Clinical Experience of Feeding Through a Needle Catheter Jejunostomy after Major Abdominal Operations

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ABSTRACT

Objective: To report our incidence of local and systemic complications after needle-catheter jejunostomy.
Design: Retrospective analysis.
Setting: University hospital, Switzerland.
Results: 100 patients (70 men and 30 women; mean age 65 years, range 42–90) had needle-catheter jejunostomy for postoperative enteral feeding. 26 developed catheter-related and 18 nutrition-related complications. Most of the complications were minor (lumenal obstruction of the catheter or local cellulitis) and only 3 patients needed reoperation, 2 because the catheter broke with extravasation of the nutrition formula into the subcutaneous tissue, and the other because of a small bowel obstruction. There was no small bowel necrosis and no patient died as a direct result of the jejunostomy. Overall, 92 patients were fed enterally according to the protocol, and 8 required removal of the catheter.
Conclusion: Needle-catheter jejunostomy gives a safe and effective access for postoperative enteral feeding. Minor technical complications are common and can be reduced by a meticulous insertion technique and careful postoperative management. Regular clinical surveillance may reduce the incidence of nutrition-related complications.

Key words: needle-catheter jejunostomy, enteral nutrition, abdominal surgery.

INTRODUCTION

Needle-catheter jejunostomy gives a temporary access to the small bowel for postoperative enteral feeding after major abdominal surgery (7, 16, 24, 31, 39). Small bowel motility and the absorptive function of the gastrointestinal tract return almost immediately postoperatively, whereas gastric and colonic function may be altered for the first 2–5 days (15, 21, 35). In recent years, enteral feeding has become the preferred route for giving nutritional support in trauma, in the intensive care unit, and to patients after major abdominal operations because of its trophic effects on the gastrointestinal tract with less bacterial translocation and low incidence of infective complications (16, 25, 30). When immunonutrition (enriched with arginine, glutamine, glycine, RNA and omega-3-fatty acids) is given soon after operation, the incidence of infective complications is less and overall ICU and hospital stay are reduced compared to patients fed parenterally (10, 22, 34). Enteral nutrition with an enriched formula is also cost-effective (34). For these reasons early enteral feeding after major abdominal operations and trauma surgery is now routine.

We know only a few published series that reported the specific complication and reoperation rates of needle-catheter jejunostomy done at the end of major abdominal operations, and so our aim in the current retrospective series was to report our local and systemic complication rates of inserting needle-catheter jejunostomies in a University hospital.

PATIENTS AND METHODS

Patients

From December 1994 to October 1997, 100 consecutive patients (70 men and 30 women), who had elective operations on the oesophagus, stomach, pancreas, or bile duct at the Department of Visceral and Transplantation Surgery, University of Bern, were given needle-catheter jejunostomies for early postoperative enteral feeding. The mean age was 65 years (range 42–90). There were two main indications for inserting the needle-catheter jejunostomy at the end of the operation: firstly we did them for patients who were malnourished having lost more than 10% of their body weight during the previous six months, and secondly for patients for whom early postoperative oral feeding was impossible as a result of the technical or surgical limitations of the operation (the possibility of delayed wound healing or anastomotic leak, prolonged postoperative ventilation, or delayed gastric emptying).

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Table I. *Clinical details of 100 patients given needle-catheter jejunostomies after major abdominal operations*
Data are expressed as mean unless otherwise stated.

Operation	No. of patients	Sex (No)		Age (years)	Duration of operation (min)	Blood loss (ml)	Stay in ICU (days)
		Male	Female				
Pancreas:							
Whipple resection	30	16	14	71	460	1600	0.8
Total pancreatectomy	2	2	0	66	590	3150	1
Necrosectomy	8	4	4	60	190	1050	24.9
Oesophagus:							
Transthoracic oesophagectomy	28	24	4	61	470	2370	7.3
Oesophagectomy with colonic interposition	7	5	2	61	650	2850	8.4
Stomach:							
Total gastrectomy	13	11	2	63	440	1600	1.4
Gastroenterostomy	2	2	0	85	130	500	1.5
Other:							
Hepaticoduodenostomy	1	1	0	57	410	2500	1
Exploratory laparotomy	6	3	3	68	110	50	0
Ileostomy	1	1	0	75	200	0	5
Ligation of gastroduodenal artery	1	1	1	70	100	2000	2
Duodenojejunostomy	1	1	0	82	300	1000	2
Total	100	70	30	65	410	1750	5.2

Surgical technique

At the end of the operation and before the abdominal cavity was closed, the needle-catheter was inserted into the jejunum as described by Delany et al. (17). The same size catheter (8F, B. Braun Medical AG, Sempach, Switzerland) was always used. The catheter was inserted through a subserosal tunnel into the jejunum and advanced 25–30 cm beyond any upper intestinal anastomosis; the proximal end was brought out through the abdominal wall. The jejunal loop was then fixed to the parietal peritoneum.

