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Laparoscopic Colorectal Surgery and Enhanced Recovery after Surgery (ERAS) Program: Experience with 120 Cases from a Single Italian Center

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Abstract

Background: The Enhanced Recovery after Surgery (ERAS) program was first introduced by Kehlet in 1999 to minimize stress response to surgery and accelerate the length of postoperative functional recovery. ERAS is a multidisciplinary program designed to improve organ function recovery adopting perioperative standardized care. In particular it consists of pre-, intra- and post-operative interventions which have the aim of reducing postoperative complications and obtaining a patient's faster recovery. Use of this protocol is spread in different surgical specialties (urology, gynecology, gastro-intestinal) but the better evidence of ERAS outcomes is described in colorectal surgery.

Methods: In this study we describe the experience of Department of General and Oncological Surgery, "A.Tortora" in Pagani (Salerno), where ERAS protocols were introduced in July 2018. From this date to March 2020, it was applied to 120 patients undergoing elective laparoscopic colorectal surgery for neoplastic or diverticular diseases. Modified ERAS protocols (using bowel preparation) were adopted in all patients, who were informed about and accept it. Shorter mouths come such as hospital stay and on set of complications have been analyzed.

Results: The median hospital stay was of 4 (3 to 23) days in the whole series with a morbidity rate of 9.1% (11/120); three patients experienced major complications (Clavien-Dindo ≥ IIIa); and only one anastomotic leak was observed. One 30-day readmission and no perioperative mortality were recorded. At the univariate analysis, the presence of complications was the only predictive factor for prolonged hospital stay (p\0.001).

Conclusion: This study analyses impact of fast-track protocols' introduction in laparoscopic colorectal surgery at Pagani' Surgical Unit. Patient, undergoing to ERAS protocols, after colorectal surgery start: Early mobilization and walking, early fluid and oral diet, and interruption of intravenous infusions. All this leads to a faster recovery of physiological homeostasis and thus the recovery of the patient. A good ERAS adherence is associated with cost reduction compared to traditional perioperative care. Our experience of a series of 120 patients undergoing to colorectal elective surgery and ERAS protocols report morbidity and a Length of Hospital Stay (LOS)'s reduction.

Keywords: Enhanced recovery; Fast-track surgery; Minimally invasive surgery

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Introduction

Enhanced Recovery after Surgery (ERAS) is a multidisciplinary program designed to improve organ function recovery, adopting perioperative standardized care [1-3]. In particular it consists of pre, intra and postoperative interventions which have the aim of reducing stress related to surgery and obtaining a patient's faster recovery. Use of this protocols spread in different surgical specialties (urology, gynecology, gastrointestinal) [3-6] but the better evidence of ERAS out comes is described in colorectal surgery [7,8]. It has been shown ERAS pathways reduce postoperative complications and hospital length of stay in patients undergoing elective colorectal surgery [9-11]. Laparoscopy is gold standard technique in combination with ERAS protocols for the treatment of colorectal diseases [12]. Even if ERAS was firstly described by Kehlet et al. in 1999 it hasn't yet obtained a large scale application for practical issues (necessity of changes in perioperative traditional care applied by many surgeons with well known and standardized results) [13]. For these reasons the median hospital stay for major colorectal surgery is [7-10] days. This study analyzed a series of 120 patients undergoing elective colorectal laparoscopic surgery to observe the impact of ERAS protocols on

length of hospital stay, on postoperative short term outcomes and to compare these data to that reported in literature.

Materials and Methods

ERAS protocols were introduced in the Department of General and Oncological Surgery, "A.Tortora" in Pagani (Salerno, Italy), in July 2018 (Table 1). From this date to March 2020, it was applied to 120 patients undergoing elective laparoscopic colorectal surgery for neoplastic or diverticular diseases. All the procedures from the patient's pre-hospitalization to post-operative care were registered in July 2018 in protocols known and applied by the whole multidisciplinary team that was composed by surgeons, anesthesiologists, oncologists and the nursing staff. Informed consent (with detailed explanation about type of surgery and ERAS protocols application) was signed by all patients during the preoperative evaluation. Patients undergoing open surgery were excluded. Other exclusion criteria were psychiatric disorders, drug and alcohol addiction.

