Routine jejunostomy tube feeding following esophagectomy

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Background: Malnutrition is an important problem following esophagectomy. A surgically placed jejunostomy secures an enteral feeding route, facilitating discharge with home-tube feeding and long-term nutritional support. However, specific complications occur, and data are lacking that support its use over other enteral feeding routes. Therefore routine jejunostomy tube feeding and discharge with home-tube feeding was evaluated, with emphasis on weight loss, length of stay and re-admissions.

Methods: Consecutive patients undergoing esophagectomy for cancer, with gastric tube reconstruction and jejunostomy creation, were analyzed. Two different regimens were compared. Before January 07, 2011 patients were discharged when oral intake was sufficient, without tube feeding. After that discharge with home-tube feeding was routinely performed. Logistic regression analysis corrected for confounders.

Results: Some 236 patients were included. The median duration of tube feeding was 35 days. Reoperation for a jejunostomy-related complication was needed in 2%. The median body mass index (BMI) remained stable during tube feeding. The BMI decreased significantly after stopping tube feeding: from 25.6 (1st–3rd quartile 23.0–28.6) kg/m^2 to 24.4 (22.0–27.1) kg/m^2 at 30 days later [median weight loss: 3.0 (1.0–5.3) kg; 3.9% (1.5–6.3%)]. Weight loss was not affected by the duration of tube feeding duration. Routine home-tube feeding did not affect weight loss, admission time or the readmission rate.

Conclusions: Weight loss following esophagectomy occurs once that tube feeding is stopped, independently from the time interval after esophagectomy. Moreover routine discharge with home-tube feeding does not reduce length of stay or readmissions. These findings question the value of routine jejunostomy placement and emphasize the need for further research.

Keywords: Esophageal cancer; esophagectomy; jejunostomy; nutrition

Introduction

It is difficult to adequately feed patients following esophagectomy. During the first postoperative days patients are regularly kept nil-by-mouth, and often complications or gastro-intestinal dysfunction impair oral intake (1-3).These problems may prolong the hospital admission time, result in a re-admission and cause extensive weight loss. Even at a long-term, a decreased caloric intake and persistent weight loss are evident in this patient group (4,5). For that reason a surgically placed jejunostomy is frequently used as route for enteral nutrition directly postoperatively.

However, the overall complication rate of a surgically placed jejunostomy is 13–38%, and serious complications

requiring a relaparotomy occur in 0–3% of the patients (6). On the other hand a jejunostomy is considered to be comfortable and effective for long-term nutritional support (2,6). Furthermore routine discharge with home-tube feeding has been advocated recently, which is facilitated by routine creation of a jejunostomy (7). The underlying hypothesis is that routine discharge with tube feeding will decrease hospital stay since previously patients often had to stay admitted due to difficulty in achieving their nutritional goals. Furthermore weight loss and hospital readmissions due to feeding problems may be decreased (7).

In this study the effects of routine jejunostomy tube feeding and routine discharge with home-tube feeding on weight changes, hospital admission time and re-admission rates following esophagectomy were analyzed and set out against the jejunostomy-related complications. Moreover factors predicting the duration of tube feeding were determined to identify subgroups that might especially benefit from selective jejunostomy placement.

Methods

A retrospective cohort study in the University Medical Center Utrecht, a tertiary referral center, was performed. The independent medical ethical committee of the University Medical Center Utrecht approved this study and declared no informed consent had to be obtained due to the retrospective and observational design of the study.

Patients

The patients were retrospectively identified in a prospectively collected electronic database. Consecutive patients undergoing an esophagectomy for cancer with gastric conduit reconstruction and a surgically placed jejunostomy at the University Medical Center Utrecht between January 01, 2009 and January 01, 2014 were included.

Jejunostomy procedure

A jejunostomy was routinely placed in the first jejunal loop distal to the ligament of Treitz. A small caliber tube was introduced into the efferent limb of the jejunal loop and attached to the jejunum with a purse string suture. The jejunal loop was fixed to the anterior abdominal wall with a double purse string suture.

