

Surgical Outcomes After Preceptores Colorectal Surgery: A Case-Controlled Trial

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ABSTRACT

Background: Laparoscopic colon surgery is technically demanding and requires a long learning curve. It is well known that supervised residents can safely perform laparoscopic colectomies. However, the efficacy of the existing methods to train experienced colorectal surgeons remains poorly analyzed. This study was undertaken to prospectively assess the impact of the participation of a preceptor assisting colorectal surgeons during laparoscopic colectomy learning curve. **Methods:** Since January 2005, one of the authors (SEAA) with a personal experience of over 300 laparoscopic colorectal procedures participates in an advanced laparoscopic colorectal surgery training program as a preceptor. The preceptor assisted 9 trainee surgeons through their learning curve in 34 consecutive operations performed between January 2005 and August 2008. All trainee surgeons are Brazilian board certified colorectal surgeons and operations were performed at 9 different community hospitals. Data of the most recent thirty four operations matched for diagnosis and type of operation performed by the same preceptor along with his surgical team were reviewed. The two groups were compared: preceptored group (PD) and control or preceptor group (P). **Results:** Operations performed by trainee surgeons (PD group) took longer than operations performed by the preceptor surgeon (198 vs. 156 min - $p=0,072$). Postoperative length of stay was similar in the two groups. There were four cases of conversion in the PD group (11,7%) and two cases in the P group (5,8% - $p=0,389$). Morbidity rates were similar in both groups (20% in P and 23,5% in PD group - $p=0,766$). Anastomotic leak occurred in one case in each group. Three patients needed conventional reoperation, one from the P group, and two from the PD group. There were no deaths. **Conclusions:** Although the reduced number of cases represents a limitation of this study, it suggests that preceptorship programs in laparoscopic colorectal surgery are probably safe for patients and effective for surgeons in practice.

Key words: laparoscopic, colectomy, colorectal, cancer, preceptorship.

Bras. J. Video-Sur, 2008, v. 1, n. 3: 122-127

Accepted after revision: June, 25, 2008.

INTRODUCTION

Laparoscopic-assisted colectomy has superior postoperative outcomes when compared with open colectomy¹⁻⁴. In addition, oncologic results of the laparoscopic approach for colorectal cancer are similar to the open approach^{2, 4, 5}.

As result, demand for laparoscopic colon operations may increase along with surgeon's interest in learning laparoscopic colectomy techniques^{6, 7}. Laparoscopic colon surgery is technically demanding and requires a long learning curve. It is widely accepted that surgeon's experience affects conversion rates and overall morbidity and mortality^{8, 9}.

It has been demonstrated that laparoscopic trainers improve resident's performance at specific tasks practiced on the trainer¹⁰. In addition, supervised

residents can safely perform laparoscopic colectomy with results similar to expert surgeons¹¹. Nevertheless, the efficacy of the existing methods to educate trained surgeons in the use of laparoscopic colectomy for colorectal disease remains poorly analyzed¹². Training resident physicians in academic centers may differ from training specialized colorectal surgeons initiating the learning curve of laparoscopic colectomy in a community environment¹³.

A preceptor is defined as a specialist in a profession especially medicine, who gives practical training to a student¹⁴. It is well known that it is possible to achieve successful transfer of laparoscopic skills during preceptorship programs of laparoscopic surgery. Nevertheless, it remains unclear if preceptored colorectal surgeons may conduct laparoscopic colorectal operations with efficacy and

safety results similar to expert surgeons. This study was undertaken to prospectively assess the impact of the participation of a preceptor assisting colorectal surgeons during laparoscopic colectomy learning curve.

PATIENTS AND METHODS

Since January 2005, one of the authors (SEAA) with a personal experience of over 300 laparoscopic colorectal procedures participates in an advanced laparoscopic colorectal surgery training program as faculty. For the students of this program, a prerequisite for participation is the availability to join a post-course program during which a preceptor will help the trainee surgeon through the learning curve.

