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Complications of Feeding Jejunostomy Tubes in Patients with Gastroesophageal Cancer

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Abstract

Background—Feeding jejunostomy tubes (FJT) in patients undergoing resection of gastroesophageal cancers facilitate perioperative nutrition. Data regarding FJT use and complications are limited.

Study design—A single institution review was performed for patients who underwent perioperative FJT placement for gastrectomy or esophagogastrectomy from 2007–2015. FJT-related and unrelated complications were evaluated.

Results—FJTs were inserted for total/completion gastrectomy (n=49/117, 41.9%), proximal gastrectomy (n=7/117, 6.0%), or esophagogastrectomy (n=61/117, 52.1%). Ninety percent (n=106/117) of patients used a FJT at some time point. Although the majority of patients (75.2%) used FJTs after discharge, 8.5% (n=10/117) never used the FJT and 10.3% (n=12/117) used the FJT only during hospitalization. Overall, 44.4% (n=52/117) had FJT-related complications, including dislodgement (n=22), clogging (n=13), and leakage (n=6). The majority of FJT complications were resolved by telephone triage (13.5%) or bedside/clinic intervention (57.7%), but 3.4% required operative intervention for small bowel obstruction (n=3) and hemorrhage (n=1). FJT complications were more common with gastrectomy than esophagogastrectomy (53.6% vs. 36.0%), perhaps related to longer FJT use in gastrectomy patients (71 vs. 38 days).

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Conclusions—FJT-related complications are common, occurring more frequently after gastrectomy than esophagogastrectomy. In most patients, complications can be managed by simple measures, rarely requiring operative intervention. Nevertheless, the need for FJTs should be carefully considered to balance nutritional benefits with the risks of insertion and usage.

INTRODUCTION

Malnutrition is a common malady in patients with cancers of the upper gastrointestinal tract and surgical management of the disease may exacerbate this condition. Therefore, feeding jejunostomy tubes (FJT) are frequently placed in patients undergoing resection of gastroesophageal cancers. Indeed, guidelines from the National Comprehensive Cancer Network (NCCN) recommend consideration of FJTs for both gastric and esophageal cancers [1, 2]. This recommendation is based on sound clinical rationale, since FJTs may help provide complete nutritional support during the management of these cancers. However, there are discrete and potentially severe morbidities associated with the placement and usage of FJTs that must be considered when weighing the value of FJTs in these patients.

Routine placement and usage of FJTs have been associated with poorer outcomes for select cancers [3, 4], but there is limited data on the outcomes of FJTs in patients with gastroesophageal cancers. Recently, two large registry studies for gastric cancer reported conflicting results whether concurrent placement of FJTs at the time of gastrectomy was associated with increased major surgical morbidity [5, 6]. Regardless of these notable conflicts, neither of these two studies specifically examined FJT-related complications. Due to the inherent limitations of registry data, these studies could only report the major complications associated with the index operation, rather than providing granular data on the problems directly associated with FJTs. Accordingly, the purpose of our investigation was to determine the nature and incidence of FJT-related complications in patients undergoing curative surgery for gastroesophageal cancers and to better understand the resources necessary to manage these complications.

METHODS

Patient selection

After obtaining approval from the Institutional Review Board of City of Hope, patients who underwent resection for gastroesophageal carcinoma with perioperative FJT placement were identified from institutional medical records from 2007 to 2015. Only patients having total/completion gastrectomy, proximal gastrectomy, and esophagogastrectomy were selected, since FJTs are routinely placed during these operations at our institution. FJTs are not routinely placed for patients undergoing distal or subtotal gastrectomy, and none was identified for this study. Patient and treatment-related variables from the study cohort were tabulated.

Method of feeding tube insertion

Three methods were used to secure the jejunostomy tubes in place. A laparoscopic Seldinger technique was used whereby a needle was introduced into the jejunum followed by a guidewire and dilating catheter. Finally, a feeding jejunostomy tube was inserted over the

guidewire. The jejunum was secured to the anterior abdominal wall using tacking sutures. Surgeon preference is to refrain from using the T-fastener at the skin. Two kits were used with this method. The first being Abbott (Abbott Nutrition, Abbott Laboratories, Columbus, OH, USA) Flexiflo Lap J™ Laparoscopic Jejunostomy Kit which contains a 10 Fr feeding tube; and the second, a Halyard (Halyard Health, Inc, Irvine, CA, USA) Introducer Kit for Jejunal Feeding Tubes with a 12 Fr feeding tube. For the open procedures, a Witzel or modified Stamm jejunostomy was performed over a 12 Fr red Robinson feeding tube.

