups performing laparoscopic colorectal surgery and a decrease in conversions (10,5% to 5,5%) and mortality (1,5% to 0,9%) rates. **Conclusions:** 1) the number of operated patients increased expressively during the last years; 2) operative indications for benign and malignant diseases were similar, and diverticular disease of the colon comprised 40% of the benign ones; 3) conversion and mortality rates decreased over time; 4) surgeon's experience didn't influence complication rates, but was associated with a lower conversion; 5) oncological outcome expressed by recurrence rates showed results similar those reported in conventional surgery.

Key Words: laparoscopic colorectal surgery; laparoscopic colectomy; laparoscopic resection.

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INTRODUCTION

During the last years, the acquisition of experience and the continuous development of laparoscopic techniques allowed the performance of more complex procedures. In this context, laparoscopic resections have been safely performed in obese patients, in the setting of acute diverticulitis and in the management of inflammatory bowel diseases.

Short-term benefits of the laparoscopic approach have been extensively reported in retrospective and prospective studies and metanalysis^{1,2}. Furthermore, it has been recently demonstrated that it is clearly possible to perform radical surgery for colorectal tumors following all the oncological

principles advocated in conventional surgery^{3,4,5}. These advances lead to the diffusion of laparoscopic techniques among general and colorectal surgeons and changed the skepticism that predominated during the early 90s.

In Brazil, the importance of the learning curve and the acquisition of technical skills⁶ have been extensively discussed during medical courses and congresses. Since 1999, the Brazilian Societies of Coloproctology and Videosurgery have divulged the results of National Registries in Laparoscopic Colorectal Surgery^{7,8,9,10,11}. Following this tendency, the publication of the present work aims to report the experience of many Brazilian groups and to compare these data with that reported in the international

literature. Furthermore, we will provide a comparison with the previous Brazilian registries.

PATIENTS AND METHODS

At the beginning of 2007, we sent a written invitation to 28 Brazilian surgeons with known experience in laparoscopic colorectal surgery in order to participate in the National Registry by sending their individual results to be grouped in a unique data bank. All participants had already undergone surgical training to acquire technical skills and have also received certificates of specialization from the Brazilian Societies of Coloproctology and Videosurgery.

After answering the survey, the surgeons did not have any access to the results of other groups nor had the opportunity to change the data that had been already sent. Methods of retrieving and reporting results were identical to our previous National Registry reported in 2001.

Surgeons were asked to send the following data: number of operated patients, sex and age, type and localization of disease, operative procedures, intra and postoperative complications, percentage and causes of conversion, mortality, histological data and rates of global and parietal recurrence.

According to this solicitation, we received data from 28 surgical teams from different states. Besides evaluating these results, we established a comparison with previous data already published.

RESULTS

A total of 28 surgical teams sent their operative results, revealing that 5259 patients had been operated on from 1992 to 2007 in different Brazilian states. Two surgical groups were excluded from the total number due to incomplete clinical and surgical data. Thus, the present series comprises 4744 patients.

The number of patients operated by each surgical team varied from 8 to 723. Only six groups reported less than 50 cases in their individual series, comprising 96 patients. Other 22 teams had operated more than 50 cases, totalizing 4648 patients in the experienced group. The vast majority of the groups had treated more than 100 patients each.

There were 1994 men (42%) and 2750 women (58%) with ages ranging from 13 to 94 years (average 57,5 years).

Benign and malignant diseases were diagnosed in 2355 (50,4%) and 2389 patients (49,6%), respectively. The topographic distribution of diseases in colonic segments, the surgical procedures and a complete list of the diseases are presented in tables 1, 2 and 3. Regarding topography, the majority of the diseases (50,7%) was found in the left colon and sigmoid, 28,5% in the rectum/anal canal, 8,1% in the right colon and 1,6% in the transverse colon.

Table 4 presents total number, percentage e variations among surgical teams regarding complications, conversions and mortality. Table 5 contains the list of 180 (3,8%) intraoperative complications that ranged from 0% to 14% among the different series. There were reported 261 (5,5%) conversions to laparotomy (Table 6), with numbers varying from zero to 16,5%. There were registered 683 (14,5 %) postoperative complications (Table 7) that varied from 5,0 to 54,9%.

