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Benefits Versus Risks: A Prospective Audit

Feeding Jejunostomy During Esophagectomy

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Abstract
Background The purpose of this prospectively collected database is to evaluate the safety, efficacy, and utility of postoperative jejunostomy feeding in terms of achieving nutritional goals and evaluating gastrointestinal and mechanical complications in patients undergoing esophagectomy.
Methods The study included 204 consecutive patients who underwent esophagectomy for various benign and malignant conditions. All patients underwent Witzel feeding jejunostomy at the time of laparotomy. Patients were followed prospectively to record nutritional intake, type of feed administered, rate progression, tolerance, and complications either mechanical or gastrointestinal.
Results Feeding jejunostomy could be performed in 99.5% patients; 6.0% of the patients had a blocked catheter during the course of feeding. The target calorie requirement could be achieved in 78% of patients by third day. In all, 95% of patients could be successfully fed exclusively by jejunostomy catheter during the postoperative period. Minor gastrointestinal complications developed in 15% of the patients and were managed by slowing the rate of infusion or administering medication. Patients spent a mean of 16.67 ± 22.00 days (range 0–46 days) on jejunostomy feeding after surgery; however, 13% required prolonged jejunostomy feeding beyond 30 days. Altogether, 64% of the patients with an anastomotic leak and 50% of the patients with postoperative complications required catheter jejunostomy feeding beyond 30 days. The mean duration for which jejunostomy tube feeding was used was significantly higher for patients who developed anastomotic disruptions (33.05 ± 16.24 vs. 14.69 ± 19.04 days; $p = 0.000$) and postoperative complications (26.67 ± 25.56 vs. 14.52 ± 18.64 days; $p = 0.000$) when compared to those without disruption or complications. There were no serious complications related to the feeding catheter that required reintervention. There was no difference in the mean body weight or weight deficit at the end of 10 days and at 1 month in patients who developed complications or anastomotic disruption when compared to their counterparts. No patient died as a result of a complication related to the feeding jejunostomy.
Conclusions Tube jejunostomy feeding is an effective method for providing nutritional support in patients undergoing esophagectomy, and it allows home support for the subset who fail to thrive. Prolonged tube feeding was continued in patients developing anastomotic disruptions and postoperative complications. Feeding jejunostomy has a definitive role to play in the management of the patients undergoing esophagectomy.

Introduction

Esophagectomy is being performed the world over for various benign and malignant conditions of the esophagus [1–3]. Patients undergoing esophagectomy often have dysphagia as a result of disease process, side effects from

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chemotherapy, decreased appetite, and weight loss [1–3]. Major surgical interventions are often fraught with complications in these nutritionally depleted patients.

Various strategies have evolved over the years to improve the nutritional status of such patients [4]. Both enteral and parenteral routes of administering nutrition have been investigated [5]. The former is the preferred route for instituting nutrition as it conserves gut integrity [4]. However, placement of a feeding catheter is not totally free from complications [6–9]. Catheter dislodgement, perijejunostomy leaks, reexplorations, and even mortality associated with a jejunostomy catheter have been reported [6–9]. Impaired respiratory function as a result of postoperative enteral feeding has also been described [10]. A number of techniques and strategies for catheter placement have been offered [6, 8, 11–13]. The present study focuses on the safety, efficacy, and utility of jejunostomy tube feeding during the postoperative period in terms of achieving nutritional goals and avoiding gastrointestinal and mechanical complications in patients undergoing esophagectomy.

Methods

From March 2003 to December 2007, a prospectively collected database of 207 patients undergoing esophagectomy for benign conditions (corrosive stricture, leiomyoma, leiomyomatosis, other benign strictures, achalasia with end-stage esophageal disease) and malignant conditions (squamous and adenocarcinoma predominantly) of the esophagus was analyzed at a tertiary care center in northern India. Patients undergoing emergency esophagectomy and those in whom primary reconstruction was deferred were not included.

