

## RIGHT COLECTOMIES: INDICATIONS, TECHNIQUES, AND RESULTS, RETROSPECTIVE STUDY OF 110 PATIENTS

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**RIGHT COLECTOMIES: INDICATIONS, TECHNIQUES, AND RESULTS, RETROSPECTIVE STUDY OF 110 PATIENTS (Abstract):** *Background:* The purpose of this retrospective study was to evaluate factors influencing morbidity and mortality associated with right or transverse colectomy. *Methodology:* We included all patients receiving a right or transverse colectomy from January 1<sup>st</sup>, 2002 until December 31<sup>st</sup>, 2007 for a total of 111 patients. Seventy-nine patients (71.8%) were treated with open surgery and 31 (28.2%) with laparoscopic surgery. Seven patients (22.6%) required a conversion from laparoscopic to open surgery. *Results:* Morbidity and mortality were 32.7% and 2.7%, respectively. The age, rate of local complications, duration of hospitalization and stays in the intensive care unit, tumor size, proportion of positive ganglions, and the rate of neoplastic recurrence were all statistically more common in patients treated with open surgery compared to laparoscopic surgery. There was no difference between groups in terms of male / female ratio, BMI, general morbidity, short- and long-term mortality, number of examined ganglions, and local recurrence. Patients with stage 1 disease were more common in the laparoscopic group. *Conclusion:* The lower rate of local morbidity, shorter hospital stay, and equivalent survival and long-term outcome recommend laparoscopic colectomy in patients whose medical status and disease stage allow for the use of this minimally invasive procedure.

KEY WORDS: RIGHT COLECTOMY; LAPAROTOMY; LAPAROSCOPY; NEOPLASM; POLYP; INFLAMMATORY BOWEL DISEASE; DIVERTICULITIS; MORBIDITY; MORTALITY.

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### INTRODUCTION

Right or transverses colectomies are associated with a high rate of morbidity and mortality [1,3,6,9,11-17,20,22-27,31]. Numerous studies have attempted to determine risk factors associated with poor outcome in order to identify high-risk patients and, when possible, modify these risk factors [2,8,11,16,18,19,24,26,31]. Many authors questioned the impact of surgical technique. Indeed, in recent years the method of surgical intervention has varied, including both traditional open techniques and minimally invasive laparoscopic access. Several reports demonstrated that the less invasive approach of laparoscopy lead to a decreased duration of hospital stay and decreased morbidity [1,2,4,6,7,9,12-14,19,21-25,31]. However, there are still hesitations among surgeons concerning the use of laparoscopy in the treatment of the cancer patient [27].

The purpose of this retrospective study is to analyze the various factors influencing the morbidity and the mortality of right and transverse colectomies, and to

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estimates the impact of open versus laparoscopic approach on the long-term outcome of cancer patients.

### PATIENTS AND METHODS

From January 1<sup>st</sup>, 2002 until December 31<sup>st</sup>, 2007, 110 patients were treated with right or transverse colectomy at the Brugmann University Hospital. Patients included 58 women and 52 men (female / male = 1.1). The mean age was 68.5 years old (range: 25-98 years old) and the mean body mass index (BMI) was 24.9 kg /m<sup>2</sup> (13-34.8 kg/m<sup>2</sup>). Operating risk was estimated by the ASA score of the American Society of Anesthesiologists. Table I shows the indication for colectomy and the surgical approach.

**Table I**  
**Indications of colectomies**

	<b>Open surgery (n=79)</b> number / percents from total	<b>Laparoscopic surgery (n=31)</b> number / percents from total	<b>Total (n=110)</b> number / percents from total
Colon cancer	52 / 47.27	16 / 14.54	68 / 61.82
Polyp	8 / 7.27	8 / 7.27	16 / 14.54
Ischemic colitis	8 / 7.27	0	8 / 7.27
Crohn's Disease	2 / 1.82	4 / 3.64	6 / 5.45
Anastomotic fistula	3 / 2.72	0	3 / 2.72
Diverticulitis	2 / 1.82	0	2 / 1.82
Eventration	2 / 1.82	0	2 / 1.82
Volvulus	0	2 / 1.82	2 / 1.82
Caecum abscess	1 / 0.91	0	1 / 0.91
Occlusion	1 / 0.91	1 / 0.91	1 / 0.91