Preoperative evaluation

All oncological patients were evaluated by Multidisciplinary Oncology Group (GOM). In the first access to the hospital the patients take a chest X-ray, cardiology counseling and blood chemistry tests, subsequently they were subjected to anesthetic evaluation or to other consultations if it was necessary.

Medical history was collected and patients signed the informed consent to the intervention after the explanation of the procedures and the possible risks. The surgical department of Pagani Hospital respects times for the diagnosis imposed by the Regional Decree n.98 of 2016, in case of tumors.

Bowel preparation

Bowel preparation is not according with the last ERAS guidelines for colorectal surgery [7]. According to the ERAS modified protocol adopted in Surgical Department of Tortora Hospital all patients must follow a 5-day residual free diet, than during the two days before the operation they have to drink 2 liters of polyethylene glycol-based solution (PEG 500 mg/ml) for each day. In case of intestinal obstruction enemas of 500 mL are performed at low pressure, twice a day.

Preoperative preparation

Thromboembolism prophylaxis with low molecular weight heparins is administered according to patient's comorbidities. Antibiotic prophylaxis is always administered perioperatively. It consists of a combination of two antibiotics: a dose of piperacillin-tazobactam (4.5 gr) or Cephtriaxone (2 gr) is infused at anesthesiological induction, at the 8th hour and at the 16th hour after surgery.

A dose of Metronidazole (500 mg) is infused at induction of anesthesia, at the 8th hour and at the 16th hour after surgery. The Prophylaxis ends within 24 h after surgery, while in case of fever therapy is set up after culture tests. The patients are hospitalized on the same day or 1 to 2 days before surgery (if a pre-operative therapy is necessary).

Postoperative care

In the evening, after surgery, patients return in to surgical unit and vital signs are checked. Generally patients are awake and positioned in a chair (preferably with armrests), they drinks small sips of water (the nasogastric tube is removed in the operating room). On the 1st Post-Operative Day (POD), bladder catheter is removed and urinary output monitored. The patient drinks at least 1500 mL/24 h and if he has not problems from the previous evening a water diet (Tea, smooth broth, coffee and chewing gum) is started.

The patient is urged to walk in the department after 4 h from surgery. Abdominal drainages (positioned only in case of extraperitoneal rectal resection) are removed after 12 h to 24 h from surgery. On the 2nd POD: The patient must walk in the department. He is fed with "light diet without fibers". All infusions are stopped and switched to medications by os.

On the 3rd POD: Patients have an 850 kcal (containing 45 g to 50 g protein) soft diet, without fiber. Blood e same are routinely performed on the 1st and 2nd POD. On the 4th POD: A switch to a 1,050 kcal diet with 55 gm of protein is made and patient's discharge is considered.

Discharge criteria include: normal vital signs and blood tests, spontaneous diuresis, complete canalization, autonomous walking and feeding, absence of complications and pain control obtained using oral drugs such as paracetamol. The first post operative evaluation is planned at 7th day from the discharge. Then on the 30th day from the operation an oncological evaluation is performed.

Analgesia control

Analgesia control is obtained using intravenous paracetamol or ketorolac. The opioids are considered as a 3rd choice (because of their important side effects including ileus, respiratory depression, and nausea and vomiting) [14]: Max 3 administrations a day, every 8 h up to 3 days. After the discharge, a pain control has to be obtained using only oral medications (paracetamol).

Surgical technique

For right hemicolectomy 4 trocars are used and an intracorporeal anastomosis performer without drainages. For left hemicolectomy and sigmoidectomies 4 trocars are used according to Knight-Griffen technique and without drainage. For rectal resections 5 trocars are adapt according to Knight-Griffen technique and in this case one or two abdominal drainages are placed. In case of rectum resection according to Miles, a definitive colostomy is performed. In case of intersphinteric rectum resection, a temporary ileostomy is made.

