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Original article

Implementation of enhanced recovery programme for laparoscopic distal pancreatectomy: Feasibility, safety and cost analysis

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ABSTRACT

Background/objectives: The adoption of laparoscopy for distal pancreatectomy has proven to substantially improve short-term outcomes. Stress response after major surgery can be further minimized within an enhanced recovery programme (ERP). However, data on the potential benefit of an ERP for laparoscopic distal pancreatectomy are still lacking. The aim was to assess the feasibility, safety and cost of ERP for patients undergoing laparoscopic distal pancreatectomy.

Methods: This is a case-control study from a Tertiary University Hospital. Sixty-six consecutive patients who underwent laparoscopic distal pancreatectomy were analyzed. Twenty-two patients were enrolled for the ERP and compared with previous consecutive 44 patients managed traditionally (1:2 ratio). Operative details, post-operative outcome and cost analysis were compared in the two groups.

Results: Patients enrolled in the ERP had similar intraoperative blood loss (median 165 ml vs. 200 ml; $p = 0.176$), operation time (225min vs. 210min; $p = 0.633$), time to remove naso-gastric tube (1 vs. 1 day; $p = 0.081$) but significantly shorter time to mobilization (median 1 vs. 2 days; $p = 0.0001$), start solid diet (2 vs. 3 days; $p = 0004$), and pass stools (3 vs. 5 days; $p = 0.002$) compared to the control group. Median length of stay was significantly shorter in the ERP group (3 vs. 6 days; $p < 0.0001$). No significant difference in readmission or complication rate was observed. Cost analysis was significantly in favor of the ERP group ($p = 0.0004$).

Conclusions: Implementation of ERP optimizes outcomes for laparoscopic distal pancreatectomy with significant earlier return to normal gut function, reduced length of stay and cost saving.

Introduction

Enhanced Recovery Programme (ERP) is an evidence-based, structured, multi-modal program for optimal perioperative care, initially developed by H. Kehlet for patients undergoing colonic surgery [1]. The main aim is to reduce surgical stress, maintain physiological functional capacity, and optimize postoperative recovery [2]. The convincing data from colorectal surgery has encouraged the progressive adoption of ERP for other surgical disciplines as well [2].

Key elements of ERP include: preadmission counseling, no bowel preparation, preoperative carbohydrate loading to avoid preoperative fasting and dehydration, balanced perioperative fluid management, multimodal analgesia avoiding opioids and using epidural or other regional anesthesia, minimally invasive surgery, no abdominal or nasogastric drains and early removal of urinary catheter, early oral feeding, early mobilization and support of gastrointestinal function [3]. In particular, the use of minimally invasive abdominal surgical techniques has been shown to decrease the stress response with a decrease in various inflammatory responses and immunodysfunction. Pulmonary function seems to be improved and postoperative ileus reduced with minimal invasive approaches. Other advantages include less pain,

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shorter hospital stays, and reduced morbidity compared to the open approach [4–6].

There is still a significant delay in the application of the ERP principles for more complex and high-risk surgical procedures such as pancreatic resections. ERP for pancreatico-duodenectomy has been previously described by several units including ours [7,8]. Evidence indicates that ERP protocols may be implemented for pancreatico-duodenectomy resulting in earlier return of normal gut function and reduction of the length of stay without increasing complications and re-admission rates [7,8]. To date, only sporadic data are available on ERP protocols for distal pancreatectomy and no studies specifically analyzed and discussed the impact of an ERP for laparoscopic distal pancreatectomy (LDP) [7,9]. Randomized clinical trials on laparoscopic colorectal cancer patients have shown further improvement of patients' recovery and length of stay when an ERP was adopted [10,11]. For this purpose a specific ERP after LDP was established and integrated into our existing infrastructure.

Previous studies showed that the adoption of laparoscopy for distal pancreatectomy (LDP) was associated with significant advantages in terms of fewer complications and shorter length of stay compared to open distal pancreatectomy [12,13]. Several studies have also supported the cost advantage or cost neutrality of LDP compared with the open counterpart [14–17].

The aim of this study was to assess the feasibility and safety of ERP for LDP and to analyze its financial impact compared to the traditional management.

Patients and methods

This is an observational case-control study (before-and-after pathway) from a Tertiary University Hospital. A prospectively collected database including 81 consecutive patients undergoing laparoscopic resection for lesions of the left pancreas was reviewed. All procedures were performed over a seven year period (July 2007 to April 2014). An ERP after LDP was introduced in November 2012 and all patients undergoing LDP for benign or malignant disease were enrolled into the program (Table 1). No preoperative exclusion criteria for ERP have been adopted. The protocol has been reviewed and approved by the central audit commission (audit unique number: ZAUD 1719).

Distal pancreatectomy was defined as resection of the pancreas to the left of the portal vein. Routine blood tests, ultrasound of the abdomen, computed tomography of the abdomen, and magnetic resonance imaging, where appropriate, were performed. Before surgery, each case was individually evaluated at an open multidisciplinary team meeting with surgeons, pathologists, oncologists, gastroenterologists, and radiologists. The consultant senior author

Table 1
Enhanced recovery protocol after laparoscopic distal pancreatectomy adopted at University Hospital Southampton.

Pre-operative patient education	Introduction to enhanced recovery pathway
	Ward routines explained
	Postoperative pain controlled explained
	Advice given regarding immediate postoperative diet and nutrition
	Planned thromboprophylaxis explained
	Referrals if required
	Decision regarding social care support on discharge
Admission	Phosphate enema 8.00 pm day prior to surgery or 8.00 am of day of surgery
	Thromboprophylaxis 6.00 pm day prior to surgery and antiembolic stockings fitted
	Normal diet 24 h prior to surgery no solid diet from 2 am (day of surgery)
	Carbohydrate loading 5.30 & 6.00 am (day of surgery)
	Nil by mouth from 6 am
Day of surgery	Patient-controlled analgesia (PCA). Paracetamol.
	Start Metoclopramide i.v. 10 mg × 3
	Intra-venous maintenance fluids
	Sips of water (30 ml/h)
Day 1	Naso-gastric tube clamped
	Intra-venous maintenance fluids as directed by consultant
	Sit out of bed for 4 h and walk up to 2 × 100 m
	Diet: start light diet including energy drinks and juices
	Drain amylase sent at 6.00 am
	Commence pancreatic enzymes if indicated
	Refer to dietician
Day 2	Naso-gastric tube removed
	Urinary catheter removed
	PCA discontinued
	Discontinue i.v. maintenance fluids if tolerating oral intake
	Diet: normal diet including energy drinks and juices
	Drain amylase sent at 6 am, drain removed if negative, discharge with drain if required
	Discharge if possible
Day 3	Sit out of bed for 6 h in total and walk up to 4 × 100 m
	Pain managed with oral analgesia
	If drain amylase positive drain to remain, discharge with drain if required
	Discharge if possible
Day 4	Sit out of bed for 6 h in total and walk up to 4 × 100 m
	Pain managed with oral analgesia
	If drain amylase positive drain to remain, discharge with drain if required
	Discharge if possible
Discharge criteria	No temperature (<37.5 °C for more than 48 h)
	Adequate pain control on oral analgesia
	Taking solid food, no intravenous fluids
	Patient mobile
	Patient willing to go home

Regular medications: octreotide 100 mcg × 3 until day 2, proton-pump inhibitor 40 mg × 1, metoclopramide 10 mg × 3.