Postoperative nutrition protocol

A standard protocol was followed for early postoperative enteral feeding. Either a standard or immunonutrition formula was started 12–24 hours postoperatively at an infusion rate of 10–20 ml/hour. By the third postoperative day the enteral formula volume reached 1000 to 1500 ml/day (40–60 ml/hour), giving an intake of 1500 kcal/day (6280 kJ) and an adequate supply of fatty acids, protein, carbohydrates, trace elements, and vitamins from the third to fourth day onwards. Enteral nutrition was administered continuously 24 hours/day. An enteral nutrition team that included a specialized nurse, a dietetician, and a physician supervised the giving of the feed. According to our department's protocol, the function of the catheter was checked three times a day and the gastric content was measured by aspiration of the nasogastric tube: if more than 100 ml were aspirated the infusion rate was changed. The general condition of the patient, as well as nausea or vomiting, abdominal distension, and diarrhea were recorded on a special form and discussed within the team.

Before oral feeding was started, a contrast radiograph was taken to confirm the integrity of the anastomosis in patients after pancreatic or gastric surgery on the fifth day, and on the seventh day after oesophageal resection. Full oral nutrition was then carefully introduced and increased gradually. The catheter was withdrawn only when oral intake was adequate or the patient was no longer malnourished. The resulting fistula closed spontaneously within 24–48 hours.

Statistical analysis

Data collected from medical records and operative reports were analysed retrospectively, and particular attention was paid to complications related to the needle-catheter jejunostomy. Results are expressed as mean (range) unless otherwise stated.

RESULTS

One hundred patients had needle-catheter jejunostomy for postoperative enteral nutrition. The tubes were inserted by 10 different surgeons in training under supervision. The operations are shown in Table I. Most of the patients had elective resection of cancer of the pancreas, oesophagus, or stomach. Placement and free passage of the catheter were achieved in all patients

Table II (a). *Summary of published prospective series of needle-catheter jejunostomy*

Variable	Delany et al. (17) *n* = 115	Eeftinck et al. (18) *n* = 210	Sarr and Mayo (32) *n* = 83
Duration of tube feeding (days)	6–55	2–84	4–80
Percentage morbidity (surgical)			
Cellulitis	0	0	0
Abscess	0	0	1
Dislodgement	3	0	0
Breakage	0	2	0
Obstruction of catheter	0	0	0
Bowel obstruction	0	3	0
Other	1	0	1
Total	4	5	2
Mortality	0	0	0
Percentage morbidity (medical)			
Diarrhoea	26	26	22
Distension	26	26	22
Aspiration	0	0	0
Other	1	0	0
Total	55	51	44
Mortality	0	0	0

Table II (b). *Summary of published retrospective series of needle-catheter jejunostomy*

Variable	Page et al. (27) *n* = 199	Smith-Choban and Max (36) *n* = 143	al-Sheiri et al. (2) *n* = 133	Wakefield et al. (39) *n* = 58	Present series *n* = 100
Duration of tube feeding (days)	1–158	<6->15	1–285	not stated	3–185
Percentage morbidity (surgical)	1	0	8	5	12
Cellulitis	1	0	0	0	1
Abscess	1	5	14	8	0
Dislodgement	1	2	0	0	2
Breakage	0	5	2	2	8
Obstruction of catheter	0	0	0	0	1
Bowel obstruction	1	1	0	0	2
Other	2	13	24	15	26
Total	0	4	0	0	0
Mortality					
Percentage morbidity (medical)					
Diarrhoea	0	29	33	0	13
Distension	0	13	33	0	5
Aspiration	0	2	2	0	0
Other	0	0	0	0	0
Total	0	44	68	0	18
Mortality	0	1	0	0	0

with no operative complications. Twenty six patients developed surgical catheter-related complications and 18 medical complications (Table II). Most of the complications were minor and only three patients needed reoperation. There were no deaths and no small bowel necrosis. Overall, 92 patients had their enteral feeding according to the protocol and in 8 the catheter had to be removed earlier because of lumenal obstruction between the second and eighth postoperative days. Five catheters could be reopened either with a Seldinger wire or by flushing with saline under pressure, but the remaining three catheters had to been withdrawn. These three patients were then fed parenterally.

