Study of Feeding Jejunostomy as an Add on Procedure in Upper Gastrointestinal Surgeries

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Abstract Jejunostomy is usually indicated as an additional procedure during major surgery of upper digestive tract to administer enteral nutrition in post-operative period. Complications associated with it can be mechanical, infectious, gastrointestinal or metabolic. The aim of the study was to evaluate safety of post-operative feeding jejunostomy in different types of major upper gastrointestinal surgeries. It was a prospective study conducted during the period between August 2009 and September 2011. Post-operative cases of major upper gastrointestinal surgeries who receive jejunostomy feeds were included in the study. Sampling was done by convenient method with sample size of 50 cases. Post-operatively, patients were monitored according to standard orders of enteral nutrition. Total calorie and protein intake through feeding jejunostomy was calculated regularly, and complications were assessed in terms of frequency, type, duration, management, and final outcome in different types of upper gastro intestinal surgeries. Analysis was done using chi square test with the help of statistical package SPSS vers.13. $P < 0.05$ was considered as significant. Complications observed were gastrointestinal –8 (16 %), mechanical –6 (12 %), infectious –4 (8 %) and metabolic –4 (8 %). Duration of complications ranged from 1 to 7 days (mean, 4 days). All types of complications observed during study were less severe and could be managed by simple measurements. Haemoglobin, serum albumin and weight of the patient at the time of discharge were improved for all patients when compared

to pre-operative values. All patients received target calories and proteins through feeding jejunostomy. Considering benefits of enteral feeding via jejunostomy tube with minor and acceptable complications, we conclude that feeding jejunostomy is a preferred route of nutritional administration in those who undergo major upper gastrointestinal surgeries.

Keywords Post-operative malnutrition · Enteral nutrition · Feeding jejunostomy · Upper gastrointestinal surgeries · Longitudinal Witzel technique · Jejunostomy complications

Introduction

Malnutrition is defined as a state of nutrition in which there is a deficiency or excess of energy, protein and other nutrients causing measurable adverse effects on tissue/body form, function and clinical outcome [1]. Previous studies show that 30–50 % of hospitalized patients are malnourished, which is associated with longer hospital stays, higher costs and increased morbidity and mortality [2–4]. Post-operative patients of upper digestive tract diseases very often face nutritional problems and require adequate nutritional support [5].

Enteral nutrition is considered to be better than total parenteral nutrition for providing feeding in various clinical settings because it is less expensive, safer and maintains the nutritional, metabolic, immunological and barrier function of the intestines with fewer septic complications [6–10]. Jejunostomy is a surgical procedure by which a tube is situated in the lumen of proximal jejunum, primarily to administer enteral nutrition or sometimes medications and on rare occasion to aspirate intestinal contents. The principal

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Fig. 1 Distribution of various complications related to feeding jejunostomy

indication of jejunostomy is as an additional procedure during major surgery of upper digestive tract where nutrition can be infused at the level of jejunum [11–13]. There are many techniques used for jejunostomy: longitudinal Witzel [14], transverse Witzel [15], needle catheter technique [16], percutaneous [17], endoscopic [18, 19] and laparoscopic techniques [20].

Complications associated with feeding jejunostomy can be gastrointestinal, mechanical, infectious or metabolic. Gastrointestinal complications include abdominal bloating, and cramps can result from delayed gastric emptying, intestinal obstruction and fermentation of the diet [21–23]. Diarrhoea occurs commonly due to

multiple factors, including prolonged antibiotic use, concomitant medications (H_2 antagonists, antacids, chemotherapy and laxatives), altered bacterial flora, formula osmolality, method or rate of infusion, lactose intolerance and bacterial contamination of formulas and delivery systems [24–26]. Antibiotics can do so by altering bacterial flora in ways that result in the overgrowth of *Clostridium difficile*, other bacteria and *Candida* [27]. Metabolic complications include fluid and electrolyte disorders, hyperglycemia, vitamin and trace element deficiencies and re-feeding syndrome [28, 29]. Infectious complications can include aspiration pneumonia, bacterial contamination of enteral formulas and infection at jejunostomy site [30, 31]. However, aspiration pneumonia is very rare in post-pyloric feeding and jejunostomy feeding is the route of choice in aspiration-risk patients [32].

Mechanical complications include tube clogging, malposition and dislodgement [11]. Other rare complications reported are intussusception [33], jejunal perforation [34] and knot formation [35].