A trocar is added if it is necessary. All service laparotomies are performed with mini-incision (4 cm) according to Pfannenstiel. Drainage is necessary in the case of extra-peritoneal anastomosis (for example in middle or low rectum resections). Nasogastric tube is positioned immediately after anesthesia and always removed upon awakening. A bladder catheter is always placed before the incision and generally removed upon awakening.

Statistical analysis

All perioperative data are registered in a database and the Clavien-Dindo Classification [15] is used to define postoperative complications. Continuous variables are presented as mean ± standard deviation or median (range) when appropriate and categorical variables are presented as frequency (percentage). Univariate analysis is performer through a stepwise linear regression model using length of hospital stay as dependent variable and age 65> years and BMI<25 kg/m^2, Male gender, ASA score, presence of complications, laparoscopy and indications (Benign/Malignant) as independent factors. Statistical analysis is carried out using SPSS software (Version 20.0. Armonk, NY: IBM Corp) for MacOS X. The significant level is set at $p<0.05$.

Results

From July 2018 to March 2020, 120 cases were included in the study and analyzed. Patients' characteristics and types of procedures are in Table 2. The 87.5% of patients (105/120) were treated for malignant disease, while the 12.5% (15/120) for benign disease (such as diverticular stenosis). The 95% (114/120) were operated by laparoscopy, with an open conversion rate of 5% (6/120) to observe oncological criteria. Types of operations with mean operative time are reported in Table 3.

It was performed temporary ileostomy in 7 patients; all of these underwent a rectal resection for rectal cancer after neoadjuvant chemoradiotherapy. Bladder catheter was always removed during the 1st POD. The first flatus was obtained after a mean of 1.5 ± 0.7 POD. A complete canalization was obtained after a mean of 2.8 ± 1.2 POD. The median Hospital Stay (HS) was 4 days (3 to 23) and the length of HS depending on different operations is depicted in Table 4.

The morbidity rate was of 9.1% (11/120), 3 patients (2.7%) experienced major complications (Clavien-Dindo >IIIa) (Table 5): An intestinal obstruction in an operated Miles patient (adherent syndrome) after one week from the discharge; a percutaneous drainage due to a pelvic abscess of the sigma in a patient undergoing to right hemicolectomy; pleural drainage for bilateral pleural effusion. Moreover, 8 patients experienced minor complications (CD II) represented, respectively, by: two postoperative nausea and vomiting during the 4th POD treated with nasogastric tube placement in one patient; one fever in patient with small abdominal abscess; catheter placement for 3 weeks in a patient with colon-bladder diverticulitis fistula; urinary infection in one case; pulmonary thickening in two cases. One patient experiences an anastomotic leak after anterior rectal resection with ileostomy. No treatment was needed in this case, except for antibiotics and the drainage was left in place until complete resolution with discharge after 8 days (CD grade II). No perioperative mortality was recorded and one 30 day rehospitalization was observed in this series.

At the univariate analysis, the presence of complications was the only predictive factor for prolonged hospital stay, p<0.001 (Table 6).

Discussion

We presented our experience of a series of 120 patients undergoing to colorectal elective surgery and ERAS protocols. There is morbidity and Length of Hospital Stay (LOS)'s reduction. ERAS protocols reduce hospital length of stay and to improve outcomes in patients undergoing colorectal surgery [10,16]. ERAS is synonymous with "fast-track" surgery [3,17]. There are three meta-analyses [18-20] of several Randomized Controlled Trials (RCTs) comparing outcomes after traditional perioperative care with fast-track care in colorectal surgery. There is LOS reduction in patients treated with fast-track care. There are also single-institution observational studies

Table 2: Patients' characteristics.

Preoperative characteristics
Age (years)
BMI (Kg/m^2)
Gender
Female
Male
ASA Score
1
2
3
Mean ASA Score
Indications
Malignant
Benign

Table 3: Type of operation with Mean Operative Time (MIN).

Type of procedure	N (%)	Mean OT (min ±) SD
Right hemicolectomy	45/120 (37.5%)	130.7 ± 45.8
Left hemicolectomy	25/120 (20.8%)	160.2 + 27.9
Sigmoidectomy	12/120 (10%)	127.8 + 40.4
Rectal Resection	38/120 (31.7%)	220.5 + 38.9

Table 4: Postoperative hospital stay.

