Operative Dictations in General and Vascular Surgery

Third Edition

Jamal J. Hoballah
Carol E. H. Scott-Conner
Hui Sen Chong

Springer

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Editors

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To my husband Harry who has always been there for me. (CS-C)

To my wife Leila, my sons Jawad and Nader, and my sister Wafa for their love and support. (JJH)

To my parents Yew Kiang Chong and Sew Ying Chung with their never ending support,

To my husband Kent Lee who is my rock and my stability,

To all my colleagues and residents at the University of Iowa who have grown and matured with me over the years. (H-S C)

Preface

A Special Word to Surgical Residents and Fellows

The operative dictation, or "op note" as it is commonly called, is one of the most important pieces of the medical record that a surgeon creates. In an era when we increasingly rely upon electronic "templates" and check lists, it is especially important to accurately record what actually happened in the operating room. This includes the indications, the findings, the steps in the procedure, who participated, and the sutures and devices that were used. This accurate yet efficient recording is a crucial skill that all surgeons must learn. It is, however, rarely taught. This book will help you with every phase of every dictation.

This is a book we wished we had when we were residents. It is a book we want our residents to have and to use. Read it before going into the OR to do a case. For each operation, we list the indications and the essential technical steps, as well as common variations and complications. Make it your practice to scan through this material before you scrub. This will serve as a quick reminder and an excellent preparation for the case at hand.

Then, in the operating room, concentrate on the details of the particular case – the findings and any particular variation in technique. Adapt the standardized operative dictation note to your needs and promptly document what occurred. Consolidate what you learn by taking notes. Learn the technical variations favored by individual attending surgeons with whom you scrub. Note their preferences in suture materials, patient positioning, and other small details.

Surgery is made up of thousands of small details. Sooner than you might believe, you will be facing your board exams and then the even greater challenge of working independently. When you do, this book will prove to be a valuable resource. It will help you recall what you have learned and determine your own technical preferences.

The 3rd edition of this book, once again, seeks to put a world of technical information in your pocket, or OR locker. New operations have been added, so that the book continues to contain the majority of procedures commonly performed by general and vascular surgeons. All chapters have been comprehensively revised to incorporate new variations in technique and indications.

Most chapters have new authors who have thoroughly revised the material. A third editor, Hui Sen Chong, an experienced minimally invasive surgeon, has been added.

We hope you will enjoy using this unique resource. We welcome your comments or suggestions.

Beirut, Lebanon — Jamal J. Hoballah, MD, MBA, FACS
Iowa City, USA — Carol E.H. Scott-Conner, MD, PhD
Iowa City, USA — Hui Sen Chong, MD

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Part I

General Surgery: Esophagus

Ivor Lewis Esophagectomy (Laparotomy, Right Thoracotomy with Thoracic Anastomosis)

1

Evgeny V. Arshava and Kalpaj R. Parekh

Indications

- Carcinoma of the middle third of the esophagus (tumors located more than 25 cm and up to 30 cm from the incisors)
- Carcinoma of the distal third of the esophagus with proximal extent extending to 30 cm from the incisors
- Inadequate length of gastric conduit for cervical anastomosis
- High-grade dysplasia in Barrett's esophagus with proximal extent extending to 30 cm from the incisors
- Rarely esophageal disorders requiring near-total esophagectomy (e.g., sigmoid esophagus secondary to achalasia)

Essential Steps

Abdominal Dissection

1. Single-lung ventilation via double-lumen endotracheal tube.
2. Upper midline abdominal incision and abdominal exploration.
3. Divide the gastrocolic ligament, preserve the right gastroepiploic vessels, and divide the left gastroepiploic and short gastric vessels.
4. Divide the gastrohepatic ligament and preserve the right gastric artery.
5. Divide the left gastric vessels.
6. Dissect hiatus and mobilize distal esophagus circumferentially within mediastinum.
7. Gastric drainage procedure: pyloromyotomy, pyloroplasty, or Botox injection to prevent delayed gastric emptying.
8. *Initiate staple line to create the 4–5 cm-wide gastric conduit (optional).*
9. Create feeding jejunostomy.
10. Close laparotomy.