A prospective analysis of 34 consecutive operations performed by nine trainee surgeons with the assistance of a preceptor (SEAA) between January 2005 and August 2008 was conducted. All trainee surgeons in this study are Brazilian board-certified colorectal surgeons with previous experience with laparoscopic colectomy under 20 cases. All trainee surgeons have one or more previous participations in advanced laparoscopic colorectal surgery courses. They composed the preceptored (PD) group. All operations in the PD group were performed at the trainee's local practice hospital and the preceptor traveled after trainee surgeon's request. Indications for surgical treatment were previously discussed between the trainee surgeon and the preceptor in all cases. All patients were operated on by the trainee surgeon with preceptor active supervision (preceptor scrubbed in all cases). All operations were conducted in an elective basis. In the PD group, the adopted surgical strategy was defined by the preceptor.

The data of the most recent thirty four operations matched for diagnosis and type of surgical procedure performed by the same preceptor along with his surgical team were reviewed. They constituted the control or preceptor (P) group. All the P group operations were performed at the same preceptor's own private practice hospital.

All patients underwent mechanical (2L PEG-based oral lavage solution) and antibiotic (ceftriaxone and metronidazole) bowel preparation prior to operation. Operations were performed under general anesthesia.

With respect to technique, five ports were used in all cases. There were no hand-assisted cases.

All colonic mobilization and rectal dissection was performed laparoscopically using a medial-to-lateral approach. For right-sided resections, anastomosis was fashioned extracorporeally through a periumbilical incision. For total colectomy, left colon, and rectal resections, after laparoscopic rectal transection, specimen extraction was performed through a suprapubic incision and a double-stapled endoscopic anastomosis was constructed. For restorative proctocolectomy, after laparoscopic full rectal dissection to the levators level, a 6-8 cm Pfannenstiel incision was created. Through the incision, the rectum was transsected, a J-pouch was constructed and a double-stapled ileal pouch-anal anastomosis with a protective ileostomy was performed.

Data gathered included demographic information (age, gender, ASA score, and previous abdominal surgery information), indications for surgical treatment, type of operation performed, median operative time and hospital stay, rate and need for conversion, general and detailed morbidity and need for reoperation.

RESULTS

Operations in the PD group were performed by 12 different preceptored surgeons at nine different hospitals. Operations in the P group were performed by the same surgical team in three different hospitals.

Demographic data are shown on Table 1. A median age of 56.2 years (range 26 to 80) and 55.2 years (range 22 to 81) was observed respectively in P and PD group — $p=0.804$. Of the 34 patients in each group, 13 (38.2%) were male in P group, and 18 (52.9%) in the PD group — $p=0.194$. Patient distribution according to ASA score in both groups was similar ($p=0.620$). Twelve (35%) patients and eight (23.5%) in P and PD group respectively had one or more previous abdominal surgeries — $p=0.273$.

The distribution of patients regarding indications for surgical treatment and operation type matched for both groups are shown on Table 2. Colorectal cancer was the most frequent indication for laparoscopic colectomy in this study (13 cases in each group) followed by diverticular disease in eight cases in each group. Right colectomy was the most frequent surgical procedure (seven cases in each group) followed by left colectomy (six cases in each group).

Table 1 - Clinical patient characteristics.

	Preceptor (N=34)	Preceptored (N=34)	p
Median age (range)	56,2 ± 13,6 (26 - 80)	55,2 ± 16,3 (22 - 81)	0,804 ⁽¹⁾
Gender (%)			
Male	13 (38,2)	18 (52,9)	0,194 ⁽²⁾
Female	21 (61,7)	16 (47)	
ASA (%)			
I	5 (14,7)	6 (17,6)	0,620 ⁽²⁾
II	19 (55,8)	14 (41,1)	
III	6 (17,6)	8 (23,5)	
IV	4 (11,7)	6 (17,6)	
Previous abdominal surgery (%)	12 (35,2)	8 (23,5)	0,273 ⁽²⁾

(1) Student's t test.

(2) Chi-square test.

Table 2 - Indications for surgical treatment and type of operation in each group (matched).