**Table II**  
**Number of patients with preoperative testing**

<b>Preoperative tests</b>	<b>Number of patients / percents from total</b>
Serum CEA*	68 / 61.82
Abdominal CT-scan	58 / 52.73
Colonoscopy	46 / 41.82
Abdominal ultrasonography	36 / 32.73
Barium enema	34 / 30.9
Bone scintigraphy	15 / 13.64
Thoracic CT-scan	9 / 8.18
PET scan	3 / 2.72

\* CEA= carcinoembryonic antigen

Seventy-nine patients (71.8%) were with traditional open colectomy and 31 patients (28.2%) were treated with laparoscopy. Table II indicates the medical tests performed in case of colon cancer, for diagnosis and staging. Statistical analyses were performed by the Wilcoxon test for the comparison of continuous variables and by the Chi-squared test for discrete variables.

## RESULTS

The conversion rate of laparoscopy to open surgery was 22.6%. The causes for conversion were: tumor not dissectable by laparoscopic approach (2 cases), adhesion of tumor to the right ureter (1 case), obesity (2 cases), tumor more extensive than expected (1 case). The overall morbidity rate was 32.7%, which included local morbidity (10.9%) and general morbidity (21.8%) (Table III). Importantly, the rate of anastomotic fistulae was 1.8%.

**Table III**  
Postoperative morbidity

Morbidity	Number of patients / percents from total
<b>Local complication</b>	<b>12 / 10.9</b>
intra-abdominal abscess	3 / 2.72
wound infection	3 / 2.72
anastomotic fistula	2 / 1.82
abscess	2 / 1.82
evisceration	1 / 0.91
stoma prolapse	1 / 0.91
<b>General complication</b>	<b>24 / 21.82</b>
infection	9 / 8.18
cardiovascular	5 / 4.54
urinary	3 / 2.72
systemic	3 / 2.72
lung	2 / 1.82
gastrointestinal	2 / 1.82

**Table IV**  
Characteristics of deceased patients\*

Patient	1	2	3
Age (years)	80	91	85
Sex	Female	Man	Female
ASA score	2	4	3
U/P	U	P	P
Operative indication	Colon necrosis with caecum perforation	Cancer of the caecum	Cancer of the caecum
Local complication	0	0	Anastomotic leak + abscess
General complication	PE + intracranial bleeding	MOF	Sepsis + MOF
Histology	Right colon ischaemia	Undifferentiated adenocarcinoma 7 from 11 lymphnodes were positives Negative margins Stage pT4N1M1	Well differentiated adenocarcinoma 10 negatives lymphnodes Negative margins Stage T4N0Mx
Autopsy	+	-	+
Cause of death	PE	MOF	PE + sepsis and abdominal abscess
Day of death (postoperative day)	19	24	9

\*U/P - urgent/planned operation; PE - pulmonary embolism; MOF - multiorganic failure; autopsy – „+” performed, „-” not performed

The mortality rate of this series was 2.7%, only one death was directly associated with surgical complications (Table IV).

Tables V and VI include the morbidity and mortality rates according to method of surgical access and according to type of admission (programmed or urgent surgery).

**Table V**  
**Morbidity and mortality according to method of surgical access**

	<b>Open surgery (n=79)</b>	<b>Laparoscopy (n=31)</b>	<b>P</b>	<b>Statistical significance</b>
Local complications	12 (15.2%)	0	0.02	S
General complications	21 (26.6%)	3 (9.7%)	0.05	NS
Mortality	3 (3.8%)	0	0.53	NS

S – significant; NS – not significant

**Table VI**  
**Morbidity and mortality according to type of admission**

	<b>Planned operation (n=79)</b>	<b>Urgent operation (n=31)</b>	<b>P</b>	<b>Statistical significance</b>
Local complication	4 (5.1%)	8 (25.8%)	0.002	S
General complication	14(17.7%)	10 (32.3%)	0.09	NS
Mortality	2 (2.5%)	1 (3.2%)	0.53	NS

S – significant; NS – not significant

**Table VII**  
**Duration of hospitalization according to method of surgical access**

	<b>Open surgery (n=79)</b>	<b>Laparoscopy (n=31)</b>	<b>P</b>	<b>Statistical significance</b>
Total number of days in the Intensive Care Unit	37 (46.8%)	9 (29%)	NA	NA
Duration of stay in the intensive care unit (days)	2.1 (0-27 days)	0.5 (0-4 days)	0.03	S
Duration of hospitalization (days)	19.9 (6-83 days)	11.8 (5-38 days)	<0.0001	S

NA – not available; S – statistical

The average duration of hospitalization was 17.7 days (range 5-83). Forty-six patients were admitted to the intensive care unit (41.8%) for an average duration of 1.8 days (range 1-27). Table VII compares the duration of hospitalization and intensive care admissions according to the method of surgical access.