Postoperative feeding

Patients were kept nil-by-mouth during the first 5–7 days following surgery. Nutritional support was initiated from the first day following surgery by protein rich tube feeding (Nutrison Protein Plus®, Nutricia) at a rate of 25 mL/h. The dosage was increased with 25 mL every 6 h until calorie and protein needs were met, calculated with modified Harris-Benedict formula with a surplus of 30–50% for the postoperative period depending on the patients' condition (8). In case of gastro-intestinal complaints, the amount of tube feeding was reduced until the complaints resolved. An energy dense tube feeding (Nutrison Concentrated®, Nutricia) was temporarily used when there were fluid restrictions and a low-fat tube feeding (Vivonex®, Nutricia) was used in case of chyle leakage.

Oral intake of clear liquids was allowed after postoperative day 5–7 and expanded to liquid and solid food as tolerated, if there was no clinical suspicion for anastomotic leakage. Continuous tube feeding was indicated until possible complications prohibiting oral intake had resolved and the oral intake amounted to more than 50% of the patients' needs. Supportive overnight tube feeding was given until the oral intake amounted to more than 75% of the patients' needs. Occasionally, overnight tube feeding was continued when oral intake exceeded 75% of the patients' needs when patients were severely malnourished preoperatively. The other exception was when patients explicitly wished to either stop or continue tube feeding.

Two regimens were maintained during the studied period. Between January 01, 2009 and June 30, 2011 patients were discharged when oral intake was sufficient without tube feeding, between July 01, 2011 and December 31, 2013 patients were discharged with tube feeding in order to facilitate early discharge.

Data items

Patient characteristics, surgical data, postoperative complications and hospital admission dates were extracted from a prospectively collected electronic database. Outliers and missing data were checked in hospital records. Anastomotic leakage was defined as a leakage requiring any treatment, ranging from opening of the cervical wound to re-operation. Pneumonia was registered when patients were treated with intravenous antibiotics based on a clinically suspected

pneumonia and chyle leakage was registered when patients were treated for chyle leakage based on a chylous aspect of thorax drain output. Recurrent nerve injury was registered when vocal cord dysfunction was seen at laryngoscopy.

The following outcome data were collected retrospectively: body weight before and after surgery, start (restart) and stop of full or overnight tube feeding, and jejunostomy-related complications within 180 days postoperatively. Body weight was registered at the moment of diagnosis, at admission for esophagectomy and at 90 and 180 days postoperatively. Jejunostomy-related complications (mortality, dislodgement or occlusion that hampered tube feeding when tube feeding was still indicated, extra-abdominal leakage, insertion site infection requiring treatment, and jejunostomy-related complications necessitating a re-operation) were registered. Dislodgement and occlusion of the jejunostomy tube were only registered when tube feeding was still indicated, thus hampering adequate nutrition. Preliminary termination of tube feeding due to a jejunostomy-related complication was also registered.

Statistical analysis

Statistical analysis was executed with SPSS version 20. Continuous variables were summarized as medians (1st–3rd quartile) and categorical data as frequencies and percentages. In univariate analysis associations were tested with the Pearson's chi-square, Fishers exact, Spearman correlation, Mann-Whitney-U or Kruskal Wallis test when appropriate. Binary logistic regression was performed to adjust for confounders. Risks were expressed as odds ratios (OR) with corresponding confidence interval (CI). The duration of postoperative tube feeding was included in the multivariate analysis regarding weight loss irrespective of P value because it was a primary variable of interest. All other factors were only included in the multivariate analyses when the P value was <0.1. In the multivariate analyses a P value <0.05 was considered to be statistically significant.

Results

Between January 01, 2009 and January 01, 2014, 236 patients (72% male) underwent an esophagectomy for cancer with a gastric conduit reconstruction and left cervical anastomosis. At time-points that weight was measured, 90 and 180 days postoperatively, 94% and 87% of the patients were alive. Loss to follow-up was 3% and 5% respectively. The follow-up duration was 180 days for all patients.

