

## Laparoscopic colorectal surgery: what to expect from an initial experience

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**ABSTRACT:** Laparoscopic colorectal surgery is less traumatic when compared to traditional surgery techniques, with well-established advantages. The objective of this study was to report the experience in laparoscopic surgical treatment of colorectal diseases. **Method:** Catalog all patients submitted to laparoscopic colorectal surgery performed by one surgeon and perform a descriptive analysis of key data from these records. **Results:** The study analyzed data from 43 patients who underwent laparoscopic colorectal surgery. Most were females (n=30; 69.77%) in relation to males (n=13; 30.23%), mean age of 57.21 years old. Among the indications for surgery, diverticular disease was the most frequent (n=20; 46.51%), followed by malignancy (n=13; 30.23%). Most patients underwent rectosigmoidectomy (n=28; 65.12%), followed by right hemicolectomy (n=6; 13.95%), with conversions in five cases (11.63%). The study observed a tendency towards increased number of surgeries, reduced average operative time as well as decreased conversions to laparotomy along the studied period. **Conclusion:** Laparoscopic colorectal surgery is a safe procedure, and with the technical development of the team, the results have been increasingly good.

**Keywords:** surgery; colorectal surgery; laparoscopy.

**RESUMO:** A videolaparoscopia colorretal apresenta-se como uma tática operatória menos traumática com vantagens bem-estabelecidas. O objetivo deste trabalho foi apresentar a experiência no tratamento cirúrgico videolaparoscópico das afecções colorretais. **Método:** Catalogar todos os pacientes submetidos à cirurgia colorretal videolaparoscópica realizadas por um único cirurgião e realizar uma análise descritiva dos principais dados a partir dos prontuários destes. **Resultados:** O estudo analisou dados de 43 pacientes que foram submetidos à cirurgia colorretal por videolaparoscopia. A maioria era do gênero feminino (n=30; 69,77%) em relação ao masculino (n=13; 30,23%) com média de idade de 57,21 anos. Dentre as indicações cirúrgicas, doença diverticular foi a mais frequente (n=20; 46,51%), seguido de doença maligna (n=13; 30,23%). A maioria dos pacientes foi submetida a retossigmoidectomia (n=28; 65,12%), seguido de colectomia direita (n=6; 13,95%), com conversões em cinco casos (11,63%). Houve uma tendência crescente no número de cirurgias, na proporção de cânceres removidos por laparoscopia ao longo dos anos em estudo, assim como uma diminuição crescente na média do tempo operatório e nas conversões para laparotomia. **Conclusão:** A videolaparoscopia colorretal é um procedimento seguro e, com a evolução técnica da equipe, os resultados vão se tornando cada vez mais satisfatórios.

**Palavras-chave:** cirurgia; cirurgia colorretal; laparoscopia.

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## INTRODUCTION

In the 1990s, the laparoscopic access was introduced in colorectal surgeries. Of reduced indications, limited to a small group of surgeons at the time, the access is today employed by innumerable coloproctologists, and the indications have been expanded to any type of colorectal procedure<sup>1-4</sup>.

The advantages of laparoscopic colorectal surgery have been consolidated by innumerable scientific studies, as this method involves a minimally invasive technique and reduced surgical trauma. Less postoperative pain, shorter hospitalization and earlier return to activities have been some of the great benefits leading to the selection of this access<sup>4-8</sup>. However, some factors make it difficult to expand this technique to an even greater number of coloproctologists, such as: learning curve, voluminous tumors or tumors infiltrating into adjacent structures, multiple intracavitary adhesions, voluminous incisional hernias, preservation of oncological principles, among others<sup>9</sup>.

In cancer, laparoscopic resections were postponed, and were adopted only after surgeons acquired more experience. Published studies that presented implantation due to trocar injury criticized at first the adoption of this access in oncological surgeries<sup>10</sup>, but other studies demonstrated similar incidence of implantation in the abdominal wall when using laparotomy<sup>11</sup>. With the improvements in surgical techniques and materials, the principles of oncological radicality have been really preserved, as indicated in several publications comparing specimens resected through laparoscopy and laparotomy<sup>6,8,12</sup>.

With this new access, new complications appeared, not only regarding the surgery itself, but also related to the pneumoperitoneum and puncture and trocars. Some authors report greater incidence of complications in the surgeon's initial experience, with the frequency of complications inversely proportional to the medical team's experience<sup>13</sup>.

The purpose of this study was to report the experience in laparoscopic colorectal surgery.