A planned Witzel [14] technique for a feeding jejunostomy was performed at the time of laparotomy as a part of the procedure using a 10F enteral tube. Enteral tube feeding through jejunostomy tube was initiated within 24 h of the surgical procedure where a gastric conduit was used, and it was deferred for 72 h where colon was used as an esophageal substitute. Over a period of 24–48 h, the volume and concentration of feed were gradually increased to achieve the target calorie requirement of the patient. The target calorie and protein was 1500 to 3000 kcal/24 h (35–40 kcal/kg) and 100 to 120 g/24 h (1.5–2.0 g/kg), respectively. Three patients died during the postoperative period and were excluded from the final analysis.

The patients were fed exclusively through the jejunostomy catheter by continuous infusion, until they could tolerate the feeds or an oral diet was resumed. Jejunostomy feeding was continued until the oral intake was adequate. All the events related to the nutritional therapy were recorded. In the event of diarrhea, the rate of infusion was slowed, the concentration was altered, and antimotility agents were added. In the event of distension, the feed was withheld until distension resolved; refeeding was started subsequently. Patients developing catheter block were managed appropriately. The total number of days of tube feeding was recorded in each patient. Preoperative body weight was recorded and was compared with the postoperative weight on days 10 and 30.

Results

Demographic parameters

The study group comprised 204 patients who underwent esophagectomy for various benign and malignant diseases of the esophagus. The mean age was 51.52 ± 26.86 years (range 10–80 years), and the male/female ratio was 2.46:1.00. The diagnosis was malignancy in 167 (81.86%) patients and benign disease in 37 patients. Among the malignant group, 44 patients were operated on after neoadjuvant therapy and 123 without neoadjuvant therapy. A transhiatal procedure was done in 136 patients and a transthoracic procedure in 68. The stomach was used as an esophageal substitute in 170 patients and the colon in 34.

Fulfillment of nutritional goals

Feeding was initiated within 24 h of surgery in 169 patients (with gastric conduit) and after 72 h in 34 patients (with colon conduit). The jejunostomy could not be placed in one patient for technical reasons. The targeted calorie requirement was achieved by postoperative day (POD) 3 in 159 patients (77.94%). The caloric requirement was met by continuous tube enteral nutrition in all of the patients by POD 6.

Tube feeding was successful in 173 (84.80%) patients without encountering any complications. The patients spent a mean of 16.67 ± 22.00 days (range 0–46 days) on jejunostomy feeding postoperatively. In 9 patients (4.41%) there was mandated interruption of the feeding for more than 48 h, and the remaining 194 (95.01%) patients were fed exclusively through an enteral tube. At the end of 10 days 106 (51.96%) patients still required supplementation by tube feeding to maintain the caloric requirement, as did 26 (12.74%) at the end of 1 month.

Assessment of nutritional status

Preoperatively, the mean serum albumin level was 3.84 ± 0.94 g/dl (range 2.8–5.0 g/dl), and the mean body

weight was 54.52 ± 22.22 kg (range 35–85 kg). At the end of 10 days, 146 (71.57%) patients had experienced a decrease in body weight. The mean deficit of weight at the end of 10 days was 2.42 ± 4.72 kg (range 0–12 kg). The mean body weight at the end 10 days was 52.32 ± 21.26 kg. The mean weight deficit and body weight at the end of 1 month were 2.23 ± 5.40 kg (0–18 kg) and 52.68 ± 21.48 kg (33–84 kg), respectively (Fig. 1). At the end of 1 month, 68 patients (33.33%) had regained their preoperative weight and 173 (84.80%) showed improvement in their body weight when compared to their respective postoperative weight at the end of 10 days.

Complications

Catheter-related complications

The feeding tube could be successfully placed in 203 patients; in one patient it could not be placed because of extensive adhesions in the infracolic compartment as a result of a previous operation. During the course of feeding, the catheter became blocked in 13 patients. Patency of the catheter lumen was established by flushing with warm saline in six patients, by enzymatic digestion of the contents of the catheter in three patients, and by a long stylet in four patients. No patient required interruption of feeding beyond 24 h because of catheter blockage.

Feeding-related complications

Thirty patients developed feed-related complications in the form of diarrhea and abdominal distension. Diarrhea developed in 16 patients and distension in 14. In nine patients, the feeding was interrupted for more than 48 h because of complications. However, feeding could be successfully reinstituted in all the patients.

