Risk Factors for Conversion and Morbidity During Initial Experience in Laparoscopic Proctectomies: a Retrospective Study

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Abstract The aim of this study was to determine the predictable factors for conversion during laparoscopic proctectomies, and for postoperative morbidity, in order to assist in defining the best candidates of patients for initial experience in laparoscopic proctectomies for rectal adenocarcinoma. A retrospective analysis of consecutive patients who underwent laparoscopic rectal resection for rectal adenocarcinoma operated by a single surgeon, between 2005 and 2012, were performed. Predictive factors for conversion and for postoperative morbidity were analyzed using univariate and multivariate analysis. Sixty-nine patients were included. There were 35 (50.7 %) men with a median age of 53 years. Forty-seven patients had tumors located below 8 cm from the anal verge, and sphincter-preserving surgery was performed in 52 (75.4 %) patients. Thirty-four patients were operated in the early period (before 2009). Conversion rate was 17.4 %. In multivariate analysis, the independent predictive factors for conversion were time period (before 2009) ($p=0.007$, Exp. 19.9; CI (95 %) 2.2–177.4) and tumors located 8 cm above the anal verge ($p=0.028$, Exp. 5.23, CI (95 %) 1.2–22.8). Twenty-two patients (31.9 %) had a complicated postoperative course. Only male gender was associated with postoperative complications ($p=0.01$, CI (95 %) 1.3–11.8). Our study showed that conversion rate is influenced by surgeon's experience, and height of

the tumor and that male gender is a predisposing factor for a higher morbidity rate. These results suggest that women with low rectal tumors requiring colo-anal anastomosis or abdomino-perineal resection would be the best candidates for early surgeons' experience in laparoscopic proctectomies for rectal adenocarcinoma.

Keywords Rectal neoplasms · Laparoscopy · Learning curve · Morbidity

Background

The reported advantages of laparoscopic rectal surgery include shorter hospital stay, less blood loss and transfusion [1], less analgesic requirement, shorter times to first bowel movement and mobilization [2], and less postoperative morbidity [3]. However, despite all these advantages, only few centers perform laparoscopic rectal resections (19.2 %) [4]. In a recent paper, Greenblatt et al. analyzed the American College of Surgeons National Surgical Quality Improvement Program (ACS NSQIP) database and reported that only 19 % of 5420 proctectomies were performed by laparoscopic approach in the USA [3]. Laparoscopic rectal resections are considered technically difficult because they require pelvic dissection, rectal transection, and anastomosis in the narrow pelvis, and therefore, it is not widely accepted and adopted yet [5]. In particular, laparoscopic low anterior resection is reported to have the highest level of technical difficulty in laparoscopic colorectal surgery [6], and therefore, the learning curve to become technically proficient may be longer than for simpler laparoscopic procedures [7]. Earlier studies reported high rates of conversion and postoperative morbidity associated with laparoscopic rectal surgery. In addition, conversion to open surgery is associated with longer hospital stay, greater

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blood loss, more postoperative morbidity, and some authors reported worse oncological results [8]. In this context, selection of patients may be an important factor at the beginning to improve patients' outcomes. The aim of this study was to analyze predisposing factors for conversion to open surgery and for surgical postoperative morbidity, in order to assist in selecting the best candidates for laparoscopic proctectomies for rectal adenocarcinoma during surgeon's early experience for these complex procedures.

Material and Methods

This study is a retrospective case series of all consecutive laparoscopic rectal resections performed by a single surgeon in a Moroccan university hospital (Ibn Sina University Hospital, Rabat) between January 2005 and December 2012. Patients eligible for laparoscopic approach in this beginning experience were those with resectable rectal adenocarcinoma (located within 15 cm from the anal verge) in the preoperative workup, ASA 1 or 2 and BMI less than 25 kg/m², and no history of submesocolic surgery. Patients with other histologic type than adenocarcinoma were excluded. The study was approved by the medical committee of the Ibn Sina University Hospital.

Preoperative workup included rigid rectal endoscopy with biopsies, total colonoscopy, chest and abdominal computed tomography (CT scan), pelvic CT scan, and carcinoembryonic antigen, and since 2010, endorectal ultra-sonography or pelvic magnetic resonance imaging. Patients with tumors located within 10 cm from the anal verge, suspected T 3–4, and/or positive lymph node on workup underwent preoperative chemoradiotherapy (CRT).