## PATIENTS AND METHODS

This is a retrospective observational study of all patients submitted to laparoscopic colorectal

surgery performed by only one surgeon and treated at the Service of Coloproctology at Torres Centro Médico.

The information was collected according to a protocol (Annex I), with the following main variables: type of site of treated diseases, procedures performed, surgery duration and hospitalization period, conversion rate and causes, intraoperative and postoperative complications, anatomopathological data of tumors, mortality and recurrence rates.

The information was collected from the patients' records, after obtaining the authorization from the institution's management, through a document (Annex II) ensuring secrecy of the patients' identity and no damage to the institution. The Informed Consent Term signed by the patients was not required, as the study only collected data contained in the patients' medical records.

A descriptive analysis of main data was performed using spreadsheets elaborated in Microsoft Excel® 2007.

The study was approved by the Research Ethics Committed of the Universidade Federal de Sergipe.

## RESULTS

From May 2007 to October 2011, 43 patients were submitted to laparoscopic colorectal surgery. Most of them were females (n=30; 69.77%) in relation to males (n=13; 30.23%). Age varied from 17 to 83 years old, with mean age of 57.21, and, most of them were from Aracaju (n=36; 83.72%). A growing number of surgeries was observed along the years (3 in 2007; 7 in 2008; 8 in 2009; 11 in 2010; 14 in 2011) (Figure 1), as well as an increasing proportion of cancer removed through laparoscopy (1 in 2008; 1 in 2009; 5 in 2010; 6 in 2011) (Figure 2). The mean period of hospitalization was 7.63 days (varying from 3 to 33 days) and the mean duration of surgery was 229.30 minutes (varying from 105 to 450 minutes).

The most frequent surgical indication was diverticular disease (n=20; 46.51%), followed by malignant disease (n=13; 30.23%), endometriosis (n=3; 6.98%), Crohn's disease (n=2; 4.65%), adenocarcinoma of the descending colon (n=1; 2.33%), lipoma in the ascending colon (n=1; 2.33%) and intestinal

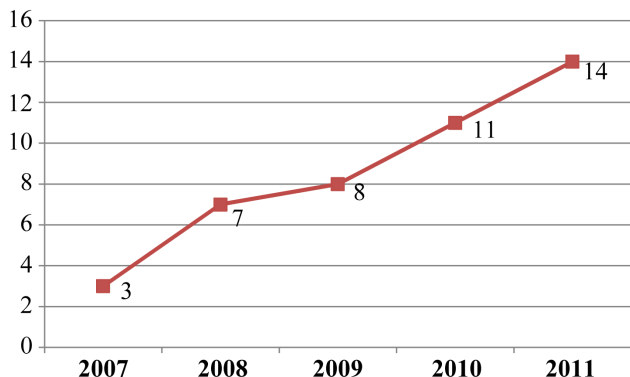


Figure 1. Number of surgeries performed between 2007 and 2011.

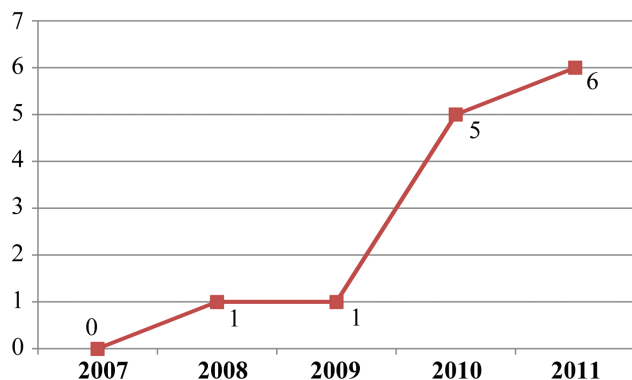


Figure 2. Number of surgeries for malignant neoplasm removal from 2007 to 2011.

reconstruction after Hartmann intervention (n=1; 2.33%) (Figure 3). Two cases (4.65%) presented two simultaneous indications: one case with diverticular disease associated with endometriosis and one case with diverticular disease associated with adenocarcinomas of the ascending and transverse colon. The tumor site distribution in colorectal diseases showed that most of them occurred in the sigmoid colon (n=24; 55.81%), followed by the ascending colon (n=4; 9.30%), rectosigmoid junction (n=3; 6.98%), rectum (n=3; 6.98%), diffuse disease (n=3; 6.98%), descending colon (n=2; 4.65%), transverse colon (n=2; 4.65%), cecum (n=1; 2.33%) and cecal appendix (n=1; 2.33%).