Recent studies have recommended feeding jejunostomy as an effective method of delivering enteral nutrition [12–14]. Despite this fact, few surgeons still are skeptical towards post-operative jejunostomy feeding because of plenty of complications, few of them being lethal. This study was aimed to evaluate the safety of post-operative

Table 1 Correlation between various parameters and overall complications of feeding jejunostomy in major UGI surgeries

	Parameter	Number of cases	Complications		P value
			Present	Absent	
1	Specific site of UGI surgeries				
a	Oesophageal	7	3 (42.9 %)	4 (57 %)	0.71 (NS)
b	Gastric	22	8 (36.4 %)	14 (63.6 %)	
c	Duodenal	2	0 (0 %)	2 (100 %)	
d	Pancreatic	19	6 (31.6 %)	13 (68.4 %)	
2	Age group (years)				
a	<40	12	4 (33.3 %)	8 (66.7 %)	0.172 (NS)
b	40–50	18	3 (16.7 %)	15 (83.3 %)	
c	50–60	15	7 (46.7 %)	8 (53.3 %)	
d	>60	5	3 (60.0 %)	2 (40.0 %)	
3	Gender				
a	Male	33	12 (36.4 %)	21 (63.6 %)	0.643 (NS)
b	Female	17	5 (29.4 %)	12 (70.6 %)	
4	BMI (kg/m^2)				
a	Under weight (<18.5)	5	1 (20.0 %)	4 (80.0 %)	0.452 (NS)
b	Normal weight (18.5–24.9)	39	15 (38.5 %)	24 (61.5 %)	
c	Over weight (>25)	6	1 (16.7 %)	5 (83.3 %)	

No significant correlation between the above mentioned parameters and overall complications of feeding jejunostomy was observed during study
 UGI upper gastro intestinal,
 BMI body mass index, NS non significant

Table 2 Comparison of haemoglobin, serum albumin and weight of the patients before surgery and at the time of discharge

	N	Mean	Standard deviation	Mean paired difference	Standard deviation of difference	95 % confidence intervals		t	P value
						Lower	upper		
Hb (pre-operative) (g/dl)	50	11.4320	1.33040	−0.2224	0.36257	−0.3254	−0.1194	4.337	<0.001 (VHS)
Hb (at discharge) (g/dl)	50	11.6544	1.25502						
Albumin (pre-operative) (g/dl)	50	3.2440	0.40866	−0.2960	0.27177	−0.3732	−0.2188	7.701	<0.001 (VHS)
Albumin (at discharge) (g/dl)	50	3.5400	0.21285						
Weight (pre-operative) (kg)	50	63.62	8.12	−0.900	3.507	−0.897	0.097	1.815	0.076 (NS)
Weight (at discharge) (kg)	50	64.52	7.78						

VHS very highly significant, NS non-significant

Significant improvement of haemoglobin and serum albumin levels were observed after post-operative jejunostomy feeding

feeding jejunostomy in different types of major upper gastrointestinal (UGI) surgeries in terms of achieving target calorie and protein requirement, the type and frequency of jejunostomy-related complications, specific interventions and outcome.

Materials and Methods

During the period between August 2009 and September 2011, post-operative patients of major UGI surgeries who received jejunostomy feeds were included in the study (Figs. 7–9). Patients with inoperable UGI tumours underwent palliative jejunostomy; cachexia or presence

of severe co-morbid illnesses were excluded. It was a prospective study and was conducted at the Govt. Wenlock Hospital, KMC Attavar, UMC hospital, KMC Ambedkar circle, Mangalore. Sampling was done by convenient method with sample size of 50 cases. Approval for the study was obtained from Time-Bound Research Ethics Committee, KMC, Manipal University, Mangalore.

Longitudinal Witzel technique of feeding jejunostomy was used for the patients, undergoing major UGI surgeries. This procedure uses a segment of jejunum that is 20 cm distal to the ligament of Treitz. A small stab wound is made on the antimesenteric border of the jejunum, and a rubber tube is inserted distally for

Fig. 2 Haemoglobin (g/dl) (pre-operative v/s at time of discharge; $P < 0.001$, significant)

Fig. 3 Serum albumin (g/dl) (pre-operative v/s at the time of discharge; $P<0.001$, significant)

approximately 20 cm. A purse-string suture is placed around the tube at the jejunostomy site. A seromuscular incision is made proximally from the tube approximately 5 cm. The jejunostomy tube is placed in the seromuscular tunnel. The tunnel is closed with interrupted sutures, and the tube is brought out through the anterior abdominal wall via a separated incision. The jejunum is then sutured to the abdominal wall [14].

Pre-operative nutritional assessment was done in the form of anthropometry and blood investigations. Post-operatively patients were monitored according to standard orders of enteral nutrition [36]. Jejunostomy feed was started at the rate of 30 mL/h on post-operative days 2–5 and gradually increased every 8 h until desired rate was achieved (100–150 mL/h). Temporary slowing or even cessation of the feed was considered whenever patients developed gastrointestinal symptoms. Total calorie and protein intake through feeding jejunostomy was calculated

regularly. Calorie requirement [total energy expenditure (TEE)] was calculated by Harris and Benedicts equation [37, 38].