Surgery was performed 6 to 8 weeks after CRT. Laparoscopic surgery was performed with five trocars according to the principles described by Heald [9]. In case of anterior resection, specimen was extracted through a 4 cm supra-pubic incision. Colorectal anastomoses were created using a mechanical circular stapler and colo-anal anastomosis were hand-sewn. In case of abdomino-perineal resection (APR), specimen was extracted through the perineal incision. Perineum was either closed, with confection of abdominal colostomy, or reconstructed using pseudo continent perineal colostomy technique.

We defined conversion as midline laparotomy or enlargement of supra-pubic incision because of inability to perform the surgical steps by laparoscopy. Causes for conversion were identified in the surgical report as described by the surgeon. We defined morbidity as surgical postoperative complications higher than grade II according to Dindo classification [10], in addition to wound infections. Concerning anastomotic leakage, we adopted the definition proposed by the International Study Group of Rectal Cancer [11]: "Defect of the intestinal

wall integrity at the colorectal or colo-anal anastomotic site (including suture and staple lines of neorectal reservoirs) leading to a communication between the intraluminal and extraluminal compartments. A pelvic abscess close to the anastomosis is also considered as anastomotic leakage."

The impact of the following variables on conversion to open surgery and postoperative morbidity was analyzed: age, gender, height of the tumor (0 to 7 cm vs. 8 to 15 cm from the anal verge at rigid rectoscopy), neoadjuvant chemoradiotherapy, type of surgery (anterior resection or abdomino-perineal resection; T stage (T 1–2 vs. T 3–4), N stage and tumor differentiation (well differentiated vs. others), and time period (before 2009 vs. after 2009).

Quantitative data are presented as median (range). Predictive factors for conversion and morbidity were identified by univariate and multivariate analyses. Univariate analysis was calculated by chi-squared or Fischer test as appropriate. Multivariate analysis was performed using logistic regression model (95 % confidence interval). Results were considered significant when *p* was less than 0.05.

To analyze the learning curve, patients were divided in two groups, before and after 2009 (34 vs. 35 patients, respectively). Comparison between patient's characteristics and morbidity was performed using Student test, chi-squared test, or Fischer test as appropriate. Results were considered significant if *p* was less than 0.05.

Results

During the study period, 69 patients underwent laparoscopic resection for rectal adenocarcinoma. Table 1 summarizes patient's characteristics. There were 35 men (50.7 %) with a median age of 53 years (range 27–76). Forty-seven patients had tumors located below 8 cm from the anal verge and 43 patients received CRT. Sphincter-preserving surgery was performed in 52 patients (75.4 %), with colo-anal anastomosis in 24 patients (46.1 %) and stapled colorectal anastomosis in 28 patients (53.9 %). After Abdomino-perineal resection, five patients had PCPC and the others had perineal closure and abdominal colostomy.

The median operating time was 300 min (range 180–720). The median number of lymph nodes analyzed was 12 (range 0–32). The median distal and circumferential margins were 2 cm (range 0–8) and 2 mm (range 0.7–24), respectively. Six patients (8.7 %) had an incomplete oncologic resection. Four patients had a positive circumferential margin (<1 mm) and two patients had a positive distal margin.

Risk Factors for Conversion

Conversion rate was 17.4 % (12/69). The most common causes of conversion were bulky tumors (four cases; 33.3 %)

Table 1 Patients' characteristics

Variable	Description	Number	Percent
Gender	Women	34	49.3
	Men	35	50.7
Age (years)	<55	39	56.5
	>55	30	43.5
Tumor location ^a (cm)	<8	47	68.1
	>8	22	31.9
CRT	Yes	43	62.3
	No	26	37.7
Surgical treatment	Anterior resection	52	75.4
	APR	17	24.6
Time period	Before 2009	34	49.3
	After 2009	35	50.7
T ^b	1–2	25	36.2
	3–4	44	63.8
N ^c	0	50	72.5
	+	19	27.5
Histologic differentiation	Well	48	69.6
	Other	21	30.4

