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Review Article

Enhanced Recovery After Surgery: A Paradigm Shift in Perioperative Care. Review Article

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Abstract

Enhanced Recovery After Surgery (ERAS®) is a multimodal protocol applied to perioperative care. These protocols are implemented by a multidisciplinary patient-centered team, incorporating outpatient clinical staff, nurses, anesthesiologists, post-operative recovery staff, nutrition staff, physical therapists, social workers, and surgeons.

Regardless of the surgical subspecialty, all ERAS® protocols share the same objectives: preoperative optimization of the patient, reduction of perioperative stress, maintenance of post-operative physiological function, and accelerated recovery time after surgery. ERAS® protocols are designed to reduce the response to surgical stress, facilitate the maintenance of body composition and organ function to achieve early recovery.

Keywords: ERAS® Protocol; Enhancer Recovery After Surgery; Multimodal Rehabilitation; Perioperative Nutrition; Review Article

Introduction

The reaction to surgical stress is the metabolic response to aggression. The prevention of stress and minimizing this response represents the central mechanism around which the concepts of multimodal rehabilitation are based, this response encompasses all the elements associated with surgery such as anxiety, fasting, tissue damage, hemorrhage, hypothermia, contribution of fluids, pain, hypoxia, bed rest, ileus and cognitive imbalance. These significant changes in metabolic and physiological homeostasis represent a threat to the organism that needs to be treated for a satisfactory return to preoperative conditions. Evidence suggests that if these alterations are not adequately treated, they could lead to increased morbidity and mortality. Therefore, it makes sense to provide not only the rational basis for an accelerated recovery, but also to minimize the potential risk of organ dysfunction leading to complications and diminishing long-term survival [1].

Method

For this review, the ERAS® Guidelines were used as a starting point, a review and analysis of the literature published in PubMed, Cochrane Library, Medline and specialized scientific journals was carried out.

Development and Discussion

Consequences of surgical stress: Surgical stress triggers the release of insulin counterregulatory hormones (catecholamines, glucagon, cortisol, growth hormone) and pro-inflammatory cytokines (tumor necrosis factor alpha [TNF-α]; interleukins: IL-1, IL-6), which lead to a state of insulin resistance, as a result, an increase in the rate of glucose production is observed accompanied by a lower body utilization of it that causes an increase in the concentration of glucose in the blood circulating. It has long been recognized that the

hyperglycemic response to surgery depends on the type, severity, and extent of tissue trauma. In fasting patients undergoing elective intraperitoneal procedures, blood glucose levels typically increase by 7-10 mmol/L [2]. The more extensive the operative wound, the manipulation of internal organs and the dissection of tissues, the greater the response to stress. One of the fundamental reasons for the effectiveness of multimodal rehabilitation programs is that many of the aspects that are handled in these protocols reduce the response to stress caused by surgical aggression and help maintain homeostasis.

Every day there is more evidence that hyperglycemia is a predictor of mortality and complications, and that even a moderate increase in blood glucose can be associated with a torpid evolution [3-5].

Patients with fasting plasma glucose values > 7 mmol/L or random plasma glucose concentrations > 11.1 mmol/L in general surgery rooms showed 18 times higher mortality, longer hospital stay and higher risk of infection [6].

On the other hand, postoperative protein catabolism is characterized by a net loss of structural and functional protein from the organism. Metabolically healthy patients lose between 40 and 80 g of nitrogen after elective open abdominal surgery, which is equivalent to 1.2 -2.4 kg of skeletal muscle [7]. Similarly, protein losses after abdominal surgery are 50% more in patients with insulin resistance.

Loss of lean muscle mass delays healing, compromises immune function, and decreases muscle strength; therefore, muscle weakness inhibits coughing, impedes mobilization, and prolongs mechanical ventilation if the patient is in an intensive care unit, complicating convalescence and increasing morbidity.

Subjects with metabolic disorders and inflammatory states such as the elderly, diabetics and cancer patients undergoing surgery may be exposed to a greater response to stress, deepening their catabolic state as a result of poor reserve, leading to postoperative complications and delayed recovery. the functionality.