Baseline characteristics

A total of 179 (76%) patients had one or more comorbidity and 171 (72%) patients received neoadjuvant chemotherapy, chemo-radiation or radiotherapy (*Table 1*). Most patients, 198 (84%), underwent a minimally invasive esophagectomy, which was a robot-assisted McKeown esophagectomy in 140 (59%) patients, and a laparoscopic transhiatal esophagectomy in 58 (25%) patients. After July 01, 2011 a significant increase in the rate of neoadjuvant chemoradiotherapy (51% *vs.* 9%, P<0.001) and transthoracic surgery (79% *vs.* 62%, P<0.001) occurred, with a concomitant increase in anastomotic leakage (18% *vs.* 30%, P=0.033) and chyle leakage (19% *vs.* 31%, P=0.039) (*Table 2*).

Jejunostomy-related complications

Jejunostomy-related complications occurred in 73 (31%) patients (*Table 2*), of which occlusion (n=26, 11%) or luxation (n=25, 11%) were most prevalent. The duration that tube feeding was administered was significantly longer after July 01, 2011, as expected since patients were mostly discharged with home-tube feeding after this date. This was accompanied by a significant increase in the total amount of jejunostomy-related complications (26% *vs.* 36%, P=0.048), occlusion (6% *vs.* 15%, P=0.035) and luxation (5% *vs.* 15%, P=0.017). The median duration of tube feeding was also longer in patients with jejunostomy-related complications; 46 [15–94] versus 24 [12–65] days (P=0.011). Irreversible jejunostomy-related complications that led to the premature termination of jejunostomy tube feeding occurred in 33 (14%) patients. Totally parenteral nutrition or nasojejunal tube feeding had to be started in 16 (7%) of these patients because they could not achieve adequate oral intake or had contra-indications for oral intake such as anastomotic leakage. A reoperation under general anesthesia was required in 5 (2%) patients to treat a jejunostomy-related complication. Two relaparotomies were performed; one for an ischemic proximal small intestine and one patient for intra-abdominal leakage. The other three reoperations were surgical drainage of a large pre-fascia abdominal wall abscesses. Jejunostomy-related mortality did not occur.

Perioperative weights

Significant weight loss occurred before cancer diagnosis (*Figure 1*). Body mass index (BMI) stabilized between diagnosis and surgery, and postoperative weight loss mainly

Table 1 Patient characteristics

	All patients, n=236	Before 01-07-2011, n=100	After 01-07-2011, n=136	P value
Gender				
Male	170 [72]	71 [71]	99 [73]	0.762
Female	66 [28]	29 [29]	37 [27]	
Age	66 [58–71]	66 [60–73]	65 [57–70]	0.107
Nicotine user	58 [25]	27[27]	31 [23]	0.432
ASA score	2 [2–2]	2 [2–2]	2 [2–2]	0.524
Preoperative weight loss	3.4% [–0.5–8.0%]	3.9% [1.7–7.2%]	4.0% [1.4–6.1%]	0.202
Preoperative TNM				
T-stage	3 [2–3]	3 [2–3]	3 [3–3]	0.456
N-stage	1 [0–2]	1 [0–2]	1 [1–2]	0.792
Comorbidity	179 [76]	79 [79]	100 [74]	0.332
Malignancy	35 [15]	17 [17]	18 [13]	0.421
Cardiac	62 [26]	25 [25]	37 [27]	0.704
Vascular	95 [40]	37 [37]	58 [43]	0.382
Diabetes	33 [14]	16 [16]	17 [13]	0.444
Pulmonary	41 [17]	19 [19]	22 [16]	0.572
Neurologic	31 [13]	17 [17]	14 [10]	0.132
Gastro-enterologic	39 [17]	22 [22]	17 [13]	0.052
Endocrinologic	14 [6]	5 [5]	9 [7]	0.603
Immunosuppressive drug use	6 [3]	1 [1]	5 [4]	0.246
Neoadjuvant therapy	171 [72]	58 [58]	113 [83]	*0.000*
None	65 [28]	42 [42]	23 [17]	
Chemotherapy	92 [39]	49 [49]	43 [32]	
Chemoradiotherapy	78 [33]	9 [9]	69 [51]	
Radiotherapy	1 [0.4]	0	1 [1]	
Type of esophagectomy				*0.000*
Open	38 [16]	11 [11]	27 [20]	
Transhiatal	8 [3]	7 [7]	1 [1]	
Transthoracic	30 [13]	4 [4]	26 [19]	
Minimally invasive	198 [84]	89 [89]	109 [80]	
Transhiatal	58 [25]	31 [31]	27 [20]	
Transthoracic	140 [59]	58 [58]	82 [60]	

This table shows the baseline data. Continuous variables data are presented as median [1st–3rd quartile], all other data are numbers [percentages]. Significant P values have been made in italic form. n, number; ASA score, American Society of Anesthesiologist score; BMI, body mass index.