The comparison between surgeons with less or more than 50 cases (Table 8) revealed no statistical differences regarding intraoperative complications (4,2% vs. 3,8%; $p=0,7$), postoperative complications (20,8% vs. 14,3%; $p=0,07$) and mortality (1,0% vs. 0,9%; $p=0,5$). But the conversion rate was significantly lower in the group of patients operated by experienced surgeons (5,4% vs. 10,4%; $p=0,04$).

There were operated 2389 (50,2%) malignant tumors classified as adenocarcinomas [2347 (98%)], spinocelular carcinomas [30 (0,6%)] and other histological types [12 (0,2%)]. Most of them were localized in the left/sigmoid colon and rectum (Table 9). According to the Astler and Collier classification obtained from 2255 tumors, there were 12,2% in stage A, 39,5% in stage B, 37,3% in stage C and 5,3% in stage D (Table 10).

Table 1 – Topographic distribution of colorectal diseases.

Topography	Number	%
Left colon and sigmoid	2407	50,7
Rectum	1339	28,2
Right colon	379	8,0
Diffuse disease	337	7,0
Transverse colon	74	1,5
Anal canal	14	0,3
Other	194	5,2

Table 2 – Number and list of operative procedures.

Operative procedure	Number	%
Anterior resection	1597	33,7
Sigmoidectomy	752	16,0
Right Colectomy	507	10,6
Abdominoperineal resection	332	7,0
Left Colectomy	314	6,5
Duhamel's operation	213	4,5
Hartmann's Reconstruction	210	4,4
Total Colectomy with ileorectal anastomosis	163	3,3
Rectopexy	119	2,5
Total Proctocolectomy with ileal pouch	111	2,3
Colon pull-through	108	2,3
Colostomy / ileostomy	84	1,8
Transverse colon resection	40	0,8
Resection of terminal ileum	24	0,5
Enteroraphy	20	0,4
Others	150	3,4
Total	4744	100

Post-operative follow-up ranged from 1 to 144 months among surgeons (average 52 months). There was a global recurrence rate of 16,3% among 2170 patients with follow-up greater than 1 year (Table 11). Parietal recurrence was detected in 19 (0,8%) patients, being 18 at the trocar insertion and 1 in a patient with

advanced disease. There were no recurrences at the incision made to withdraw the resected bowel.

When comparing the present and previous Brazilian Registries^{7,8,9,10,11} one may note that since the 2001 series (with 16 surgical teams), the number of groups that routinely perform laparoscopic

Table 3 – Number of benign diseases.

Local	Number	% of the series	% of benign diseases
diverticular disease	961	20,2	39,4
chagasic megacolon	325	6,8	14,8
endometriosis	158	3,3	6,7
Hartmann's reconstruction	197	4,1	8,3
polyps	132	2,7	5,6
rectal prolapse	129	2,7	5,4
Crohn's disease	97	2,0	4,1
ulcerative colitis	85	1,7	3,6
familiar adenomatous polyposis	79	1,6	3,3
colonic inertia	36	0,7	1,5
perforation	20	0,4	0,8
lipoma	9	0,2	0,4
angiodisplasy	6	0,1	0,25
others	116	2,4	5,0
Total	2356	49,6	100

Table 4 – Number and percentage of complications, conversions and mortality.

Event	Number		Variation	
	N	%	Minimal	Maximum
Intraoperative complications	180	3,8	0,0	14,0
Postoperative complications	683	14,5	5,0	54,9
Conversions	261	5,5	0	16,5
Mortality	43	0,9	0	2,8

Table 5 – Types of Intraoperative Complications.

Complications	Number	% of patients	% of complications
vascular injury (abdominal cavity)	52	1,0	28,8
Small bowel injury	44	1,0	24,4
Colon and rectal injury	20	0,5	11,1
Ureter injury	16	0,2	8,3
vascular injury (abdominal wall)	10	0,2	5,5
others	32	0,6	17,6
Total	181	3,8	100,0

Table 6 – Number, percentage and causes of conversion to laparotomy.

