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OPTIMIZING POSTOPERATIVE ANALGESIA IN ENCHANCED RECOVERY AFTER SURGERY THE ERAS PROTOCOL

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Abstract

Due to its capacity to reduce morbidity, shorten the length of hospital stay and lower costs, enhanced recovery after surgery has become the standard of care in various surgical procedures, while having no negative impact on readmission rates or mortality.

The main objectives of enhanced recovery after surgery are: reducing complications, length of hospital stay and new readmissions, reducing variability of care and costs. This kind of care is patient-focused, outcome-driven, standardized, evidence-based and interdisciplinary. The main recommendations provided by the Enhanced Recovery after Surgery Society are based on quality of evidence and are categorized in the following way: high, moderate, low and very low; whereas its guidelines are divided into 3 groups: preoperative, intraoperative and postoperative.

The pathways of enhanced recovery after surgery offer safe and cost-effective approaches to perioperative care, which improve patient outcomes without increasing rates of complications.

Keywords: *Enhanced recovery after surgery, complications, evidence-based.*

Introduction

Enhanced recovery after surgery (ERAS) has become the standard of care across various surgical procedures due to its ability to reduce morbidity, shorten the length of stay (LOS), and lower costs, while having no negative impact on readmission rates or mortality (1). But even in modern-day surgery, there are still dogmas in everyday practice. We ask ourselves what is dogma? The term /ˈdɒgmə/ *noun* refers to 'a principle or set of principles laid down by an authority as incontrovertibly true,' applies to certain strong beliefs whose adherents are not willing to rationally discuss them. Therefore, how can we identify dogmas in general surgery? The answer: in preoperative prolonged fasting, mechanical bowl preparation (MBP), nasogastric tube insertion (NGT), drains and prolonged bed rest. The solution? The evidence always trumps dogma. The ERAS protocols were first introduced in the 1990's, by Dr. Henrik Kehlet, a Danish surgical gastroenterologist (2). His patient-centered, evidence-based, outcome-driven, multidisciplinary team developed pathways for surgical specialties and facility environment to maintain preoperative organ function and reduce the profound stress response following surgery, as well as to optimize their physiologic function, and facilitate recovery. The goal was fast-track surgery. These recommendations form an integrated continuum, as the patient moves from home through the prehospital/preadmission stage, following the preoperative, intraoperative, and postoperative

phases of surgery and home again (2).

The main objectives of ERAS are: reducing complications and LOS and new readmissions, reducing variability, reducing costs, improving quality of care, and increasing value = quality/cost (3). What is the main difference between traditional care vs ERAS care? The traditional care is provider-focused, has high variability, and physician-driven. On the other hand, the ERAS care is patient-focused, outcome-driven, standardized, evidence-based and interdisciplinary. The main ERAS recommendations are based on the quality of evidence and can be categorized as: high, moderate, low and very low. The guidelines in the ERAS protocol are divided in 3 groups: preoperative, intraoperative, and postoperative. The preoperative guidelines include: patient information, optimization of preexisting medical conditions, adequate nutrition and fasting time, carbohydrate intake prior to surgery, pre-anesthetic medication and anti-thrombotic prophylaxis. The intraoperative guidelines include: antimicrobial prophylaxis, multimodal anesthesia, adequate approach for preventing postoperative nausea and vomitus (PONV), optimal fluid therapy and prevention of hypothermia; whereas the postoperative guidelines include: fluid management, postoperative glycemic control, adequate postoperative nutrition, early mobilization, rapid hydration and nourishment, appropriate intravenous therapy, early catheter removal, regular oral anesthesia, and avoiding opiates (4).

In terms of the patient information, the preadmission understanding of the surgery and treatment-related implications, as well as counselling to reduce the patient's fear and anxiety and to improve the postoperative wound healing, perioperative nourishment, mobilization and pain control are of utmost importance. Thoug evidence may be week, the ERAS protocols pay great attention to these recommendations.

In terms of medical optimization, the most important preexisting conditions that must be taken into consideration are smoking habits, and alcohol and drugs consumption. Do they make any difference? And when should the patient quit these habits prior to the surgery? Yes, they definitively do. Alcohol and smoking consumption should be halted 4 weeks prior surgery (5,6).