Thoracic Dissection

11. Reposition patient in the left lateral decubitus position.
12. Right posterolateral thoracotomy through the fifth intercostal space.
13. Divide the azygos vein.
14. Dissect the esophagus from the hiatus up toward the thoracic outlet. Include paraesophageal and subcarinal lymph nodes in the specimen.
15. Pull stomach into the chest and create a 4–5 cm-wide gastric conduit.
16. Divide the esophagus proximally and remove the specimen.

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17. Perform stapled/sutured esophagogastric anastomosis.
18. *Close hiatus around the distal stomach*.
19. Place the chest tube and close the chest.

Note These Variations

- Creation of the gastric conduit in the abdomen versus in the chest
- Stapled vs sutured anastomosis (size of stapler and type of suture)
- Pyloromyotomy vs pyloroplasty vs Botox injection

Complications

- Anastomotic leak
- Anastomotic stricture
- Gastric necrosis
- Delayed gastric emptying
- Injury to the tracheobronchial tree
- Splenic injury
- Chylothorax
- Hiatal hernia
- Reflux and dumping syndrome

Template Operative Dictation

Preoperative Diagnosis *Carcinoma/high-grade dysplasia* of the *middle/lower third of the esophagus/other*

Procedure Ivor Lewis esophagectomy

Postoperative Diagnosis Same

Indications This ___-year-old *male/female* with *carcinoma/high-grade dysplasia of the esophagus extending from ___ to ___ cm/other. (If carcinoma, details of preoperative staging and any neoadjuvant chemotherapy and radiation therapy are given.)* Esophagectomy was indicated.

Description of Procedure Patient was positioned supine. Time-outs were performed using both preinduction and pre-incision safety checklists to verify correct patient, procedure, site, and additional critical information prior to beginning the procedure. After induction of general anesthesia, the patient was intubated with a double-lumen endotracheal tube.

An upper midline laparotomy was performed from the xiphoid process to the umbilicus. The abdomen was explored for metastatic disease, and *none was noted/describe other findings*. The left triangular ligament was divided and the left lobe of the liver was retracted.

The stomach was inspected and the right gastroepiploic artery determined to have a palpable pulse. The gastrohepatic ligament was divided. A *replaced/accessory left hepatic artery was identified and preserved/divided*. The right gastric artery was preserved. The left gastric vascular pedicle was identified and divided proximally, including all adjacent lymph nodes in the specimen.

Attention was then directed to the hiatus. The phrenoesophageal ligament was divided. The distal esophagus was encircled with a Penrose drain for retraction. The hiatus was enlarged and circumferential mediastinal esophageal dissection was carried up to the level of the inferior pulmonary ligament.

The gastrocolic ligament was incised in its avascular portion and divided toward the hiatus, dividing the short gastric vessels with care taken to preserve the right gastroepiploic vessels. A *portion of the greater omentum was preserved on the greater curvature for subsequent buttressing around the anastomosis.* The greater curvature of the stomach was then mobilized toward the pylorus, and posterior adhesions of the stomach to the retroperitoneum were taken down.

A Kocher maneuver was performed (very rarely needed).

A *pyloromyotomy/Heineke-Mikulicz pyloroplasty/injection of Botox* was performed to improve gastric emptying postoperatively.

At approximately the level of the third large vein ("crow's foot") along the lesser curvature, lymphatic tissue and vessels were mobilized and divided. Starting from the lesser curvature of the stomach, several stapler loads were sequentially

applied toward the fundus of the stomach, thus creating a 4–5 cm-wide gastric conduit and ensuring a 5 cm margin distal to the tumor. The specimen was removed and sent to pathology to confirm that both margins are adequate and free of tumor. The gastric conduit stapler line was then oversewn with a running absorbable suture of ___.

A feeding *Stamm/Witzel* jejunostomy was placed 20 cm distal to ligament of Treitz and secured to the abdominal wall with multiple tacking sutures.

Hemostasis in the abdomen was assured. The fascia was closed with *a running suture of ____*. The skin was closed with *skin staples/subcuticular sutures.*

The patient was repositioned in the left lateral decubitus position and re-prepped. A right posterolateral thoracotomy was performed through the fifth intercostal space with division of the latissimus dorsi muscle and preservation of the serratus anterior muscle. Single-lung ventilation was established, allowing for anterior retraction of the lung and exposure of the posterior mediastinum. The inferior pulmonary ligament was divided. The azygos vein was isolated and divided. The esophagus was then dissected circumferentially from the level of the hiatus toward the thoracic inlet. The vagal nerves were divided at the level of the azygos vein and cephalad dissection was performed with care to avoid injury to the recurrent laryngeal nerves. Paraesophageal and subcarinal lymph nodes were included with the specimen. Visible lymphatic were carefully ligated.