Table 2 Postoperative complications

	All patients, n=236	Before 01-07-2011, n=100	After 01-07-2011, n=136	P value
Surgical complications				
Anastomotic leakage	59 [25]	18 [18]	41 [30]	*0.033*
Chylothorax	61 [26]	19 [19]	42 [31]	*0.039*
Recurrent nerve injury	16 [7]	5 [5]	11 [8]	0.351
Pneumonia	103 [44]	43 [43]	60 [44]	0.864
Duration of jejunostomy tube feeding (days)	35 [13–74]	18 [12–48]	45 [13–100]	*0.002*
Jejunostomy-related complications	73 [31]	24 [24]	49 [36]	*0.048*
Occlusion	26 [11]	6 [6]	20 [15]	*0.035*
Luxation	25 [11]	5 [5]	20 [15]	*0.017*
Infection (at insertion site)	19 [8]	8 [8]	11 [8]	0.980
Extra-abdominal leakage from insertion site	16 [7]	4 [4]	12 [9]	0.145
Reoperation under general anaesthesia	5 [2]	3 [3]	2 [2]	0.420
Jejunostomy-related mortality	0	0	0	–
Jejunostomy-related complications causing termination of tube feeding	33 [14]	12 [12]	21 [15]	0.451

This table presents the principal surgical complications and all jejunostomy-related complications. Patients could have more than one complication. Data presented are numbers [percentages] or median [1st–3rd quartile]. Significant P values have been made in italic form.
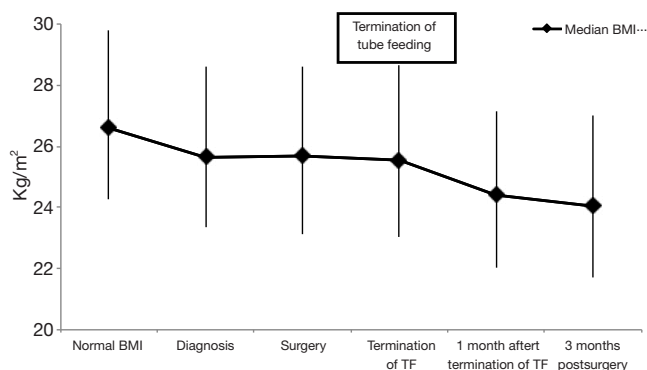

Figure 1 This figure shows the median BMI with corresponding interquartile range on time points before and after surgery. BMI, body mass index; TF, tube feeding.

occurred in the first 90 days following surgery. Weight loss primarily occurred after tube feeding was stopped. At the time tube feeding was stopped the median BMI was 25.6 (23.0–28.6) kg/m^2, which decreased to 24.4 (22.0–27.1) kg/m^2 within 1 month (P<0.001). This was a median of 3.0 (1.0–5.3) kg weight loss, corresponding with a median of 3.9% (1.5–6.3%) weight loss. No significant associations were found between the amount of weight loss at 90 days postoperative and duration of tube feeding or the application of full or supplementary home-tube feeding in univariate and multivariate analysis (*Table 3*).