	N
Cancer	
anterior resection	5
sigmoidectomy	1
abdominoperineal resection	2
right colectomy	5
Diverticular disease	
left colectomy	8
Crohn's disease	
right colectomy	2
total colectomy	1
Ulcerative colitis	
restorative proctocolectomy	2
Polyp	
sigmoidectomy	2
anterior resection	1
right colectomy	1
Polyposis	
restorative proctocolectomy	2
total colectomy	1
Endometriosis	
anterior resection	1
Total	34

Surgical outcomes are shown on Table 3. Operations performed by trainee surgeons (PD group) took longer than operations performed by the preceptor surgeon (198 vs. 156 min), although it did not reach

statistical difference (p=0.072). Postoperative length of stay did not differ between the groups [six days (range 3-22) in P group, and seven days (range 4-20) in PD group, p=0.296]. Conversion occurred in four of the cases operated on by trainee surgeons and in two of the cases operated on by the preceptor surgeon (p=0.389) leading to a conversion rate of 11,7% in PD group and 5,8% in P group. The indications for conversion are shown in Table 4. For the operations conducted by the preceptor surgeon, tumor fixation during a right colectomy for cancer and adhesions in a case of left colectomy for diverticular disease in a patient with previous hysterectomy for endometrial cancer led to conversion in two cases. For the operations conducted by the trainee surgeons, failure to progress led to conversion in two cases. Failure to progress occurred in a case of total colectomy for Crohn's disease and in another case of left colectomy for diverticular disease. The other reasons for conversion in this group were right colon tumor fixation in one case and pelvic bleeding during oncologic anterior resection for rectal cancer in another case.

The presence of the preceptor as surgeon did not significantly affect overall morbidity. Morbidity rates were similar in both groups (23.3% in P group and 26.7% in PD group — p=0.766) — Table 3. Minor complications included wound infection and ileus. Major complications included anastomotic leak, colonic injury, and perineal hernia (Table 5). Clinically significant anastomotic leak occurred in one case in each group. One patient in the PD group suffered an iatrogenic left colon perforation and needed

Table 3 - Surgical outcomes.

	Preceptor (N=34)	Preceptored (N=34)	p
Median operative time (min)	156 (100 -290)	198 (110 -390)	0,072 ⁽¹⁾
Median hospital stay (min)	6 (3 - 22)	7 (4 - 20)	0,296 ⁽¹⁾
Conversion (%)	2 (5,8)	4 (11,7)	0,389 ⁽²⁾
Morbidity (%)	7 (20,5)	8 (23,5)	0,766 ⁽³⁾
Reoperation (%)	1 (2,9)	2 (5,8)	1,000 ⁽²⁾

(1) Mann-Whitney's test.

(2) Fisher's exact test.
Chi-square test.**Table 4 - Reasons for conversion.**

	Preceptor (N=34)	Preceptored (N=34)
Failure to progress		2
Tumor fixation	1	1
Adhesions	1	
Bleeding		1
Total	2 (5,8)	4 (11,7)

Table 5 - Detailed morbidity.

	Preceptor (N=34)	Preceptored (N=34)
Major		
Anastomotic leak	1	1
Colonic injury		1
Small bowel injury		
Minor		
Wound infection	3	3
Ileus	3	2
Perineal hernia		1
Total	7 (20,5%)	8 (23,5%)

reoperation. Wound infection and ileus occurred similarly in the two groups. One case of perineal hernia diagnosed 2 months after abdominoperineal resection in the PD group also needed reoperation.

Three patients needed conventional reoperation, one from the P group, and two from the PD group. Anastomotic leak led to reoperation with protective stoma in the P case. Two patients operated on by trainee surgeons needed reoperation. In one

case, an iatrogenic colonic injury was treated with suture and protective ileostomy. The other case was a perineal hernia that required laparotomy and placement of pelvic biologic mesh.

There were no deaths for the entire series.

DISCUSSION

The learning curve for laparoscopic colectomy may significantly vary but most studies have placed it between 20 and 70 cases^{8, 15}. For the majority of general or colorectal surgeons, this is a steep curve. The reason is that the average number of colectomies performed yearly in the United States is between six and 13 for general surgeons, and 26 for colorectal surgeons¹⁶⁻¹⁸. As result, many practicing surgeons may take several years to become proficient in laparoscopic colorectal surgery techniques.

