

Enhanced recovery after pancreatic surgery

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Enhanced recovery programmes are becoming increasingly popular across surgical specialties as a means to focus and optimise peri-operative care. It is now well recognised that a structured and comprehensive approach to patient care can improve postoperative outcomes and reduce length of hospital stay [1]. The principle of 'Enhanced Recovery After Surgery' (ERAS) was pioneered in the field of colorectal surgery where the addition of goal orientated recovery was found to further improve patient progress towards discharge. This may be as much to do with the specifics of the recovery programme itself as the education and coordination of the multidisciplinary team in creating a 'standard' to which everyone can work. By applying these principles to other surgical procedures, it is anticipated that similar gains may be seen.

Pancreatic surgery is undertaken either due to concerns over a possible or proven malignant lesion or with the aim of improving symptoms in selected patients with chronic pancreatitis. Pancreatic resections include removal of the proximal pancreas (Whipple's pancreaticoduodenectomy), or removal of the pancreatic tail (distal pancreatectomy). These major surgical procedures carry considerable risk related both to the intra-abdominal surgery as well as pancreas specific issues such as post-operative pancreatic leak. It has become increasingly recognised that the traditional postoperative approach of prolonged bed rest, limited mobilisation, persistent intra-abdominal drainage and delayed re-introduction of oral nutrition may not provide the optimal conditions for a speedy recovery.

This article reviews the issues and evidence relating to optimised pre, intra and post-operative care in the setting of enhanced recovery for pancreatic surgery. Figure 1 summarises the main components of an Enhanced Recovery Programme. The current article draws from recent guidelines recently published by the ERAS Society [2]. Encouragingly, the feasibility of introducing an enhanced

recovery programme in pancreatic surgery has recently been demonstrated [3].

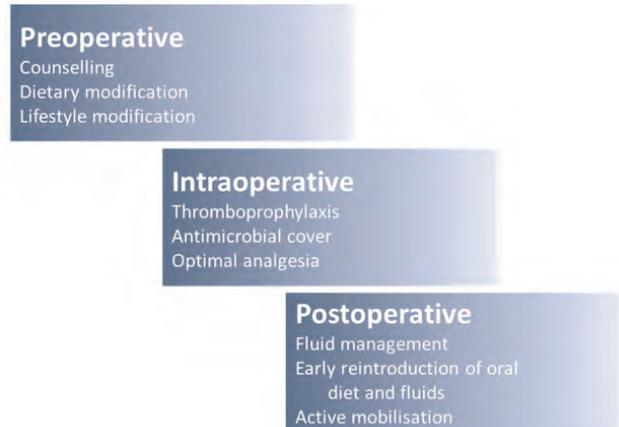


Figure 1. Summary of the main domains of the Enhanced Recovery Programme

Optimising preoperative management

In recognising surgery as a major physiological insult, the enhanced recovery programme begins in the pre-operative period, with an aim to get the patient to theatre in an optimal condition. There is much common ground across major surgical procedures in terms of preparedness for surgery and various pre-operative strategies have been trialled, covering counselling, dietary advice and lifestyle modification. Specific to pancreatic-oduodenectomy, there has been controversy regarding the routine use of pre-operative endoscopic biliary drainage in patients who present with obstructive jaundice. However, a Cochrane review found no benefit to routine drainage and a more recent randomised controlled trial showed an increased morbidity rate with routine drainage [4]. In recent recommendations produced by the ERAS Society, it was suggested that routine biliary drainage should not be considered if the serum bilirubin is $<250 \mu\text{mol/l}$, based on the current evidence available [2].

Lifestyle modifications such as abstinence from alcohol for alcohol abusers and smoking cessation for smokers should be strongly encouraged [5,6]. Nutritional status should be reviewed and where there is evidence of malnutrition, the patient's condition may be optimised with pre-operative oral supplements, or occasionally using supplemental enteral nutrition. Importantly, the patient must

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acknowledge their responsibility in the run up to surgery and have an understanding of the expected postoperative course. This may be most effectively delivered by routine preoperative counselling where a customised plan can be put in place for the peri-operative period addressing the patient's ideas, concerns and expectations.

Peri-operative immunonutrition using arginine-supplemented diet may reduce infective complications and has been trialled in elective surgery with a recent systematic review suggesting that it may be of some benefit [7]. Although these studies were not undertaken in patients undergoing pancreatic surgery, the balance of evidence suggests that this strategy should be considered. Oral bowel preparation is not recommended, and may contribute to dehydration and electrolyte abnormalities in the peri-operative period. While there is no specific evidence for or against routine bowel preparation in pancreatic surgery, the evidence for avoiding bowel preparation in patients undergoing colorectal surgery is well documented [8] and this finding can be considered translatable to pancreatic surgery.

