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ORIGINAL ARTICLE

Does enhanced recovery reduce postoperative ileus after colorectal surgery?

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Summary
Introduction: While enhanced recovery after surgery (ERAS) has been proven to improve results in colorectal operations with regard to morbidity and duration of hospital stay, its impact on recovery of bowel motility is poorly documented. The aims of this study were to assess the impact of ERAS on bowel motility recovery, and to assess the consequences of the definition of postoperative ileus on its reported incidence in the literature.
Material and methods: This is a single-center prospective observational study of consecutive patients who underwent colorectal resection with anastomosis over a period of 17 months. Global resumption of intestinal transit (GROT) was defined as passage of stool combined with alimentary tolerance of solid food.
Results: One hundred and thirty-one patients were included. A median of 14 items (range: 13—16) was complied out of 19 observable items in the protocol. Median time to passage of flatus (MTPF) was 2 days and the GROT was 3 days. The time interval to MTPF as well as to GROT decreased as adherence to the ERAS protocol increased (respectively $P < 0.001$, $r^2 = 0.11$ and $P = 0.04$, $r^2 = 0.06$). The incidence of postoperative ''ileus'' varied from 1.5% to 61.8% depending on the interval chosen to define ileus (cut-off from 1 to 7 days). Adherence to $\geq 85\%$ of the items in the ERAS protocol protected patients from ''prolonged ileus'', i.e., lasting ≥ 4 days (OR = 0.35; 95% CI = 0.15 to 0.83).
Conclusion: The implementation of and compliance with an ERAS protocol allowed a reduction in the time to GROT. There is a need for a consensual definition of postoperative ileus.

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Introduction

Postoperative ileus is currently a real problem in surgery since it results in increased hospital costs, particularly for colorectal surgery, and also because it is responsible for an increase in postoperative morbidity and patient discomfort during the period before resumption of intestinal transit (ROT) [1,2].

Since the reports of Kehlet and Fearon et al. [3,4], many studies have investigated the benefit of multidisciplinary management to improve postoperative rehabilitation [5—7] as recommended by the ERAS® Society (Enhanced Recovery After Surgery) [8,9] and by GRACE [10], for colorectal, urologic, orthopedic, gynecologic or major vascular surgery. While the utility of ERAS for colorectal surgery has been clearly demonstrated with regard to reduction of duration of hospitalization [6—8], to improvement of quality of life in the perioperative period [11], and to a decrease in the overall cost of care [12], its impact on decreasing duration of postoperative ileus has not been amply documented.

Whereas there are no consensual criteria for assessing ROT (time interval to passage of flatus, to removal of nasogastric [NG] tube, to passage of stool), Vather et al. have proposed a definition of ileus based on the presence of at least two of five proposed criteria [13]. Van Bree et al. later confirmed the primary endpoint of ROT as passage of stool in association with tolerance of a solid diet [14]. However, there is no consensus regarding what constitutes a normal interval for ROT since, according to various authors, a normal time limit for ROT is arbitrarily placed between 3 and 7 days [13,15—20]. This lack of consensus leads to a bias that makes comparison of these studies impossible.

The main aim of this study was to evaluate the impact of ERAS on ROT in the postoperative period after colorectal surgery. The secondary objective of this study was to assess the importance of the definition of ileus in relation to its reported incidence in the literature.

Material and methods

Patients

This is an observational prospective single-center study conducted between July 1, 2013 and January 1, 2015 in our University Hospital. All consecutive patients undergoing colectomy or proctectomy during this period were analyzed, including those who underwent emergency surgery, had bowel obstruction, or required a stoma.

The start of the inclusion period corresponded to the initiation of the ERAS protocol in our surgical service. Since need for ICU stay in the immediate postoperative period interfered with adherence to the ERAS protocol, this was a criterion for non-inclusion.

The project was submitted to and approved by the local ethics committee.

ERAS protocol

The protocol was developed jointly by the anesthesiology and visceral surgery teams based on an analysis of the scientific literature on the subject and the recommendations of the ERAS® society [8,9] and GRACE group [10]. Table 1 summarizes the different components of the ERAS program observed throughout the study.

Data

Data were collected and recorded systematically in a paper questionnaire and then transferred to an anonymous electronic database. The following information was recorded:

- pre-surgery: weight, height, age, medical and surgical history, American Society of Anesthesiologists (ASA) score, treatments, oral sweetened liquid intake, prescription of pre-medication and surgical indication;
- intraoperative: volume of intravenous fluids administered, body temperature, analgesics administered, antiemetic use, operative time, duration of operation room occupancy, surgical approach, type of anastomosis, drains of the abdominal cavity, stomach and bladder, use of parietal analgesia, and use of bowel preparation;
- postoperative: analgesics administered, anti-emetics administered, course of advancement to oral diet, interval to flatus and stool transit, complications, presence of ileus, interval to ROT, duration of hospitalization.

Morbidity was classified according to the Clavien/Dindo classification [21]. Complications above Grade 2 were considered serious complications.

The interval to global ROT (GROT) was defined as the time from surgery to the time of passage of stool in association with tolerance of solid food intake [14].

Postoperative ileus was defined by the combination of at least two of the following five criteria [13]:

- nausea or vomiting for 12 hours;
- inability to tolerate a solid or semi-solid food for two meals;
- abdominal distension;
- lack of stool or gas for 24 hours;
- radiologic images of ileus on computed tomography (CT) scan.

The ''normal interval'' for GROT was successively redefined as 1, then 2, ... up to 7 postoperative days, and the incidence of ileus was then successively calculated based on these varying definitions.

The theoretical hospital stay corresponded to the date the surgeon authorized hospital discharge while the actual hospital stay corresponded to the date the patient actually left.

The primary endpoint was overall adherence to the ERAS protocol, as measured by the number of protocol measures adhered to during the hospital stay (Table 2).

Statistical analysis

Continuous variables were expressed as medians with interquartile range measurement. A linear regression was performed for variables when a correlation with the time was sought. The evaluation of the significance of the latter was carried out by a search for the correlation factor and the Fisher test.

Thereafter, we arbitrarily chose an 85% compliance rate with the ERAS protocol to be acceptable. Group (M) (with < 85% compliance) was compared to Group (P) (with > 85% compliance) to assess the impact of ERAS on the incidence of prolonged ileus.

For this phase of the study, ''prolonged ileus'' was defined as ileus extending beyond four days. For categorical variables, results were reported as numbers and percentages and compared using Pearson's Chi^2 test. For quantitative variables, results were reported as the median with 25th