Although large volumes are associated with better outcomes in laparoscopic colorectal surgery¹⁹, it is unrealistic to expect that laparoscopic colorectal procedures will be performed only in large volume centers. For this reason, minimal access surgery fellowships have become one of the most highly sought training programs in the post-residency period in the United States²⁰. Although this is true, not all surgeons, mainly the busy practice ones have the opportunity of attend to such a program.

There are few, if any, structured preceptorship programs in colorectal surgery, designed for established surgeons. Moreover, there is little literature at this topic and many anecdotal reports whereby expert laparoscopic surgeons have spent significant time training surgeons in the community. Preceptorships tend not to occur in academic health centers other than in the form of observerships because of competition from other trainees (residents and fellows)¹³. Nevertheless, the number of eligible cases for elective colorectal surgery outside academic

and reference centers may be reduced. Therefore, in order to ensure the best possible outcome given the low number of eligible laparoscopic colorectal procedures per surgeon, the recruitment of a trained laparoscopic surgeon as a preceptor of the practicing staff surgeons in one or more institutions has already been proven effective ¹².

There is little objective data about how well patients undergoing operation as part of a preceptorship programs go. This study, although still preliminary, provides a unique opportunity of knowing early results of a preceptorship program in laparoscopic colorectal surgery inside the student surgeon's work place.

Due to the still reduced number of cases in the preceptorship program and in order to prevent confounding variables, it was decided to analyze surgical outcomes from cases matched for diagnosis and type of performed operation. Also, in this study, the same preceptor performed (P group) or supervised the operation (PD group). This factor may bring consistency eliminating the variability of different preceptors. Another important issue of this study comes from the chosen method for selecting the operations in the PD group. All preceptored cases were defined by the trainee surgeon. As result, they represented the surgical diagnosis or surgical technique with which the trainee surgeons had reduced experience or additional expertise support.

While operations took place in 12 different hospitals, the techniques, instruments, methods and postoperative care were nearly the same between the two groups.

There was consistency between groups with respect to their age, sex, ASA score, and history of previous abdominal surgery (Table 1).

In this study, PD operations took median 42 minutes longer to perform than operations in P group, although this did not reach statistical significance ($p=0.072$). This finding comes as no surprise since the surgical team in P group was always the same and the preceptor has more practice and expertise in performing the procedures than do the preceptored surgeons.

Outcomes between P and PD groups were similar regarding length of stay and morbidity. This may be attributed to the relatively small number of cases in the current study. The two groups did not differ regarding minor morbidity. Nevertheless, there was some difference regarding major morbidity.

Undiagnosed colonic perforation leading to reoperation is a potentially life-threatening complication. Moreover, it represents a technical complication commonly associated to the learning curve. Whether this technical error would have occurred had the preceptor been operating instead of the trainee surgeons will always be subject to expeculation. The incidence of postoperative complications in this study compares favorably to other published reports ^{4 11}.

Conversion rates of laparoscopic colorectal surgery vary widely between 7% and 40% ²¹. Conversion rate has been known to be a reliable outcome measure reflecting proficiency in laparoscopic colorectal procedures. Although there were 4 conversions in the PD group and 2 in the P group, there was no significant difference ($p=0.389$). Nevertheless, a close evaluation of the reasons to convert may explicit some aspects (Table 4). It seems to be true that the occurrence of conversion after a number of cases operated on by an experienced surgeon reflects his decision to reduce patient selection for a laparoscopic approach. It is well known that adhesions and a large tumor represent, indeed, a true limitation of the method. On the contrary, bleeding and failure to progress may reflect a learning curve effect.

The reduced number of cases represents an important limitation of the present study. Another important issue comes from the variables chosen to reflect the adequacy of the learning curve. It is probably true that conversion rate and operative time are less important than complication and readmission rates in defining good outcomes and hence the learning curve. Complication and readmission rates are more important than operative time and conversion rates for evaluating the learning curve and quality of laparoscopic colorectal surgery ²². In the present study we had no access to readmission data.

This study suggests that preceptorship programs in laparoscopic colorectal surgery are probably safe for patients and effective for surgeons in practice, although surgeons' introduction through basic and hands-on courses is required for acquisition of necessary technical skills .

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