

# Functional Conduit Disorder Complicating Esophagectomy



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## KEYWORDS

• Esophagectomy • Disorders • Functional conduit disorder • Esophageal cancer

## KEY POINTS

- Multimodality therapy as well as early detection of esophageal cancer has increased long-term survival, making postoperative quality of life an important issue in a larger portion of patients following esophagectomy.
- Functional problems after esophagectomy can dramatically affect quality of life.
- Anastomosis placed in the mid and lower chest can increase the incidence of delayed gastric emptying and reflux.
- Delayed gastric emptying, anastomotic stricture, dumping, and reflux are common sequelae of esophagectomy.
- Surgeons should be committed to long-term follow-up of these patients and develop strategies for treating these functional disorders.

## INTRODUCTION

In the United States, esophagectomy is performed for a wide spectrum of conditions but predominantly for cancer. Approximately 85% of the 18,170 patients diagnosed annually with esophageal cancer in the United States will die of their disease.<sup>1</sup> The early detection and resection of esophageal cancer provides the best chance of cure.<sup>2</sup> The most common esophageal cancer surgical procedures are (1) open transhiatal esophagectomy, (2) open transthoracic or Ivor Lewis esophagectomy (ILE), (3) open 3-hole or McKeown esophagectomy, and (4) hybrid or full minimally invasive esophagectomy.<sup>3–5</sup> All these procedures are complex, technically challenging, and require advanced surgical skill and training. The optimum approach to resection depends on individual patient and tumor characteristics, body habitus,

patient comorbidities, history of previous surgery, individual surgeon biases, and surgeon preferences. The advantages of various technical approaches and the incidence of morbidity and mortality associated with esophageal resection, as well as postoperative quality of life, remain controversial issues in thoracic surgery and thoracic oncology.

Outcomes from surgical approaches for esophageal cancer have significantly improved. In the early 1940s, perioperative mortality of 72% was associated with esophagectomy.<sup>6</sup> In 1946, introduction of the standardized Ivor Lewis approach for esophagectomy helped to reduce this mortality.<sup>3</sup> Modern case series estimate that perioperative mortality ranges from 5% to 10%, with morbidity rates greater than 50%,<sup>7–10</sup> although high-volume centers have demonstrated a mortality rate less than 2%.<sup>11–13</sup> Currently, overall 5-year

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survival rate in patients amenable to definitive treatment ranges from 19% to 30%.<sup>14</sup> Barrett's surveillance programs have increased detection of early-stage cancer, increasing the potential for cure and making the maintenance of quality of life increasingly important. Esophagectomy has the potential to be a life-altering operation. Patients can lose up to 15% to 20% of their body weight from the time of diagnosis through the first 6 months after the surgery, but this trend typically stabilizes after 6 months. Most patients adapt to smaller, more frequent, meals. Simple sugars and fluids at mealtime may need to be avoided until the function of the conduit is established. It is important to match the surgical approach according to the tumor and physiologic issues. Other factors that can affect functional outcome include choice of reconstructive conduit, and location, as well as technique of anastomosis. Short-term conduit function will vary but can be impacted by timing of nasogastric (NG) tube removal, timing of resumption of oral diet, and utilization of postoperative jejunostomy feeding tubes.

The reconstructive method of choice for most surgeons after esophagectomy is gastric interposition (>90% of the cases). Colon interposition is an appropriate alternative but in many centers the colon is used when the stomach is unavailable due to tumor extension or previous surgery.<sup>15,16</sup> According to the Society of Thoracic Surgeons (STS) guidelines, the gastric tube is the preferred esophageal substitute. Alternatively, in some cases, the small intestine, pedicled Roux-en-Y reconstruction (typically appropriate to the level of the inferior pulmonary vein), free graft (requires microvascular anastomosis), or pedicled skin-muscle flaps, can be selectively used. Either thoracic or cervical anastomoses are applied for gastric tube reconstruction. The creation of the gastric neo-esophagus is associated with substantial alteration to the stomach blood supply. Ligation of left gastric, short gastric, and left gastroepiploic arteries typically results in significant potential for ischemia at the tip of the conduit, which is typically the location of the anastomosis.<sup>17</sup> Anastomotic methods can include hand-sewn anastomoses (continuous and interrupted sutures, single-layer or double-layer sutures, absorbable or nonabsorbable stitches), stapling (circular and linear), and combined hand-sewn and stapled anastomoses.<sup>18,19</sup>

Delayed gastric emptying (DGE), dumping syndrome, anastomotic stricture/leak, and reflux are recognized postoperative complications that can contribute to nutritional problems and impact postoperative quality of life. There is no one surgical approach that can eliminate any one of these complications, but certain techniques have the

potential to reduce conduit dysfunction. The restoration of foregut function after esophagectomy greatly affects patient satisfaction and continues to challenge esophageal surgeons. This review focuses specifically on functional conduit disorders after esophagectomy.

## DELAYED GASTRIC EMPTYING

After esophagectomy, the stomach is commonly used to restore the continuity of the upper gastrointestinal tract.<sup>20,21</sup> However, functional conduit disorders, such as DGE, can occur, which significantly impacts postoperative nutrition and quality of life. DGE puts patients at increased risk of aspiration pneumonia, malnutrition, decreased patient satisfaction, prolonged hospital stay, and readmissions.<sup>22,23</sup> The current literature reports the incidence of DGE as ranging between 10% and 50%.<sup>24-27</sup> However, documenting the actual incidence is complex because the definition of DGE varies among institutions. Most of the time patients complain of reflux, regurgitation, early satiety, pain, and bloating while eating.

DGE may result from a number of causes: vagotomy, torsion of the stomach in the right chest, compression of distal gastric conduit at the hiatus, gastric conduit redundancy, and pyloric obstruction. The incidence of DGE appears to be higher in patients with intrathoracic anastomosis due to the increased potential of gastric conduit redundancy above the level of the diaphragm. Early satiety after esophagectomy is common, and results from diminished motor function and loss of gastric reservoir. Immediately after esophagectomy, the gastric conduit functions as a nonmotile tube, and ingested food must empty by gravity alone (Fig. 1). Patients should be routinely advised to initiate oral nutrition with multiple (5-6) small portions throughout the day, rather than attempt to consume 3 regular meals in the first month after reconstruction. Gastric contractility is not completely lost after esophagectomy and the denervated stomach may recover some motor function over time. This is one of the issues that surgeons use to support a stepwise resumption of oral intake following esophagectomy and the use of temporary jejunostomy tubes. The motor activity of the gastric tube is affected by the size, shape, and location of the neo-esophagus. The gastric conduit can be placed in 3 locations: (1) the original esophageal bed in posterior mediastinum, (2) retrosternal space, or (3) tunneled subcutaneously anterior to the sternum. There have been no studies to date that show significant differences in conduit emptying between these various pathways.<sup>28-30</sup>

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