Multimodal rehabilitation protocols aim to reduce this response to stress and facilitate accelerated recovery in the postoperative period. There are 23 core elements of ERAS® care that have scientific support for their use. These components are distributed throughout the perioperative process [8,9].

Preadmission	Effect/goal
Quit smoking and excessive alcohol consumption	Reduce complications
Preoperative nutritional evaluation and, if necessary, nutritional therapy	Reduce complications
Medical optimization of chronic diseases	Reduce complications

Table 1: Pre-admission ERAS® protocol recommendations [8,9].

Patients should be informed about their surgical intervention and instructed on how they can help to achieve a rapid return to their home, a nutritional risk assessment should be carried out and the implementation of an immediate nutritional intervention if it is necessary as part of the preoperative management.

Alcohol abuse increases postoperative morbidity by two to three times. It has been shown that a month of abstinence before surgery decreases postoperative morbidity due to an improvement in organic function.

Smoking is another risk factor that has a negative influence on recovery. It is common for smokers to have an increased risk of postoperative scarring and pulmonary complications. In smokers, a month of abstinence is recommended to reduce the incidence of complications [10].

Pre-operative	Effect/Objective
Structured pre-operative information and participation of the patient and family or caregivers	Reduce anxiety, involve the patient to improve protocol compliance
Carbohydrate intake	Reduce insulin resistance, improve well-being, possibly faster recovery
Prophylaxis against thrombosis	Reduce thromboembolic complications
Prophylaxis against infection	Reduce infection rates
Prophylaxis against nausea and vomiting	Reduce postoperative nausea and vomiting

Table 2: Preoperative ERAS® protocol recommendations [8,9].

Preoperative fasting and carbohydrate treatment

Fasting from midnight before surgery has been a standard practice with the belief that this measure ensures an empty stomach

and therefore reduces the risk of aspiration in elective surgeries, it really does not There is scientific evidence about this dogma. A meta-analysis that includes a Cochrane review with 22 controlled and randomized studies showed that fasting from midnight does not reduce gastric content or increase its pH compared to patients who were allowed to ingest clear liquids up to 2 hours before of anesthetic induction for surgery [11,12].

Similarly, the ingestion of clear liquids up to 2 hours before surgery does not increase the prevalence of complications. The American and European Societies of Anesthesia now recommend the ingestion of clear liquids up to 2 hours before anesthetic induction, as well as the ingestion of solid food up to 6 hours before [13,14].

Recommendations are to administer oral complex carbohydrate supplements to the patient preoperatively, 800 ml the night before surgery and another 400 ml of carbohydrate supplements 2 to 3 hours before induction of anesthesia (mainly 12.5% maltodextrin) [15,16]. This reduces the catabolic state caused by fasting and surgery. Fasting before surgery inhibits insulin secretion and promotes the release of catabolic hormones, such as glucagon and cortisol [17]. Increasing insulin levels preoperatively with oral carbohydrates reduces postoperative insulin resistance, maintains glucagon stores, decreases protein breakdown, and improves muscle strength [18]. Barriers to implementing this evidence-based recommendation include resistance among surgeons and anesthesiologists. Oral carbohydrate therapy preoperatively should be used routinely.

Prophylaxis against thromboembolism

There is sufficient evidence to support the use of pharmacological thromboprophylaxis with low molecular weight heparin (LMWH). A recent study with 4195 colorectal surgery patients showed that pharmacological prophylaxis reduces the prevalence of symptomatic deep venous thromboembolism from 1.8 to 1.1% and also decreases overall cancer mortality [19].

Antimicrobial prophylaxis and skin preparation

It is recommended that the dose of IV antibiotic should be administered 30-60 minutes before making the incision, it is also beneficial to repeat a dose in prolonged procedures [20] The administered antibiotic must have coverage against aerobic bacteria and anaerobic. A study comparing different types of skin cleansing material showed that the overall prevalence of surgical site infection was 40% lower in the chlorhexidine group compared to the povidone iodine group [21]

Postoperative nausea and vomiting (PONV)

PONV affect 25% to 35% of all surgical patients and is the leading cause of patient dissatisfaction and delayed discharge from the hospital. The etiology is multifactorial and can be classified into three factors: patient, anesthesia and surgery. The use of inhalational anesthetic agents, nitrous oxide, and parenteral opiates increase the risk significantly. In recent years, the concept of multimodal management for PONV has gained popularity, this technique combines pharmacological and non-pharmacological antiemetic measures added to ERAS® programs [22].