Table VIII gives the results of the histological examination of excised tumors. The average follow-up of these patients was 23.6 months (range 2-63); Table IX indicates the rate of local recurrence, metastases, and long-term mortality.

## DISCUSSIONS

In our series of 110 patients treated with right or transverse colectomy, the mean age was 68.5 years old (range 40-82.3 years), which is comparable to that in the

literature [1-16,18-27,31]. Three studies [8,11,27] were limited to a precise age range. One study [11] was limited to young patients (age < 40 years) with colon cancer. The authors reported that these patients often have a poor prognosis, and attributed this to the fact that in this age group diagnosis is often made in the late stages of disease (stages III and IV). Furthermore, histological examination showed a more unfavourable histology in younger patients, with more than 50% showing undifferentiated or mucinous adenocarcinoma. In 2 studies [8, 27], patients over 75 years of age were examined. The authors assert that age does not have to be a limiting factor when making the decision to treat surgically, whether by open or laparoscopic technique.

**Table VIII**  
**Characteristics of patients with colon cancer**

	<b>Open surgery (n=52)</b>	<b>Laparoscopy (n=16)</b>	<b>p</b>	<b>Statistical meaning</b>
Age (years)	72.8 (42-98)	62.5 (25-83)	0.02	S
Sex ratio F/M	25 / 27	10 / 6	0.78	NS
BMI (kg/m <sup>2</sup> )	25.2	25.2	0.59	NS
Tumor location				
- right colon	40(76.9%)	13(81.2%)	0.84	NS
- transverse colon	10(19.2%)	3(18.8%)	0.52	NS
- right and transverse colon	2 (3.8 %)	0		NS
Size of tumor (cm)	4.7	3.6	0.005	S
Save margins	52 (100%)	16 (100%)	/	/
Histology				
- adenocarcinoma	52 (100%)	13 (81.2%)	0.02	S
- carcinoid tumor	0	3 (18.8%)	0.005	S
Number of ganglions				
- examined	12.9	13.9	0.97	NS
- positive	1.8	0.4	0.01	S
TNM				
- stage 0	2 (3.8%)	0	0.47	NS
- stage I	1 (1.9%)	3 (23.1%)	0.005	S
- stage II	22 (42.3%)	8 (61.6%)	0.21	NS
- stage III	19 (36.5%)	2 (15.3%)	0.14	NS
- stage IV	8 (15.4%)	0	0.13	NS

BMI – Body Mass Index; S – significant; NS – not significant

**Table IX**  
**Follow-up of the patients with colon cancer**

	<b>Open surgery (n=52)</b>	<b>Laparoscopy (n=16)</b>	<b>p</b>	<b>Statistical significance</b>
Local recurrence	1 (2.2%)	0	0.81	NS
Metachronous metastases	11 (23.9%)	2 (15.4%)	0.59	NS
Death	1 (2.2%)	0	0.68	NS
Date of death (postoperative months)	3.5	0	0.76	NS
Total follow-up (months)	22.5 (2-59)	26 (3- 67)	0.71	NS
Patients lost to follow-up	6	3	NA	NA

S – significant; NS – not significant; NA – not available

The male to female rate in our study was similar to that reported in the literature; our patients were 47.3% male, while previous studies reported 13.5% to 57.1% male

[1,2,4-27,31]. One publication [8] reported a 3 to 5 year survival advantage for women with colon cancer compared to men.

The mean BMI of our patients was 24.9kg/m<sup>2</sup>. Rates reported in the literature range from 20.75 to 32.7kg/m<sup>2</sup> [4,6,22,23,26,27]. One study evaluated the feasibility of laparoscopic colectomy in obese patients [26], reporting that it is possible to perform in obese patients but requires an experienced surgical team.