Causes	Number	% of patients	% of conversions
Technical difficulty	68	1,4	26,0
Intestinal adhesences	53	1,1	20,3
Fixed tumor	38	0,8	14,5
visceral injuries	9	0,2	3,5
hemorrhage	40	0,8	15,2
Ureter injury	8	0,17	3,0
Prolonged operative time	9	0,2	3,5
Impossibility of oncological surgery	7	0,17	2,7
others	14	0,3	5,3
Total	261	5,5	100,0

colorectal surgery increased 75% (28 teams), leading to a significant increase in the number of operated patients from 1843 to 5259 (real increase of 185%).

From 1991 until 2007, we found an average of 328 operations per year. However, when looking separately to different periods, it is easy to see that this number rose from 184 patients/year during 1991-2001 to 570 patients/year during 2001-2007. Regarding the experience with the laparoscopic approach, 18 (64%) groups have performed colorectal procedures

for more than ten years, and 22 surgical teams (78,5%) have treated more than 50 patients.

The evaluative analysis of the numbers presented in Table 11 shows that surgical indications of benign diseases remained stable until 2003, representing, today, half of the procedures performed due to the increasing number of colorectal tumors. It is also evident that diverticular disease is still the most common benign disease corresponding to approximately 40% of the indications in this group.

Table 7 – Number, percentage and causes of postoperative complications.

Complications	Number	% of patients	% of complications
abdominal wall infection	212	4,5	31,0
fistula / leakage	134	2,8	19,6
cardiopulmonar problems	47	1,0	7,0
abdominal abscess	42	0,9	6,1
intestinal obstruction	34	0,7	5,0
incisional hernia	26	0,5	3,8
prolonged ileus	32	0,7	4,7
anastomotic stenosis	25	0,5	3,8
hemorrhage	22	0,4	3,2
urinary retention	18	0,4	2,6
urinary infection	13	0,2	1,9
others	78	1,6	11,2
Total	683	14,5	100,0

Table 8 – Comparative results between groups with less than and more than 50 operations.

Outcome	Less than 50 cases		More than 50 cases		P value
	N	Per cent	N	Per cent	
intraoperative complications	4	4,2	176	3,8	0,7
postoperative complications	20	20,8	663	14,3	0,07
operative mortality	01	1,0	42	0,9	0,5
conversions to laparotomy	10	10,4	251	5,4	0,04 *
total	96		4648		

*Statistical significance.

The registries of morbidity showed average rates of 4% for intraoperative and 15% for postoperative complications; the latter varied from 13% to 20% during recent years. On the other hand, mortality and conversion rates have presented a tendency to decrease from 1,5% to 0,9% and from 10,5% to 5,5%, respectively.

Regarding oncological results, the global recurrence rates among 2170 patients with follow-up greater than 12 months was 16,3% in average. In these patients, parietal recurrence was detected in less than 1% in all the individual series (average 0,8%).

DISCUSSION

Since its introduction in 1991, the perspectives of laparoscopic approach in the treatment of colorectal diseases have been continuously evaluated. Although initially severely criticized, the accumulated experience

during the last 17 years established its advantages, benefits and limitations. For example, laparoscopic procedures are now considered the ideal method of access to perform a colostomy or the resection of benign diseases such as polyps and non-complicated diverticular disease^{12, 13}.

Today, the recognition of its limitations raises the importance of an adequate preoperative preparation and selection of patients with less risk of complications and conversion, thus saving the conventional approach to those situations associated with greater technical demand. Such difficult clinical settings would be multiple previous abdominal surgery, complicated inflammatory diseases, complex intestinal fistulas, fixed and bulky tumors and other less common conditions^{14, 15}. Furthermore, the acquisition of technical skills in the areas of coloproctology and advanced laparoscopy is essential to achieve a better outcome.

Table 9 - Localization and percentage of malignant tumors.