Timing of feeding jejunostomy tube placement

Select patients had FJTs placed prior to their definitive surgical resection for esophageal cancer. The indications for early placement of FJTs included poor nutritional status prior to initiation of neoadjuvant chemoradiation (n=2) and inability to have adequate oral intake during neoadjuvant therapy (n=2). Additionally, patients who completed neoadjuvant chemoradiation for esophageal cancer and had residual disease on restaging underwent diagnostic laparoscopy with FJT placement prior to definitive surgery (n=5); however, these patients did not use their FJT prior to the index operation. All other patients had FJTs placed at the time of definitive surgical resection.

Jejunostomy tube teaching and instruction

Patients received scripted training regarding jejunostomy tube care from the nursing staff prior to discharge. Additionally, home health nurses travelled to patients' homes to help set up the feeds and reinforce tube teaching and care.

Assessment of complications

Medical records were examined for FJT-related complications from the time of FJT placement through the completion of adjuvant therapy. These complications were assessed from nursing triage telephone calls, visits to the institution's 24-hour outpatient evaluation and treatment center, inpatient progress notes, and outpatient clinic notes. All complications were recorded and graded according to the Clavien-Dindo (C-D) classification scale [7]. Minor complications were defined as C-D grades I-II and major complications were defined as C-D grades III-V.

RESULTS

Pathologic and operative characteristics

A total of 117 patients were included in the final study cohort, including 61 patients with esophagogastrectomy and 56 patients with gastrectomy. Demographic data of these patients are included in Table 1. Esophageal cancer patients had higher rates of pathologic complete response related to their higher rates of neoadjuvant therapy (neoadjuvant in esophageal cancer patients, 75.4% vs. neoadjuvant in gastric cancer patients, 32.1%) (Table 1). Regarding the surgical procedure for gastric cancer, total/completion gastrectomy was performed in 87.5% (n=49/56) of patients and proximal gastrectomy was performed in 12.5% (n=7/56) of patients. For patients with esophageal cancer, 67.2% (n=41/61) underwent Ivor-Lewis esophagogastrectomy and 32.8% (n=20/61) underwent 3-field McKeown esophagogastrectomy. As previously indicated, 14.8% (n=9/61) of esophageal

cancer patients had FJTs placed prior to definitive resection, while all gastric cancer patients had FJTs placed at the time of definitive surgical resection.

The majority of FJTs were placed by minimally invasive techniques (74.4%, n=87/117). Esophageal cancer patients were more likely to have FJTs placed by modified Seldinger technique (93.4%, n=57/61), while FJTs in gastric cancer patients were placed by modified Seldinger technique (30.4%, n=17/56), Witzel technique (44.6%, n=25/56), or Stamm method (16.1%, n=9/56) (Table 1).

Patterns of perioperative feeding jejunostomy tube use

Overall, 90.6% (n=106/117) of patients used a FJT for nutritional support during the perioperative period. Tube feedings were initiated in 83.8% (n=98/117) of patients during the postoperative inpatient period and 3.4% (n=4/117) in the preoperative period, while 12.8% (n=15/117) of patients did not receive tube feedings during the index postoperative inpatient period (Figure 1A). In these 15 patients, 10 never used the FJTs, 4 used the FJT only after discharge from inpatient hospitalization, and usage for 1 patient was unknown.

After discharge from inpatient hospitalization, 75.2% (n=88/117) of these patients continued usage of FJTs, 10.3% (n=12/117) discontinued tube feedings, 8.5% (n=10/117) never used their FJT at any time point, and 6.0% (n=7/117) were lost to follow-up (Figure 1B). For the entire cohort, patients remained on tube feedings after discharge from inpatient hospitalization for a median of 45 days (range 5–591). Upon comparison, gastric cancer patients utilized FJTs for a longer period of time than esophageal cancer patients (median, 71 days vs. 38 days) (Table 2).

The use of FJTs was also examined in relation to receipt of adjuvant therapy. For the entire cohort, 43.6% (n=51/117) of patients received some form of adjuvant therapy (Table 2). For these patients who received adjuvant therapy, 37.3% (n=19/51) of patients used the FJTs. Gastric cancer patients more frequently received adjuvant therapy than esophageal cancer patients (58.9% vs. 29.5%) (Table 2); furthermore, gastric cancer patients were also more likely to use their FJT during adjuvant therapy (45.5% vs. 22.2%) (Table 2).