Duration of postoperative tube feeding

Directly following surgery, tube feeding was given for a median uninterrupted period of 35 [13–74] days (*Table 2*). Complete tube feeding was given for 12 [10–33] days and over-night supplementary tube feeding for 5 [1–29] days. Tube feeding continued for an uninterrupted period following surgery exceeding 180 days in 10 patients (4%), and until the moment of death in 13 patients (6%). An American Society of Anesthesiologists (ASA) class >2, presence of systemic comorbidities, application of neoadjuvant chemoradiotherapy and discharge with home-tube feeding regimen were independent predictors for a duration of tube feeding of 35 days or longer (*Table 4*). ASA class >2 was significantly associated with anastomotic leakage (OR 3.2, 95% CI, 1.58–6.64, P=0.001) and pneumonia (OR 2.4, 95% CI, 1.17–4.49, P=0.001) and the application of neoadjuvant therapy was associated with anastomotic leakage (OR 1.7, 95% CI 0.9–3.2, P=0.079)

Table 3 Factors associated with weight loss at 90 days postoperative

	Weight loss at 90 days		Univariate		Multivariate	
	<1.0 Kg/m², n=93	≥1.0 Kg/m², n=119	Odds ratio/B	P value	Odds ratio/B	P value
Male gender	59 [63]	94 [79]	2.2 [1.2–4.0]	0.012	1.9 [0.92–3.9]	0.084
Preoperative weight loss	1.3 [0.1–3.0]	0.54 [−0.34–1.4]	N/A	<0.001	0.90 [0.81–0.99]	*0.025*
Malignancy in history	17 [18]	12 [10]	0.5 [0.23–1.1]	0.085	0.64 [0.24–1.7]	0.382
GI-comorbidity	10 [11]	24 [20]	2.1 [0.9–4.6]	0.064	1.9 [0.69–5.4]	0.207
Pulmonary comorbidity	20 [22]	14 [12]	0.49 [0.23–1.0]	0.055	0.44 [0.17–1.1]	0.081
Neoadjuvant therapy	62 [67]	94 [79]	1.9 [1.0–3.5]	0.043	1.3 [0.58–2.7]	0.565
Pneumonia	29 [31]	59 [50]	2.2 [1.2–3.8]	0.007	2.6 [1.3–5.3]	*0.006*
Recurrent laryngeal nerve injury	10 [11]	5 [4]	0.36 [0.12–1.1]	0.065	0.3 [0.06–1.4]	0.122
Duration of postoperative tube feeding	40 [13–90]	28 [12–62]	N/A	0.109	1.0 [0.99–1.0]	0.634

This table presents the multivariate p-values for all factors associated with weight loss at 3 months in univariate analysis with a P value <0.1. The duration of direct postoperative tube feeding was also included since this was the main variable of interest. Data are presented as absolute number [percentage] or median [1st–3rd quartile]. Significant P values in multivariate analysis have been made in italic form. B, regression coefficient; N/A, not applicable.

Table 4 Preoperative factors that predict the duration between surgery and stopping of tube feeding

	Duration of tube feeding		Univariate		Multivariate	
	<35 days, n=119	≥35 days, n=117	Odds ratio	P value	Odds ratio	P value
ASA class >2	9 [8]	30 [26]	4.2 [1.8–9.3]	<0.001	2.6 [1.0–6.5]	*0.045*
Chronic use of immunosuppressive drugs	0 [0]	6 [5]	N/A	0.014	N/A	N/A
Systemic comorbidities	80 [67]	99 [85]	2.7 [1.4–5.0]	0.002	2.3 [1.0–5.2]	*0.038*
Cardiac comorbidity	21 [18]	41 [35]	2.5 [1.4–4.6]	0.002	1.4 [0.7–2.9]	0.323
Vascular comorbidity	39 [33]	56 [48]	1.9 [1.1–3.2]	0.018	1.0 [0.5–1.9]	0.999
Diabetes	10 [8]	23 [20]	2.7[1.2–5.9]	0.013	1.6 [0.6–4.1]	0.320
Chemoradiotherapy	27 [23]	51 [54]	2.6 [1.5–4.6]	0.001	2.2 [1.1–4.3]	*0.026*
Routine home-tube feeding	54 [45]	82 [70]	2.8 [1.7–4.8]	<0.001	2.4 [1.3–4.6]	*0.005*

This table shows the results of univariate and multivariate analysis of preoperative factors associated with the duration of tube feeding directly following surgery with a P value <0.1 in univariate analysis. Data are numbers [percentage] or odds ratios [95% confidence interval]. Significant P values in multivariate analysis have been made in italic form. Immunosuppressive drugs could not be included in the multivariate analysis because one cell was empty. 95% CI, 95% confidence interval.

and pneumonia (OR 1.6, 95% CI, 0.9–2.7, P=0.096). When anastomotic leakage and pneumonia were entered into the multivariate model, ASA class and neo-adjuvant chemoradiotherapy were no longer significantly associated with a prolonged duration of postoperative tube feeding.