Patients' nutrition is significantly important as it is a common ground that impaired physiological performance in malnutrition can alter the body fluid dislocation, muscle strength, healing of the wound itself, and immune deficiency. Poor wound healing, increased volume for drug distribution, possible respiratory infections, suture dehiscence and ineffective complications lead to an increased intra-hospital mortality rate. Therefore, the question is who should receive preoperative nutrition support? It should always be the moderately and severely malnourished patients. In terms of elective surgical procedures, the nutrition support should be administered 7 to 10 days prior surgery; while the enteral route is preferred when possible, combined with postoperative nutrition and immune-enhanced formulas. The fasting time prior to surgery in standard practice is from midnight on the day before. The goal is to reduce the volume and acidity of the stomach content and decrease the risk of pulmonary aspiration. However, the Cochrane review of 22 RCTs, fasting from midnight showed no reduction in gastric content and no rise in pH of gastric fluid (7). On the contrary, it demonstrated that this kind of fasting challenges the normal physiology, and offers no guarantee of an empty stomach. Prolonged fasting carries a risk of dehydratation, hypotension when administering anesthesia, which increased the need for more fluids, while the end result is fluid overload. The ERAS guidelines are clear: light preoperative food intake 6 hours and clear fluids 2 hours prior surgery that lead to less intravenous fluid demand and improved outcomes.

In regard to surgical stress, it is well known that it increases with insulin resistance. That's why undergoing a carbohydrate treatment prior to surgery is important: 20% glucose IV or a 12.5% carbohydrate drink (400 ml) 2h before anesthesia + 800 ml in the evening before. The effects of preoperative carbon hydration are: reducing the metabolic stress of surgery, reducing insulin resistance, improving pre-/postoperative wellbeing and postoperative muscle function, reducing lean body mass losses, and faster recovery (3,4).

The preanesthetic medication and antimicrobial prophylaxis are imperative in reducing the risk of surgical infections. The optimal time is 30-60 minutes before the incision, while repeated doses should be administered during prolonged procedures (≥3h)/Massive blood loss/fluid loading through intravenous route, with a spectrum covering the suspected pathogens (aerobic ± anaerobic bacteria)(3,4).

In addition to the preoperative guidelines of the ERAS protocol, the anti-thrombotic prophylaxis is very important because of the risk od deep vein thrombosis in 30% and pulonary embolisam in 1% of the patients undergoing major surgery. This prophylaxis could be mechanical (compression stocking with intermitent pneumatic compression) or pharmacological (low molecule weight of heparin LMWH administrated 2 hours before surgery) (8).

The intraoperative guidelines of the anesthesia protocal should focus as much as possible on regional anesthesia, considering the reduced postoperarive use of opiates, quicker awakening and early enteral intake and mobilization. The use of multimodal and regional analgesia is superior to opioids (epidural analgesia, i/v analgesia, wound catheters/infiltration and peripheral blocks) (9).

Another intraoperative component that should be prevented when possible is PONV. The risk factors include: female patients, non smokers, motion sickness desease, volatile anesthetics, intravenous opioids and nitrous oxide. The prevention incorporates multimodal approach consisting of pharmacological and non-pharmacological techniques: total intravenous anesthesia TIVA, minimal fasting, carbonchydrate loading, adequate hydratation, regional anesthesia and non steroid inflamatory drugs NSAID (10).

Intraoperative fluid management is an art of medicine. Based on personal judgments, it is vital in terms of the postoperative outcome. In different patients, the fluid requirements vary; therefore, the fluid shifts should be minimized. This is the reason why fluid administration should be goal-directed. The type of preferred fluid is balanced isotonic crystalloid solutions, and they should be discontinued as soon as possible. Vasopressors are indicated in hypotensive normovolemic patients (11).

When we discuss hypothermia prophylaxis, we should define the term hypothermia-central temperature < 36 C. Risk factors include: wound infections, prolonged cicatrisation, cardiac events, shivering that increases O2 consumption, bleeding, coagulation disorders, trombocites dysfunction, postoperative ileus, increased pain, prolonged emergence time, etc.

