



# Jejunostomy or nasojejunal tube after esophagectomy: a review of the literature

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**Abstract:** Patients undergoing esophagectomy for cancer are a difficult to treat group of patients. At diagnosis they will present some degree of malnutrition in up to 80% and the causes are from multifactorial origin: the inability of food ingestion, advanced age, taste disturbances, and morbidity related to neoadjuvant treatment. In order to restore the nutritional status, enteral nutritional support is preferable to parenteral support because of the risks of septic complications associated with venous catheters. During the postoperative period, the oral route is often inaccessible in these patients due to swallowing disorders and eventually mechanical ventilation, and if possible, often it does not provide sufficient caloric amounts for postoperative energy balance. For these reasons, it is usually recommended additional nutritional support. There are few studies in the literature that specifically address which is the most adequate route for enteral nutrition in patients undergoing esophagectomy. Nasojejunal catheters present a higher incidence of local complications, such as displacement and occlusion, whereas jejunostomy is more associated with reinterventions for the treatment of complications secondary to extravasation. Although there is weak evidence in the literature and a lack of randomized, prospective and multicenter studies evaluating the best enteral nutrition route in the postoperative period of esophagectomy, the use of the nasoenteric catheter seems to be adequate due to its simplicity of positioning and low rates of severe complications. In this paper a review is performed of the evidence about this subject.

**Keywords:** Enteral nutrition; esophagectomy; jejunostomy; nasojejunal catheter; parenteral nutrition; nutritional support

Submitted Nov 12, 2018. Accepted for publication Dec 10, 2018.

doi: 10.21037/jtd.2018.12.62

**View this article at:** <http://dx.doi.org/10.21037/jtd.2018.12.62>

## Introduction

Esophagectomy is considered a complicated procedure, indicated for the curative treatment of benign, premalignant and malignant lesions of the esophagus. Eighty percent of the patients show some degree of malnutrition. The etiology of malnutrition is multifactorial and includes

anorexia induced by neoplasia; gastrointestinal disorders such as dysphagia, odynophagia, nausea, and vomiting; nutrient absorption disorders; side effects of neoadjuvant treatment; and constitutional aspects such as age and comorbidity (1-4).

Esophagectomy is a surgical procedure usually performed by a 3-stage approach (abdominal, thoracic and cervical

phases). It is associated with high rates of complications especially cardio-respiratory and anastomotic leakages (5,6). These complications will increase the length of hospital stay and hospital costs (3). Moreover, mortality rates between 1% and 4% are described in the most dedicated world centers (7).

During the postoperative period, the maintenance of patients in a nil per mouth regimen is unacceptable, since such practice worsens the already depleted nutritional status of these patients. The enteral oral route is not always available, and the parenteral route carries the risk of septic complications, especially those related to central venous catheters (8,9).

This review article will address the main aspects related to nutritional support on the postoperative period of patients submitted to esophagectomy, especially those related to the use of nasojejunal catheter and jejunostomy as routes for enteral feeding.

### **Nutritional aspects in patients with malignant esophageal neoplasia**

Patients with esophageal cancer are a group at nutritional risk. It is estimated that 80% of them have some degree of malnutrition at cancer diagnosis. This is because oral food ingestion is hampered by symptoms such as dysphagia, odynophagia and chest pain, which not only prevent the adequate intake of nutrients but also cause hyporexia, hampering, even more, the food intake inability (4).

Recently, neoadjuvant chemoradiotherapy have been indicated in some stages before surgery for esophageal cancer. It will be a cause of palate disturbances which can worsen even more the hyporexia. Local site effects directly associated with chemoradiotherapy can further aggravate the nutritional deficit of these patients. Furthermore, patients under neoadjuvant treatment, also will have, frequently depression disorders and lesions in gastrointestinal mucosa that generates a deficit of absorption of nutrients and its metabolism (10).

Malnutrition is known to increase the risk of postoperative complications such as deep venous thrombosis, anastomotic leakages, and respiratory infections related to mortality in 50% of patients (11).

Patients with malignancies tend to have higher resting energy expenditure than healthy individuals (12). Bosaeus *et al.* analyzed 297 patients with malignant tumors of different etiologies, most of them of the gastrointestinal tract. They noted that weight loss was significant associated

with high energy expenditure at rest than with low volume of ingested food (11).