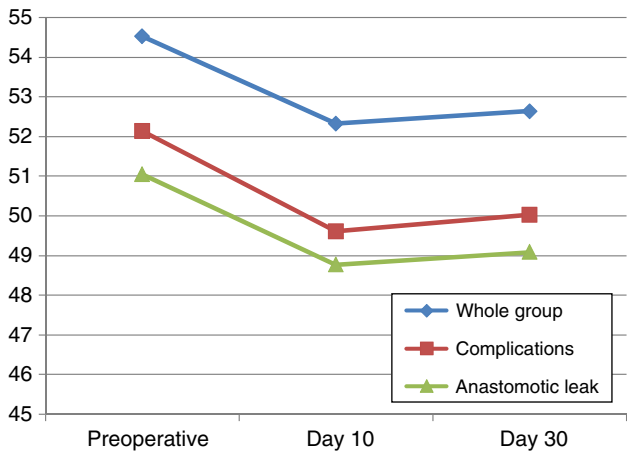

Fig. 1 Mean body weight preoperatively and at the end of postoperative days 10 and 30. Note that the three plots are almost parallel

Anastomotic disruptions and feeding

A total of 22 anastomotic disruptions were encountered during the entire study (Table 1). Catheter-related complications were similar in the two groups (9.09% vs. 6.59%, $p = 0.65$). Likewise, feeding-related complications were similar in the groups (22.72% vs. 13.73%, $p = 0.42$). The use of a feeding catheter beyond 10 days (100% vs. 46.15%, $p = 0.000$) and 30 days (63.63% vs. 6.59%, $p = 0.000$) was significantly higher in patients with anastomotic failure. The mean duration that the feeding catheter was used to achieve nutritional goals was significantly longer in patients with anastomotic disruption than in those without disruption (33.05 ± 16.24 days vs. 14.69 ± 19.04 days, $p = 0.000$).

There was no difference in the mean preoperative weight (51.05 ± 21.34 vs. 54.95 ± 22.24 kg, $p = 0.12$) or in serum albumin levels (3.78 ± 0.86 vs. 3.85 ± 0.96 g/dl, $p = 0.52$) in patients with and without anastomotic leak. There was no difference in the mean body weight at the end of 10 days (48.77 ± 20.56 vs. 52.75 ± 21.24 kg, $p = 0.098$) and 30 days (49.09 ± 21.04 vs. 53.06 ± 21.34 kg, $p = 0.10$) in the groups (Figs. 1, 2). Likewise, the deficit in weight was similar at the end of 10 and 30 days in both groups.

Postoperative complications and feeding

A total of 36 patients with postoperative complications were encountered in the entire study (Table 2). The catheter-related (8.33% vs. 6.55, $p = 0.71$) and feeding-related (16.67% vs. 14.29%, $p = 0.91$) complications were similar in the two groups. The use of a feeding catheter beyond 10 days (77.78% vs. 46.43%, $p = 0.001$) and at 30 days (50.00% vs. 4.76%, $p = 0.000$) was significantly higher in patients with postoperative complications. The mean duration for which the feeding catheter was used to achieve nutritional goals was significantly higher in patients with postoperative complications (26.67 ± 25.56 vs. 14.52 ± 18.64 days, $p = 0.000$).

There was no difference in the mean preoperative weight (52.14 ± 21.24 vs. 55.04 ± 22.36 kg, $p = 0.16$) or serum albumin levels (3.74 ± 0.92 vs. 3.86 ± 0.94 g/dl, $p = 0.19$) in patients with or without complications. There was no difference in the mean body weight at the end of 10 days (49.61 ± 20.14 vs. 52.90 ± 21.38 kg, $p = 0.092$) or 30 days (50.03 ± 21.04 vs. 53.19 ± 21.30 kg, $p = 0.11$) in both groups (Figs. 1, 3). Likewise, the deficit in weight was similar at the end of 10 and 30 days in the two groups.