Localization	Number	% of all patients	% of all tumors
Left colon/ sigmoid	712	15,0	29,8
Upper rectum	573	12,0	24,0
Distal rectum	376	8,0	15,7
Medium rectum	252	5,3	10,5
Right colon	368	7,7	15,4
Transverse colon	74	1,5	3,0
Anal canal	14	0,3	0,6
Diffuse	14	0,3	0,6
Sincronic lesion	4	0,08	0,16
Terminal ileum	2	0,04	0,08
Total	2389	50,3	100

Table 10 – Histological classification.

Astler & Coller	Number	
	N	%
A	293	12,2
B	941	39,5
C	892	37,3
D	129	5,3
Indetermined	129	5,3
Total	2389	

N = number.

As reported before, the average number of treated patients raised from 184/year during 1991-2001⁹ to 570/year during 2001-2007; moreover, 64% of the surgeons have performed laparoscopic colorectal procedures for more than 10 years. This data indicate that the laparoscopic surgical teams in our country have an enormous experience with this approach thus favoring proper postoperative results.

When comparing the last⁹ and the present National Registry, it is easy to note an increase in cancer patients that represented 39,8% and 50,4% of the total cases, respectively. Consequently, the

Table 11 – Evolutive Results of Brazilian Registries.

Year authors	1998 Souza JV Regadas FS	2001 Campos FG	2003 Ramos JR	2007 Valarini R Campos FG
Number of patients	1161	1843	2154	4744
diseases				
benign	690 (59,4 %)	1109 (60,2 %)	1242 (57,7 %)	2355 (49,6 %)
cancer	471 (40,5 %)	734 (39,8 %)	912 (42,3 %)	2389 (50,4 %)
DDC	216 (18,6 %)	369 (33,3 %)	411 (33,1 %)	960 (39,4 %)
Complications				
Intraop	42 (3,6 %)	73 (4,0 %)	104 (4,8 %)	180 (3,8 %)
Postop	148 (12,7 %)	367 (20 %)	369 (17,1 %)	683 (14,5 %)
Conversion	122 (10,5 %)	199 (10,6 %)	177 (8,2 %)	261 (5,5 %)
Mortality	18 (1,5 %)	29 (1,6 %)	25 (1,1 %)	43 (0,9 %)
recurrence				
global		83 (14,0 %)	105 (18,3 %)	354 (16,3%)*
portal		3 (0,5 %)	3 (0,5 %)	19 (0,8%)*

DDC = diverticular disease of the colon.

*In 2170 patients with follow-up greater than 12 months.

management of benign diseases decreased to half of the operations (49,6%). Probably, this change into a more frequent indication for cancer patients is due the accumulation of surgical experience and to the recognition that the laparoscopic approach can provide an effective oncological resection^{1; 3, 16, 17, 18, 19, 20, 21}.

It is also important to note that the rate of portal or parietal recurrences remained stable in the present series (0,8%) comparing to the previous registry (0,5%)⁹. These rates are within the range of 0,5 to 2,5% observed after conventional resections^{22, 23, 24} and are also comparable to other published laparoscopic series²⁵. In a revision of 12 prospective and randomize studies, Martel e Boushey²⁶ observed that the parietal recurrence rate varied from 0% to 0,94% among 2342 patients submitted to laparoscopic operations. The data support the current idea that parietal recurrence is associated with the advanced nature of certain neoplasms and / or inadequate operative technique²⁷.

During an average follow-up of 52 months (1 to 144), there were detected tumoral recurrences in 15,3%. The majority of them were diagnosed during the first 48 months after surgery, similarly to what occurs in conventional surgery^{7, 28, 29, 30}. In the Italian Registry published in 2001, Silecchia et al³¹ reported recurrence rates of 18,5% and 12,7% for patients with rectal or colon cancers, respectively.

Besides cancer (50,4%), the most frequent operative indications in this series were diverticular disease (20,2%), chagasic megacolon (6,8%), endometriosis (6,4%), benign polyps (5,4%) and Hartmann's reconstruction (4,4%). As shown in Table 3, the treatment of inflammatory bowel diseases (3,8%) and rectal prolapse (2,5%) were less commonly performed. The most common operative procedures were sigmoidectomies and anterior resections (49,5%), while total colectomy (3,3%), proctocolectomy (2,3%) and rectopexy (2,5%) were less commonly indicated. These numbers are related to the incidence of each colorectal disease and to the selection of patients / procedures to be operated through the laparoscopic access.