Feeding jejunostomy tube complications

There were FJT-related complications in 44.4% (n=52/117) of patients. One complication occurred in 35.9% (n=42/117) of patients, two complications occurred in 6.0% (n=7/117) of patients, and three complications occurred in 2.5% (n=3/117) of patients (Table 3). Gastric cancer patients experienced a higher rate of FJT-related complications than esophageal cancer patients (53.6% vs. 36.0%, respectively) (Table 3). The most common FJT-related complications were mechanical in nature, including dislodgement (n=22), clogging (n=13), leak at skin site (n=6), and anchor suture loss/skin irritation (n=13) (Table 3).

For the 22 dislodged FJTs, 13 were replaced at bedside, 5 were replaced by interventional radiology (IR), and 4 were not replaced. For the 13 clogged FJTs, 4 required replacement while the other 9 were successfully unclogged. In addition to FJTs replaced by IR, four major FJT-related complications occurred: three were small bowel obstruction near the FJT insertion site and one involved major hemorrhage in the small intestine at the FJT insertion

site. All four major complications occurred in gastric cancer patients and all required operative intervention to resolve the complication. The major and minor complication rates are listed in Table 3. In regards to open jejunostomy, there was a 50% (n=15/30) complication rate from dislodgement (n=6), clogging (n=5), anchor suture loss/skin irritation (n=3) and leak at skin site (n=1).

Rates of non-FJT-related complications were similar between gastric cancer and esophageal cancer patients (Table 3). In relation to infectious complications, 29.9% (n=35/117) of patients were treated for an infection, with 5.1% (n=6/117) for superficial wound infections, 1.7% (n=2/117) for intra-abdominal abscesses, 6.8% (n=8/117) for anastomotic leak, and 10.3% (n=12/117) for pneumonia.

Resources utilized to resolve feeding jejunostomy tube complications

The majority of FJT-related complications were resolved at the bedside/clinic (57.7%, n=30/52) or by telephone instruction via triage hotline (13.5%, n=7/52) (Figure 2). Other resources or methods utilized to manage FJT-related complications included interventional radiology (n=6/52), discontinuing tube feedings and changing to total parenteral nutrition (TPN) (n=4/52), and operative intervention as described above (n=4/52) (Figure 2).

Total parenteral nutritional (TPN) usage in patients with perioperative jejunostomy tubes

Despite having perioperative FJTs, 18.8% (n=22/117) of patients utilized TPN for nutritional support after surgery. Most commonly the patient required additional nutritional support after the original FJT had already been removed (n=6/22, 27.4%). Other reasons included tube feeding intolerance (n=4/22, 18.2%), clogged or dislodged FJT (n=3/22, 13.6%), small bowel obstruction (n=3/22, 13.6%), conduit leak or necrosis (n=3/22, 13.6%), persistent chyle leak (n=2/22, 9.1%), or combined nutritional support with both tube feedings and TPN (n=1/22, 4.5%).

DISCUSSION

The nutritional status of patients with cancer is directly tied to performance status; therefore, the maintenance of adequate caloric intake is critical when considering major medical and surgical therapies. As such, there is strong rationale to place and use FJTs in patients undergoing radical surgery for gastric and esophageal cancers. In our experience, FJTs facilitate adequate enteral nutritional support with acceptable rates of major morbidity and no mortality. The review of our data also highlights noteworthy discussion points about the value of FJTs in select patients and the apparent outcome differences between patients who undergo either gastric or esophageal cancer surgery. Overall, our study results show that usage of FJTs is associated with high rates of complications, most of which are minor and can be easily managed; however, our data also suggests that the placement of a FJT should be carefully considered since utilization is not universal even after its placement.

Our results show that while FJT-related complications were relatively frequent, most were resolved with telephone management or through bedside/clinic evaluation. Interestingly, we observed that esophageal cancer patients had fewer FJT-related complications than gastric cancer patients, the reasons for which are likely multi-factorial. First, 15% of

esophagogastrectomy patients had FJTs placed preoperatively, whereas all gastrectomy patients had FJTs placed at the time of definitive surgical resection. Second, patients with esophagogastrectomy had FJTs that were placed into small intestine with unaltered anatomy. In contrast, patients with gastric cancer mostly had total gastrectomy with Roux limb reconstruction. The new anastomoses/connections in the small intestine and resulting internal hernia defect (i.e., Peterson's space) may increase the risk for small bowel complications. Third, gastric cancer patients more frequently received prolonged tube feedings during adjuvant therapy, whereas esophageal cancer patients more frequently received neoadjuvant therapy.

