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HOT TOPICS IN PAIN AND HEADACHE (N ROSEN, SECTION EDITOR)

Essential Elements for Enhanced Recovery After Intra-Abdominal Surgery

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Abstract

Purpose of Review Enhanced recovery pathways provide a framework outlining the best perioperative care for intra-abdominal surgical procedures. To date, no evidence-based umbrella guidelines exist for all intra-abdominal surgeries.

Recent Findings PubMed and worldwide web searches were performed with the keywords: "ERAS," "Enhanced Recovery After Surgery," +/− "protocol." Manuscripts addressing intra-abdominal procedures were selected with the date range 2012–2017. The enhanced recovery philosophy is based in the realization that a traditional hospital works in silos that need to be broken to ensure a care protocol that follows and optimizes the journey the patient makes during the perioperative care. Enhanced recovery interventions can be categorized into preoperative, perioperative, and postoperative interventions. By design each intervention is planned and coordinated by a multidisciplinary ERAS team. The interventions discussed in this manuscript should be applied to patients on an individual basis depending on their needs.

Summary In this review, the most common elements of ERAS protocols in intra-abdominal procedures are reviewed, particularly those which provided the best outcomes and are generalized to all intra-abdominal procedures.

Keywords Enhanced Recovery After Surgery · Intra-abdominal surgery · Pancreaticoduodenectomy · Colorectal surgery Bariatric surgery

Introduction

Henrik Kehlet, a Danish surgeon, was the first to introduce the concept of Enhanced Recovery After Surgery (ERAS)© [1]. He attributed the delay of patient recovery to the surgical stress response, which is induced by metabolic and endocrine changes and adversely affects organ function after surgery. Henrik believed that no single perioperative intervention can modify these

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changes, but rather, all disciplines must work in unison to enhance the recovery of the patient. Kehlet and Mogensen published a study to report the feasibility and efficacy of a multimodal rehabilitation regimen in promoting the postoperative recovery in patients undergoing open sigmoidectomy [1]. This was a breakthrough study that eventually lead to the development of the ERAS society and the emergence of procedure-specific protocols.

Evidence-based ERAS protocols have since been published and practiced in many surgical procedures. These include pancreaticoduodenectomy, colorectal surgery, and bariatric surgery.

To the best of the authors knowledge, this is the first manuscript to create evidence-based umbrella ERAS guidelines for intra-abdominal surgeries. We performed PubMed and worldwide web searches with the keywords: "ERAS," "Enhanced Recovery After Surgery," +/− "protocol." Manuscripts addressing intra-abdominal procedures were selected, resulting in studies with the date range 2012–2017. In this review we discuss the most common elements of ERAS protocols in intra-abdominal procedures particularly those which provide the best outcomes and are generalizable to all intra-abdominal procedures.

Preoperative Interventions

Milestones and Discharge Criteria Counseling

Before surgery, the health care provider should discuss preoperative milestones and discharge criteria with the patient and/or the patient's family [2, 3••, 4–8, 9••]. An open dialog and transparency with patients are increase positive perioperative patient outcomes. Patients who are mentally prepared for what is happening to them are more likely to comply and cooperate with health care provider recommendations.

Ileostomy (Where Applicable) and Wound Care

Ileostomy education, marking, and counseling on wound care and dehydration avoidance should be included in the preoperative setting. Ostomy is associated with prolonged length of stay in the hospital after colorectal surgery [8]. Structured patient stoma education drastically improves patient quality of life and psychosocial adjustment, and reduces hospital length of stay, while also reducing hospital-associated costs. This has been affirmed in a systematic review and several single-center and multi-center research studies [10, 11]. Furthermore, a randomized trial reported that patient education was most effective if presented preoperatively [12].

Preoperative Nutrition and Bowel Preparation

Presently, anesthesiology societies recommend the intake of clear fluids up to 2 h and solids 6 h before the induction of anesthesia [13]. Preoperative carbohydrate conditioning involves the use of iso-osmolar drinks consumed 2–3 h before the induction of anesthesia. This practice attenuates the development of postoperative insulin resistance, reduces postoperative nitrogen and protein losses, and maintains lean body mass [14]. This practice is also associated with a significant reduction in the length of hospital stay [15, 16].

With regard to bowel preparation, mechanical bowel preparation (MBP) plus oral antibiotic bowel preparation (OBP) prior to colorectal surgery is associated with reduced complication rates [8]. Although there appear to be no meaningful benefits of MBP when used alone with regard to complications, a 2016 meta-analysis comparing MBP coupled with OBP versus MBP alone reported a reduction in total surgical site and incisional site infection, with no reported difference in the rate of organ/space infection after the elective colorectal surgery [17].

