

Body mass index as a predictor of complications and conversion in patients undergoing laparoscopic colectomy

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COSTA BXM, QUEIROZ FL, LAMOUNIER PCC, LACERDA FILHO A, PAIVA RA, FRANÇA PR, REGO RSN, RABELO FEF. Body mass index as a predictor of complications and conversion in patients undergoing laparoscopic colectomy. *J Coloproctol*, 2011;31(4): 330-333.

ABSTRACT: Objective: Evaluate the predictive value of body mass index (BMI) for hospital length-of-stay, surgical conversion, and postoperative complications in laparoscopic colorectal surgeries. Methods: Retrospective analysis of 152 patients undergoing laparoscopic colorectal surgery. Patients were divided into two groups: group I (BMI \leq 30) and group II (BMI $>$ 30). The average hospital length-of-stay and the complication and conversion rates of the groups were compared. Results: Group II had a longer average hospital length-of-stay (9.852 versus 7.112 days) and higher conversion rate (33.3 versus 14.4%). BMI $>$ 30 is a risk factor for conversion, with odds ratio (OR) of 2.972 (95% confidence interval - CI 1.157–7.633). No significant difference was observed between the groups regarding complications. Conclusions: Obesity (BMI $>$ 30) significantly increases the conversion rate of laparoscopic colorectal surgery and increases the average hospital length-of-stay of patients.

Keywords: body mass index; laparotomy; laparoscopy; colorectal surgery; postoperative complications.

INTRODUCTION

Laparoscopic colon resection, described for the first time in 1991¹ for diverticular disease treatment, is today an alternative technique for the treatment of most benign or malign diseases that affect this segment of intestine. Despite the initial difficulties, the experience acquired has allowed to extend indications to obese, elderly, intestinal inflammatory disease² patients and patients submitted to prior laparotomy.

Once the equivalence of oncologic radicality of laparoscopy in relation to conventional surgeries, the procedure was extended to the treatment of malign tumors of colon and rectum, promoting the technique and its consolidation as a safe alternative for the treatment of colorectal diseases³⁻⁷. With the procedure safety, also

from the oncologic perspective, as well as the laparoscopy advantages, such as reduced pain, morbidity, ileum, hospital length-of-stay and postoperative infection rates^{8,9}, laparoscopic colectomy has become the method of choice for colon surgeries in large centers.

Today, laparoscopic colectomy is widely used in specialized centers, with 40% of elective colectomy procedures performed in the USA between 2005 and 2006⁹. The increasingly common use of this technique has enabled a detailed and individualized evaluation of the risk factor for the conversion to the laparotomy technique and postoperative complications¹⁰. The availability of proper material and the surgeon's experience are examples of deeply studied factors. Other conditions, such as the influence of excessive weight, are still points to be discussed.

Study carried out at the Coloproctology Clinic at the Hospital Felício Rocho – Belo Horizonte (MG), Brazil.
Financing source: none.
Conflict of interest: nothing to declare.

Submitted on: 08/05/2011
Approved on: 09/06/2011

PATIENTS AND METHODS

This was a retrospective and observational study, based on the analysis of specific protocols of patients submitted to laparoscopic colorectal surgery at the Hospital Felício Rocho (MG), from October 2007 to June 2011.

In this period, 152 laparoscopic colorectal surgeries were performed and the corresponding protocols were analyzed. The patients were sorted into two groups. Group I had patients with BMI of 30 or less, totaling 125 (82.2%). Group II had patients with BMI over 30, totaling 27 (17.8%) (Table 1).

The rates of conversion to conventional surgery, in-hospital complications and the mean hospital length-of-stay were compared between the two groups. In-hospital complications considered in the analysis were as follows: hypovolemia, atelectasis, pneumonia, pulmonary thromboembolism, deep venous thrombosis, urinary infection, urinary retention, surgical site infection, intestinal fistula, pelvic abscess, intestinal ischemia, evisceration, acute myocardial infarction and subcutaneous emphysema.

Fisher's exact test was used to evaluate the homogeneity of the groups in relation to age and presence or absence of malignancy, in each of both associations.

Odds ratio (OR) was used as an association measurement to compare the conversion and complication rates during the hospital length-of-stay between the two groups. The *t* test was used to evaluate the mean hospital length-of-stay.

The study was evaluated and approved by the Research Ethics Committee of the Hospital Felício Rocho – protocol n° 364/11.

RESULTS

From the 125 patients in Group I, 57 were males (45.6%) and 68 females (54.4%). From the 27 patients

in Group II, 16 were males (59.3%) and 11 females (40.7%) (Table 1).

When considering the age group distribution, Fisher's exact test showed no significant difference between the groups (test result: 0.551). The test also showed homogeneous groups in terms of frequency of malign and benign diseases in each group (test result: 0.291) (Table 1).

Statistically significant differences were observed in relation to hospital length-of-stay and rate of conversion to conventional surgery between the groups. In terms of in-hospital complications, no statistically significant differences were observed.

Group I had mean hospital length-of-stay lower than Group II (7.112 *versus* 9.852 days), with *p*=0.048 (Table 2).

