

Application of Enhanced Recovery after Surgery in Gastrointestinal Surgery based on Multidisciplinary Team

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Abstract: Chinese gastrointestinal surgeons are building up our own high level evidence in evidence-based medicine, With tremendous clinical trials carrying out in gastrointestinal cancers. Besides, Standardized procedure of diagnosis and treatment should be promoted. More personalized schemes are needed. The model of multidisciplinary team can be more widely and deeply applied. In order to further optimize the surgical pathways and promote the clinical application of ERAS in surgery, it is important to raise awareness of the ERAS concept, advocate multi-disciplinary cooperation model, including surgery, anesthesiology, nursing, clinical nutrition, etc. to improve the application of ERAS in gastrointestinal surgery, promote medical and health management performance. And the concept of enhanced recovery after surgery should be more operable. To keep pace with the times, the gastrointestinal surgeons have to seek for innovative technology and new ideas.

Keywords: ERAS, Multidisciplinary Team, Gastrointestinal Surgery, Anaesthesia

Enhanced recovery after surgery (ERAS) is a multidisciplinary protocol of care delivered to patients with the aim of maintaining normal physiology and thereby facilitating postoperative recovery¹. Based on the original work of Kehlet and Wilmore², the ERAS protocol is now used routinely, especially in the field of surgery for colorectal cancer. The combination of various perioperative approaches has led to significant reductions in surgical morbidity and mortality rates, the duration of hospital stay, and the cost of hospitalization, and has greatly improved postoperative recovery³.

The main contents of ERAS perioperative management include: patients education, optimization of anesthetic prescription, reduction of operative stress, control of nausea and vomiting and postoperative intestinal paralysis, management of multi-mode analgesia, management of catheter, reasonable nutritional support, and standards and planning of discharge¹. ERAS is a systematic project designed for preoperative and postoperative multistage management. Therefore, ERAS in multidisciplinary collaboration mode has been widely recognized.

1. Application of ERAS in gastrointestinal surgery

1.1 Preparation before operation

1.1.1 Preoperative education and communication

The good communication with patients, can improve the negative emotion and enhance the self-confidence of the patients and the family, and can obviously reduce the anxiety of the patients and improve patients' postoperative recovery; on the other hand, the patient's

trust can be obtained, and the ideal doctor-patient relationship can be established.

1.1.2 Evaluation and control of basic diseases

The majority of gastric cancer patients are elderly, who are always accompanied by hypertension, diabetes, heart failure, chronic obstructive pulmonary disease, anemia, hypoproteinemia or malnutrition. These complications seriously affect the clinical outcome of patients. Before operation, the patients' cardiopulmonary function should be evaluated actively, and be given symptomatic treatment in time, for adjusting the whole body state of the patients. Patients should be educated to give up smoking and drinking, exercise the cardiopulmonary function, and improve the state of malnutrition.

1.1.3 Gastrointestinal preparation

Studies have shown that traditional methods (fasting at night before operation, cleaning enema, etc.) do not reduce the incidence of postoperative complications, but can make intestinal wall edema and brittleness prone to bleeding. Repeated mechanical enema and diarrhea also affected patients' rest and reduced their physical fitness. It has been agreed that there is no need to clean the intestine before gastrointestinal surgery, and less recommendation of oral osmotic laxatives and clean enema, which helps to maintain water and electrolyte acid-base balance⁴.

1.1.4 Oral carbohydrate before operation

Long-term fasting may decrease preoperative energy

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reserve and lead to intraoperative hypoglycemia and starvation stress. Since liquid food can be emptied after 2 hours, it is suggested that oral 50 g of carbohydrates 2 hours before anesthesia can relieve anxiety and hunger caused by fasting before anesthesia, reduce the degree of insulin resistance after operation, and do not increase the risk of accidental aspiration during anesthesia⁵.

1.1.5 Prophylactic use of antibiotics

Patients undergoing major abdominal surgery should be given prophylactic antibiotics half an hour before operation. If the operation time is longer than 3 hours, antibiotics should be added once.

