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Enhanced recovery after surgery (ERAS) protocol for gastrectomy: A tailored program developed at a gastric cancer unit

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ABSTRACT

Background:

Planning for and managing patients who follow multidisciplinary paths allow institutions to provide better care administration; greater collaboration among medical staff, patients, and their relatives; better patients education; reduced possible complications related to surgery and hospital stay; and increased patient adherence to the proposed treatments due to better information. The ERAS Society's guidelines align in this direction, and many institutions are now looking to apply the suggestions contained in its items. This effort is especially important in surgical oncology. In this work, we report the experience of our center in developing tailored guidelines for patients undergoing gastrectomy based on evidence from the literature and adapted to address the availability of personnel and equipment in our institute.

Methods:

A permanent institutional working group was established at St. Mary's Hospital. Evidence-based comprehensive research was conducted to find optimal perioperative care management for patients undergoing gastrectomy.

Evidence and recommendations were thoroughly evaluated and considered together with the items from the ERAS Society's guidelines.

Results:

A complete patient pathway has been established from the first outpatient visit to discharge.

All ERAS items were considered and adapted to our hospital's care environment. Education, nutrition, anesthesiologist care, surgical approach, and ward organization are the main points of strength highlighted in the present work.

Conclusion:

This proposed institutional evidence-based protocol show comprehensive management for patients with gastric cancer eligible for enhanced surgical pathways.

Key words:

ERAS, Enhanced Recovery After Surgery, Gastrectomy, Gastric Cancer.

Background:

Gastric cancer is the second leading cause of cancer-related death globally, and surgery is the most important treatment of this disease. Even so, gastric cancer surgery remains a high-risk procedure that is associated with clinically significant postoperative stress, complications, and relevant sequelae. The morbidity and mortality of radical gastrectomy are 9.1–46.0% and 0–13%, respectively.

In this context, ERAS programs have been proposed with which to improve postoperative physiological functionality and facilitate patient recovery. ERAS protocols have many elements, including preoperative patient education, preoperative loading of carbohydrates, nutrition from the first postoperative days, early mobilization of patients, and antithrombotic prophylaxis.

Briefly, we summarize the evidence relating to the points of greatest interest:

Nasal–Gastric Tube, Abdominal Drainage, Mobilization

No advantage is reported in the literature from the routine use of the nasogastric tube[1].

Some studies have shown that the nasogastric tube is not able to reduce the risk of anastomotic leakage, the number of lung complications, or mortality and that it significantly reduces the patient's postoperative comfort[2-4]. Furthermore, Yang's meta-analysis[5] indicated that postoperative maintenance of the tube prolongs the postoperative ileum and time to first flatus. Yamada[6] reported that complications that could be caused by a shortening of the postoperative fasting period, such as pneumonia ab-ingestis or anastomotic leakage, did not increase in a group of patients undergoing ERAS. In addition, the absence of abdominal drainage is an additional factor that improves patient comfort, stimulates and facilitates walking.

The evidence does not show any benefit to using abdominal drainage in numerous surgical procedures[7, 8]. However, little evidence is available regarding gastric surgery. In particular, the use of drainages after total gastrectomy is still widely debated in the context of the development of ERAS programs.

An important item in the ERAS protocol is early mobilization[9], which is facilitated by absence of the tube and drainage as well as by early removal of the urinary catheter. Smart[10] has shown that failure of early patient mobilization is significantly associated with an extension of the postoperative stay.

Several studies[6, 11-13] have shown that application of these points of the ERAS program can significantly accelerate recovery of postoperative intestinal function compared with conventional management.

Nutrition

Consideration of functional outcomes such as first flatus or resumption of peristalsis can be at risk of bias. For this reason, it is appropriate to analyze in more detail variables related to recovery of oral intake.

ERAS protocols require that the patient not be subjected to long periods of fasting. Early nutrition has been shown to reduce postoperative catabolism, accelerate the return of intestinal function, and reduce the risk of complications[14, 15]. Furthermore, Lewis et al. [16] confirmed in their meta-analysis that keeping patients on an empty stomach brings no benefit. Several studies have shown that early oral nutrition not only is feasible in gastric surgery but also brings significant benefits[11, 17]; however, this point remains controversial.