Regarding the procedures performed, most patients were submitted to rectosigmoidectomy (n=28; 65.12%), followed by right colectomy (n=6; 13.95%),

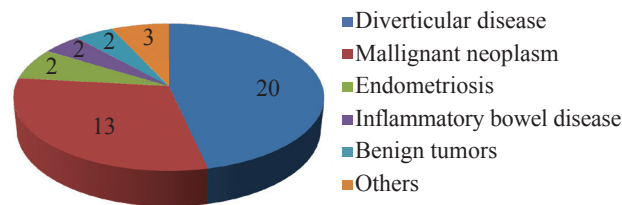


Figure 3. Distribution by surgical indication.

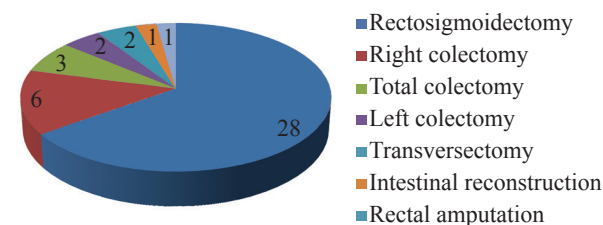


Figure 4. Distribution of surgical procedures performed.

total colectomy (n=3; 6.98%), left colectomy (n=2; 4.65%), transversectomy (n=2; 4.65%), intestinal reconstruction after a Hartmann intervention (n=1; 2.33%) and rectal amputation (n=1; 2.33%) (Figure 4). Five cases (11.63%) presented conversion and the causes were: presacral bleeding, anastomotic bleeding, tumor in the left ureter and left external iliac artery, lesion in the left ureter and adhesions with lesions in the small bowel. Besides these five intraoperative complications, three other occurred but no conversion was required: fault in mechanical suture, peripancreatic bleeding and another with lesion in the small bowel, totaling eight cases with intraoperative complications (18.60%).

Postoperative complications were observed in 12 patients (27.91%), which were: 1) rectal bleeding associated with wall hematoma and deep venous thrombosis; 2) respiratory failure associated with hemodynamic instability and extended ileum; 3) wall hematoma progressing to incisional hernia; 4) anastomotic bleeding; 5) obstruction with small bowel necrosis, with reoperation required for resection, and progressing to short-bowel syndrome; 6) necrosis of

the lowered colon associated with intracavitary collections and non-lithiasic cholecystitis; 7) bowel obstruction due to recurrent neoplasm with carcinomatosis; 8) obstruction due to adhesion and stenotic anastomosis, with recurrent neoplasm; 9) hernia at the trocar site, as well as stenotic colorectal anastomosis; 10) rectal bleeding; 11) rectal bleeding, progression to stenotic anastomosis; 12) anastomotic dehiscence and peritonitis, requiring multiple surgeries, progressing to death on the 33<sup>rd</sup> hospitalization day.

When analyzing the groups of 2 most frequent surgical indications, we have the following results: in patients that had diverticular disease as the surgical indication, the mean period of hospitalization was 6 days (ranging from 3 to 21 days) and the mean duration of surgery was 237.95 minutes (ranging from 105 to 400 minutes). The most frequent surgical procedure in this group of patients was rectosigmoidectomy (n=20), followed by total colectomy (n=2). Conversion to laparotomy was required in 3 patients. In patients with malignant neoplasm, the mean hospitalization was 11.85 days (ranging from 4 to 33 days) and the mean duration of surgery was 232.69 minutes (ranging from 150 to 450 minutes). The most frequent surgical procedure was rectosigmoidectomy (n=6), followed by right colectomy (n=4), left colectomy (n=1), transversectomy (n=1) and rectal amputation (n=1). Conversion was required in two patients, two presented recurrent neoplasm and one died after surgical complications. The most frequent histological type was adenocarcinoma (n=12), followed by carcinoid tumor (n=1). It was possible to obtain information regarding the degree of differentiation and complete disease staging in 10 cases; 80% were moderately differentiated and 20% well differentiated. Regarding the disease staging, 50% were stage II, 40% stage III and 10% stage I. Mean resected ganglia were 16.33 (ranging from 8 to 38).