1.2 Intraoperative measures

1.2.1 Operation safety management

Surgical safety verification system can significantly reduce the incidence and mortality of surgical complications, improve the clinical outcome of patients, and recommend the application in the global operation process⁶. When the patient enters the operating room, before the operation begins and leaves the operating room, must strictly carry out the check system, prevents the wrong operation patient, the wrong operation place and the wrong operation. Safety check before operation can avoid all kinds of harmful risks of elective operation, which is of great significance to promote communication and communication between operation teams and prevent surgical mistakes.

1.2.2. Anesthesia management

General anesthesia can delay the recovery of gastrointestinal function after operation. Thoracic epidural block combined with general anesthesia can reduce the dose of anesthetic, reduce the effect on gastrointestinal function, and effectively inhibit the stress response of gastric cancer patients during perioperative period⁷. It also can maintain hemodynamics stable and is beneficial to postoperative analgesia and shortening the time of postoperative intestinal paralysis. General anaesthesia drugs should be selected for quick, short-acting anesthetics or short-term opiates such as fentanyl, which can ensure that patients can wake up quickly after surgery and reduce the residual effect and adverse reactions of anesthetic drugs.

1.2.3 Liquid management

The application of goal-oriented blood pressure control and infusion theory can ensure the blood perfusion of important organs. The blood pressure should be properly controlled at a lower level, then adjusted to a normal level after operation, and the volume of fluid should be strictly controlled, in order to avoid tissue edema caused by water overload⁸.

1.2.4 Avoid hypothermia during operation

During the operation, the adaptation ability of gastric cancer patients to environmental changes was decreased, a large amount of hypothermia fluid was

injected. Using unheated flushing fluid and the inhibitory effect of general anesthesia on the center of body temperature regulation were easy to cause hypothermia and aggravate the stress response, which lead to abnormal coagulation function, even induce arrhythmia, and prolong anesthesia recovery time^{9, 10}. Therefore, it is necessary to keep operating room and liquid temperature suitable, and body temperature should be monitored and thermal blanket should be used to prevent adverse reactions caused by hypothermia. Antithrombotic socks and mechanical antithrombotic pump should be used to prevent deep venous thrombosis¹.

1.2.5 Surgical mode selection

The concept of minimally invasive surgery advocated by ERAS should be applied throughout the operation of gastric cancer, and the surgical incision should be minimized on the basis of the full exposure of the surgical field. Avoid injury and bleeding, minimize blood transfusion and shorten operation time. At present, more than 60% of patients with gastric cancer in Japan and South Korea are early pathological changes, and laparoscopic surgery is also recommended, which can reduce surgical trauma stress, promote patients' recovery, and quality of life. The KCLASS (Korea) and CLASS (China) studies on laparoscopic radical gastrectomy for advanced gastric cancer have shown excellent surgical safety and short-term tumor control effects. The effect is comparable to that of previous open surgery¹¹.

1.2.6 Tube management

Because various drainage tubes can obviously affect the postoperative activity and increase the negative psychology of the patients, it is suggested that the indications for the use of all kinds of catheters should be strictly grasped. Previous studies have shown that it is safe for patients with gastric cancer not to use nasogastric tube during selective abdominal surgery¹². Placing nasogastric tube for a long time after operation can increase the risk of oropharyngeal side effects and pulmonary infection. Urinary catheter should be removed 24 hours after operation to avoid discomfort or urinary tract infection. Although RCT studies have shown that conventional use of drainage tubes in cholecystectomy, joint replacement, colectomy, thyroidectomy and hysterectomy, and pancreatectomy is not beneficial. However, the need for abdominal drainage after radical gastrectomy is still controversial. There is still a risk of anastomotic leakage, bleeding or lymphatic leakage after radical gastrectomy, so it is necessary to place a peritoneal drainage tube.