Although early resumption of feeding has been shown to accelerate recovery of the patient after several surgical procedures, use of such an approach after gastrectomy has historically been viewed with distrust born out of a concern, not well demonstrated in the literature, that early oral intake could cause anastomotic leakage or intestinal obstruction.

Over the past few years, several studies have confirmed that early feeding after gastrectomy is safe and that it is associated with an improvement in functional recovery and a reduction in hospital stay[6, 18]. In particular, a randomized controlled trial reported data on safety in the resumption of oral feeding from the second postoperative day after gastrectomy[19].

Studies by Makuuchi[20] and Pedziwiatr[21], which contrasted use of an ERAS protocol and conventional management after gastrectomy, confirmed that resumption of oral nutrition is safe from the second postoperative day and that it is correlated with a reduction in postoperative administration of fluids intravenously as well as with early discharge[22].

Sugisawa[20] evaluated anastomotic leakage rate and pneumonia ab-ingestis to evaluate the real risk attributable to early nutrition. In this study, incidence of anastomotic leakage was 0.8% in the ERAS group—a figure not only lower than that of its historical comparison cohort (1.7%) but also in line with or lower than data from previous studies reporting conventional perioperative management (0.8–1.9%). Hence the author concluded that early oral nutrition does not adversely affect the anastomotic site. Similar results were obtained by Yamada[6, 23], who showed a similar incidence in incidence of leaks (1.1%).

Hospital Stay

The effects of adopting an ERAS program on postoperative hospital stay depend not only on clinical factors but also on the health systems and sociocultural substrate of patients. For example, Yamada[6] reported that even though ERAS patients had a quicker functional recovery than those in the conventional group, length of stay did not significantly differ between the two groups. The authors attributed this result first to the Japanese Diagnosis Procedure Combination-based Payment System (DPC), which allows patients to extend their hospitalization at a reduced cost.

Among others, Sugisawa[20] reported that the median of postoperative hospital stay was significantly reduced in the ERAS group (8 days) compared with its historical cohort (10 days; $p = 0.001$). Similar results were obtained by Wang[11]. With regard to postoperative complications and the need for reoperation, all studies confirmed the safety of the ERAS approach and the absence of any statistically significant difference with the control groups[6, 20].

In conclusion, it has been widely demonstrated that adoption of management based on ERAS principles in

a reference center for gastric cancer can improve the patient's functional recovery and quality of life while allowing early discharge[24].
We show, in the present article, the ERAS Protocol approved at our gastric cancer unit.

ERAS PROTOCOL

Eligibility of patients:
Each patient must meet all the inclusion criteria and none of the exclusion criteria:

Inclusion Criteria
- Histological diagnosis of gastric cancer
- Preoperative staging performed by EGD and/or endoscopic ultrasound and CT, in accordance with international guidelines
- Early gastric cancer (EGC)
- Advanced gastric cancer (AGC)
- Patients treated with curative intent, in accordance with international guidelines

Exclusion Criteria
- Distant metastasis: peritoneal carcinosis, liver metastases, remote lymph node metastases, Krukenberg tumors, involvement of other organs
- Patients at high operative risk, as defined by the American Society of Anesthesiologists (ASA), score ≥ 4
- History of previous abdominal surgery for gastric cancer
- Synchronous malignant tumor in other organs
- Palliative surgery

Preoperative outpatient/home management:

Preoperative Counseling and Education
The meeting with the patient must take place well in advance of the planned intervention and/or hospitalization in a dedicated environment (ERAS outpatient clinic) stocked with easily accessible and readily understandable information material, allowing for an interview between the patient and the multidisciplinary team (surgeon, anesthesiologist, nurse, dietician). The aim is to promote compliance with the protocol by sharing the objectives with the patient and motivating him or her to adhere to the path outlined. To this end, family members participate in the preoperative interview and assist the patient both during the hospitalization and once they return home.
Counseling should take place sufficiently in advance of the scheduled admission date. It is highly recommended that the meeting take place in a multidisciplinary manner, with simultaneous participation of all professionals involved. Doing so allows all subjects to share health education and information data that the patient must receive, while avoiding repetition and finalizing the interview in an optimal way.
The anesthesiologist and surgeon should inform the patient of the relevant procedures and obtain informed consent. It is advisable that verbal information be integrated with delivery of informative material (brochures, brochures, videos, etc.).

