

Enhanced recovery after colorectal surgery: an update on current practice

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Abstract

The concept of 'enhanced recovery' after surgery gained traction in the 1990s and has continued to evolve over the last three decades. It incorporates a host of evidence-based interventions into the patient care pathway and aims to eliminate those practices that were based in tradition and slowed the patient's recovery. The pathway is designed to involve the patient and the wider surgical team along with primary care and support services. Enhanced recovery pathways have been emerging for a wide range of surgical subspecialties and the principles are applicable to all non day-case surgical interventions. Enhanced recovery after surgery pathways can be divided for simplicity into preoperative, intraoperative and postoperative care and some of the important elements are described in this article along with the supporting evidence.

Keywords Enhanced recovery; perioperative care

Introduction

'Enhanced recovery after surgery' (ERAS) programmes are now considered to be standard practice after colorectal surgery and are fast becoming the norm for all major surgical procedures in any of the surgical specialties. Programmes differ in certain respects depending on the specialty and geographical location but have certain common themes, the basic principles of which are the involvement of the patient and family in decision-making preoperatively and the involvement of the wider hospital team in formulation and execution of a complete patient pathway of care which is evidence-based, leading to a quicker recovery for the patient with less chance of physiological derangement at any stage of the perioperative period.

Preoperative practice

Patient education

Education of the patient and family regarding the nature of their illness, the decisions which need to be made, the options available and their consequences and the nature of the perioperative

pathway are all integral parts of an effective enhanced recovery programme. Written information leaflets are useful and commonly available to inform patients about their illness and treatment options. It is essential that patients about to undergo any form of major surgery are given contact details for the appropriate nurse specialist in case they have any further questions prior to their surgery and further consultation should be encouraged in the event of confusion or concern.

Assessment and optimization of comorbidities

All patients undergoing major surgery are now routinely seen at an anaesthetic preoperative assessment clinic. In addition to providing patient information these clinics are essential in order to assess and optimize any coexisting medical comorbidities, and to stratify the patient so that the appropriate level of postoperative care can be arranged in advance. Stratification is now generally performed by exposing the patient to a physically 'stressful' environment (usually on a cycle or treadmill), in order that the physiological response of the patient can be assessed. The anaerobic threshold (AT) is the point at which the patient moves from aerobic to anaerobic metabolism and gives a good indication of how the patient will respond to major surgery. The VO_2 Max is another good indicator of this and represents the maximum amount of oxygen that the patient can utilize in a minute per kg of body weight. This is covered in more detail elsewhere in this issue.

Curtailed fasting and carbohydrate loading

The traditional practice of overnight fasting to prevent risk of aspiration during anaesthetic induction is now considered obsolete. Prolonged fasting is associated with poorer postoperative outcomes due to increased insulin resistance and risk of hypovolaemia. The standard practice at present is a fasting period of 6 hours for solids and 2 hours for clear liquids prior to surgery and does not increase the risk of aspiration at induction.

Perioperative carbohydrate intake has been shown to decrease postoperative insulin resistance, minimize postoperative protein and nitrogen loss from catabolism and preserve lean body mass. Clinically, this is manifested by a faster recovery period and shorter duration of stay in hospital.¹ A clear oral fluid containing a high concentration of complex carbohydrate (typically 12.5% maltodextrin) should be given to all patients the night before and 2 hours prior to surgery as part of the ERAS pathway. This is considered safe in patients with uncomplicated type 2 diabetes mellitus but large-scale studies of its safety in patients with gastroparesis is currently lacking.

Selective bowel preparation

Use of mechanical bowel preparation has been linked to significant fluid and electrolyte shifts and prolonged postoperative ileus. At present, it is not routinely recommended in enhanced recovery pathways for colorectal surgery. A recent meta-analysis showed that the use of bowel preparation did not prevent against anastomotic leak and had comparable mortality, reoperation rate and incidence of wound infections with patients who had no bowel preparation or rectal enema alone.² There may, however, be specific indications for the use of mechanical bowel preparation in cases of low rectal anastomoses with a proximal diverting stoma. A 2010 randomized controlled trial demonstrated

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significantly increased postoperative morbidity in patients with a diverting stoma who did not receive mechanical bowel preparation, with a trend towards a higher risk of anastomotic leak in this group.³ Further studies will be necessary to evaluate the full significance of these findings.

Intraoperative practice

Surgical technique

The use of minimally invasive techniques is strongly advocated where possible in elective colorectal surgery and is at least as safe as the open approach with comparable long-term oncological outcomes.⁴ The benefits of laparoscopic and laparoscopic-assisted colorectal resections are well-documented and lead to a shorter duration of inpatient stay.⁵ The stress response to surgery is minimized due to the considerably smaller degree of trauma to the abdominal wall. Postoperative recovery is significantly accelerated due to decreased pain and opiate requirement which in turn prevents respiratory complications and facilitates earlier mobilization. Minimally invasive surgery is also associated with earlier return of gut function postoperatively.

