

ERAS and pancreatic surgery: a review

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Abstract Pancreatic surgery is still considered as a high-risk abdominal surgery. While the mortality rate is low, the morbidity remains high ranging from 30 to 60%. In 2012, the ERAS study group published the official recommendations to implement the enhanced recovery after surgery (ERAS) program in patients undergoing PD. Non-randomized studies have shown that ERAS was safe and feasible. They reported a significantly shortened LOS with lower morbidity in ERAS group. However, the level of evidence remains low due to absence of randomized study and because of a substantial heterogeneity in the content of ERAS protocols. Future studies should be prospective, multicentric and designed with a structured implementation of standardized ERAS pathway.

Keywords Enhanced recovery after surgery · ERAS · Pancreatectomy · Pancreatic surgery

Introduction

Review: The Enhanced Recovery after Surgery (ERAS) pathway is a multimodal and evidence-based framework developed to reduce peri-operative surgical stress, to decrease post-operative complications and to accelerate post-operative recovery [1]. The ERAS program was initially implemented in colorectal surgery [2] and was

associated with a significant reduction in post-operative morbidity and LOS [3, 4].

Pancreatic surgery has been traditionally considered a high-risk surgery. During the last few decades, advances in surgical techniques associated with the centralization of pancreatic resections in high volume centers have resulted in a lower mortality rate (<5%) after pancreaticoduodenectomy (PD) [5]. However, the morbidity rate remains high with prolonged length of postoperative hospital stay [6, 7]. Pancreatic surgery remain challenging because some issues are still debate: when should we recommend pre operative biliary drainage? Should we use prophylactic abdominal drain routinely? Is there any risk to recommend early feeding in patients with multiple digestive anastomoses? Hence, the ERAS pathway could contribute to improve post-operative outcomes after pancreatic surgery by resolving these different challenges.

Programs based on enhanced recovery protocols in patients undergoing pancreatectomy have been developed over a decade [8]. In 2012, the ERAS group has published evidence-based consensus recommendations for pancreatic surgery, including preoperative counseling, peri-operative oral immunonutrition and no more pre operative fasting. Oral intake of solid food was allowed up to 6 h before surgery. Carbohydrate loads were given the previous day and up to 2 h before anesthesia. Pre operative biliary drainage should be not recommended in patients with a serum bilirubin concentration >250 µmol/l. Pre-operatively, the anesthetists don't give any premedication and avoid fluid overload to obtain a near-zero fluid balance. Prophylaxis of nausea and vomiting (PONV) was started and consisted of at least two different pharmacological agents. Antibioprophylaxis was performed in each patient. Post-operative analgesia was ensured using a midthoracic epidural or patient-controlled analgesia in cases of

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contraindication. To prevent hypothermia, a body bear hugger and warming set for intravenous infusions were used. Defined protocols were used to manage peri-operative glycemia and avoid hyperglycemia. The nasogastric tube inserted during the surgery was removed before the anesthesia was reversed. Pre-emptive use of nasogastric tubes postoperatively should not be performed routinely. A prophylactic abdominal drain should not be placed routinely. Early removal of drains after 72 h may be advisable in patients at low risk (i.e., amylase content in drain ≤ 5000 U/l) for developing a pancreatic fistula. Antithrombotic prophylaxis was started on the day of surgery. The patients followed an early oral feeding program. Clear fluids with nutritional supplements were allowed 6 h after surgery and progressively expanded to solid food. Oral laxatives were given from PoD 1. The patients also benefited from early mobilization: they were instructed to sit on the evening of the day of surgery and start to walk on PoD 1. Patients were discharged when they fulfilled all of the following criteria: good pain control with oral analgesia only, tolerance of solid food, no intravenous fluids, independently mobile at the pre-operative level, and acceptance of discharge.

The implementation of ERAS pathway includes simultaneous strategies such as prospective database, audit and feedback systems in order to report the adherence to ERAS protocol. It constitutes a major advantage in ERAS program when compared to other fast track program. Indeed, simply developing evidence based protocols is not enough to change practice and reporting of adherence to protocol should be a standard item [9].

Few comparative studies have evaluated ERAS program implementation in patients undergoing pancreatectomy, and those that did were always retrospective, monocentric, and based on historical controls [10–18]. These studies differed by resection type but most of them included only patients undergoing PD [10, 12, 15–18]. Seven studies [10, 11, 14–17] reported a significant decrease in post-operative LOS in the ERAS group, while morbidity was reduced significantly in only one study [11]. In 2013, Coolen [8] published a systematic review and meta analysis including 8 studies. Patients undergoing pancreatic surgery in ERAS pathway had a significant shorter length of hospital stay (LOS) with less morbidity. Mortality and readmission remain unchanged. Implementation of ERAS was also associated with a significant decrease in total hospital cost. These results were confirmed by the meta analysis of Kagedan [19] which included two additional studies. LOS was significantly reduced in ERAS group, while there was no difference in term of morbidity and mortality rate. Both meta analysis reported [11, 19] reported a median LOS of 7–13 days.

According to these results, implementation of ERAS pathway in pancreatic surgery is successful. However, it is important to notice that there are only retrospective and monocentric studies. It could be very interesting to confirm these results in multicentric and prospective trials.

Besides, it is essential to implement ERAS pathway with success to report the adherence. Indeed, in colorectal surgery, a multicenter and prospective study showed that improving overall compliance with the ERAS program was associated with reductions in complications and LOS [20]. In pancreatic surgery, most studies [2, 11–13, 15, 16] did not investigate compliance rate with the ERAS program or reported incomplete data. Moreover, meta-analysis also revealed substantial heterogeneity in the content of peri-operative care protocol [8, 19]. In this context, it is difficult to determine the true impact of ERAS program between intervention and control group. In addition, it is still unclear which specific components of ERAS program is the most important to improve outcomes for patients undergoing pancreatic resection.

Robertson et al. [18] reported an overall compliance ranging from 72 to 86% in 50 patients undergoing PD with ERAS pathway. However, this study included only 10 items, and a multidisciplinary hepatopancreatobiliary team designed the ERAS protocol by reviewing published reports. Thus, it did not adhere to the ERAS guidelines. Braga et al. [21] reported a higher adherence to pre- and intra-operative items, while adherence to post-operative items was suboptimal at 47–66%. Only 12 items were assessed. In subgroup analysis, the adherence was significantly higher in uneventful patients, while a lower compliance was found in patients with major complications. Unfortunately, the sample size of the study did not allow the weighing of the independent impact of single ERAS items on patient recovery and outcome.

Implementation of ERAS pathway in pancreatic surgery is safe and feasible according to the published data. Through a standardized care protocol, LOS and morbidity is significantly decreased while the mortality and the readmission remain stable. Nonetheless, there are some limits. First the level of evidence remains low or moderate due to absence of prospective and multicentric study and because of a substantial heterogeneity in the content of ERAS protocols in pancreatic surgery. Secondly in most of the study, we did not know the compliance to ERAS pathway. Yet, we know by personal experience that implementation of a standard care protocol is not so easy and depend also on patient education, increased communication and collaboration, and better evidence for ERAS interventions [22]. Future studies should be directed towards assessing the association between compliance rate and short term post operative outcomes after structured

implementation of standardized ERAS pathway in multi-centric and prospective study.

Compliance with ethical standards

Conflict of interest The authors declare that they have no conflicts of interest.

Ethical approval The article is in accordance with ethical standards.

Research involving human participants and/or animals This article does not contain any studies with human participants or animals performed by any of the authors.

Informed consent For this type of study formal consent is not required.

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