Preventive methods for hypothermia: warming devices (forced air warming blankets), warmed intravenous fluids, warm gases in laparoscopic surgery (12).

According to the ERAS protocols, postoperative analgesia is the principal and significantly most important part of the puzzle. The goal is to achieve effective pain relief with optimal analgesia. This is important in the reduction of cardiovascular, cognitive, endocrino-metabolic complications in all patients, decreasing the risk of chronic pain, allowing early mobilisation and early

return of gut function and feeding. The preferred analgesia techniques are: multimodal analgesia with avoidance of intravenous pioids, regional anesthesia techniques, thoracic epidural analgesia (TEA), spinal analgesia, local anesthetic techniques, transversus abdominis plane (TAP) block, etc. The analgesic regimen is specific to the type of surgery/incision. The effect of opioid sparing is: reduction in PONV, POI, sedation, and respiratory depression. Drugs of choice are: paracetamol and NSAIDS, lidocaine, and dexmedetomidine infusion (13).

Postoperative fluid management, the same as in the intraoperative setting, should also be goal-oriented (11).

In the postoperative phase of the treatment, the control of insulin resistance is key for successful pain management. Despite the traditional belief that hyperglycemia in the acutely stressed patient is "not dangerous", all glucose levels > 11mmol/L should be treated (14).

Despite the low to moderate risk of womiting, early enteral nutrition postoperatively is highly recommended because it can lower the rate of dehiscence, as well as the rate of infections, pneumonia, and intra-abdominal abscess (15).

Early mobilization is a crucial component of the enhanced recovery after surgery (ERAS) pathways. It can counteract the adverse physiological consequences of surgical stress and immobilization. It reduces the risk of postoperative complications, accelerates the recovery of functional walking capacity, positively impacts patient-reported outcomes and reduces hospital stay, thereby reducing care costs (16).

Enhanced recovery as a main concept in 'fast-track' surgical recovery may be seen as a resistance to the traditional patient-centered approach, which is fundamental to modern healthcare. The perception that ERAS protocols are rushing patient care is certainly not the case, as ERAS has been proven to reduce mortality and complication rates, and lower the overall costs of care. In Dai et al.'s study about the Whipple procedure, the ERAS group demonstrated: lower morbidity rate than the conventional group (50% vs. 90.8%; P¼0.00), fewer issues of delayed gastric emptying compared to conventional care patients (0 vs. 11.2%; P¼0.011), reduced incidence of pancreatic fistula – grade B, C – than conventional care (14.7 vs. 30.6%; P¼0.018) (17). Kobayashi et al. also demonstrated the value of ERAS in reducing complications after surgery, this time related to liver resection, with different complexity grades: grade I, low; grade II, intermediate; and grade III, high complexity. The study included 437 patients and it found that not applying the ERAS protocol was a significant predictor of postoperative complications for every complexity grade (18). Between 2019 and 2020, Shen et al. studied benign hysterectomy in 475 women. Their results showed that compliance with ERAS resulted in significant reductions in postoperative complications, with rates of 20.4% vs. 41.2% vs. 38.1% for groups I, II and III, respectively. Early removal of the urinary drainage and early mobilization and oral nutrition can be significantly associated with fewer complications after surgery (19). Zhou et al's laparoscopic bariatric surgery of patients with applied ERAS protocols and those with conventional care once again demonstrated the wisdom of ERAS implementation across the surgical spectrum. Overall, 435 patients were included, 198 of whom were included in the conventional group and 237 patients in the ERAS cohort, resulting in a significant reduction of complications in the ERAS group (2.1% vs. 8.6%; P<0.01) (20).

ERAS pathways offer safe and cost-effective approaches to perioperative care, which improve patient outcomes without increasing the rates of complication. Since the inception of ERAS in

1997, so-called 'fast-track' surgical pathways have become widely used in multiple specialties, and the standard of perioperative care has improved substantially, in no small share, due to the work of the ERAS Society. Key advancements have been made, including preoperative carbohydrate loading, patient education and early enteral nutrition.

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