CRT neoadjuvant chemoradiotherapy, APR abdomino-perineal resection

^a Tumor location: distance between the anal verge and the inferior border of the tumor

^b T stage on surgical specimen

^c N stage on surgical specimen

and difficult rectal stapling (five cases; 41.6 %). Table 2 summarizes the results of univariate analysis. Multivariate analysis showed that time period before 2009 ($p=0.007$, Exp. 19.9; CI 2.2–177.4) and tumors located below 8 cm from the anal verge ($p=0.028$, Exp. 5.23, CI (95 %) 1.2–22.8) were independent factors for conversion. In the subgroup of patients who underwent anterior resection, analysis showed that patients with stapled colorectal anastomosis had higher conversion rate than patients with colo-anal anastomosis (0 vs. 25 %, $p=0.01$).

Risk Factors for Morbidity

Postoperative morbidity occurred in 31.9 % of patients. Causes of morbidity are shown in Table 3. Anastomotic leaks occurred in ten patients (19.4 %). Four patients (5.8 %) were reoperated for peritonitis (two patients), intestinal obstruction (one patient), and stoma necrosis (one patient). One patient (1.4 %) died in the postoperative period (peritonitis secondary to anastomotic leakage). Statistical analysis (Table 4) showed that male gender was the only predictive factor of postoperative morbidity ($p=0.01$, CI (95 %) 1.3–11.8).

Table 2 Risk factors for conversion to open surgery: univariate analysis

Variable	Description	n (%)	p value
Gender	Women	5/34 (14.7)	0.56
	Men	7/35 (20)	
Age	<55	5/39 (12.8)	0.25
	>55	7/30 (23.3)	
Tumor location (cm)	<8	5/47 (10.6)	0.04
	>8	7/22 (31.8)	
CRT	Yes	4/43 (9.3)	0.04
	No	8/26 (30.8)	
Surgical treatment	Anterior resection	7/52 (13.5)	0.13
	APR	5/17 (29.4)	
Period	Before 2009	11/34 (32.4)	0.001
	After 2009	1/35 (2.9)	
T	1–2	5/25 (20)	0.74
	3–4	7/44 (15.9)	
N	0	9/50 (18)	1
	+	3/19 (15.8)	
Differentiation	Well	8/48 (16.7)	1
	Other	4/21 (19)	

Tumor location: distance between the anal verge and the inferior border of the tumor. Conversion: to open surgery

CRT neoadjuvant chemoradiotherapy, APR abdomino-perineal resection

Learning Curve Analysis

Table 5 shows comparison of the characteristics of the population between the two periods (before and after 2009). There was no difference in gender distribution, age, median height of tumor, and rate of tumors located below 8 cm from the anal verge. Conversion rate was statistically lower in the second period (2.9 vs. 32.4 %, $p=0.001$). Morbidity rate was lower in the second period but the difference was not significant.

Discussion

This study addressed the issue of selection of patients in the beginning of experience in laparoscopic resections for rectal adenocarcinoma. We considered that the best patients would be those associated with less conversion to open surgery and less postoperative morbidity.

Table 3 Postoperative complications

Complication	Number	Percent
Anastomotic leak	10/52	19.2
Wound infection	2/69	2.69
Urinary	5/69	7.2
Respiratory	2/69	2.69
Reoperations	4/69	5.8
Deaths	1	1.44

Table 4 Risk factors for postoperative morbidity

Variable	Description	N (%)	p value
Gender	Women	6/34 (17.6)	0.012
	Men	16/35 (45.7)	
Age	<55	12/39 (30.8)	0.82
	>55	10/30 (33.3)	
Tumor location (cm)	<8	16/47 (34)	0.57
	>8	6/22 (27.3)	
CRT	Yes	15/43 (34.9)	0.49
	No	7/26 (26.9)	
Surgical treatment	Anterior resection	15/52 (28.8)	0.34
	APR	7/17 (41.2)	
Period	Before 2009	12/34 (35.3)	0.49
	After 2009	10/35 (28.6)	
T	1–2	9/25 (36)	0.54
	3–4	13/44 (29.5)	
N	0	16/50 (32)	0.97
	+	6/19 (31.6)	
Differentiation	Well	14/48 (29.2)	0.46
	Other	8/21 (38.1)	
Conversion	No	17/57 (29.8)	0.5
	Yes	5/12 (41.7)	