Harris and Benedicts equation:

For men

$$\text{BEE} = 66.5 + (13.75 \times W) + (5.003 \times H) - (6.775 \times A)$$

For women

$$\text{BEE} = 655.1 + (9.563 \times W) + (1.850 \times H) - (4.676 \times A)$$

TEE in kcal/day

$$\text{TEE} = \text{BEE} \times \text{stress factor}$$

where W =weight in kilograms; H =height in centimetres; A =age in years; TEE=total energy expenditure; BEE=basal energy expenditure.

Patients were regularly monitored and complications were assessed in terms of frequency, type, duration, management and final outcome. Analysis was done by

Fig. 4 Weight (kg) of the patients (pre-operative v/s at the time of discharge ($P=0.076$, non-significant))

Table 3 Comparison between the required and achieved calories and proteins through feeding jejunostomy

	N	Mean	Standard deviation	Standard error mean	Mean paired difference	Std deviation difference	95 % confidence interval of difference		t	P value
							Lower	upper		
Total calories required (kcal)	50	2,006.720	271.781	38.436	−587.900	279.983	−667.470	−508.330	14.848	<0.001 (VHS)
Total calories achieved (kcal)	50	2,594.620	268.657	37.994						
Total proteins required (g)	50	95.230	11.892	1.682	−5.504	2.657	−6.259	−4.749	14.648	<0.001 (VHS)
Total proteins achieved (g)	50	100.734	12.138	1.717						

VHS very highly significant

All patients received target calories and proteins through feeding jejunostomy

chi-square test with the help of statistical package SPSS version13. $P<0.05$ was considered as significant.

Results

The total number of cases in the study was 50. Mean age of the patients was 47.9 years (range, 20–70 years). Among them, 33 (66 %) were male and 17 (34 %) were female. Patients underwent different types of major upper gastrointestinal surgeries, such as oesophageal 7(14 %), gastric 22 (44 %), duodenal 2(4 %) and pancreatic 19(38 %). Intra-operatively, feeding jejunostomy was placed.

Complications observed included gastrointestinal 8 (16 %), mechanical 6(12 %), infectious 4(8 %) and metabolic 4(8 %) (Fig. 1). Duration of complications ranged

from 1 to 7 days (mean, 4 days). No significant correlation between the overall complications of feeding jejunostomy and various parameters analyzed during study (type of UGI surgery, age, gender and pre-operative nutritional status) was observed (Table 1).

Haemoglobin, serum albumin and weight of the patient at the time of discharge were improved for all patients when compared to pre-operative values (Table 2 and Figs. 2, 3 and 4). All patients received target calories and proteins through feeding jejunostomy (Table 3 and Figs. 5 and 6).

Discussion

As mentioned earlier, jejunostomy feeding aims to maintain nourishment post-operatively and prevent complications

Fig. 5 Total calories (kcal) required vs achieved ($P<0.001$, significant)

Fig. 6 Total proteins (g) required vs achieved ($P<0.001$, significant)

Figs. 7, 8 & 9 Post-operative patients of major upper gastrointestinal surgeries with feeding jejunostomy

that may result from lack of nutrition particularly in post-operative patients of major UGI surgeries, and the complications associated with it can be mild to life threatening.

In our prospective study, various types of complications were observed. Gastrointestinal complications such as abdominal bloating, cramps and diarrhoea seen in eight patients were managed by stopping jejunostomy feeding temporarily and antispasmodics. Mechanical complications, in the form of recurrent tube clogging observed in four patients, were managed by regular flushing of the tube with warm saline and sodium bicarbonate. Tube dislodgement occurred in two patients and re-insertion of tube done under local anaesthesia. Metabolic complications observed in the form of hyperglycaemia in two patients were managed by decreasing the flow rate of jejunostomy feeding temporarily and adjusting insulin dosage; hypokalaemia seen in one patient was treated with potassium supplements; hypernatraemia seen

in one patient was treated by hypotonic saline and stopping the jejunostomy feeding temporarily. Jejunostomy site wound infection occurred in four patients, which were treated by regular cleaning and dressing with application of topical antiseptics (Figs. 10, 11 and 12).

Even though the frequency of complications was greater in our study than that in previous similar studies, the severity of complications was less and could be managed by simple measures [11–14, 39]. No significant morbidity or mortality related to the feeding jejunostomy occurred, no relaparotomy was required and no anastomotic leak was observed.

Feeding jejunostomy is standard practice in our institution during major UGI intestinal surgeries. Therefore, control group of patients without feeding jejunostomy could not be obtained for comparison.

This study results will help the health care professionals to know the importance of nutritional supplementation in post-operative patients, particularly in UGI surgeries and the usefulness of feeding jejunostomy as a preferred route of nutritional administration.

Conclusion

This study results revealed that complications associated with jejunostomy feeding are minor, short lived and easily treatable. Considering the nutritional benefits of enteral feeding via jejunostomy tube with minor and acceptable complications, we conclude that feeding jejunostomy is a preferred route of post-operative nutritional administration in patients who undergo major UGI surgeries.

Figs. 10 & 11 Jejunostomy site wound infection

Fig. 12 Jejunostomy site wound infection and skin maceration

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