Discussion

Patients undergoing esophagectomy often have dysphagia as a result of disease process, side effects from

Table 1 Comparison of patients with and without anastomotic failure

Parameter	With anastomotic leak	Without anastomotic leak	*p*
No. of patients	22	182	
Catheter complications	2 (9.09%)	12 (6.59%)	0.65
Failure to place	0	1	1.00
Catheter blocked	2	11	0.63
Feeding-related complications	5 (22.72%)	25 (13.73%)	0.42
Diarrhea	3	13	0.39
Distension	2	12	0.65
Need to stop feeds for >48 h	2 (9.09%)	7 (3.85%)	0.25
Using catheter feed >10 days	22 (100%)	84 (46.15%)	0
Using catheter feed >30 days	14 (63.63%)	12 (6.59%)	0
Duration of FJ use (days)	33.05 ± 16.24	14.69 ± 19.04	0
Preoperative albumin (g/dl), mean and range	3.78 ± 0.86 (3.1–5.0)	3.85 ± 0.96 (2.8–5.0)	0.52
Preoperative weight (kg), mean and range	51.05 ± 21.34 (35–79)	54.95 ± 22.24 (36–85)	0.12
Weight deficit (kg), mean and range at 10 days	2.68 ± 5.28 (0–11)	2.39 ± 4.66 (0–12)	0.59
Weight deficit (kg), mean and range at 1 month	2.68 ± 7.26 (0–16)	2.18 ± 5.14 (0–18)	0.41

FJ Feeding jujunostomy

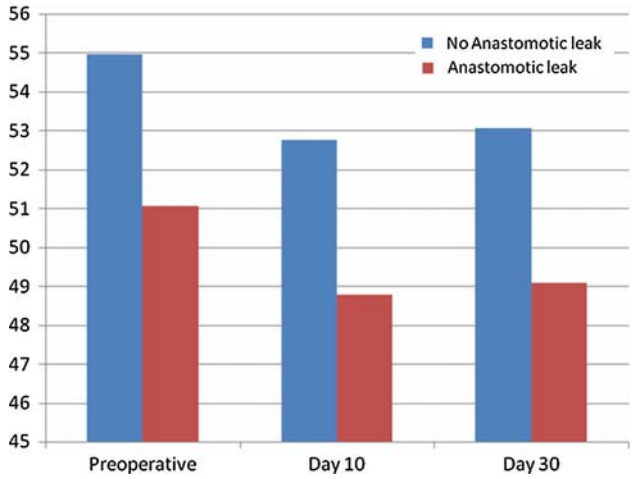

Fig. 2 Mean body weight of patients with or without an anastomotic leak. A similar trend is observed

chemotherapy, decreased appetite, and weight loss [1–3]. Major surgical interventions are often fraught with complications in these nutritionally depleted patients. The patients require fasting for another 5 to 7 days until the esophago-conduit anastomosis heals [1–3]; but adding to the existing malnutrition, the nothing-by-mouth status for another week can be detrimental in these patients [4]. There is no controversy regarding the need of nutritional supplementation in patients undergoing a major surgical procedure [4]. A prospective randomized trial comparing enteral and parentral nutrition in patients undergoing esophagogastric surgery found enteral nutrition to be safe and associated with mainly reversible minor complications [5]. In another randomized trial comparing nasoduodenal tube and feeding jejunostomy, the former was found to be safe and an equally efficient way to provide nutritional support after esophageal resection [7].

In a recent study of 205 patients undergoing esophagectomy, needle catheter jejunostomy was found to be an effective method to provide nutritional support during the postoperative period, and it allowed home support for those with poor intake for a prolonged period of time [8]. In a retrospective study by Sica et al. [15], needle catheter jejunostomy was found to be safe with a low complication rate. Jenkinson et al. [6] described the performance of feeding jejunostomy at the time of diagnostic laparoscopy and used the feeding catheter for a longer period of time. In a series of more than 500 esophagectomies, Witzel tube jejunostomy was found to be an efficient way to provide enteral nutrition [16]. Bueno et al. [17] described selective use of postoperative endoscopic percutaneous placement of a jejunostomy catheter only in patients who were developing complications. In the present study, feeding jejunostomy was performed at the time of laparotomy in all except one patient.