Tube feeding was restarted in 36 (15%) patients during the first 180 days following esophagectomy during the studied period (*Table 5*). The indication to restart tube feeding was insufficient oral intake in 20 (56%) patients. Tube feeding was restarted via the jejunostomy in 22 (61%) patients. In the remaining 14 (39%) patients a nasojejunal tube had to be placed because the jejunostomy had already been removed. Tube feeding was restarted via the jejunostomy at 34 [26–53] days from surgery, and via the

nasojejunal tube at 98 [72–165] days (P>0.0001).

Discharge with home-tube feeding

In 2009 a minority of patients (25%) were discharged with home-tube feeding whilst in 2013 the majority of the

patients (77%) were discharged with home-tube feeding. Discharge with home-tube feeding was associated with a significant reduction in the number of patients that needed to restart tube feeding after discharge (30% *vs.* 4%; P<0.001) (*Figure 2*). Discharge with tube feeding was not correlated with a reduction in the length of hospital stay (median 16 *vs.* 15 days; P=0.217) or a reduction in hospital readmissions (10% *vs.* 12%; P=0.669).

Table 5 Restart of tube feeding

	n=36
Indications	
Insufficient oral intake	20 [56]
Weight loss	6 [17]
Dysphagia	4 [11]
Late anastomotic leakage	3 [8]
Swallowing disability	1 [3]
Chyle leakage	1 [3]
Dilatation-related perforation	1 [3]
Route	
Jejunostomy	22 [61]
Nasojejunal tube	14 [39]
Type	
Continuous	16 [44]
Overnight (supplementary)	20 [56]
Duration within 6 months (days)	24 [13–64]
Continued tube feeding >6 months postoperative	9 [25]

This table shows the data on restarting tube feeding within 6 months after discharge. Continuous variables data are presented as median [1st–3rd quartile], all other data are numbers [percentages].

Discussion

The present study was performed to evaluate potential benefits and complications of routine jejunostomy tube feeding following esophagectomy. It was shown that weight remained stable during the period of tube feeding following esophagectomy. However, patients were not able to maintain their usual weight without support and lost weight after tube feeding was stopped, independent of the duration of tube feeding. Also a low rate of major jejunostomy-related complications occurred that required reoperation.

Other studies investigating jejunostomy tube feeding report weight loss between 1.0 kg at 1 month after esophagectomy and 7.0 kg at the first postoperative visit (9-12). This is comparable to the weight loss that occurred after the termination of tube feeding in our study. Patients continue to lose weight until a new balance between food-intake and energy requirements is reached (13,14). There are two studies with a follow-up period of 1 and 3 years following esophagectomy, with and without jejunostomy, that show that weight loss occurs during the first 6 months postoperatively (4,15). After that period weight remains relatively stable but at a lower level than the patients pre-operative weight. The current study shows that weight loss cannot be prevented following esophagectomy. The main
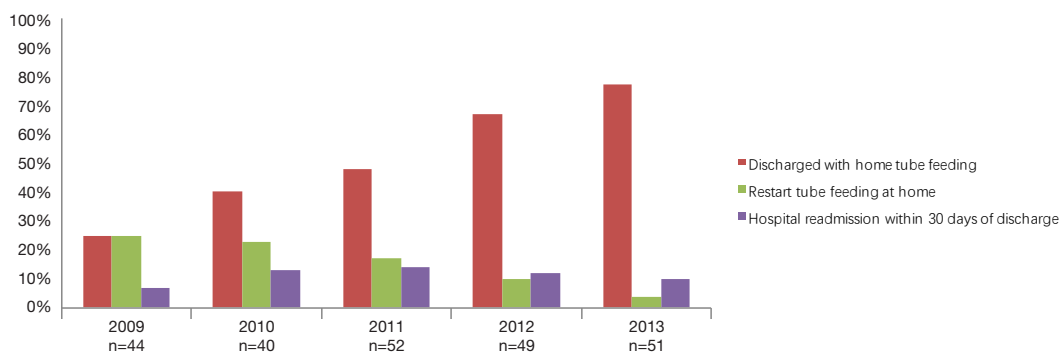