In our study, ASA scores ranged from 1 to 4 with an average of 2.4. These figures are similar to those in the literature where ASA score scores range from 1 to 4 with an average of 1.2 to 2.6 [4,6,21-23,27].

Regarding indication for surgery, almost all authors report exclusively on resection for colon cancer. Only one study [21] lists the different diagnoses requiring a colectomy. In this report, 11.8% of patients had colon cancer and 82.4% had multiple polyps. This is markedly distinct from the distribution in our study, where 62.3% of patients were diagnosed with colon cancer, 7.3% with ischemic colitis, and 5.5% with Crohn's disease.

Many reports have evaluated the impact of open versus laparoscopic surgical access [1-4,7,9,13,14,19,20,22,24,25,27,31]. The majority of authors are in favor of laparoscopy owing to a lower rate of local complications, pain, and length of hospitalization. However, some authors expressed concern with the use of laparoscopy for surgical resection of the cancerous colon [28-30]. These authors associated laparoscopy with an increased risk of local tumor spread, notably to the sites of trocars insertion.

In our series, the rate of conversion from laparoscopy to open surgery was 22.6%, which is slightly higher than that reported in the literature (7.4-16.9%) [4,12-14,17,19,23,31]. The reasons for conversion in our series are similar to those reported by other authors, and include intra-abdominal adhesions, difficulties linked to dissection, or optimum access of the surgical zone. Inflammation and bleeding are other common causes of conversion, but were not observed in our series.

Total morbidity and mortality were 32.7% and 2.7%, respectively, in our study. Morbidity rates reported in the literature range from 3 to 51.8%. Such margin of variation can be explained by variations in patient selection; studies including patients with an ASA of 4 are rare [1,11,14,27]. Moreover, many authors exclude data from patients whose surgical operation was palliative [2,9,12,13,16-21,23,25,26]. In studies that include patients with an ASA over 4 and those receiving palliative resection, total morbidity varies from 23 to 35.5% [11,15]. These results are comparable in our findings. The rate of digestive fistula in our study was 1.8%, lower than that reported in the literature (2.8-9.1%) [15,17]. Mortality rates range from 0 to 27% in the literature, but when stage IV patients and those with ASA 4 are included, the rate is 20.4-27%. [11,15].

The mean length of hospitalization in our series was 17.7 days (5-83 days). In the literature, the mean length of hospitalization ranges from 6.9 to 13.3 days regardless of surgical technology used [4,6,9,14,17,18,20,21]. There is a noticeable difference between our results and those of other authors; however, studies including patients most likely to have long-term hospitalizations do not report the mean length of the stay [11,15,27], and no study includes data on admission and stay in the intensive care unit.

Histological analysis of resection specimens plays an important role in the accurate diagnosis and guidance of treatment decisions for cancer patients. In our patients, the average tumor size was 4.1cm, which is slightly lower than reports in the

literature, where tumor size varies from 4.3 to 5.9cm [6,14]. Resection margins were negative in 100% of our patients, a value comparable to that in the literature (71.9-100%) [6,8,14]. The majority of tumors in our series were adenocarcinoma. In the literature, this rate varies from 94.5% to 100% [6,14].

On average, 13.1 lymphnodes were examined histologically in our series. In the literature, the number of examined ganglions varies from 11.1 to 24 [6,15,20]. However, we observed a large difference in the rate of positive ganglions, with only 1.5% in our series compared to 33.4-37.4% in the literature [14,20]. Finally, as mentioned previously, our series included a higher percentage of patients with advanced stage disease (stage III and IV) (44.6%). In the literature, this rate varies between 25.8 and 33.3% [7,11,15,20].

Our patients were followed for an average of 25.6 months. In the literature, the mean duration of the follow-up ranges from 1 to 111 months [1,3,6-9,12,14,15,18,20-22]. The rate of recurrence of our series is slightly above that in the literature (23.8% and 20.3%, respectively) but it is interesting to note that our long-term mortality rate (1.5%) is lower than that reported in the literature (18-56.3%) [8,15].

## CONCLUSIONS

The main indication for right or transverse colectomy is colon cancer. Open access and laparoscopic access are two surgical techniques allowing curative treatment of colon cancer, and these two methods have identical long-term postoperative morbidity, mortality, and disease progression. Nevertheless, a decreased rate of local morbidity and shorter hospital stay support the use of laparoscopic surgery in patients without contraindications.

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