Tumor location: distance between the anal verge and the inferior border of the tumor. Conversion: to open surgery

CRT neoadjuvant chemoradiotherapy, APR abdomino-perineal resection

Conversion rate to open surgery in this study was 17.1 %. In the literature, it varies between 0 to 21.9 % [5]. Our study showed that patients with tumors located above 8 cm from the anal verge had significantly higher conversion rate. Knowing that all of them had partial or total mesorectal excision with colorectal anastomosis. Moreover, in patients who had anterior resection, the conversion rate was significantly higher after colorectal than those with colo-anal anastomosis (0 % vs.

Table 5 Comparison of patients' characteristics before and after 2009

Variable	Before 2009	After 2009	p value
Conversion (%)	32.4	2.9	0.001
Male gender (%)	52.9	48.6	0.71
Age (median)	52.7	54.4	0.58
Tumor location (median cm)	6.7	7.1	0.7
>8 cm	32.4	31.4	0.93
CRT	44.1	31.4	0.27
APR	32.4	17.1	0.14
Well differentiated	76.5	62.9	0.21
T 1–2	29.4	42.9	0.24
N+	35.3	20	0.15

Tumor location: distance between the anal verge and the inferior border of the tumor. Conversion: to open surgery

>8 cm tumor located above 8 cm from the anal verge, CRT neoadjuvant chemoradiotherapy, APR abdomino-perineal resection, N+ positive lymph node in pathologic examination of the specimen

25 %, $p=0.01$). This high rate of conversion can be explained by anatomical and technical difficulties when performing section of mesorectum and rectal transection [12, 13]. To perform colorectal anastomosis, it is necessary to divide the mesorectum, to expose adequately the smooth rectal wall in order to facilitate uniform and reliable transection of the rectum [12]. The difficulty is that laparoscopic rectal dissection is performed in an anatomically narrow space where intrapelvic manipulation is restricted and working space is limited. Moreover, the available laparoscopic instruments do not allow the introduction of a mechanical stapler deep in a narrow pelvis, and the design of the device prevents application at a right angle to the bowel [13]. Therefore, most authors consider rectal transection as one of the most difficult procedures in laparoscopic rectal surgery and that it greatly influences conversion to open surgery [4, 12–15]. However, conversion rate in patients who underwent colorectal anastomosis decreased from 58.3 % in the early period to 0 % in the second period, suggesting that with increasing experience, this difficult surgical step can be completed by laparoscopy.

Several studies have shown that conversion to open surgery correlates with surgical expertise and that it is a strong indicator for the learning curve in laparoscopic surgery [8, 12, 16, 17]. Agha et al. reported a significant decrease of conversion rate from 13 % during the first 100 procedures to 3 % for the last 100 procedures [8]. In a series of 98 laparoscopic rectal resections, Morino et al. reported an improvement of conversion rate from 24 % for the first 25 cases to 13 % for the last 23 cases [16]. In our study, conversion to open surgery decreased from 32.4 % in the early period (first 35 patients) to 2.9 % in the latter period ($p=0.001$) with no change in patients' characteristics between the two periods, meaning that the improvement was related to the surgeon's learning curve. The reported cutoff for the learning curve in regard of conversion rate is reported to be up to 150 cases in the literature [12]. In this study, the surgeon achieved this learning curve after performing 35 rectal resections.

The two other most important factors associated to conversion in the literature are BMI [8] and male gender [12, 13]. BMI could not be assessed since this study included only patients with BMI less than 25 kg/m². Conversion rate was higher in male gender without reaching statistical significance.

However, male gender was the only predictive factor for morbidity in this study, which is in accordance with previous reports in the literature [4, 12, 13]. Male patients had more anastomotic leaks, wound infections and urinary complications than women. The difference between genders was marked in case of stapled colorectal anastomosis (28.6 vs. 6.7 %). Male patients have narrower and deeper pelvis than women [4]. Thus, technical difficulties in rectal transection are more frequent in male than females, resulting in more multiple firing, usually with a Z form, which creates a potential ischemic zone in the rectal stump

with high risk of leakage [12, 13]. These difficulties could explain the high rate of AL in this study.