Placement and maintenance of the jejunostomy catheter is not entirely safe [6–10]. Han-Geurts et al. [7] described leakage from the jejunostomy site, mandating rexploration in 1 of 79 patients undergoing jejunostomy. In another series of 262 patients undergoing feeding jejunostomy during esophagectomy 1.5% major catheter-related complications were reported [15]. Ryan et al. [8], in their experience of 8 years, reported a relaparotomy rate of 1.4% and 0.5% mortality as a result of needle catheter jejunostomy. Gerndt and Orringer [16] reported 2.1% major complications related to Witzel tube jejunostomy. In a recent series, Witzel feeding jejunostomy had a complication rate of 1.5% and was found to be safe on a long-term basis [18]. However, there were no deaths as a result of the

Table 2 Comparison of patients with and without postoperative complications

Parameter	With postoperative complications	Without postoperative complications	*p*
No. of patients	36	168	
Catheter complications (%)	3 (8.33%)	11 (6.55%)	0.71
Catheter blocked	3	10	0.70
Failure to place	0	1	1.00
Feeding-related complications	6 (16.67%)	24 (14.29%)	0.91
Diarrhea	3	11	0.72
Distension	3	13	1.00
Need to stop feeds for >48 h	3 (8.33%)	6 (3.57%)	0.38
Using catheter feed >10 days	28 (77.78%)	78 (46.43%)	0.001
Using catheter feed >30 days	18 (50.00%)	8 (4.76%)	0
Duration of FJ use (days)	26.67 ± 25.56	14.52 ± 18.64	0
Preoperative albumin (g/dl), mean and range	3.74 ± 0.92 (2.8–5.0)	3.86 ± 0.94 (2.8–5.0)	0.19
Preoperative weight (kg), mean and range	52.14 ± 21.24 (35–84)	55.04 ± 22.36 (36–85)	0.16
Weight deficit (kg), mean and range at 10 days	2.83 ± 5.26 (0–11)	2.33 ± 4.60 (0–12)	0.25
Weight deficit (kg), mean and range at 1 month	2.58 ± 6.12 (0–16)	2.15 ± 5.24 (0–18)	0.39

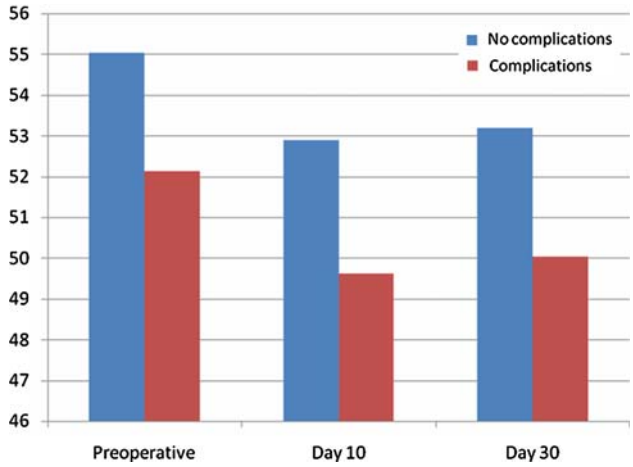

Fig. 3 Mean body weight of patients with or without complications. A similar trend is observed

adjunct procedure. The current series reports a 0.5% incidence of catheter-related complications. No reexploration or mortality occurred as a result of the jejunostomy tube.

In a study of 43 laparoscopically placed feeding jejunostomies, dislodgement occurred in 14% of patients and catheter block in 9%. All the problems were tackled with simple bedside maneuvers without the need for any major intervention. The authors reported the use of catheters for a period of more than 10 weeks [6]. Yagi et al. [9] reported a 4% incidence of skin excoriation as a result of the feeding catheter. Wakefield et al. [19] reported a 2% incidence of catheter dislodgement and no mortality. Others have reported up to 35% minor catheter-related complications [7]. In the present series, catheter blockage occurred in 6.4% patients; the blockage could be managed easily by simple bedside maneuvers. There was no dislodgement or skin excoriation. This could be explained by the relatively short duration of catheter usage.