Although indicated in only 1,8% of the patients, laparoscopic stoma is now considered a safe and simple procedure associated with a low risk of contamination and infection¹². It also represents the ideal method for fecal deviation in palliative conditions and as a preliminary approach before chemoradiation of rectal cancer³⁴.

Management of diverticular disease of the colon, especially in the non-complicated form, has deserved a great consideration in many European and American centers. In 1999, Kockerling et al³² reported that diverticular disease represented 27% of all indications in 1118 patients treated in a European multicenter study. Similarly, a research endorsed by the American Societies of Endoscopic and Colorectal Surgery revealed that 74% of the surgeons usually perform laparoscopic surgery for such patients³³.

The morbidity associated with segmentar laparoscopic colectomies is comparable to those observed after laparotomy. In the present series, 180 (3,8%) patients presented intra-operative complications (IOC), a percentage situated within the range reported in other series (1,4 a 5,1%)^{3, 35}. Bowel (1,0%) and vascular injury inside the cavity (1,0%) comprised more than 50% of IOC and, besides been rare, may have a great impact on outcome. For this reason, they must be prevented with the help of gravity to keep the small bowel away and by maintaining constant visualization of the instruments.

It is important to note that there was a significant reduction of the incidence of ureteral injury that dropped from 0,6% in 2001 to 0,2% in the current series. This result is probably due to the greater experience of the surgeons as well to the crescent utilization of medial to lateral approach of the mesentery.

This medial access involves the vascular control of the pedicle followed by the mobilization of the mesentery towards the abdominal wall, saving the Toldt fascia liberation for the last. This maneuver allows the identification of the plane between the mesocolon and the retroperitoneum, preserves the colon lateral ligaments and thus ameliorates the exposition of retroperitoneal structures such as ureter and iliac vessels³⁶.

The temporal evolution is also reflected on the reduction of conversion rates from 10,6% in 2001 to 5,5% in 2007 (range from 0 to 16,5%). Technical problems (1,4%) and intestinal adherences (1,1%) represented half of conversion cases. Causes related to cancer were less common, such as fixed tumor (0,8%) or impossibility of oncological surgery (0,17%). This suggests that adequate staging and previous patient selection contribute to improve postoperative outcome.

Similarly, the morbidity rates have also shown an important decrease, with average scores going from 20% (8 to 30%) in 2001 to 14,5% (5 to 54,9%) in the present series. This tendency is also reflected on the mortality rates of the two periods, when one observes a smaller rate in 2007 (0,9%) against 1,6% (0 to 3,2%) during the previous registry.

The interpretation of the results presented here must take into account some factors related to the multicentric nature of the study. First, the final numbers translate the status of distinct surgical teams in terms of accumulated operative experience and frequency of laparoscopic operations in a routine setting. Consequently, it is easy to imagine that we have compared results derived from teams with different indication criteria and operative techniques.

In this series, there were only four groups with less than 12 operated patients. Besides this, their data were included because we know that those surgeons acquired technical skills in colorectal laparoscopic surgery by participating in operative procedures performed with other experienced surgeons from the same city.

This early experience is well recognized when we compared surgical outcomes in groups that performed more than or less than fifty operations. We found no differences regarding intra, postoperative complications and mortality, although the average conversion rate was significantly lower among the experienced groups.

Second, although the surgical instruments and equipment are similar to all surgeons, the quality of management of certain intra and postoperative complications (early diagnosis, availability of diagnostic resources, hospital infection rates, etc) probably lead to different perspectives in the patient's outcome reflected on the individual results presented here.

All but two surgical teams comprised patients that have been treated in private services. Within this setting, adherence to postoperative follow-up is easily achieved, so it is possible to obtain valuable data regarding recent and late outcome.

Finally, besides the great numeric variation found in some analyzed parameters, the overall judgment of the evaluative results raises the impression that we have evolved toward a firm and mature development that justifies the noticed tendency in reducing the complication, conversion and mortality rates over the years.

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