Assessment of Respiratory
If the patient has a positive history of severe respiratory disease (COPD, asthma, sleep apnea syndrome), a clinical-instrumental evaluation of respiratory function is indicated, aimed at identifying subjects who could benefit from pre- and/or postoperative respiratory physiotherapy.
Nutritional and Behavioral Management in the Preoperative Period
- Assessment of nutritional status and dietary prescriptions. A preoperative nutritional risk assessment should be performed, preferably using the Malnutrition Universal Screening Tool (MUST https://www.bapen.org.uk/screening-and-must/must-calculator)[25, 26]. Preoperative administration of immunonutrition is indicated for at least 5 days in all patients, and at least 7 days in malnourished patients, before surgery. The dietitian's evaluation is indicated in patients with a MUST score ≥ 2.
- The patient should be asked to abstain from smoking and intake of all alcoholic beverages.
- In the days preceding the intervention (5 days), the patient should follow a special diet, as outlined during the outpatient visit.
- The patient is hospitalized the afternoon before surgery and from the start of the hospitalization can ingest only rusk, clear liquids, and dinners tailored by the dietetic and nutrition service.
- The patient may not consume food during the 6–8 h before surgery but might be able to consume clear liquids (clear fluids: water, tea, coffee, sports drinks, meat or vegetable broth, fruit juices without grape/apple/blueberry pulp, popsicles without pulp or pieces of fruit) up to 2–4 h before surgery.
- The patient must also be instructed in how to take the immunonutrient mixtures per OS. The protocol provides for the intake of 750 mL/day of product, starting 5 days before surgery (7 days in the malnourished patient).
- Administer a maltodextrin-based drink free of lipids, lactose, fiber, and gluten in the recommended dose of 800 mL the evening before the intervention and then, if the intervention occurs in the afternoon, another in a dose of 400 mL 2–4 h before the intervention. The drink should be taken fresh and not at room temperature.

Intestinal Preparation
No preparation of principle.

Antithrombotic Prophylaxis
According to guidelines.

Antibiotic prophylaxis
Administration of cefazoline 2 g IV 30 min before induction.

Operative management:

Anesthesiological Protocol

Premedication

- Low doses of Midazolam ~0.05mg/kg.

Type of anesthesia:

- general balanced with vapors: sevoflorane or desflurane associated with continuous infusion of short-acting opiates such as remifentanyl

or

- totally intravenous anesthesia (TIVA TCI) with propofol and remifentanyl in continuous infusion so as to associate anesthesiological depth control with BIS (bispectral index) sensor
- Use of fast-metabolizing curaries such as cisatracurium or those that guarantee a total reversal of neuromuscular blockade by sugammadex, such as rocuronium
- Continuous monitoring with skin temperature sensor
- Patient skin heating systems

Intraoperative fluid therapy optimization

- Heating of fluids infused to the patient
- EW1000 Edwards less invasive hemodynamic monitoring based on pulse contour method with headphone sensor or intra-arterial catheter for beat-by-beat evaluation of cardiac output (CI) and stroke volume (SV)
- Optimization of intraoperative fluid therapy according to SV, based on the NICE protocol, to avoid edema of the intestinal mucosa and consequent slowing of motility due to overloading or underloading ischemias of the intestinal loops[27].

Intraoperative Pain and Postoperative Nausea and Vomiting (PONV) Control

- Transversus abdominis plane block (TAP block): Ropivacaine 0.2% (8-10ml/h) infused for 48-72 h through a multihole catheter.
- Use of Paracetamol and fans, infiltration of surgical wounds with long-acting local anesthetics such as levobupivacaine or ropivacaine for pain control
- Intraoperative prevention of postoperative nausea and vomiting according to Apfel score[28]
- Removal of the SNG if present before the end of the intervention
- In the event of open interventions, infiltration of the surgical wound with long-acting local anesthetics such as levobupivacaine or ropivacaine and placement of continuous-release catheters of local anesthetic at the suprafascial level.