Nonpharmacological measures include avoiding stimuli that induce nausea and vomiting such as inhaled anesthetics and increased use of propofol for induction and maintenance of anesthesia, minimal preoperative fasting, and use of oral carbohydrate loading, in addition, maintaining an adequate hydration of patients may also have a beneficial effect. The use of regional anesthetic techniques and the transverse abdominal plane block have been shown to reduce the use of opiates in the postoperative period, which could influence the prevalence of PONV [23].

The use of nonsteroidal anti-inflammatory drugs is an alternative to the use of opioid analgesia. Regarding the use of antiemetics, their potency is facilitated if two or more antiemetics are used in combination: serotonin analogues ondansetron or droperidol. Dexamethasone has also been shown to have a positive effect in reducing the prevalence of PONV.

Intra-operative	Effect/Objective
Minimally invasive surgical techniques	Reduce complications, faster recovery, reduce pain
Standardized anesthesia, avoiding long-acting opioids	Avoid or reduce postoperative ileus
Maintain fluid balance to avoid over or under hydration, administer vasopressors to support blood pressure control	Reduce complications, reduce postoperative ileus
Epidural anesthesia for open surgery	Reduces stress response and insulin resistance, basic postoperative pain management
Restrictive use of surgical site drains	Support mobilization, reduce pain and discomfort, no proven benefit of use
Removal of nasogastric tubes before reversal of anesthesia	Reduce risk of pneumonia, support oral intake of solids
Body temperature control using warm airflow blankets and heated intravenous infusions	Reduce complications

Table 3: Intraoperative ERAS® protocol recommendations [8,9].

Enhanced recovery programs after surgery typically contain several elements with an emphasis on the common: minimizing catabolism and improving stress response. By maintaining homeostasis, the patient avoids catabolism with the consequent loss of protein, muscle strength and cell dysfunction [24]. Some of these strategies include epidural or spinal analgesia to reduce the endocrine stress response, anti-inflammatory drugs to reduce the inflammatory response, early feeding after surgery to ensure energy intake, and optimal pain control to avoid stress and resistance to insulin.

Another goal is to maintain fluid balance, too little fluid can cause decreased perfusion and organ dysfunction, while salt overload and intravenous fluids are recognized as one of the main causes of postoperative ileus and its complications [25,26].

Maintenance of euvolemia, cardiac output, and delivery of oxygen and nutrients to tissues are important to preserve cellular function, especially when there is tissue injury and repair is necessary. Once patients are euvolemic, vasopressors can be used as needed to maintain blood pressure. Post-operative intravenous fluids are usually discontinued approximately 24 hours after surgery. The ERAS® program also avoids several elements of traditional care that have been shown to be detrimental, such as routine use of nasogastric tubes, prolonged urinary catheterization, and prolonged or inappropriate use of abdominal drains.

Post-operative	Effect/Objective
Early mobilization (day of surgery)	Support return to normal movement
Early intake of oral fluids and solids (offered on day of surgery)	Supports energy and protein delivery, reduces fasting-induced insulin resistance
Early removal of urinary catheters and IV fluids (morning after surgery)	Support ambulation and mobilization.
Use of gum, laxatives, and peripheral opioid blocking agents (when opioids are used)	Support return of bowel function
Intake of nutritional supplements rich in protein and energy	Intake of nutritional supplements rich in protein and energy
Multimodal approach to opioid-sparing pain control	Pain control reduces insulin resistance, supports mobilization
Multimodal approach to the control of nausea and vomiting.	Minimizes post-operative nausea and vomiting and supports energy and protein intake.
Audit of results and processes by a multidisciplinary team on a regular basis	Key to improving results

Table 4: Postoperative ERAS® protocol recommendations [8,9].