1.3 Postoperative management

1.3.1 General treatment

ERAS encourages patients to get out of bed early after operation, which can reduce the loss of muscle tissue, improve lung function and oxygen cooperation, promote postoperative intestinal peristalsis and prevent deep venous thrombosis of lower extremity. The

amount of fluid should be restricted properly, and 2000ml should be taken as the best one every day. Too much liquid could cause tissue edema, delay the recovery of gastrointestinal function, and reduce the healing ability of anastomotic stoma. Restrictive fluid infusion can reduce edema, increase serum albumin content and reduce the incidence of postoperative complications⁹. The traditional view is that flatus and defecate is the standard for the recovery of intestinal function. Therefore, gastric cancer surgery needs to keep patients from eating for a long time. The concept of ERAS suggests that colorectal surgery patients can eat before their gastrointestinal function is fully recovered. Early enteral nutrition could promote intestinal peristalsis, decrease catabolism, protect intestinal mucosal barrier and enhance postoperative immune function¹³. But it is necessary to carry out individualized measures according to the gastrointestinal function of the patients, follow the principle of a small number of times, increments gradually, and closely observe the changes of the patient's condition.

1.3.2 Postoperative pain management

Effective postoperative analgesia is one of the important contents of ERAS. Pain control management is best implemented by anesthesiologist, pain specialist, surgeon and nurse. The necessary psychological guidance can reduce the use of painkillers and shorten the length of stay in hospital¹⁴. After the operation, the long-acting local anesthetic can be injected into the incision area, and the epidural catheter can be used for analgesia with opioid drugs. Which have positive effect on adverse reaction, and decrease the influence on the respiratory tract and gastrointestinal function. There is a great analgesic effect of (NSAIDs) and COX2 blockers combined with peripheral non-steroidal anti-inflammatory drugs. However, traditional opioids can lead to some adverse reactions, such as nausea, respiratory depression, gastrointestinal function recovery and addiction. The study found that compared with systemic intravenous opioid analgesics, epidural analgesia can significantly reduce the risk of postoperative death, and the incidence of atrial fibrillation, supraventricular tachycardia, deep venous thrombosis, respiratory inhibition, atelectasis, pneumonia, intestinal obstruction and postoperative nausea and vomiting, and promote the recovery of intestinal function. However, there are hypotension, pruritus, urinary retention and motor nerve block problems¹⁵.

1.3.3 Management of postoperative complications

The incidence of postoperative complications of gastric cancer is 10-40%¹⁶. Serious complications can lead to death, increase the incidence of unplanned reoperation and readmission, prolong hospitalization time, increase economic burden, and seriously affect the prognosis of patients. The changes of vital signs should be observed closely after operation. In case of serious complications, doctors should follow the "3s" principle. That is, to

take active measures to maintain the sustention of basic vital signs. To support the patient's visceral function and supplement various substances and nutrients. the "3s" principle can be highly summed up the core concept of treatment during the successful treatment of many critical gastrointestinal patients.

2. Multidisciplinary Cooperation and Management in the Development of ERAS

2.1 Multidisciplinary teams

The patient is an organic whole, may be combined with a variety of diseases or needs a variety of treatment methods, which requires multi-department collaboration treatment. ERAS has been popularized and applied in various surgical disciplines. Its main contents include patient education, optimization of anesthetic methods, reduction of surgical stress, reduction of postoperative nausea, vomiting and intestinal paralysis, full analgesia, and rational use of various drainage tubes. Early nutrition and activities out of bed, standardized discharge standards, etc. This also means that the clinical development of ERAS necessarily involves anesthesia, surgery, nursing, nutrition and other related departments.