In the other hand, morbidity rate was not significantly different between the two periods, especially in male patients (44.4 vs. 47 %). However, in female patients, complications occurred less frequently in the second period (25 vs. 11.1 %). These results suggested that the learning curve for postoperative morbidity was not still completed in male patients. There is a debate whether the rate of postoperative complications improves with the number of cases managed [18–21]. Ito and Marusch did not find a relationship between the experience and postoperative complications [18, 19]. In these studies, there was a tendency to operate more complicated cases with increased experience and complications rates were similar or even higher with increased experience. Thus, results were not accurate because the groups compared were different. In our study, the two groups compared were similar, particularly in regard to tumor characteristics (T stage and height of tumor). Kayano et al. [12] analyzed the learning curve in 250 consecutive patients undergoing laparoscopic rectal resection and found that complications decreased significantly with the number of cases managed. Interestingly, they also reported the number of required cases for the learning curve was higher for postoperative morbidity than for conversion rate. Anastomotic leak rate varies in the literature from 6 to 18 % [22–24]. Park et al. reported a significant decrease in AL rate from 20 to 3 % with the surgeon's experience and standardization of rectal transection technique [7]. Therefore, in laparoscopy, standardizing the rectum transection is important and the proper technique of rectum transection is indispensable to improve patient's outcome [7, 12, 13].

Our results suggested that women with tumors located below 8 cm from the anal verge, scheduled for anterior resection with colo-anal anastomosis, or abdomino-perineal resection would be the best candidates for early experience in laparoscopic resections for rectal adenocarcinoma. With increased experience, surgeons could extend their indications to higher tumors in women, then to rectal tumors in male patients. There is a lack of data in the literature regarding selection of patients for laparoscopic rectal surgery. Laurent et al. analyzed risk factors predisposing to conversion and morbidity in TME with sphincter preservation in 200 patients and concluded that the laparoscopic approach is not a good option for men with a stapled anastomosis because of high morbidity rate [13]. Indeed, rectal surgery is harder in men because of a narrower pelvis. However, if we exclude the anterior dissection of the rectum, the other technical steps of this procedure are shared between males and females including lateral and posterior rectal dissection in the pelvis, rectal transection, and anastomosis. By getting familiar to these techniques in less challenging cases (women larger pelvis), surgeons would be able to transfer these skills to more difficult ones like men narrower pelvis. It was confirmed by many studies reporting low

conversion and morbidity rates in men with increased experience [4, 7, 17]. Male patients were associated with high morbidity in our analysis and should only be operated by high experienced surgeons.

This study has some limitations. It was retrospective with small number of patients and included a selected population with BMI less than 25 kg/m² and without major comorbidities. However, these results could help surgeons to choose the best patients for starting experience in laparoscopic surgery for rectal adenocarcinoma without compromising patients' outcomes, and to plan rising difficulty according to the improvement in their learning curve.

Conclusion

This analysis of our early experience in laparoscopic surgery for rectal adenocarcinoma showed that conversion rate is influenced by surgeon's experience, height of the tumor, and type of anastomosis and that male sex is associated to higher morbidity. It also shown that conversion and morbidity rates in females improved with surgeon's experience. These results suggested that women with tumors located below 8 cm from the anal verge, scheduled for anterior resection with colo-anal anastomosis, or abdomino-perineal resection would be the best candidates for early experience in laparoscopic resections for rectal adenocarcinoma.

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Compliance with Ethical Standards

Conflict of Interest The authors declare that they have no competing interests.