Type of procedure	Median HS (days)
Right hemicolectomy	
Left hemicolectomy	
Sigmoidectomy	
Rectal resection	

Table 1: ERAS modified protocol at the Surgical Unit of Tortora Pagani Hospital.

Preoperative phase	
Preoperative counseling	Patients were evaluated by the GOM and adequately informed to ameliorate adherence to the protocol
Bowel preparation	It is not according to ERAS guidelines and consists of oral assumption of PEG.
Thromboembolism prophylaxis	Low molecular weight heparins were administered if patients have comorbidities.
Antibiotic prophylaxis	Penicillins or cephalosporins were used at indution, at 8th and 16th hour post intervention
Intraoperative phase	
Minimally invasive surgery	Laparoscopic technique with intracorporeal or extracorporeal anastomosis with smallest incision
Postoperative phase	
Nasogastric tube	Removed in the operating room
Pain control	Paracetamol or ketorolac i.v., opioids as 3rd choice
Early mobilization	It begins 4 h after the intervention. Walking encouraged from POD 1
Oral fluid and food intake	Oral fluid intake begins the same day and soft diet from POD1
Urinary catheter removal	Up on awaking or on POD1

[21-23] describing LOS reductions ranging from 1 to 3 days, after the introduction of ERAS protocols. At first, it was thought that protocols could only be adopted for young and healthy patients. Now, the ERAS protocols are applied to a less-selected patient population. ERAS can be considered safe in elderly patients undergoing colorectal surgery also with one or more comorbidity [24-26]. In fact, in this study 52 patients older than 65 years of age (45%) have been involved. This is the reason why there were 71/120 patients (59.2%) classified as ASA 3 (with 2 or more comorbidities). ERAS protocols' application promotes early restoration of patient's homeostasis [27] after colorectal surgery. All patient, undergoing to ERAS protocols, after colorectal surgery start: early mobilization and walking, early fluid and oral diet, and interruption of intravenous infusions [8,13]. All this leads to a faster recovery of physiological homeostasis and thus the recovery of the patient. Median LOS is 4 days, that's a good result, considering heterogeneous series of patients. A good ERAS adherence is associated with cost reduction [28] compared to traditional perioperative care. At Pagani's Surgical Unit ERAS protocols have been changed about bowel preparation. Despite scientific evidence not encourage bowel preparation of patients undergoing to colorectal surgery. We believe that a clean colon makes bowel manipulation safer, without possibility of contamination of abdomen. A recent review [29] demonstrating Surgical Site Infections (SSIs) rates of colorectal surgery varying from 5.4% to 23.2%, with a weighted mean of 11.4%. The last (published in November 2019) Clinical Practice Guidelines for the use of Bowel Preparation in Elective Colon and Rectal Surgery of the American Society of Colon and Rectal Surgeons say that "MBP (Mechanical Bowel Preparation) combined with preoperative oral antibiotics is typically recommended for elective colorectal resections. Grade of Recommendation: Strong recommendation based on moderate-quality evidence, 1B" [30].

At Pagani's Surgical Unit no antibiotics are been used before surgery. Recently, a lot of surgical units have reintroduced preoperative MBP alone or with oral antibiotics [31-33]. The results showing reduced SSIs [32].

Based on this important clinical evidence, maybe it is necessary to review our protocol and also introduce prophylaxis with oral antibiotics in the preparation of patients undergo to elective colorectal surgery.

Conclusion

The ERAS program, first introduced by Kehlet in 1999 to minimize stress response to surgery and accelerate the length of postoperative functional recovery, has become standard of care in colorectal surgery. Our experience with 120 patients confirms the implementation of ERAS protocols for colorectal surgery improves the results also with heterogeneous population. Compared to results in the recent literature, ours results are similar both in term of reduction of LOS and morbidity.