Group I presented the conversion rate of 14.4 *versus* 33.3% from Group II (*p*=0.020). The OR of this association was 2.972 (95% confidence interval - CI 1.157–7.633). Therefore, the patients in Group II have a conversion chance 2.972 higher than the patients in Group I (Table 3).

Table 2. Mean hospital length-of-stay.

	n	Mean	Standard deviation
Up to 30	125	7,11	5,408
>30	27	9,85	10,148
General	152	7,60	6,546

Table 3. Conversion rate versus grouped body mass index.

	Up to 30	Over 30	Total
Converted	14.4%	33.3%	17.8%
Did not convert	85.6%	66.7%	82.2%
Responders	100.0%	100.0%	100.0%
	125	27	152

Table 1. Table showing the comparisons between the groups.

BMI	Number	Male	Female	<60 years of age	61–80 years of age	>80 years of age	Benign	Malign
Up to 30	125 (82.2%)	57 (45.6%)	68 (54.4%)	73 (58.4%)	47 (37.6%)	5 (4.0%)	27 (21.8%)	97 (78.2%)
>30	27 (17.8%)	16 (59.3%)	11 (40.7%)	13 (48.1%)	13 (48.1%)	1 (3.7%)	3 (11.5%)	23 (88.5%)
Total	152 (100.0%)	73 (48.0%)	79 (52.0%)	86 (56.6%)	60 (39.4%)	6 (3.9%)	30 (20.0%)	120 (80.0%)

Group I had 11.2% of in-hospital complications and Group II, 11.1% (OR: 1.009, 95%CI 0.260–3.787). Therefore, as data were collected, there are no evidences of difference in the chances of in-hospital complications between the two groups (Table 4).

DISCUSSION

Obesity increases hospital length-of-stay of patients submitted to laparoscopic colorectal surgery. According to Kurmann et al., BMI over 27 increases the risk of surgical site infection, a fact that considerably enhances hospital length-of-stay (15 *versus* 8 days)¹². In a retrospective study that evaluated laparoscopic colectomy exams from 2002 to 2007, Kim C. Lu et al. concluded that obesity is a predictive factor for conversion and that, when compared to fully laparoscopic surgery, the converted surgery leads to longer hospital length-of-stay¹³. Chew et al., when analyzing 418 patients, concluded that, the greater the BMI, the longer that mean hospital length-of-stay¹⁴. The results of our study confirm the literature mentioned and show that the BMI over 30, in the studied group, increased the mean hospital length-of-stay (9.85 *versus* 7.11 days). On the other hand, a study conducted by Delaney et al. did not show any difference in hospital length-of-stay when comparing obese and non-obese patients¹⁵.

The surgical conversion rate is greater in obese patients. According to a study developed by Chew et al., higher BMI increases the conversion rate (OR: 1.15)¹⁴. The conversion risk due to obesity was confirmed by other authors, such as Kim C. Lu et al.¹³ (OR: 1.9). The results of this study also indicate obe-

Table 4. Complication rate versus grouped body mass index.

	Up to 30	>30	Total
Without complications	11.2%	11.1%	11.2%
With complications	88.8%	88.9%	88.8%
Responders	100.0%	100.0%	100.0%
	25	27	152

sity as a predictive factor for conversion, showing that patients with BMI over 30 have a conversion chance 2.972 higher than the patients with BMI under 30.

The comparative analysis of post-laparoscopic colectomy between obese and non-obese patients shows divergent results in the literature. It occurs probably due to the absence of standardization of which complications are considered and computed. Just as Tuech et al.¹⁶, our study did not show any significant difference in complication rates when comparing obese and non-obese patients.

This study was a retrospective analysis, in which 152 patients submitted to laparoscopic colorectal surgery has their results analyzed. The study results agree with most available reports in the literature, showing longer hospital length-of-stay (9.85 *versus* 7.11 days) and greater conversion rate (OR: 2.972) in patients with BMI over 30. Regarding postoperative complications, the studied population did not show any statistically significant difference when comparing the groups with BMI over or under 30.

RESUMO: Objetivo: Avaliar o valor preditor do índice de massa corporal (IMC) para o tempo de internação hospitalar, conversão cirúrgica e complicações pós-operatórias nas cirurgias laparoscópicas colorretais. Métodos: Realizada análise retrospectiva de 152 pacientes submetidos à cirurgia laparoscópica colorretal. Os pacientes foram divididos em dois grupos: grupo I (IMC≤30) e grupo II (IMC>30). Os grupos tiveram as médias de permanência hospitalar, as taxas de complicações e de conversão comparadas. Resultados: O grupo II apresentou maior tempo médio de permanência hospitalar (9,852 *versus* 7,112 dias) e maior taxa de conversão (33,3 *versus* 14,4%), sendo o IMC>30 um fator de risco para conversão, com *odds ratio* (OR) de 2,972 (Intervalo de confiança - IC 95% 1,157-7,633). Não houve diferença significativa entre os grupos com relação às complicações. Conclusões: A obesidade (IMC>30), aumenta significativamente a taxa de conversão da cirurgia colorretal laparoscópica, assim como aumenta a média de tempo de permanência hospitalar dos pacientes.

Palavras-chave: índice de massa corporal; laparotomia; laparoscopia; cirurgia colorretal; complicações pós-operatórias.

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