Prior published reports do not provide consensus regarding the benefits and dangers of FJT in patients with gastroesophageal cancers. Most studies have focused on patients with esophageal cancer. Three such randomized controlled trials evaluated FJT usage with other modalities and did not find differences in postoperative complications, anastomotic leak, or length of stay. These studies were limited by heterogeneous comparison groups and small cohorts (range, 12–79 patients) [8–11]. Retrospective studies in esophageal cancer patients have concluded that FJT placement is safe and often useful [12, 13], but should be utilized selectively [14, 15].

Aside from a past single-institution study [16], two recent large national registry studies have published differing conclusions regarding the risks and benefits of FJTs after gastrectomy for gastric cancer. Sun and colleagues, utilizing the American College of Surgeons National Surgical Quality Improvement Project (NSQIP) database, observed no difference in mortality, major complication, infectious complication, or early reoperation between the FJT and non-FJT groups [6]. In contrast, a US Gastric Cancer Collaborative (USGCC) database study observed that while major complications were not higher in patients with FJT after gastrectomy, there were higher rates of infectious complications [5]. Neither of these two studies provided detailed outpatient data and only provided a broad overview of the complications associated with FJTs, but not directly resulting from their placement or usage.

Ours is also a retrospective study limited by incomplete data on tube feeding end dates and receipt and completion of adjuvant therapy. Additionally, we did not have the laboratory data to sufficiently determine whether nutritional support via FJT impacted body mass index or nutritional markers such as pre-albumin. Nevertheless, our study identifies several salient findings. We observed complications directly related to FJT placement and usage and we learned that patients with gastric cancer appear to have higher risk for these FJT-related complications. Importantly, many patients who received FJTs still required caloric supplementation with TPN and some patients who received FJTs never used them.

In summary, although relatively common, the vast majority of FJT-related complications were easily remedied by simple measures. The reoperation rate was very low and there were no mortalities associated with FJT-related complications. This highlights the fact that FJT placement is not a simple, risk-free procedure, and that it still requires a sound clinical plan to manage its use and anticipated complications. FJT placement should be tailored to each

patient, taking into account the resultant surgical anatomy and the anticipated need for adjuvant therapy.

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Figure 1.
Patterns of feeding jejunostomy tube usage (A) during index hospitalization and (B) after discharge
FJT, feeding jejunostomy tube

Figure 2.
Resources required to manage feeding jejunostomy tube complications
TPN, total parenteral nutrition

Table 1

Characteristics of patient undergoing resection for gastroesophageal cancer

	All N=117	Esophagogastrectomy N=61	Gastrectomy N=56
Age *	65 (19–89)	65 (29–85)	65.5 (19–89)
Sex			
Male	85/117 (72.6%)	53/61 (86.9%)	32/56 (78.6%)
Female	32/117 (27.4%)	8/61 (13.1%)	24/56 (42.9%)
Histology			
Adenocarcinoma	109 (93.2%)	56 (91.8%)	53 (94.6%)
Squamous cell carcinoma	5 (4.3%)	5 (8.2%)	0 (0%)
Other	3 (2.5%)	0 (0%)	3 (5.4%)
pT stage			
0	14/117 (12.0%)	13/61 (21.3%)	1/56 (1.8%)
1	36/117 (30.8%)	19/61 (31.1%)	17/56 (30.4%)
2	23/117 (19.7%)	11/61 (18.0%)	12/56 (21.4%)
3	38/117 (32.5%)	18/61 (29.5%)	20/56 (35.7%)
4	6/117 (5.0%)	0/61 (0%)	6/56 (10.7%)
pN stage			
0	49/117 (41.9%)	31/61 (50.8%)	18/56 (32.1%)
1	41/117 (35.0%)	23/61 (37.7%)	18/56 (32.1%)
2	16/117 (13.7%)	5/61 (8.2%)	11/56 (19.6%)
3	10/117 (8.5%)	2/61 (3.3%)	8/56 (14.4%)
Unknown	1/117 (0.9%)	0/61 (0%)	1/56 (1.8%)
Final pathologic stage			
0/pCR	11/117 (9.4%)	10/61 (16.4%)	1/56 (1.8%)
I	35/117 (29.9%)	17/61 (27.9%)	18/56 (32.1%)
II	30/117 (25.6%)	15/61 (24.6%)	15/56 (26.8%)
III	31/117 (26.5%)	17/61 (27.9%)	14/56 (25.0%)
IV	10/117 (8.6%)	2/61 (3.2%)	8/56 (14.3%)
Neoadjuvant therapy			
Yes	64/117 (54.7%)	46/61 (75.4%)	18/56 (32.1%)
No	53/117 (45.3%)	15/61 (24.6%)	38/56 (67.9%)
Procedure			
Total/completion gastrectomy	44/117 (37.6%)	--	44/56 (78.6%)
Total gastrectomy with HIPEC	5/117 (4.3%)	--	5/56 (8.9%)
Proximal gastrectomy	7/117 (6.0%)	--	7/56 (12.5%)
Ivor-Lewis esophagogastrectomy	41/117 (35.0%)	41/61 (67.2%)	--
FJT placement before surgery		7/41 (17.1%)	--
3-field McKeown esophagogastrectomy	20/117 (17.1%)	20/61 (32.8%)	--