Maintaining an appropriate fluid and nutritional oral intake for as long as possible prior to surgery may help maintain homeostasis and reduce the requirement for intervention, such as pre-operative intravenous fluids. Clear fluids may be continued up until two hours pre-operatively as gastric volume has not been shown to increase with this time scale [9]. Solids should be withheld six hours before anaesthesia, and in patients without diabetes pre-operative oral carbohydrate loading may be appropriate. There is no evidence of any clinical benefit in prescribing long acting sedatives or pre-emptive analgesia prior to anaesthesia [10] and this may continue to affect patients in the post-operative period [11]. Short acting anxiolytics may be used if required for procedures such as epidural catheter insertion [10].

Optimising intra-operative patient care

The enhanced recovery approach to intra-operative care is centred around effective thromboprophylaxis, suitable antimicrobial cover and optimising analgesia. Specifically, opioid use should be minimised in the post-operative period due to the potential for delayed return of gut function, respiratory depression and mental impairment / confusion.

Low molecular weight heparin reduces the risk of thromboembolic complications [12]. However, it is important to be aware of local safety guidelines especially in relation to epidural catheters. In patients at high risk of thromboembolism mechanical devices providing intermittent pneumatic calf compression may also be used. Antimicrobials should be administered 30-60 minutes prior to skin incision and it may be necessary to repeat intra-operative

doses depending on the length of surgery [13].

Mid-thoracic epidurals have been shown to provide both superior pain relief and fewer respiratory infections compared with intravenous opiate analgesia. There may be a role for wound catheters or TAP (Tranversus Abdominus Plane) blocks, in reducing the requirement for opiate analgesia although results are variable and in some cases conflicting. Assessing the patient's risk of post-operative nausea and vomiting (PONV) may enable use of different pharmacological agents than would otherwise be used to minimise the risk of PONV.

Choice of skin incision is the domain of the individual surgeon with no evidence to support a certain approach. In recent years laparoscopic pancreatic surgery, especially distal pancreatectomy, is becoming increasingly common and may lead to an improved postoperative course for selected patients.

Patient temperature should be monitored and maintained using appropriate warmed air or circulating water systems intra-operatively. There is no evidence to suggest that routine nasogastric drainage improves outcomes and patients with a nasogastric tube in situ have a higher incidence of atelectasis and pneumonia [14]. Nasogastric tubes should not be inserted routinely.

Optimising post-operative patient care

The post-operative principles of early enteral intake and early active mobilisation form the basis of the postoperative goals. Appropriate assessment and management of peri-operative fluid balance is crucial to achieving these aims and minimising morbidity. This begins in the pre-operative period as previously discussed but is perhaps most obvious in the post-operative period where the stress response to surgery, intravenous fluid administration and patient medications can lead to rapid patient deterioration associated with hypo or hypervolaemia and electrolyte abnormalities if poorly managed. The enhanced recovery programme is not prescriptive, but rather focuses on the appropriate use of individualised goal directed fluid management. The aim is to avoid a "routine" prescription of a certain post-operative fluid regimen but rather encourage regular patient assessment and fluid balance monitoring to prevent fluid and salt overload. The use of balanced crystalloids, as opposed to 0.9% saline, is preferable in minimising salt retention and metabolic acidosis associated with high sodium concentrations [15].

There is little evidence to recommend the routine use of peri-anastomotic drainage but if a drain has been placed during surgery, removal of drains at 72 hours should be considered in patients at low risk of pancreatic leak/fistula (ie. <5000U/L amylase in drain fluid) to facilitate

progress. Somatostatin analogues have been considered with the aim of reducing the incidence of pancreatic fistula through a reduction in pancreatic exocrine secretion (and splanchnic blood flow). A recent meta-analysis reported a reduction in overall fistula rate with somatostatin analogue treatment, although subgroup analysis of clinically significant fistulae showed no significant difference [16]. There may be a role for somatostatin analogues in certain subgroups of patients (ie. those with a soft pancreas or small pancreatic duct) [2].

Transurethral catheters can be removed on post-operative day one or two unless there is a specific requirement for continued urinary drainage or concerns about fluid balance status. If a requirement for prolonged urinary catheterisation is anticipated (ie. more than four days), supra-pubic catheterisation may be appropriate [17]. Oral fluids and nutrition should be considered early following surgery, with patients commencing a normal diet as soon as possible post-operatively. Parenteral or enteral nutrition should not be commenced routinely unless specifically indicated. Finally, an audit of the enhanced recovery programme should run concurrently to monitor compliance with the programme, assess clinical outcomes and identify any areas of concern.

In conclusion, enhanced recovery programmes provide a structured approach to peri-operative care aiming to include a multitude of factors which have been shown to benefit patient progress from the preoperative period through to patient discharge. While many of these factors may already be practiced individually, co-ordinating "best practice" for each domain into a single programme of care can lead to improved outcomes for patients undergoing major pancreatic surgery.

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