In view of the complications, many have described selective, rather than indiscriminate, use of jejunostomy catheters/tubes [11, 17, 20]. Modification of the strategy of placing the jejunostomy tube has also been advocated [12, 13, 20]. Reichle et al. [20] described fixing of the jejunal loop to the abdominal wall during the laparotomy and performing endoscopically guided intubation later should the need arise.

Most series report that they achieved the targeted caloric level within 48 to 72 h [7, 8, 10, 15, 16, 21, 22]. In the present series, the nutritional requirement was achieved in 78% of the patients. The feeding in patients with colonic interposition was deferred for 72 h in view of the distal colocolic anastomosis. This could explain the lower number of patients getting adequate calories by POD 3. In all, 96% of the patients in the present series could be fed uninterruptedly through the jejunostomy tube; nine patients required cessation of feeding for more than 48 h. Other studies have also reported a good success rate of enteral feeding through a jejunostomy catheter/tube [7, 8, 10, 15, 16, 21, 22] .

The reported incidence of gastrointestinal discomfort in the form of distension and diarrhea varies from 5% to 35% [4, 7, 8, 10, 15, 16, 21, 22]. However, most of the symptoms are self-limiting and can be easily corrected by alterating the infusion rate, changing the concentration, or temporarily ceasing the feeding for 12 to 24 h [4, 7, 8, 10, 15, 16, 21, 22]. In the present series, the incidences of diarrhea and distension were 7.84% and 6.86%, respectively.

The use of a feeding tube/catheter is mandated until oral intake of the patient is adequate. In the event of an anastomotic fistula, adequate oral intake is precluded. In a recent study evaluating the anastomotic techniques of cervical esophagogastric anastomosis, it was found that a lowered incidence of leakage could significantly hasten the initiation of an oral diet [23]. In another study by Hunerbein et al. [24], which evaluated the role of self-expandable plastic stents to treat thoracic anastomotic leakage after esophagectomy, an oral diet was resumed after 18 days in patients undergoing conventional treatment for anastomotic leak. They reported early feeding in patients with anastomotic leak treated by stent. In this study, the stent was used as a conduit to resume feeding via the normal route [24]. Hence, in the presence of an anastomotic leak, an alternate route of nutrition should be maintained. In one large series, the incidences of postoperative esophageal stricture causing moderate to severe dysphagia were 11% (moderate) and 3% (severe) [3]. In a study by Kondra et al. [23], the incidence of dysphagia associated with stricture requiring postoperative dilation was markedly decreased in a group with a lower incidence of leakage. Another study found a statistically significant association of anastomotic leakage and postoperative anastomotic stricture [25]. An anastomotic stricture can further impair oral intake, requiring one to address the need for access to tube feeding for a longer period of time.

Unpredictable emptying of the dennervated intrathoracic stomach, delayed gastric emptying, dumping, or other gastrointestinal dysfunction can further delay adequate oral intake in individuals who otherwise would have an uneventful recovery [26]. Ryan et al. [8] reported a median of 15 days of feeding catheter use; 26% of their patients required more than 20 days. Sica et al. [15] also described the use of feeding catheters beyond 20 days in 19% of their patients. In another series, 11% patients at 3 weeks and 6.9% patients at 2 months needed nutritional support through the feeding tube [16]. In the present series, at the end of 10 days 52% patients and at the end of 1 month 13% patients were still on supplemental nutritional support. Patients developing anastomotic failure and postoperative complications required tube feeding for a significantly longer period of time. Although a large number of patients with complications and anastomotic disruptions were fed through the jejunostomy catheter for prolonged periods, their mean body weight and weight deficit at the end of 1 month was comparable to that of their counterparts.

Conclusion

Witzel feeding tube jejunostomy is a safe, effective way to provide nutritional support to patients undergoing esophagectomy. Most of these patients can tolerate the feeds. Only a few develop minor complications, which can be managed by simple bedside maneuvers. Those developing postoperative complications and anastomotic failure required nutritional support for a longer period of time. Body weight at the end of 1 month was comparable in the two groups. Finally, feeding jejunostomy has a definitive role to play in the management of patients undergoing esophagectomy. Therefore, an enteral feeding tube should be placed at the time of laparotomy in all patients undergoing esophagectomy.

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