In addition to these problems, there were 17 complications that were directly related to the insertion technique (Table II). Twelve patients developed local cellulitis at the cutaneous entry site of the catheter. In all patients, however, cellulitits was treated locally and all catheters were left in situ and continued to be used

for enteral feeding. One patient developed an abscess and the catheter had to be withdrawn, but the abscess could be treated locally. Two catheters broke and the nutrition formula extravasated into the subcutaneous abdominal tissue; these needed revision. Another patient developed temporary biliary reflux beyond the catheter that resolved spontaneously without any further treatment. The most severe complication developed in a patient who had had a total gastrectomy. On the eleventh postoperative day he developed acute small bowel obstruction and needed an emergency reoperation. The small bowel had strangulated around the needle-catheter. Reposition was possible only after removal of the catheter, but small bowel resection was not needed. His further postoperative course was uneventful.

The nutrition protocol was not tolerated by 18 patients; 13 developed watery diarrhoea when the enteral feeding was started and the remaining five developed severe wind. These patients were either fed at a reduced rate over a few days or given a modified formula. None ceased to be fed through the jejunostomy. Eighteen patients were discharged home to continue enteral nutrition through the jejunostomy. The mean duration of enteral feeding was 22.1 days (range 3–185 days). After removal of the catheter, all the fistulas healed spontaneously and no further catheter-related complications developed.

DISCUSSION

The purpose of the current study was to investigate the safety and efficacy of needle-catheter jejunostomy after major abdominal operations in a University hospital.

Major operations on the upper gastrointestinal tract often prohibit oral postoperative feeding for several days, so an alternative route for nutritional support is essential. Traditionally, total parenteral nutrition through a central venous line was chosen, but the use of central venous lines is associated with severe complications such as an increased risk of infection, catheter sepsis, and thromboembolism (1, 23, 26). TPN itself also has some relevant disadvantages compared to enteral nutrition. Serious hepatic dysfunction can develop, particularly in children, probably as a result of disturbed cholecystokinin metabolism (28). However, enteral feeding particularly if it is started soon after operation and given in the form of immunonutrition causes fewer infective complications than TPN by protecting gut mucosal integrity and maintaining gut immune function (8). In addition, its costs are three to six times less than those of TPN (27, 34). Since the late 1970s, different routes have been developed to give enteral nutrition with increasing success (3, 4, 12, 18–20, 32, 36, 40). In 1977 Delany et al. published a prospective study using needle-catheter jejunostomy (17), and this technique is now widely accepted (2, 9, 17, 19, 27, 39). Clinical studies have shown that it is safe and effective, and has many advantages over other accesses for enteral feeding such as gastrostomy tube, or a Witzel jejunostomy, and parenteral feeding (12, 19, 20). Nevertheless, it also has some complications. Reported technical complications include local cellulitis and abcess formation at the entry site, which are the far most common (Table II). These can usually be treated locally without removal of the catheter (6). Dislodgement (39), lumenal obstruction, knotting (5, 13), localized jejunal necrosis (11, 29, 33), intestinal pneumatosis (1, 14, 33), jejunal perforation (38), and small bowel obstruction have rarely been reported (19). However, they all require removal of the needle-catheter. Intestinal pneumatosis and small bowel necrosis, which occur in about 0.3% of cases, both have a high mortality (33).

Abdominal distension, diarrhoea, vomiting, and even pulmonary aspiration are functional complications usually caused by either the nutrition formula or too fast an infusion speed. These complications, which occur in 22%–50%, can be prevented by meticulous surveillance of the patient (2, 17, 19, 27, 39); gastric reflux must be carefully controlled during the early postoperative course. Increasing the infusion rate depends on the absence of clinical symptoms (abdominal pain, distension, and diarrhoea) and no gastric reflux. This strict protocol resulted in no pulmonary aspiration or deaths in our series. Pulmonary aspiration is a common postoperative complication of gastrostomy-fed patients (up to 35%) (12), whereas it is less common in jejunostomy-fed patients (1%–5%) and is usually not fatal (2, 37, 40). Overall early enteral feeding was accomplished in 92 of our 100 patients, which is in agreement with other series (9, 10, 34).

In conclusion, needle-catheter jejunostomy is safe and effective for postoperative enteral feeding. Technical complications can be limited by a meticulous insertion technique and careful postoperative care of the catheter. Regular clinical surveillance may prevent nutrition-related complications. The clinical superiority and cost-effectiveness of enteral over parenteral nutrition is now widely accepted, and the needle-catheter jejunostomy gives reliable access for it.

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