Surgical Technique

- Surgical access: 2D/3D/4K laparoscopic, robotic-assisted via the Da Vinci platform Yes. Laparotomic access is considered when the minimally invasive approach is not practicable.
- Drains: Not positioned in the distal gastrectomy. In the case of total gastrectomy, 1 drainage is positioned near the esophagus–jejunal anastomosis.

Postoperative management:

Immediate Postoperative Monitoring

- Transfer of the patient to recovery room
- Recovery of cognitive skills and evaluation according to Ramsay score
- After laparoscopic/robotic intervention continuous monitoring of CO2 in spontaneous breathing for 1 h
- Pain assessment with analogue–visual VAS scale at 5, 30, and 60 min
- Temperature control (time 0, 3 h, 6 h)

Postoperative Nausea and Vomiting (PONV)

- The goal in ERAS is not to suspend liquid intake and oral feeding. Optimal control of symptoms (nausea and vomiting) with multimodal drug therapy (e.g., cortisone, ondansetron) should be guaranteed.
- In subjects who are at high risk of PONV (assessed on the basis of Apfel score), anti-emetic therapy should be prescribed, in principle[28].

Prophylaxis of Postoperative Pain

- Infiltration of surgical wounds with local anesthetic
- Administration of 1 g Paracetamol IV 20 min before the end of the intervention, repeated 4 h and 8 h apart
- Targin 20 mg cpr for OS or ketorolac 30 mg IV as needed

Nutritional Management

Specific nutritional protocol attached, but general principles include the following:

1. Preventing and/or managing malnutrition by default through nutritional risk assessment and gradual introduction of energy and nutrients until complete coverage needs are met.
2. Adaptation of diet to the new anotomic–functional capacities of the residual gastrointestinal tract and prevention or modulation of the different symptoms that can arise in the early postoperative period (sense of early satiety, nausea, vomiting, reflux, and dumping syndrome) through the following:

- splitting the diet into small and frequent meals (at least 6 meals/day)
- fluid intake between meals, reduced intake of foods and drinks rich in simple sugars due to their high osmotic power
- behavioral recommendations for meal management: eat slowly in small bites, chew well and sit upright for at least 30 to 60 minutes after the meal

Resumption of Thromboembolic Prophylaxis

Enoxaparin sodium starting from the 2nd postoperative day and in accordance with the guidelines.

Use of Antibiotics

Avoid if not necessary.

Infusion Therapy
Suspend when oral intake of fluids meets patient's water needs.

Gastrografin Swallow
1st postoperative day.

Urinary Catheter Removal
1st postoperative day.

Start Mobilization
- Encourage patient to mobilize as early as 2 h after returning to the ward.
- 1st day: patient must stay out of bed for at least 8 h and walk at least 600 m.
- 2nd day: normal activity, not less than that prescribed for the 1st day.
- It is recommended that adequate rooms and armchairs be used to help the patient stay out of bed. It is useful for the patient to keep a diary in which to record time spent out of bed and, providing appropriate references, the precise distance walked.

Respiratory Rehabilitation Using Incentive Spirometer
1st postoperative day.

Drainage Removal
After execution of gastrografin swallow (1st postoperative day).

Discharge criteria:
- Ability to mobilize and independently practice personal hygiene care
- Free diet according to nutritional indications
- Adequate pain control with oral analgesics and VAS score ≤ 4
- No clinical or laboratory evidence of postoperative complications or unresolved medical problems
- Patient consent

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JD ST were involved in conception of the study. JD, ST, ADC, RC, AC, LS, AM, IG, SB, AP were involved in designing the study, analyzing the literature, references searching and in drafting the rationale. JD, ST, ADC, RC, AC, MS, AM, IG, SB, AP were involved in description of the study methods.

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Competing interests
No benefits in any form have been received or will be received from a commercial party related directly or indirectly to the subject of this article.

Availability of data and materials
The datasets used and/or analyzed during the current study are available
from the corresponding author on reasonable request.

Appendix A. Supplementary data
Supplementary data associated with this article can be found, in the on-line version at https://www.journalofgastricsurgery.com/index.php/JGS/article/view/21

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Not applicable

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