Other minimally invasive techniques such as robotic-assisted colorectal resection, single-incision laparoscopic surgery (SILS) and natural orifice transluminal endoscopic surgery (NOTES) procedures have been attempted with some success, but there is currently little evidence to warrant their use outside of a trial setting.

Where open surgery is performed, a recent systematic review suggests that transverse incisions appear to be associated with less pain and postoperative opiate use compared to midline laparotomy incisions.⁶ However, the same study showed no difference in length of inpatient stay and rate of pulmonary complications between both groups.

Maintenance of normothermia

Intraoperative hypothermia is a common phenomenon that occurs secondary to anaesthesia and heat loss from the abdominal cavity. Hypothermia interferes with homeostasis and is associated with multiple adverse outcomes including wound infection, cardiac events, bleeding and coagulopathy. Close monitoring of core temperature and prevention of hypothermia using active warming devices is strongly recommended at present.

Inspired oxygen concentration

The use of high inspired oxygen concentration (HIOC) is a subject open to debate. It has been proposed that HIOC minimizes the risk of surgical site infection, particularly in patients undergoing colorectal surgery.⁷ However current literature on the subject contains significant heterogeneity and it is recommended that the FiO₂ be titrated to produce normal blood gas levels to protect against the potential risks of hyperoxia.

Perioperative fluid management

Optimal fluid balance is a crucial component of the ERAS pathway. Preoperatively this is minimized by selective use of bowel preparation, curtailed fasting allowing intake of clear fluids up to 2 hours before surgery and administration of an oral carbohydrate preload. Both fluid depletion and overload have been shown to increase postoperative morbidity. Fluid overload and electrolyte imbalance have been shown to increase bowel oedema and affect anastomotic integrity. Intraoperative fluid administration should

be guided by real-time cardiac output monitoring with oesophageal Doppler studies. This is termed goal-directed fluid therapy and has been shown to reduce postoperative morbidity and duration of hospital stay.⁸ There is no consensus on the type of fluid that should be administered and there appears to be little difference in outcomes between colloids and crystalloids. Where hypotension occurs secondary to epidural analgesia in the normovolaemic patient, judicious use of vasoconstrictor drugs is recommended rather than liberal fluid administration.

Tubes, catheters and drains

The presence of tubes and drains is a significant impediment to early mobilization and themselves are associated with various complications. Routine use of prophylactic nasogastric tubes is not recommended following elective colorectal surgery as there is strong evidence linking it to respiratory morbidity and delayed gut motility.⁹ Placement of pelvic drains has not been shown to decrease rates of anastomotic leaks and confer no additional benefit; as such, routine use of these is also discouraged. Urinary catheters are associated with urinary tract infections and their early removal (ideally on postoperative day 1) is recommended, unless there is a specific clinical indication for the contrary.

Postoperative practice

Early mobilization

Prolonged postoperative bed rest has now been linked to increased incidence of venous thromboembolism (VTE), prolonged insulin resistance, muscle loss from catabolism and respiratory complications such as atelectasis and pneumonia.

Current ERAS protocols typically encourage mobilization as soon as 4 hours postoperatively. Typically, patients are encouraged to spend 2 hours out of bed on the day of surgery and 6 hours daily thereafter until discharge.

Postoperative analgesia

Systemic analgesia: effective pain relief remains a cornerstone of every ERAS programme. It enables early mobilization and prevents complications such as respiratory infections and venous thromboembolism. Opiate analgesia is associated with significant morbidity (respiratory depression, drowsiness, decreased mobility, PONV and delayed gut function) and should be avoided where possible. A multimodal analgesic regime typically comprising paracetamol and non-steroidal anti-inflammatory drugs (NSAIDs) is extremely effective at achieving sufficient pain relief especially in combination with the regional/local analgesia described below. There have been some weak associations between the use of NSAIDs and COX-2 inhibitors with increased risk of anastomotic leak, but a subsequent meta-analysis showed no significant increase in leak rates in patients receiving postoperative NSAIDs in the first 48 hours after surgery.¹⁰

Recently, systemic administration of intravenous magnesium, or local anaesthetic (such as lidocaine) has increasingly been used and is shown to decrease systemic opiate requirements. Currently, the precise details of administration that achieves the best analgesic effect remains undefined.

Regional/local analgesia: thoracic epidural analgesia (TEA) remains the gold standard in patients undergoing open colorectal

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