References

1. Lujan J, Valero G, Hernandez Q et al (2009) Randomized clinical trial comparing laparoscopic and open surgery in patients with rectal cancer. *Br J Surg* 96:982–989
2. Ng SSM, Leung KL, Lee JFY et al (2008) Laparoscopic-assisted versus open abdominoperineal resection for low rectal cancer: a prospective randomized trial. *Ann Surg Oncol* 15:2418–2425
3. Greenblatt DY, Rajamanickam V, Pugely AJ et al (2011) Short-term outcomes after laparoscopic-assisted proctectomy for rectal cancer: results from the ACS NSQIP. *J Am Coll Surg* 212:844–854
4. Ogiso S, Yamaguchi T, Hata H et al (2011) Evaluation of factors affecting the difficulty of laparoscopic anterior resection for rectal cancer: "narrow pelvis" is not a contraindication. *Surg Endosc* 25: 1907–1912
5. Hotta T, Yamaue H (2011) Laparoscopic surgery for rectal cancer: review of published literature 2000–2009. *Surg Today* 41:1583–1591

6. Jamali FR, Soweid AM, Dimassi H et al (2008) Evaluating the degree of difficulty of laparoscopic colorectal surgery. *Arch Surg (Chicago, Ill : 1960)* 143:762–767
7. Park IJ, Choi G-S, Lim K-H et al (2009) Multidimensional analysis of the learning curve for laparoscopic colorectal surgery: lessons from 1,000 cases of laparoscopic colorectal surgery. *Surg Endosc* 23:839–846
8. Agha A, Fürst A, Iesalnieks I et al (2008) Conversion rate in 300 laparoscopic rectal resections and its influence on morbidity and oncological outcome. *Int J Color Dis* 23:409–417
9. Heald RJ, Husband EM, Ryall RD (1982) The mesorectum in rectal cancer surgery—the clue to pelvic recurrence? *Br J Surg* 69:613–616
10. Pa C, Barkun J, de Oliveira ML et al (2009) The Clavien-Dindo classification of surgical complications: five-year experience. *Ann Surg* 250:187–196
11. Rahbari NN, Weitz J, Hohenberger W et al (2010) Definition and grading of anastomotic leakage following anterior resection of the rectum: a proposal by the International Study Group of Rectal Cancer. *Surgery* 147:339–351
12. Kayano H, Okuda J, Tanaka K et al (2011) Evaluation of the learning curve in laparoscopic low anterior resection for rectal cancer. *Surg Endosc* 25:2972–2979
13. Laurent C, Leblanc F, Gineste C et al (2007) Laparoscopic approach in surgical treatment of rectal cancer. *Br J Surg* 94:1555–1561
14. Kuroyanagi H, Oya M, Ueno M, Fujimoto Y et al (2008) Standardized technique of laparoscopic intracorporeal rectal transection and anastomosis for low anterior resection. *Surg Endosc* 22:557–561
15. Kuroyanagi H, Akiyoshi T, Oya M et al (2009) Laparoscopic-assisted anterior resection with double-stapling technique anastomosis: safe and feasible for lower rectal cancer? *Surg Endosc* 23: 2197–2202
16. Morino M, Allaix ME, Giraudo G et al (2005) Laparoscopic versus open surgery for extraperitoneal rectal cancer: a prospective comparative study. *Surg Endosc* 19:1460–1467
17. Park IJ, Choi G-S, Lim KH et al (2009) Multidimensional analysis of the learning curve for laparoscopic resection in rectal cancer. *J Gastrointest Surg* 13:275–281
18. Ito M, Sugito M, Kobayashi A et al (2009) Influence of learning curve on short-term results after laparoscopic resection for rectal cancer. *Surg Endosc* 23:403–408
19. Marusch F, Gastinger I, Schneider C et al (2001) Experience as a factor influencing the indications for laparoscopic colorectal surgery and the results. *Surg Endosc* 15:116–120
20. Wishner JD, Baker JW Jr, Hoffman GC et al (1995) Laparoscopic-assisted colectomy. The learning curve. *Surg Endosc* 9:1179–1183
21. Reissman P, Cohen S, Weiss EG et al (1996) Laparoscopic colorectal surgery: ascending the learning curve. *World J Surg* 20:277–281, discussion 282
22. Morino M, Parini U, Giraudo G et al (2003) Laparoscopic total mesorectal excision. *Ann Surg* 237:335–342
23. Scheidbach H, Schneider C, Konradt J et al (2002) Laparoscopic abdominoperineal resection and anterior resection with curative intent for carcinoma of the rectum. *Surg Endosc* 16:7–13
24. Leroy J, Jamali F, Forbes L et al (2004) Laparoscopic total mesorectal excision (TME) for rectal cancer surgery: long-term outcomes. *Surg Endosc* 18:281–289