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Preliminary Experience of Fast-track Surgery Combined with Laparoscopy-assisted total Mesorectal Excision for Rectal Cancer

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Abstract

Background: Fast-track surgery may allow accelerated recovery in rectal surgery; however, postoperative complications are a cause for concern. We aimed to retrospectively analyze the morbidity and mortality associated with a fast-track protocol for patients with rectal carcinoma in a high volume center.

Methods: From January 2010 to June 2011, 78 patients underwent laparoscopic anterior resection for rectal carcinoma and were enrolled in a program of early recovery after surgery. The Clavien-Dindo Classification was applied to evaluate the severity of postoperative complications.

Results: Fifty-three (68%) men and 25 (32%) women (median age, 63 years) participated in the study. Postoperative mortality was 0. The overall morbidity was 33.3%. The most common complications were infection of the surgical wound, pulmonary infection, and cardiopulmonary events. A surgical drain was used in 77.8% of patients; the prevalence of anastomotic leaks was 2.6%. The median hospital stay was 12 days (including 3-4 days of hospitalization receiving routine examination: complete colonoscopy, whole abdominal enhanced CT before surgery), 3.8% patients were re-admitted.

Discussion: The fast-track program after laparoscopic anterior resection for rectal carcinoma in high volume centers is a safe and effective method that can improve the mortality and morbidity of patients.

INTRODUCTION

There have been significant improvements in the surgical management of rectal carcinoma over the last decade. Mortality rates associated with anterior resection for rectal carcinoma and symptomatic anastomotic leakage, the most important complication following rectal resection with anastomosis, have dropped below 2 and 22%, respectively [1-3]. However, postoperative morbidities resulting from rectal surgery remain high and require prolonged hospital stays.

Recently, the concept of fast-track surgery was introduced to decrease postoperative morbidity, reduce hospital stay time, and lead to an earlier return to normal life after surgery [4-6]. Fast-track protocols require the collaboration of multidisciplinary teams to allow pre-operative preparation; anesthetic, intraoperative and surgical management; and post-operative care including optimal control of pain, early normalization of digestive function, and early mobilization of the patient. Several studies have demonstrated the effectiveness of fast-track programs in colon resection and rectal surgery [7,8].

In this study, a cohort study was carried out to examine the morbidity and mortality after laparoscopic lower anterior resection of the rectum in patients included in a fast-track

program in a high volume center at the Shengjing Hospital of China Medical University.

PATIENTS AND METHODS

Study design

From January 2010 to June 2011, 78 patients were enrolled in a fast-track program for laparoscopic anterior resection of rectal carcinoma (Table 1). Rectal cancer was defined as carcinoma ≥5cm and ≤15 cm from the anal margin. A retrospective analysis was performed to investigate the occurrence of post-operative mortality and morbidity.

Surgical technique

The surgery was performed by a single surgical team. The technique involved an anterior resection for rectal carcinoma with a total mesorectal excision (TME). All surgery for laparoscopic rectal cancer resection was performed intracorporeally, including mobilization, vessel ligation, transection, and anastomosis. The dissection was begun by high ligation of the inferior mesenteric artery (IMA) at its origin from the aorta. If a significant ascending left colic artery was encountered, an effort was made to preserve it while completing a thorough lymphatic clearance of all the lymph nodes at the base of the IMA. The rectum was then mobilized as far down as possible on its posterior and right lateral surfaces before opening the anterior rectal space from right to left, extending from Douglas's pouch. The dissection was then pursued by alternating right lateral, left lateral, anterior, and posterior dissection down to the pelvic floor. The dissection of the mesorectum was carried out between the parietal and visceral planes of the pelvic fascia. The rectum was excised completely enveloped within the visceral pelvic fascia and the anastomosis was performed using standard double-stapling techniques anastomosis. No patients had iliac diverting stoma.

Early recovery protocol

The main pillar of our protocol was the suppression of all traditional, not evidence-based measures, according to the current literature, such as the systematic preoperative mechanical bowel preparation, the postoperative use of nasogastric tube, and the routine use of drainage. Before surgery, patients were provided with detailed information describing the postoperative protocol. Drainage was not routinely used, unless it was judged absolutely necessary. When a nasogastric tube was inserted during surgery, it was removed on the operating table at completion of the procedure. On the first day after surgery, gastrointestinal and pulmonary functions were restored and oral tolerance to liquids was started. Subsequently, the diet was increased until the fourth day when patients were discharged if there was no fever, proper oral tolerance, and good pain control with oral analgesia. The implementation and application of our fast-track program over the one and half year study period is summarized in Table 2.

Table 1: Patient characteristics, tumor staging and treatment data.

	n	%
Sex		
M	53	67.9
F	25	32.1
Distance of tumor from anal verge		
5-10 cm	38	48.7
11-15 cm	40	51.3
Dukes stage		
A	19	24.4
B	43	55.1
C	16	20.5
D	0	
Procedure		
LAR stapled anastomosis	68	87.2
LAR coloanal anastomosis	10	12.8

LAR, lower anterior resection

Morbidities

The Clavien-Dindo classification of surgical complications was applied to assess postoperative outcomes (Table 3) [9].