References

1. Greer NL, Gunnar WP, Dahm P, Lee AE, MacDonald R, Shaukat A, et al. Enhanced recovery protocols for adults undergoing colorectal surgery: A systematic review and meta-analysis. Dis Colon Rectum. 2018;61(9):1108-18.
2. Toh JWT, Cecire J, Hitos K, Shedden K, Gavegan F, Pathmanathan N, et al. The impact of variations in care and complications within a colorectal Enhanced Recovery after Surgery (ERAS) program on length of stay. Ann Coloproctol. 2021;38(1):36-46.
3. Schwenk W. [Enhanced recovery after surgery-Does the ERAS concept keep its promises]. Chirurg. 2021;92(5):405-20.
4. Cerantola Y, Valerio M, Persson B, Jichlinski P, Ljungqvist O, Hubner M, et al. Guidelines for perioperative care after radical cystectomy for bladder cancer: Enhanced Recovery after Surgery (ERAS(R)) society recommendations. Clin Nutr. 2013;32(6):879-87.
5. Bisch SP, Nelson G. Outcomes of Enhanced Recovery after Surgery (ERAS) in gynecologic oncology: A review. Curr Oncol. 2022;29(2):631-40.
6. Rosa F, Longo F, Pozzo C, Strippoli A, Quero G, Fiorillo C, et al. Enhanced Recovery after Surgery (ERAS) versus standard recovery for gastric cancer patients: The evidences and the issues. Surg Oncol. 2022;41:101727.
7. Gustafsson UO, Scott MJ, Hubner M, Nygren J, Demartines N, Francis N, et al. Guidelines for Perioperative Care in Elective Colorectal Surgery: Enhanced Recovery After Surgery (ERAS®) Society Recommendations: 2018. World J Surg. 2019;43(3):659-95.
8. Nygren J, Thacker J, Carli F, Fearon KC, Norderval S, Lobo DN, et al. Guidelines for perioperative care in elective rectal/pelvic surgery: Enhanced Recovery After Surgery (ERAS®) Society recommendations. Clin Nutr. 2012;31(6):801-16.
9. Greco M, Capretti G, Beretta L, Gemma M, Pecorelli N, Braga M. Enhanced recovery program in colorectal surgery: A meta-analysis of randomized controlled trials. World J Surg. 2014;38(6):1531-41.
10. Cavallaro P, Bordeianou L. Implementation of an ERAS pathway in colorectal surgery. Clin Colon Rectal Surg. 2019;32(2):102-8.
11. Meillat H, Brun C, Zemmour C, de Chaisemartin C, Turrini O, Faucher M, et al. Laparoscopy is not enough: full ERAS compliance is the key to improvement of short-term outcomes after colectomy for cancer. Surg Endosc. 2020;34(5):2067-75.
12. Kehlet H, Wilmore DW. Evidence-based surgical care and the evolution of fast-track surgery. Ann Surg 2008;248(2):189-98.
13. Boon K, Bislenghi G, D'Hoore A, Boon N, Wolthuis AM. Do older patients (>80 years) also benefit from ERAS after colorectal resection? A safety and feasibility study. Aging Clin Exp Res. 2021;33(5):1345-52.
14. Simpson JC, Bao X, Agarwala A. Pain management in Enhanced Recovery after Surgery (ERAS) protocols. Clin Colon Rectal Surg. 2019;32(2):121-28.
15. Dindo D, Demartines N, Clavien PA. Classification of surgical complications: A new proposal with evaluation in a cohort of 6336 patients and results of a survey. Ann Surg. 2004;240(2):205-13.
16. Varadhan KK, Neal KR, Dejong CH, Fearon KC, Ljungqvist O, Lobo DN. The Enhanced Recovery after Surgery (ERAS) pathway for patients undergoing major elective open colorectal surgery: A meta-analysis of randomized controlled trials. Clin Nutr. 2010;29(04):434-40.
17. Ban KA, Berian JR, Ko CY. Does Implementation of Enhanced Recovery after Surgery (ERAS) protocols in colorectal surgery improve patient outcomes? Clin Colon Rectal Surg. 2019;32(2):109-13.
18. Lv L, Shao YF, Zhou YB. The Enhanced Recovery after Surgery (ERAS) pathway for patients undergoing colorectal surgery: An update of meta-analysis of randomized controlled trials. Int J Colorectal Dis. 2012;27(12):1549-54.
19. Adamina M, Kehlet H, Tomlinson GA, Senagore AJ, Delaney CP. Enhanced recovery pathways optimize health outcomes and re source utilization: A meta-analysis of randomized controlled trials in colorectal surgery. Surgery. 2011;149(06):830-40.
20. Tan SJ, Zhou F, Yui WK, Chen QY, Lin ZL, Hu RY, et al. Fast track programmes *vs.* traditional care in laparoscopic colorectal surgery: A meta-analysis of randomized controlled trials. Hepatogastroenterology. 2014;61(129):79-84.
21. Thiele RH, Rea KM, Turrentine FE, Friel CM, Hassinger TE, McMurry TL,