When dividing all 43 patients into 3 groups of 14 first surgeries (group 1), 14 intermediate surgeries (group 2) and 15 last surgeries (group 3), we obtained the following results: 1) growing reduction was observed in the mean duration of surgery (Figure 5), group 1 presenting 246.07 minutes (ranging from 170 to 450 minutes), group 2 with 225.36 minutes (105 to 400 min.) and group 3 with 217.33 minutes (105 to 360 min.); 2) growing number of surgeries for malig-

nant neoplasm removal was observed in all 3 groups (Figure 6), group 1 with 2 cases, group 2 with 5 cases and group 3 with 6 cases; 3) reduced number of conversion to laparotomy (Figure 7), group 1 with 3 cas-

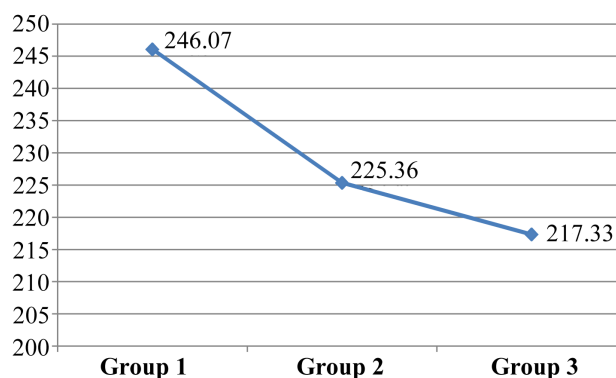


Figure 5. Mean duration of surgery in the three groups of surgery.

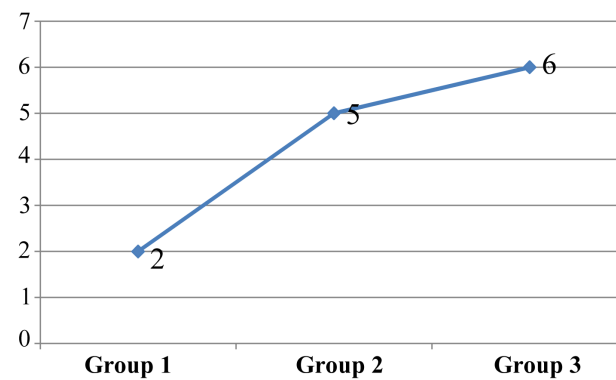


Figure 6. Number of surgeries for malignant neoplasm removal in the three groups.

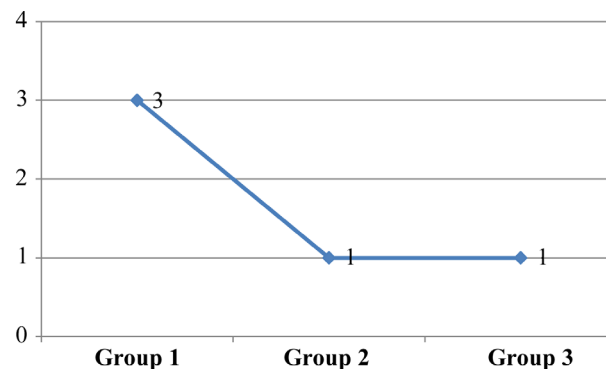


Figure 7. Number of conversions to laparotomy in the three groups of surgery.

es, group 2 with 1 case and group 3 with 1 case. Mean hospitalization was 6.07 days in group 1, 10.29 days in group 2 and 6.60 in group 3.

When dividing the groups of the 2 most frequent surgical procedures into subgroups, we had the following results: from total 28 rectosigmoidectomy procedures, the 14 first interventions (subgroup 1) had mean duration of surgery of 250.36 minutes (ranging from 170 to 450 minutes), while the 14 last interventions (subgroup 2) presented mean duration of 206.79 minutes (105 to 300 minutes). Subgroup 1 had 3 conversions, while subgroup 2 had no conversion. From total 6 right colectomy procedures, the 3 first interventions (subgroup 1) had mean duration of surgery of 186.67 minutes (ranging from 170 to 210 minutes), while the 3 last interventions (subgroup 2) presented mean duration of 171.67 minutes (120 to 200 minutes). No conversions were performed in this group of surgeries (Table 1).

## DISCUSSION

The study analyzed 43 patients submitted to laparoscopic colorrectal surgery in the State of Sergipe. Most were females (n=30; 69.77%) in relation to males (n=13; 30.23%); age varied from 17 to 83 years old, with mean age of 57.21. The national Brazilian record of colorectal videosurgery in 2007<sup>3</sup>, which gathered data from 28 medical teams from different Brazilian states, also presented a greater number of female patients (n=2,750; 58.6%), at similar mean age (57.7 years old). The study observed increasing number of surgeries along the years, which is also demonstrated in this national record of 2007, as well as in studies conducted in other countries<sup>14</sup>.