Anastomotic leak was defined as drainage of intestinal liquid, or as demonstrated by sinogram. Postoperative bleeding was defined by a requirement for urgent relaparotomy, or the need to transfuse more than 2 red blood cell packs after surgery; blood transfusion was performed when hemoglobin levels were less than 7 mg/dl.

Statistical analysis

All statistical analyses were performed with SPSS version 18.0. The normality of variables was investigated using the Shapiro-Wilk test. The associations between two quantitative variables in multivariate analyses were examined with the Spearman rho correlation coefficient. The variables significantly related to the presence of morbidity and hospital stay were identified using logistic (LR) and multiple linear regressions, respectively.

RESULTS

Of the 78 patients studied 53 (68%) were male; the median patient age was 63 years (range, 54–70). All of the patients were operated upon for malignant etiologies (Table 4). The incidences of previous abdominal surgery (cholecystectomy, appendectomy, biliary bypass, gastrostomy, exploratory laparotomy, colectomy) and previous colorectal surgery were 13% and 3.1%, respectively.

The fast-track protocol resulted in an overall morbidity rate of 33.3%. The most frequent morbidities were general complications including catheter sepsis, unknown fever, urinary tract infections, and depression; and surgical wound infections (10.3%), respiratory complications (6.4%), cardiorespiratory complications (5.1%), post-operative bleeding (3.8%) and intestinal obstruction (3.8%). 1.3% of cases required drainage placement during the postoperative period (percutaneous). Patients with a previous surgical history had a higher incidence of overall morbidity, anastomotic leakage, pulmonary complications, and readmission, although this was not statistically significant.

Associated surgery was related to an increase in general morbidity, anastomotic leak, postoperative hemorrhage, lung complications, reoperation rate, and increased postoperative

Table 2: Fast-track protocol after laparoscopic anterior resection for rectal carcinoma.

Stay	Treatment
Before Surgery	Detailed information given to the patient regarding the postoperative course
	Drink 800 ml of a carbohydrate-rich solution the day before and 400ml 2 h before surgery.
Day 0	General anesthesia
	Start of tolerance to liquids
Day 1	Removal of Foley catheter
	Move to floor
	Moving the patient to a chair
	Chew gum to promote intestinal peristalsis
	Blow a balloon to restore pulmonary function
	Drink water
Day 2	Removal of venous analgesia
	Non-residue diet
Day 3	Stop PTN
	Semi-liquid diet
Day 4	Soft diet
Day 5	Discharge if no fever, proper oral tolerance and good pain control with oral analgesia

Table 3: The Clavien-Dindo Classification of surgical complications following laparoscopic anterior resection for rectal carcinoma*.

Grades	Definition
I	Any deviation from the normal postoperative course without the need for pharmacological treatment or surgical, endoscopic and radiological interventions.
	Allowed therapeutic regimens are: drugs as antiemetics, antipyretics, analgesics, diuretics and electrolytes and physiotherapy. This grade also includes wound infections opened at the bedside.
II	Requiring pharmacological treatment with drugs other than such allowed for grade I complications.
	Blood transfusions and total parenteral nutrition are also included.
III	Requiring surgical, endoscopic or radiological intervention
III-a	intervention not under general anesthesia
III-b	intervention under general anesthesia
IV	Life-threatening complication (including CNS complications)* requiring IC/ICU-management
IV-a	single organ dysfunction (including dialysis)
IV-b	multi organ dysfunction
V	Death of a patient
Suffix 'd'	If the patients suffer from a complication at the time of discharge, the suffix "d" (for 'disability') is added to the respective grade of complication. This label indicates the need for a follow-up to fully evaluate the complication.

* brain hemorrhage, ischemic stroke, subarachnoid bleeding, but excluding transient ischemic attacks (TIA); IC, Intermediate care; ICU, Intensive Care Unit.

mortality. Associated surgery was a risk factor for postoperative mortality (OR=12; 95% CI: 1.43-100.9; P = 0.046).

Each increase in 10 years of patient age multiplied the probability of morbidity by 1.4 times (95% CI: 1.1–2.6, LR, P = 0.012) after adjusting for the presence of drainage. Furthermore, total stay increased by 6 days for patients older than 70 years (95% CI: 1–15, multiple linear regression, P = 0.039).

The median hospital stay was 12 days (range, 9–26 days) including 3–4 days of hospitalization receiving routine examination (e.g., complete colonoscopy, whole abdominal enhanced CT) before surgery). The total stay was significantly higher for anastomotic leakage, postoperative bleeding, intra-abdominal abscess, surgical wound infection, pulmonary complications, reoperation, and readmission. Three of the patients who were readmitted (3.8%), required conserved treatment. Overall, the fast-track protocol was associated with a decreased risk of morbidity over time (LR, P = 0.072).

Table 4: Indications for laparoscopic anterior resection for carcinoma of the rectum.