Successful implementation of the preoperative and intraoperative elements of the ERAS® protocol allows patients to mobilize and eat on the day of major abdominal surgery. Post-operative elements address glucose control, fluid balance, nausea and vomiting, gastric decompression, stimulation of intestinal transit, diet, and early mobilization.

Several ERAS® interventions affect insulin action and resistance, thus improving glycemic control without risk of causing hypoglycemia [27,28] such as avoiding fasting, using an epidural, managing pain, and mobilize after surgery.

Fluid balance/Restricted fluid regimen

Surgical stress results in salt and water overload [29], while volume imbalance worsens surgical outcome. Preoperative oral carbohydrate loading and restrictive intraoperative and postoperative intravenous fluids are associated with reduced postoperative risk and are important predictors of outcome [30,31].

Postoperative nausea and vomiting (PONV)

The use of antiemetics can be classified into four pharmacological subtypes depending on the receptor system on which they act: cholinergic, dopaminergic (D2), serotonergic (5-hydroxytryptamine type 3 (5-HT3) and histaminergic (h1): Each of these classes is superior to placebo in reducing the risk of PONV, there is also ample evidence regarding the use of dexamethasone, which has been postulated to act via central and peripheral mechanisms. antiemetic is facilitated if two or more antiemetics are used in combination: serotonin analogues ondansetron or droperidol [32]. Dexamethasone has also been shown to have a positive effect in reducing the prevalence of PONV, but its long-term immunosuppressive effects in cancer patients are unknown.

If postoperative nausea and vomiting occur despite prophylaxis, additional agents not used for prophylaxis can be added to maximize the power of multimodal management [33].

Nasogastric decompression

A Cochrane meta-analysis of 33 trials with more than 5000 patients evaluated nasogastric decompression after abdominal surgery [34]. It concludes that routine nasogastric decompression after abdominal surgery should be avoided, because patients without a nasogastric tube (NGT) compared with those with NGT had significantly fewer pulmonary complications, earlier time to passage of flatus, and earlier time to oral diet. It is recommended that an NGT placed intraoperatively be removed prior to reversal of anesthesia [35].

Postoperative ileus poses a significant problem after elective abdominal surgery. There is a general consensus among surgeons that some degree of ileus is a normal, unavoidable, physiological response to abdominal surgery [36-38].

The use of epidurals and avoiding fluid overload in the postoperative period are associated with a better return of peristalsis after abdominal surgery [39,40]. Early feeding after surgery has also been associated with early recovery of bowel function [41-43].

Early postoperative diet and artificial nutrition

The intake of normal foods and nutritional supplements from the day of surgery until oral intake is achieved is considered essential in an ERAS® protocol to maintain homeostasis [44].

Following surgery, nutritional goals include providing sufficient support for wound healing and avoiding excessive loss of lean body mass [45]. Prolonged periods of fasting are associated with impaired barrier function of the gastrointestinal tract, atrophy of the endothelial microvilli and the decrease in the mass of lymphoid tissue associated with the intestine [46]. These changes are related to an increase in intestinal dysfunction, infection, sepsis [47,48] and decreased tolerance to enteral nutrition (EN) [49].

Early oral feeding within 24 hours after colorectal resection is safely tolerated by 80%-90% of patients [50-53] When ERAS® protocols are followed in colorectal surgery, oral feeding as soon as 4 hours after surgery is safe and improves the result [54-55]. Randomized controlled trials of early oral or enteral feeding versus no oral feeding show that early feeding reduces the risk of infection and is not associated with an increased risk of bowel anastomotic leakage [53,56-59].

There is overwhelming evidence to support early resumption of a normal enteral diet, which should be the standard of care after most types of surgery [60].

Conclusion

Enhanced recovery post-surgery protocols represent a paradigm shift in how surgical care is delivered and how practice changes are disseminated and implemented. These results are based on an innovative approach to teamwork, continuous auditing and support for change and improvement based on statistical data. These protocols offer the patient the opportunity for a quick and uneventful recovery after surgery with short-term and long-term benefits, as well as improve quality of care and save money.

Enhanced recovery protocols after surgery may be a key strategy to address high-cost issues in surgical care by offering improved quality care at lower cost.

Conflict of Interests

The authors declare no conflict of interest.

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