Most patients had benign disease, with malignant neoplasm leading to surgery observed in 13 cases (30.23%). The study also observed increased number of cancer removed through laparoscopy during the analyzed period, also reported in other national and international studies<sup>3,14</sup>. Diverticular disease was the most frequent indication (n=20; 46.51%), and 2 other cases had diverticular disease associated with another pathology, totaling 22 cases (51.16%). At the Service of Coloproctology at the Hospital das Clínicas da Universidade Federal do

**Table 1.** Mean duration of surgery and number of conversions in the procedures of rectosigmoidectomy and right colectomy.

Mean duration of rectosigmoidectomy	228.57 minutes
14 first surgeries	250.36 min
14 last surgeries	206.79 min
Conversions in rectosigmoidectomy	3
14 first surgeries	3
14 last surgeries	0
Mean duration of right colectomy	179.17 min
3 first surgeries	186.67 min
3 last surgeries	171.67 min
Conversions in right colectomy	0

Ceará and at the Hospital São Carlos, in the City of Fortaleza<sup>7</sup>, cancer treatment occurred in 141 cases (35.1%), with this as the most frequent indication, followed by diverticular disease in 107 (26.7%). The national Brazilian record of colorectal video-surgery in 2007<sup>3</sup> also showed malignant disease (n=2,389; 49.6%) as the most frequent indication, with diverticular disease in 961 cases (20.2%).

Among the surgical procedures, rectosigmoidectomy was the most frequent intervention (n=28; 65.12%), followed by right colectomy (n=6; 13.95%). A similar pattern was observed in national records<sup>3,4</sup>. Results of records from laparoscopic colorectal surgeries performed in the State of Minas Gerais – Brazil, from 1996 to 2009<sup>4</sup>, showed rectosigmoidectomy as the most frequent procedure (n=207; 41.1%), followed by right colectomy (n=63; 12.5%). Conversion was observed in five cases (11.63%) out of eight cases with intraoperative complications (18.60%) in our study. One analysis performed in Singapore<sup>14</sup>, the rate of conversions was 10.5%. The Brazilian medical literature<sup>3</sup> reports conversions to laparotomy in 5.5%, with rates ranging from 0 to 16.5% among the medical teams.

When analyzing the group of patients with malignant neoplasm, the most frequent histological type was adenocarcinoma (n=12; 92.31%), followed by carcinoid tumor (n=1; 7.69%). Most of



them were moderately differentiated (80%) and were classified as stage II (50%) and III (40%) of the disease. Mean resected ganglia were 16.33 (ranging from 8 to 38). The record of surgeries performed in Minas Gerais<sup>4</sup>, the national record of colorectal videosurgery in 2007<sup>3</sup> and the international medical literature<sup>14</sup> report similar results in their studies.

Our study enabled to analyze the learning curve in several evaluations. When dividing all 43 patients into 3 groups of 14 first surgeries (group 1), 14 intermediate surgeries (group 2) and 15 last surgeries (group 3), we observed growing reduction in the mean duration of surgery, growing proportion of surgeries for malignant neoplasm removal and reduced number of conversions to laparotomy. When dividing the groups of two most frequent surgical procedures into subgroups with the first half of surgeries (subgroup 1) and the second half of surgeries (subgroup 2), we observed reduced mean duration of surgery and reduced rate of conversions. In the study conducted by Bruch

et al.<sup>15</sup>, the learning curve in laparoscopic colorectal surgery was analyzed by dividing 300 patients into 3 groups of 100, for the period of 5 years. Conversion was observed in 22 cases (7.3%). The incidence of conversion reduced from 8.0% (first and second groups) to 6.0% (third group), and the mean duration of surgeries also reduced in the 3 groups: from 251.4 to 213.5 minutes (first and second groups) and to 196.9 minutes (third group).

## CONCLUSION

Based on the results of this study, we concluded that laparoscopic colorrectal surgery is a safe and comprehensive procedure. The preservation of oncological principles is possible in this approach, with low complication and tumor recurrence rates. This study showed the learning curve as an initial obstacle to complete utilization of laparoscopy in colorectal surgery, but, with the technical development of the team, the results have been increasingly good.