Moreover, an increase in serum of acute phase proteins, such as C-reactive protein and mannose-binding protein, and proinflammatory cytokines—interleukin 1 and 6 and tumor necrosis factor were found. It seems that patients with malignancies have a state of hypermetabolism with increased protein intake, hepatic gluconeogenesis, insulin resistance and glucose intolerance (10).

### **Post-operative nutrition support**

It is clear that patients submitted to radical surgical treatment for esophageal cancer should receive some form of nutritional support in the postoperative period. This nutritional support should be established as early as possible in order to reduce catabolism, restore immune and cardio-respiratory functions and avoid as possible the postoperative weight loss (13).

The benefits of adopting recommendations related to the Enhanced Recovery After Surgery (ERAS) protocols are well known. The primary objective is to stimulate postoperative measures that favor the patient early recovery, reducing the length of hospital stay. Among them are measures that aim to avoid the paralytic ileus stimulating the early introduction of enteral feeding (14-16).

In a recent guideline published on the benefits of the ERAS protocol in the recovery of patients undergoing colorectal surgery, some perioperative clinical maneuvers have been strongly recommended. They all provided a reduction in postoperative morbidity, accelerated the patient functional recovery, and were all related to early hospital discharge (17).

Amid those, worth it the introduction of oral feeding as soon as the patient regains consciousness and can start eat. Early reintroduction of the oral nutrition was not only not associated with an increase in postoperative nausea and vomiting but also was associated with a reduction in length of hospital stay.

Findlay *et al.* in a meta-analysis, evaluated the implementation of ERAS program guidelines in patients undergoing esophagectomy. They found six non-randomized publications whose group of patients showed great heterogeneity and the included population did not allow a reliable analysis. However, despite this, the authors suggest that the ERAS program in esophagectomized patients may be compatible with lower postoperative morbidity and mortality and associated with shorter

hospitalization time (18).

In a recent systematic review study by Markar *et al.*, the early reintroduction of the enteral feeding was associated with a reduction in hospital stay. This occurred especially when early oral feeding had happened in patients operated by dedicated surgeons in high-volume hospitals. This association was also related to a reduction in postoperative morbidity and mortality rates (19).

Regarding route for nutritional support, when comparing parenteral to enteral route, it seems very clear that, whenever possible, postoperative nutritional support should be done by the enteral route (20,21).

Gabor *et al.* evaluated 88 patients submitted to parenteral or enteral nutritional support in the postoperative period after esophagectomy because of gastroesophageal junction tumor. There were 44 patients analyzed in each of these groups. Nutritional support was started on the first postoperative day in both situations. They observed a similar incidence of postoperative morbimortality, but the length of stay in the intensive care unit and overall hospital stay were lower in the group receiving enteral nutritional support (21).

Fujita *et al.* retrospectively analyzed 164 patients undergoing esophagectomy for esophageal cancer: eighty-eight patients received parenteral nutrition, and the other 76 patients' enteral nutrition. Mortality in both groups was similar as was the overall rate of postoperative complications. Nevertheless, the most severe postoperative complications, such as pneumonia and anastomotic leakage were lower in the enteral nutrition group, but also the hospital stay was shorter (22).

Although postoperative morbidity and mortality in patients nourished by one of these two pathways were similar, enteral nutritional support has some other advantages. It has a lower cost, it is capable of delivering macro and micronutrients in the in natura form, maintains the integrity of the gastrointestinal mucosa and intestinal barrier, reducing bacterial translocation, the systemic inflammatory response and septic complications.

Moreover, the enteral route is considered more physiological and less burdensome than parenteral nutrition. According to a meta-analysis that included 2,552 patients, the enteral feeding was associated with fewer general complications ( $P=0.004$ ), fewer infectious rates ( $P=0.001$ ), less anastomotic leaks ( $P=0.03$ ) and shorter hospital stay ( $P=0.02$ ) (23).

However, the enteral feeding cannot always be administered, sometimes caused by a prolonged ileus,

sometimes because of diarrhea induced by the enteral diet and sometimes caused by an intense inflammatory response associated with low perfusion situation. In such cases, parenteral nutrition should be indicated (24).

Another point of controversy lies in the definition of the ideal moment to start the enteral feeding in the postoperative period. In order to obtain the maximal benefits of the enteral nutritional support, it should be started in the first 48 hours of the postoperative period. It is known that, based on studies on experimental animals, the regular intestinal motor activity is restored about four to eight hours after the surgical trauma (13).

