

ORIGINAL ARTICLE

Early oral feeding after pancreatoduodenectomy enhances recovery without increasing morbidity

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Abstract

Objective: The aim of this study was to evaluate whether a change in the routine feeding strategy applied after pancreatoduodenectomy (PD) from nasojejunal tube (NJT) feeding to early oral feeding improved clinical outcomes.

Methods: An observational cohort study was performed in 102 consecutive patients undergoing PD. In period 1 ($n = 51$, historical controls), the routine postoperative feeding strategy was NJT feeding. This was changed to a protocol of early oral feeding with on-demand NJT feeding in period 2 ($n = 51$, consecutive prospective cohort). The primary outcome was time to resumption of adequate oral intake.

Results: The baseline characteristics of study subjects in both periods were comparable. In period 1, 98% ($n = 50$) of patients received NJT feeding, whereas in period 2, 53% ($n = 27$) of patients did so [for delayed gastric emptying (DGE) ($n = 20$) or preoperative malnutrition ($n = 7$)]. The time to resumption of adequate oral intake significantly decreased from 12 days in period 1 to 9 days in period 2 ($P = 0.015$), and the length of hospital stay shortened from 18 days in period 1 to 13 days in period 2 ($P = 0.015$). Overall, there were no differences in the incidences of complications of Clavien–Dindo Grade III or higher, DGE, pancreatic fistula, postoperative haemorrhage and mortality between the two periods.

Conclusions: The introduction of an early oral feeding strategy after PD reduced the time to resumption of adequate oral intake and length of hospital stay without negatively impacting postoperative morbidity.

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Introduction

Pancreatoduodenectomy (PD) is the treatment of choice for resectable (pre-)malignant neoplasms in the pancreatic head or peripapillary region.¹ Although postoperative mortality rates have decreased over recent decades,² PD is still associated with

significant morbidity, including a 33–45% incidence of delayed gastric emptying (DGE),^{3–5} which interferes with the resumption of a normal diet after surgery and frequently results in the need for nutritional support and a prolonged hospital stay.⁶

Some studies have suggested that enteral nutrition after PD reduces hospital length of stay (LoS), readmission rates and complication rates.^{7–9} The guidelines of the European Society for Parenteral and Enteral Nutrition (ESPEN) recommend the routine use of early enteral nutrition in all patients undergoing major gastrointestinal resections for cancer.¹⁰ By contrast, the current American Society of Parenteral and Enteral Nutrition (ASPEN) guidelines recommend the use of on-demand postoperative nutritional support.¹¹ In addition, a recent systematic review suggested that oral feeding, with on-demand nasojejunal tube (NJT)

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feeding, is the most appropriate routine feeding strategy after PD because it is at least non-inferior to enteral and parenteral nutrition in terms of hospital LoS and risk for complications.¹² Furthermore, nasoenteral and parenteral feeding strategies are associated with specific complications, including the dislodgement of NJTs in a third of patients, bowel strangulation and perforation following percutaneous jejunostomy (albeit rarely) and, in cases of parenteral nutrition, an up to twice as high risk for infectious complications.^{13–17} However, studies directly comparing early oral feeding with routine NJT feeding after PD are lacking.

The discrepancy in views on the optimal routine feeding strategy after PD (routine versus on-demand nasoenteral feeding) and the lack of evidence to support routine (par)enteral nutrition after PD led the study institution to change its feeding protocol from routine NJT feeding to an early oral feeding strategy with on-demand NJT feeding. The aim of this study was to evaluate whether this change in the routine postoperative feeding strategy improved outcomes.

Materials and methods

Patients

An observational, non-randomized, prospective cohort study with historical controls was performed in 111 consecutive patients undergoing PD at the University Medical Centre Utrecht from June 2010 to December 2012. A subset of these patients ($n = 20$) has been described in a previous study.¹³ Included were adult patients undergoing any of classic Whipple PD, pylorus-preserving PD or total pancreatectomy for any indication. Excluded were all patients who underwent PD in the transition period (October–December 2011), during which the new early oral feeding strategy was introduced on the ward ($n = 9$). In this transition period, all nurses and treating physicians attended a training session conducted by the study coordinator and the department's dietician to explain the standardized early oral feeding protocol. To further improve adherence, the protocol was made available to all nurses and physicians on a plastic card on the ward. No other changes in surgical or medical treatment strategy (e.g. surgical technique, erythromycin use) that might influence outcomes were introduced during the entire study period. Patients were categorized into two groups based on the period in which they underwent surgery and thereby the routine feeding protocol to which they were subjected.

Period 1: Routine NJT feeding

In period 1 (June 2010 to September 2011), the routine postoperative feeding strategy was NJT feeding. Enteral nutrition was delivered via a NJT (Freka Trelumina tube; Fresenius Kabi Ltd, Runcorn, UK), which was placed in the jejunum during PD. The tube was introduced by the anaesthesiologist through the nose, into the stomach and advanced for ≥ 30 cm through the duodeno- or gastrojejunostomy into the efferent limb after the creation of the dorsal part of this anastomosis. The tube was secured to the nostrils with tape. The patency of the tube was tested before the

abdomen was closed. Enteral nutrition (NV Nutricia, Zoetermeer, the Netherlands) was started on the first postoperative morning at a rate of 25 ml/h and increased by 25 ml per 6 h to the amount advised by the consulting dietician according to national guidelines.¹⁸ In the event of dislodgement of the NJT, the tube was replaced only when oral intake in the following days was expected to be inadequate.

Oral intake was started depending on digestive symptoms. When oral intake was adequate, enteral nutrition was discontinued. The NJT was removed at this stage.

Period 2: Early oral feeding strategy

The early oral feeding strategy implemented in period 2 (January–December 2012) involved the resumption of oral intake as per the feeding protocol. Patients were started on oral feeding immediately after surgery and were given liquid drinks from day 0 (day of surgery), solid food from day 2 and a regular diet from day 3. Oral nutritional supplements given twice per day (200 ml Nutridrink Protein; NV Nutricia) were initiated on day 2 and discontinued at discharge.

Oral intake was recorded daily and evaluated on days 4 and 7 by the consulting dietician. When oral intake was insufficient on postoperative day 7 ($< 50\%$ of the required daily calorie/protein intake as calculated by the dietician), a NJT was endoscopically placed (on demand) and enteral nutrition was administered until oral intake was adequate.

In patients who were found to suffer from malnutrition at preoperative screening, a NJT was placed during PD to enable the provision of postoperative enteral nutrition according to the protocol followed in period 1. According to the intention-to-treat principle, these patients were included in the early oral feeding strategy group (period 2). Oral feeding was initiated simultaneously according to the early oral feeding protocol, but no oral nutritional supplements were given.

Preoperative management

In both periods, all patients were preoperatively screened for malnutrition in the outpatient department by trained nurses using the Malnutrition Universal Screening Tool (MUST)¹⁹ and were informed about the postoperative feeding strategy. In the event of malnutrition [defined by a MUST score of ≥ 2 , a body mass index (BMI) of < 18.5 kg/m² and/or severe preoperative weight loss], patients were referred to a dietician and started on preoperative nutritional support, including oral nutritional supplements or enteral nutrition, if possible, at least 14 days before surgery.

Surgical approach

The surgical approach was identical in both periods. Pancreaticoduodenectomy was performed by a team specializing in hepatobiliary and pancreatic surgery. Reconstruction was performed with an end-to-side, duct-to-mucosa pancreatojejunostomy [International Study Group of Pancreatic Surgery (ISGPS) type IAS0²⁰] over a 6-cm, 6-Fr stent, end-to-side

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