For a long time, it has been regarded that surgeons play the main role in the treatment of gastrointestinal neoplasms. However, modern oncology has put forward new and higher requirements for surgeons. The treatment of modern gastrointestinal tumors involve medical imaging department, oncology department, radiotherapy department, pathology department, anesthesiology department, surgery and so on, then the MDT model emerges as the times require. The work of MDT includes preoperative staging (professional radiographs and endoscopes), pathological staging, evaluation of neoadjuvant chemoradiotherapy efficacy and targeting site detection, and postoperative comprehensive treatment. If the relative discipline personnel can be relatively fixed and specialized, it can also provide a great practical basis for the standardization of gastrointestinal surgery. On this basis, it can provide individualized treatment for patients and improve the long-term outcome.

2.2 Change of Multidisciplinary concept

ERAS clinical studies show that the goal of accelerating the recovery of patients cannot be achieved by simply changing the techniques or methods. At present, it has gained consensus on the multidisciplinary collaboration of ERAS. But due to the independence of various professional fields, it is still very difficult to realize the coordination and unification of clinical subjects. The current ERAS program mainly consists of surgeons, anesthesia and other related disciplines involved in the whole process of treatment. Although there have been great achievements, but still shortcomings, which are highlighted by the lack of coordination between the program makers and the practitioners of the relevant procedures. Because of the difference of patients' situation, anesthesiologists and the surgeons, there's also a big diversity in the effect of execution. Surgery is difficult to make accurate evaluation on anesthetic methods and effects, and surgery cannot give professional guidance to anesthetic work. Vice versa,

anesthesiology is an indirect management of patients, unable to determine the operation mode and postoperative rehabilitation management. It is obvious that the single subject-led ERAS program is difficult to effectively integrate the related disciplines and professional habits. Therefore, the effective promotion of ERAS requires multidisciplinary conceptual change and renewal. The key, to improve the understanding of the connotation of ERAS, is to break through the "barrier" effect of discipline, and to adhere to the deep integration of multi-disciplinary teams under the principle of patient-centered, especially the coordination of anesthesia and surgery¹⁷.

First of all, the principle of ERAS is patient-centered, and all relevant disciplines implement effective methods of diagnosis and treatment around the interests of patients. Secondly, the therapeutic effect should be evaluated by relevant professional departments, for example, anaesthesiology evaluate anesthesia and analgesic effect, prevention and treatment of postoperative nausea and vomiting and cognitive impairment, and so on. Third, multidisciplinary collaborative ERAS therapy requires an overall organizer, such as the top-level designer of the hospital, whose role is to effectively organize collaborative relationships in related disciplines. Coordinate the professional cooperation between disciplines to work out the overall implementation plan of ERAS. However, no matter what kind of modes are adopted, the patient's benefit should be the center, in order to promote the patient's early recovery and to realize the maximum satisfaction of the patient.

2.3 ERAS has only the beginning, not the end

In 1997, the concept of ERAS was proposed Professor Henrik Kehlet in Denmark, the core of which is to reduce trauma and stress. In each stage of perioperative period, the psychological and physical stress response of the patients was reduced through various measures. The aim is to shorten the hospital stay, reduce the incidence of complications, reduce the risk of readmission, reduce mortality and reduce medical costs. Reviewing years of practical research on ERAS, Professor Kehlet believes that effective implementation of ERAS requires multidisciplinary collaboration^{18, 19}, and that the study of ERAS must adhere to its original intention to perform its duties in various professional disciplines around the theme of patient-centred, and to realize the early recovery of the patients on the basis of safety and painless²⁰. Therefore, it is not difficult to understand that the core of ERAS is to focus on patients and fully fulfill their respective responsibilities. ERAS is only a comprehensive idea about the interests of patients from the overall point of view.

From the perspective of development, ERAS is also evolving, from "fast-track surgery", which started with optimizing the surgical management process, to ERAS, which focuses on every aspect of the perioperative period. However, no matter how it develops, patient-centered will be the eternal core of ERAS. With the transformation and integration of modern medicine, the connotation of ERAS will be expanded to meet the increasing needs of patients, from improving the operation transformed into improving the humanities, from procedural, standardized to individualized.

Human medicine needs are growing, ERAS will continue to improve, a long way to go, endless development¹⁷.

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