Those who oppose the early introduction of the postoperative enteral feeding in patients operated for esophageal cancers report the risks of stasis of food in the gastric tube and vomiting that would cause dilatation and mechanical stress to the esophageal anastomosis increasing the risk of anastomotic leakage, but also refer to the absorptive incapacity presented by the gastrointestinal tract direct after operation.

Notwithstanding, Gabor *et al.* compared the results of enteral nutrition and total parenteral nutritional support in patients submitted to esophagectomy and gastrectomy. The enteral feeding was more efficient in the prevention of gastric mucosa atrophy, in the preservation of immunocompetence, in the earlier return of intestinal activity, and in a lower risk of intestinal bacterial translocation (21).

In a recent observational cohort study of patients undergoing esophagectomy and gastrectomy for cancer by Lopes *et al.*, it was observed that the introduction of the early enteral feeding in the postoperative period was associated with a trend of lower incidence of septic complications and a reduction in the hospital stay (25).

### **Enteral feeding route—oral, nasoenteric catheter and jejunostomy**

Despite all benefits, the early introduction of oral and enteral feeding in patients undergoing esophagectomy is not always possible. Unfortunately, for many reasons, the oral route, especially in the first days after the surgical procedure, is not reliable (26).

It is known that the postoperative morbidity of esophagectomy is not negligible, especially from the respiratory point of view. Often there is a need for prolonged periods of mechanical ventilation, at which time, for obvious reasons, patients are unable to take oral

food (6). Also, there may be an oropharynx motor incoordination and, while swallowing, there is a risk of pulmonary aspiration and postoperative pneumonia.

Food intake may also be a cause of post-eating vomiting, especially in this group of patients who may have delayed gastric emptying. This vomit could increase the possibility of anastomotic leaks (26). Other studies have evaluated the early oral feeding in the direct postoperative esophagectomy period, showing that the early oral feeding was not associated with an increased incidence of vomiting and nausea, nor was it considered a risk factor for anastomotic leakage. Moreover, those patients who received early oral feeding have a shortened hospital stay (25).

Weijs *et al.* in a non-randomized prospective and multicentric study, evaluated the impact of early oral feeding in the postoperative period of patients undergoing esophagectomy. Fifty patients were operated consecutively and compared to a historical group of 50 other patients submitted to the same surgical procedure (27).

The incidence of postoperative pneumonia was 28% in the early oral feeding group and 40% in the oral fasting group ( $P=0.202$ ). The incidence of aspiration pneumonia was identical in both groups. There was no statistical difference in the incidence of anastomotic leak (14% *vs.* 24%). They found a shorter hospital stay and intensive care unit stay for the group receiving an early oral feeding.

However, after esophagectomy, patients cannot always restore the oral diet early in the postoperative period, and even when it happens, it takes time to the caloric intake usually necessary to balance the daily energy expenditure (28). Furthermore, when there are postoperative complications, these patients may require enteral nutritional therapy for periods longer than 30 days, since this is, in general, the expected time for the spontaneous closure of cervical anastomotic leaks. Also, patients may evolve with swallowing disorders which would require a longer use of this enteral route after discharge in up to 23% of patients (29).

In general, the enteral diet has benefits for the patient, such as a decrease in infectious complications, a lower cost and a shorter hospital stay (8,21,24,30,31). Other advantages are the modulation of the organic response, the positive influence on tissue healing and splanchnic flow, stimulating intestinal motility and, consequently, decreasing postoperative paralytic ileus (24,32,33).

For these and other reasons, additional enteral nutrition is recommended through biocompatible catheters, usually positioned in the proximal jejunum. Essentially, there are

two access routes to administer the enteral diet: nasoenteral catheter or by jejunostomy (17,34,35).

Preoperative placement of the nasoenteral catheter via the transanal route in the proximal jejunum is not considered a highly complex procedure. Nevertheless, and not infrequently, the nasojejunal catheter may displace, externalize and even obstructs, which would prevent its use as an enteral nutritional route in the postoperative period (36). Its exchange and repositioning may be a cause of increased surgical morbidity. In such situations, it is frequent to change the feeding to parenteral nutrition.

Differently, jejunostomy presents lower displacement rates, obstruction, and exteriorization. Per contra, it is a more complicated procedure when compared to the nasoenteric catheter, whose related complications may be important, such as catheter-adjacent dermatitis, wound infection, intestinal obstruction and leakages with peritonitis. Reoperations due to complications related to jejunostomy occur in up to 3% of the cases (37).