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Annex I

**RESEARCH Protocol**  
**LAPAROSCOPIC COLORRETAL SURGERY: iniTial EXPERIENCE**

Name:		Registration:
Age:	Birth Date:	Gender:
Marital Status:		Occupation:
Origin:		Place of Birth:
Date of Surgery:		Hospitalization period:
Duration of Surgery:		
1. Surgical indication:		
<input type="checkbox"/> Malignant neoplasm		<input type="checkbox"/> Diverticular disease
<input type="checkbox"/> Inflammatory bowel disease		<input type="checkbox"/> Benign tumors
<input type="checkbox"/> Intestinal reconstruction after Hartmann procedure		
<input type="checkbox"/> Others: _____		
2. Tumor site:		
<input type="checkbox"/> Cecum		<input type="checkbox"/> Ascending colon
<input type="checkbox"/> Transverse colon		<input type="checkbox"/> Descending colon
<input type="checkbox"/> Sigmoid colon		<input type="checkbox"/> Rectum
<input type="checkbox"/> Cecal appendix		<input type="checkbox"/> Anal canal
3. Surgery performed:		
<input type="checkbox"/> Rectosigmoidectomy		<input type="checkbox"/> Right colectomy
<input type="checkbox"/> Left colectomy		<input type="checkbox"/> Total colectomy
<input type="checkbox"/> Rectal amputation		<input type="checkbox"/> Others: _____
4. Conversion:		
<input type="checkbox"/> Yes	<input type="checkbox"/> No	
4.1. Conversion causes:		
<input type="checkbox"/> Technical difficulty		<input type="checkbox"/> Fixed tumor
<input type="checkbox"/> Adhesions		<input type="checkbox"/> Visceral lesion
<input type="checkbox"/> Bleeding		<input type="checkbox"/> Others: _____
5. Intraoperative complications:		
<input type="checkbox"/> Lesion of the ureter		<input type="checkbox"/> Vascular lesion
<input type="checkbox"/> Lesion of the small bowel		<input type="checkbox"/> Lesion in the colon
<input type="checkbox"/> Fault in mechanical suture		<input type="checkbox"/> Hypercapnia
<input type="checkbox"/> Others: _____		
6. Postoperative complications:		
<input type="checkbox"/> Infection in surgical injury		<input type="checkbox"/> Anastomotic dehiscence or fistula
<input type="checkbox"/> Extended ileum		<input type="checkbox"/> Bowel obstruction
<input type="checkbox"/> Bleeding		<input type="checkbox"/> Peritonitis
<input type="checkbox"/> Others: _____		
7. Anatomopathological analysis:		
7.1. Diverticular Disease of Colons:		
<input type="checkbox"/> Yes	<input type="checkbox"/> No	
<input type="checkbox"/> Diverticulitis		<input type="checkbox"/> Diverticulosis



### Annex I - Continuation

7.2. Cancer:

Histological type: \_\_\_\_\_

7.2.1. Degree of differentiation:

- Well differentiated  Poorly differentiated  
 Moderately differentiated  Undifferentiated

7.2.2. Number of dissected ganglia: \_\_\_\_\_  
 Negative  Positives How many: \_\_\_\_\_

7.2.3. Staging:

TNM (primary tumor extension, metastasis in regional lymph node, distant metastasis) \_\_\_\_\_

8. Mortality:

- Yes  No

8.1. Cause of surgical mortality:

- Intra-abdominal sepsis  Heart failure  
 Acute anemia (bleeding)  Respiratory infection  
 Others: \_\_\_\_\_

9. Recurrent neoplasm:

- Yes  No

### Annex II

#### AUTHORIZATION

I, head of the \_\_\_\_\_, authorize chief investigator Dr. Fábio Ramos Teixeira to perform data search in the records of patients submitted to laparoscopic colorretal surgery. The investigator guarantees that the execution of this study will not bring any type of damage to this institution, and that the identify and moral integrity of the patients, whose records will be analyzed in this study, will be preserved. Under no circumstance should public disclosures mention names. The researcher will clarify any doubt about the study, and for this reason, should always be found at the address and telephone number below.

\_\_\_\_\_  
**HEAD OF THE INSTITUTION**

\_\_\_\_\_  
**FÁBIO RAMOS TEIXEIRA  
HOSPITAL UNIVERSITÁRIO**

**Address: Rua Cláudio Batista, S/N – 49060-100 – Aracaju (SE), Brazil – Tel.: (55 79) 2105-1700,  
Fax: (55 79) 2105-1743**

ATTENTION:

For this study, no Informed Consent Term will be required, as the study has no direct contact with the patients, only having the access to data from their medical records!