Figure 2 This figure shows the percentage of patients that was discharged with tube feeding at home each year, set out against the number of patients that had to bed readmitted within 30 days of discharge and patients that had to restart tube feeding whilst being at home.

question is from which moment after surgery weight loss can be accepted.

A theoretical advantage of a jejunostomy is that patients may be discharged with home-tube feeding for a long period. This regime was developed to facilitate the early discharge despite insufficient oral intake and to prevent readmission due to insufficient oral intake. The present study shows that these goals were not achieved. The reason might be that the multivariate analysis was insufficient to correct for the strong influence of the concomitant higher rate of anastomotic leakage, chyle leakage and application of neoadjuvant chemoradiotherapy in the period that discharge with home-tube feeding was routine. However not even a trend to improvement was found.

Though proposed benefits could not be confirmed, jejunostomy tube feeding related complications frequently occurred and were in line with rates reported in literature. This study shows that the risk for tube-related complications is related to the duration that tube feeding is administered. Occlusion, dislocation and insertion site infection of the jejunal feeding tube occurred frequently and were comparable to rates reported in literature (0–7% occlusion, 0–11% dislocation, 1–25% infection) (9,11,12,16-22). Previous reports also showed that severe jejunostomy-related complications requiring reoperation occur in 0–3% of all patients, which was confirmed by the present study (9,11,12,16,18,20,23). Furthermore in a randomized trial it was shown that immediate jejunostomy tube feeding may impair respiratory mechanics and may decrease mobility following esophagectomy (24).

These data question whether jejunostomy tube feeding should be routinely applied following esophagectomy since early enteral feeding can also be applied via a nasojejunal tube. Comparable amounts of nutrients can be applied via this route, and serious complications have not been reported (16). The only drawbacks are frequent dislocation, in 20–35% of all patients (16,25,26) and discomfort for the patient. Thus in case of an indication for long-term tube feeding, such as anastomotic leakage, a jejunostomy tube may be preferable. Another option for direct enteral feeding is oral feeding (27). However, following esophagectomy early initiation of oral intake is believed to increase sequelae of anastomotic leakage and pneumonia rates. Though a safety and feasibility trial has shown encouraging results the results of a randomized controlled trial on this topic have to be awaited (28-30).

It is the question whether a patient tailored approach may be possible, creating a feeding jejunostomy only in those patients that are at high risk for a prolonged need for tube feeding postoperatively. In this study, comorbidities, ASA class 3 or 4, neoadjuvant chemoradiation were independent risk factors for a prolonged duration of tube feeding. The association between ASA class and neoadjuvant therapy with the duration of postoperative tube feeding probably results from the increased risk for anastomotic leakage and pneumonia. This underlines the need for multivariable models that predict which patients will suffer from those complications, since these are most likely to benefit from jejunostomy placement (31).

Conclusions

Several hypothetical benefits of routine jejunostomy tube feeding following esophagectomy over nasojejunal tube feeding were studied. Weight loss was found to be postponed until the moment that jejunostomy tube feeding was stopped. Routine discharge with home-tube feeding did not reduce the length of hospital stay, number of hospital readmissions and weight loss. Meanwhile jejunostomy-related complications, occasionally life-threatening occurred. This study shows that the routine use of jejunostomy tube feeding following esophagectomy can be questioned emphasizing the need for further prospective studies.

Acknowledgements

Footnote

Conflicts of Interest: The authors have no conflicts of interest to declare.

Ethical Statement: The independent medical ethical committee of the University Medical Center Utrecht approved this study (No. 14-349/c) and declared no informed consent had to be obtained due to the retrospective and observational design of the study.

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