	All N=117	Esophagogastrectomy N=61	Gastrectomy N=56
FJT placement before surgery		2/20 (10.0%)	--
FJT placement approach			
Laparoscopic/Laparoscopic-assisted	87/117 (74.4%)	57/61 (93.4%)	30/56 (53.6%)
Open	30/117 (25.6%)	4/61 (6.6%)	26/56 (46.4%)
FJT placement technique			
Modified Seldinger	74/117 (63.3%)	57/61 (93.4%)	17/56 (30.4%)
Stamm	10/117 (8.5%)	1/61 (1.7%)	9/56 (16.1%)
Witzel	28/117 (23.9%)	3/61 (4.9%)	25/56 (44.6%)
Unknown	5/117 (4.3%)	0/61 (0%)	5/56 (8.9%)

* median (range); pT, pathologic T stage; pN, pathologic N stage; pCR, pathologic complete response; FJT, feeding jejunostomy tube

Table 2

Feeding jejunostomy tube duration and usage during adjuvant therapy

	All N=117	Esophagogastrectomy N=61	Gastrectomy N=56
Time on TF after inpatient discharge (median, days)	45 (5–591)	37.5 (5–439)	71 (7–591)
1–30 days	26/74 (35.2%)	15/44 (34.1%)	11/30 (36.7%)
31–60 days	17/74 (23.0%)	14/44 (31.8%)	3/30 (10.0%)
61–90 days	9/74 (12.2%)	5/44 (11.4%)	4/30 (13.3%)
>90 days	22/74 (29.7%)	10/44 (22.7%)	12/30 (40.0%)
Adjuvant therapy			
Did not require therapy	52/117 (44.4%)	37/61 (60.7%)	15/56 (26.8%)
Received therapy	51/117 (43.6%)	18/61 (29.5%)	33/56 (58.9%)
Used FJT during therapy	19/51 (37.3%)	4/18 (22.2%)	15/33 (45.5%)
Unknown	14/117 (12.0%)	6/61 (9.8%)	8/56 (14.3%)

FJT, feeding jejunostomy tube; TF, tube feedings

Table 3

Complications in patients undergoing resection for gastroesophageal cancer

	All N=117	Esophagogastrectomy N=61	Gastrectomy N=56
Number of FJT complications			
No complication	65/117 (55.6%)	39/61 (64.0%)	26/56 (46.4%)
1 complication	42/117 (35.9%)	20/61 (32.8%)	22/56 (39.3%)
2 complications	7/117 (6.0%)	1/61 (1.6%)	6/56 (10.7%)
3 complications	3/117 (2.5%)	1/61 (1.6%)	2/56 (3.6%)
Type of FJT complication			
<i>Mechanical</i>	54	21	33
Dislodged	22	8	14
Clogged	13	3	10
Suture reaction/fell out	13	6	7
FJT leak	6	4	2
<i>Non-mechanical</i>	14	5	9
TF intolerance	5	3	2
FJT site infection	4	1	3
SBO	3	0	3
Major bleeding	1	0	1
Other	1	1	0
Non-FJT inpatient complications			
Minor (I–II)	42/117 (35.9%)	22/61 (36.1%)	19/56 (33.9%)
Major (III–IV)	30/117 (25.6%)	17/61 (27.9%)	13/56 (23.2%)
Death (V)	1/117 (0.9%)	0/61 (0%)	1/56 (1.8%)
Length of stay (median)	9 (5–83)	9 (5–83)	9 (5–67)

FJT, feeding jejunostomy tube; TF, tube feedings