et al. Standardization of care: Impact of an enhanced recovery protocol on length of stay, complications, and direct costs after colorectal surgery. J Am Coll Surg. 2015;220(04):430-43.

22. Miller TE, Thacker JK, White WD, Mantyh C, Migaly, J Jin J, et al. Reduced length of hospital stay in colorectal surgery after implementation of an enhanced recovery protocol. Anesth Analg. 2014;118(05):1052-61.

23. Teeuwen PH, Bleichrodt RP, Strik C, Groenewoud JJM, Brinkert W, van Laarhoven CJHM, et al. Enhanced Recovery after Surgery (ERAS) versus conventional postoperative care in colorectal surgery. J Gastrointest Surg. 2010;14(01):88-95.

24. Slieker J, Frauche P, Jurt J, Addor V, Blanc C, Demartines N, et al. Enhanced recovery ERAS for elderly: A safe and beneficial pathway in colorectal surgery. Int J Colorectal Dis. 2017;32(2):215-21.

25. Lirosi MC, Tirelli F, Biondi A, Mele MC, Larotonda C, Lorenzon L, et al. Enhanced recovery program for colorectal surgery: A focus on elderly patients over 75 years old. J Gastrointest Surg. 2019;23(3):587-94.

26. Fagard K, Wolthuis A, Verhaegen M, Flamaing J, Deschodt M. A retrospective observational study of enhanced recovery after surgery in older patients undergoing elective colorectal surgery. Plos One. 2020;15(5):e0232857.

27. Brescia A, Tomassini F, Berardi G, Sebastiani C, Pezzatini M, Dall'Oglio A, et al. Development of an Enhanced Recovery after Surgery (ERAS) protocol in laparoscopic colorectal surgery: Results of the first 120 consecutive cases from a university hospital. Updates Surg. 2017;69:359-65.

28. Joliat GR, Hubner M, Roulin D, Demartines N. Cost analysis of enhanced recovery programs in colorectal, pancreatic, and hepatic surgery: A systematic review. World J Surg. 2020;44(3):647-55.

29. Young H, Knepper B, Moore EE, Johnson JL, Mehler P, Price CS. Surgical site infection after colon surgery: National healthcare safety network risk factors and modeled rates compared with published risk factors and rates. J Am Coll Surg. 2012;214(5):852-9.

30. John M, Bafford AC, Francone TD, Gaertner WB, Eskicioglu, Cagla E, et al. The American Society of Colon and Rectal Surgeons Clinical Practice Guidelines for the use of bowel preparation in elective colon and rectal surgery. Dis Colon Rectum. 2019;62(1):3-8.

31. Keenan JE, Speicher PJ, Thacker JK, Walter M, Kuchibhatla M, Mantyh CR. The preventive surgical site infection bundle in colorectal surgery: An effective approach to surgical site infection reduction and health care cost savings. JAMA Surg. 2014;149(10):1045-52.

32. Wick EC, Hobson DB, Bennett JL, Demski R, Maragakis L, Gearhart SL, et al. Implementation of a surgical comprehensive unit-based safety program to reduce surgical site infections. J Am Coll Surg. 2012;215(2):193-200.

33. Ohman KA, Wan L, Guthrie T, Johnston B, Leinicke JA, Glasgow SC, et al. Combination of oral antibiotics and mechanical bowel preparation reduces surgical site infection in colorectal surgery. J AmColl Surg. 2017;225(4):465-71.