Pathology	n	(%)
Adenocarcinoma	69	88.5
Adenosquamous carcinoma	7	9
Undifferentiated carcinoma	2	2.5

Analysis of postoperative morbidity according to severity

According to the Clavien-Dindo Classification, grade II (15.4%) and grade I (7.7%) post-operative morbidities were the most frequent. Grade IVa had a frequency of 5.1% due to monitoring of emergency re-operated patients in the immediate postoperative period in the intensive care unit (ICU) (Table 5).

Both surgical wound infection and cardiopulmonary complications were distributed similarly over all morbidity

Table 5: Analysis of postoperative complications according to the disease classification following laparoscopic anterior resection for rectal carcinoma.

Degree	n	(%)	WI	CRC	AL	IAA	H	PI	IO
I	6	7.7	4	1	0	0	1	0	0
II	12	15.4	3	1	2	0	1	3	2
IIIa	2	2.6	1	0	0	1	0	0	0
IIIb	2	2.6	0	0	0	0	1	0	1
IVa	4	5.1	0	2	0	0	0	2	0
IVb	0	0	0	0	0	0	0	0	0
V	0	0	0	0	0	0	0	0	0
Total	26	33.3	8	4	2	1	3	5	3

CRC, cardiorespiratory complications; H, hemorrhage; AL, anastomotic leakage; IAA, intra-abdominal abscess; WI, wound infection; PI, pulmonary infection; IO, intestinal obstruction.

grades. Anastomotic leak was most frequent in grade II. The patients with intra-abdominal abscess were classified as grade IIIa. Of the 2 patients with post-operative bleeding one were classified as grade II, the others were grade I (Table 5).

The median total hospital stay was 9 days (range, 5–11) with no morbidities, 12 days (range, 8–14) for Grade I, 14 days (range, 11.5–21.5) for grade II, 35.5 days (range, 21–40.5) for grade IIIa, 30 days (range, 22–38) for grade IIIb, 52 days (range, 25–62) for grade IVa, 36 days (range, 22–40) for grade IVb, and 32 days (range, 14.5–40) for grade V postoperative complications (Kruskal Wallis, P = 0.006). The severities of the complications were highly correlated with total length of hospital stay (Spearman rho = 0.769, P < .001).

Influence of intra-operative intra-abdominal drainage on morbidity and mortality

Overall postoperative morbidity variables (37.0% with drainage *vs*. 54.2% with no drainage) and anastomotic leak (1.9% with drainage *vs*. 4.2% without drainage) were significantly decreased in patients without intra-operative intra-abdominal drainage placement (Table 6). Pulmonary and cardiac complications had a similar incidence in both groups. The placement of percutaneous or surgical postoperative drainage was higher in the intra-operative intra-abdominal drainage group. Postoperative bleeding and re-admission were higher in patients without intra-operative intra-abdominal drainage. In the LR model, including age and drainage, the placement of drainage multiplied the probability of overall morbidity by 4.5 (Table 6).

DISCUSSIONS

The concept of fast-track surgery resulting in early recovery of the patient has recently been introduced. Fast-track programs seek to improve outcomes in the postoperative period by reducing both morbidity and the period of convalescence. Compliance with the strategies outlined in fast-track protocols has led to good results.[10-12] The mortality rate of 1%, overall morbidity of 33.3%, and median total hospital stay of 12 days associated with our fast-track program are comparable to those previously reported for other centers.[8, 11] The 12 day average period of hospitalization in our program includes 3-4 days of hospitalization receiving routine examination (e.g., complete colonoscopy, whole abdominal enhanced CT) before surgery. The time spent for postoperative gastrointestinal decompression tube and urinary catheter removal, off bed activities, and eating are considered 'fast'.

Our hospital performs an average of 143 fast-track resections per year, most of them by a single surgeon. A previous study identified surgeons as high-volume if they performed ≥10 rectal resection cases/year.[13] Therefore, we consider our center to be 'high-volume' and our surgeon to be a skilled 'high-volume' surgeon. The favorable outcomes associated with our fast-track program can be attributed to the coordinated inter-disciplinary care provided in our hospital.

The morbidity classification system proposed by Clavien-Dindo provided a subjective and precise rating system regarding our patients' clinical condition and the need for specific treatment.[9] Our protocol did not include the routine placement of drainage as a drainage tube is a risk factor for anastomotic leakage.[14-16] Patients without drainage maintain excellent general status and they achieve oral feeding and an early hospital discharge; should any secondary leakages occur, drainage is performed transgastrically. We found that intra-operative drainage is not helpful in preventing the occurrence of complications and may lead to them, although this was not a statistically significant finding in our multivariate analyses.

Associated surgery at our center involved laparoscopic rather than open fast-track anterior resection for rectal carcinoma. Various randomized trials from multi-center series have shown that only minor differences exist for post-operative morbidity between open and laparoscopic fast-track colonic resection surgeries,[17-22] with no differences in the anastomotic leakage rate.[23]

CONCLUSIONS

We conclude that fast-track laparoscopic anterior resection for rectal carcinoma leads to a positive outcome for the patient and is a cost-effective option for healthcare systems.

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