However, the best access route to the gastrointestinal tract for enteral feeding has not been established, and there is no consensus among authors. Currently, the route used, whether nasojejunal catheter or jejunostomy, is usually defined according to the surgeon's preference and protocols of his institution.

The European Society of Parenteral and Enteral Nutrition (ESPEN) classified as grade A recommendation the early introduction of oral or enteral oral diet in the first 24 hours in gastrointestinal operations and, as grade B recommendation, starting the diet by catheter when the anastomosis is performed proximal in the gastrointestinal tract (38).

There are few comparative studies on the best way to offer enteral diet in the postoperative period. Abu-Hilal *et al.* published a retrospective study in 2010 in which 100 patients undergoing pancreatoduodenectomies had jejunostomies (25%), or gastrojejunostomies (32%) or nasoenteric catheters (43%). Complications were more frequent with percutaneous techniques (24% and 34%) when compared with nasoenteric catheters (12%), respectively (39). Gerritsen *et al.* retrospectively evaluated 144 patients undergoing duodenopancreatectomy, showing that the nasoenteric catheter group had more complications related to the catheter (41% *vs.* 23%,  $P=0.06$ ), most of them due to its displacement. In eight of the 15 patients, the catheter could be repositioned. However, the jejunostomy group presented more severe complications, requiring relaparotomy in 6% of cases, and one of these patients died (40).

### Comparative studies between jejunostomy and nasojejunal catheter

As shown previously in this review, there is a consensus among authors that the enteral feeding should be started as soon as possible, usually within the first 48 hours postoperatively. Still, there are few studies directly comparing the best access route for the introduction of the enteral nutrient in the postoperative period of patients submitted to esophagectomy.

Han-Geurts *et al.* published the only randomized prospective study on esophagectomy patients. They compare the best route of enteral nutrition, jejunostomy or nasoenteral catheter in a group of 150 patients. There were 79 patients with jejunostomy and 71 patients in the group of nasoenteral catheter. The total duration of enteral feeding, catheter-related complications, and enteral feeding intolerance were similar in both groups. There was no statistical difference regarding the incidence of anastomotic leakages in cervical anastomosis and pneumonia in both groups (41).

In another prospective and randomized study comparing the nasoenteric catheter and jejunostomy as a nutritional route in the postoperative period of patients submitted to upper digestive tract operations (esophagectomy, gastrectomy and pancreaticoduodenectomy), Torres Júnior *et al.* evaluated 42 patients. There were 21 patients submitted to jejunostomy and 21 patients to nasoenteral catheter. There was no statistical difference between the groups regarding the incidence of catheter-related complications and, according to the authors, jejunostomy had the benefit of being able to be used for longer periods, especially in those patients with severe postoperative complications and longer hospital stay (42).

Wang *et al.* in a meta-analysis study, evaluated 420 patients in five comparative studies evaluating the use of postoperative nasoenteral catheter or jejunostomy for feeding. They observed that the length of hospital stay, duration of nutritional support and return to the oral diet were lower in the nasoenteral catheter group. Catheter displacement was more frequent in the nasojejunal catheter group but, unlike jejunostomy, no patient had to be operated on due to catheter-related complications (43). Berkemans *et al.* confirmed these results (44).

The Taiwan Society of Gastroenterology, in patients undergoing esophagectomy, suggest the superiority of jejunostomy over the nasoenteral catheter, since the former has lower indices of displacement and interruption of the

nutritional support. Nevertheless, they concluded that, in randomized studies, there is no evidence of the superiority of one nutritional route over the other (45).

### Conclusions

Patients submitted to esophagectomy constitute a select group of patients. They usually present some degree of malnutrition that is associated with an increase in postoperative morbidity and mortality. Moreover, the early introduction of oral feeding is not always possible, and its benefits have not yet been completely proven. The enteral feeding should preferably be used over the parenteral feeding and, for this, it is necessary to use the nasoenteral catheter or jejunostomy. There is no superiority of one route over the other and, due to the lower incidence of severe complications associated to the nasoenteric catheter, this should be the preferred route of enteral nutrition in patients undergoing esophagectomy.

### Acknowledgements

None.

### Footnote

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

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**Cite this article as:** de Vasconcellos Santos FA, Torres Júnior LG, Wainstein AJ, Drummond-Lage AP. Jejunostomy or nasojejunal tube after esophagectomy: a review of the literature. *J Thorac Dis* 2019;11(Suppl 5):S812-S818. doi: 10.21037/jtd.2018.12.62