Preoperative Order Entry

Preoperative order entry may be utilized in the management of postoperative nausea and vomiting prophylaxis, surgical site infection prevention, and multimodal opioid-sparing pain management plans. If modification of an anticoagulation regimen is necessarily secondary to the planned use regional or neuraxial anesthesia, such changes may be made in advance in the perioperative evaluation clinic.

Perioperative Interventions

Nausea and Vomiting Prophylaxis

Twenty-five to thirty-five percent of surgical patients experience postoperative nausea and vomiting (PONV) [4]. PONV is associated with major abdominal surgery for colorectal disease [18]. Prophylactic anti-emetics can reduce PONV by 40% [19••]. Under this model, the patient arrives for his surgery with an electronic order set containing appropriate premedication already in his chart. Risk stratification and order entry is performed during the preoperative evaluation clinic visit. Timely delivery and administration of premedication for PONV prophylaxis (as well as anxiolysis, multimodal analgesia, etc.) is important and requires collaboration between anesthesiology, pharmacy, and preoperative area nursing personnel.

Multimodal Analgesia

Minimizing opioid consumption is associated with an earlier return of bowel function and a shorter length of hospital stay [20–23]. The most common and simple strategy to limit patient opioid intake is to utilize narcotic alternatives including acetaminophen, nonsteroidal anti-inflammatory drugs (NSAIDs), and gabapentin as the first line of treatment [24]. Although many health care centers choose to begin a multimodal analgesic regimen preoperatively, the efficacy of preemptive analgesia remains controversial (due to lack of statistically significant data) and mainly limited to epidural blockade and TAP blocks [9].

A T6-T12 thoracic epidural is considered the gold standard in open abdominal procedures opioid-sparing regimens. However, despite the significant analgesic benefit of thoracic epidural analgesia, it was found to have either no impact or even cause a delay in hospital discharge after laparoscopic procedures.

Goal-Directed Fluid Therapy

Both IV fluid overload and extreme fluid restriction can significantly impair organ function, increase postoperative morbidity, and prolong hospital stay [25, 26]. In high-risk patients or patients undergoing major abdominal surgery, the use of objective parameters such as stroke volume or cardiac output, or dynamic fluid responsiveness measures such as stroke volume variation and pulse pressure variation allows for more accurate, patient-specific fluid resuscitation. Goal-directed fluid therapy (GDFT) reduces postoperative morbidity and the length of hospital stay, particularly in high-risk patients undergoing major surgery [27, 28].

Postoperative Interventions

Early Ambulation

Prolonged immobility can lead to the following complications: skeletal muscle loss and weakness, atelectasis, insulin resistance, thromboembolic disease, and decreased exercise capacity. Bedrest-associated deconditioning can be reduced with early onset physical activity [10]. Few studies investigate the impact of specific strategies to increase mobilization versus allowing early ambulation ad libitum.

Ileus Prevention

Immediately after elective colorectal surgery, patients should be offered a regular diet. Multiple randomized studies, meta-analyses, and observational studies demonstrate that early (< 24 h) feeding accelerated GI recovery and decreased hospital length of stay. The rate of complications and mortality (OR = 0.41, 95% CI, 0.18–0.93) is also decreased with early feeding. ERAS consensus guidelines support early feeding in patients; however, providers must be cognizant that the risk of vomiting in these patients will increase [10]. Therefore, prophylactic PONV care should be administered.

Multimodal Analgesia in the Postoperative Phase

Beginning with PACU admission, acute pain service teams would be expected to continue to manage the patient's multimodal analgesia regimen. This allows for continuity of pain treatment care from the preoperative admission (epidural/TAP block placement) until hospital discharge. Institutions with an existing perioperative surgical home initiative are able to routinely employ this intervention.

Summary

In the bundled payments and outcome-driven compensation models being used in the USA today, it is integral for institutions to be cognizant of these factors and employ evidence-based strategies to achieve the outcomes being pursued. Although ERAS protocols address most of these issues so effectively that it may soon become the standard of care, it must be noted that the initiative is still in its nascent stages. Prior to universal adoption, more high-quality data supporting ERAS protocols will certainly be needed. As it is currently a "hot topic," many academic institutions are currently studying the various implementation of the ERAS initiative and the next few years are expected to provide a wealth of high-quality data from RCTs and meta-analyses.

Compliance with Ethical Standards

Conflict of Interest Amir Elhassan, Ihab Elhassan, Amjad Elhassan, Krish D. Sekar, Ryan E. Rubin, and Elyse M. Cornett declare no conflict of interest. Alan D. Kaye serves on the Speakers Bureau of Depomed and Merck. Richard D. Urman received research funding from Medtronic.

Human and Animal Rights and Informed Consent This article does not contain any studies with human or animal subjects performed by any of the authors.

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