The esophagus was divided proximally *with a linear cutting stapler/electrocautery.*

The stomach was gently pulled into the chest with care to avoid torsion. Gastroesophageal anastomosis was then performed.

[Choose One]

If sutured: A gastrostomy was performed distal to the proximal staple line. A two-layered anastomosis was constructed between the distal esophagus and the stomach using an inner layer of running ___ and an outer interrupted layer of ___.

If stapled with a linear stapler: A gastrostomy was performed 3 cm distal to the staple line. Interrupted sutures were placed to align the gastric conduit and esophagus. A 35 mm long linear cutting stapler was placed into the cervical esophagus and gastric conduit to create the anastomosis. A nasogastric tube was advanced through the anastomosis and toward the pylorus under direct visualization. The anastomosis was then completed with a full thickness running inner layer of __ suture and an outer interrupted __ suture seromuscular layer.

If stapled with circular stapler: Sizers were used for esophagus to select a ___-mm circular stapler (use at least 25 mm). A full thickness purse-string suture was placed on the esophagus and tied after the anvil was inserted. A gastrostomy was then made/*a small area on the gastric conduit staple line was incised* and the circular stapler inserted into the stomach. The spike was advanced through the anterior wall of the stomach at least 2 cm away from the staple line and engaged with the anvil. The EEA stapler was closed and fired, and two complete donuts were noted. The nasogastric tube was advanced through the anastomosis and toward the pylorus. The gastrostomy was closed with a linear stapler/*in two layers with suture*.

A portion of the omentum was wrapped around the anastomosis and tacked to the apex of the pleura with interrupted sutures.

The hiatus was closed around the stomach with interrupted __sutures.

Two thoracostomy tubes were placed. After adequate re-expansion of the lung, the thoracotomy was closed with figure-of-eight pericostal sutures followed by a running __ suture in layers.

A debriefing checklist was completed to share information critical to postoperative care of the patient. The patient tolerated the procedure well and was taken to the postanesthesia care unit in stable condition.

Acknowledgment This chapter was contributed by Carol E. H. Scott-Conner, M.D., in the previous edition.

2 McKeown Esophagectomy/Three Incision Esophagectomy (Laparotomy, Right Thoracotomy with Cervical Anastomosis)

Evgeny V. Arshava and Kalpaj R. Parekh

Indications

- Carcinoma of the middle or upper third of the esophagus
- High-grade dysplasia of the middle or upper third of the esophagus
- Rarely: esophageal disorders requiring near-total esophagectomy

Essential Steps

Thoracic Dissection

1. Single-lung ventilation via double-lumen endotracheal tube.
2. Right posterolateral thoracotomy through the fifth or sixth intercostal space.
3. Divide the azygous vein.
4. Dissect the esophagus from hiatus into the apex and include paraesophageal and subcarinal lymph nodes into the specimen.
5. Further dissect esophagus bluntly with finger into the thoracic inlet.
6. Avoid injury to the recurrent laryngeal nerves.
7. Place chest tube and close the chest.

Abdominal and Cervical Dissection

1. Double-lung ventilation via double-lumen endotracheal tube.
2. Upper midline abdominal incision and abdominal exploration.
3. Divide the gastrocolic ligament, preserve the right gastroepiploic artery, and divide the left gastroepiploic artery and short gastric arteries.
4. Divide the gastrohepatic ligament and preserve the right gastric artery.
5. Divide the left gastric vessels.
6. Dissect hiatus and mobilize distal esophagus within mediastinum
7. Gastric drainage procedure: pyloromyotomy, pyloroplasty, or Botox injection to prevent delayed emptying.
8. Perform cervical incision along the left sternocleidomastoid muscle and divide strap muscles
9. Mobilize and divide cervical esophagus.
10. Esophagus is drawn into the abdomen.
11. Create a 4–5 cm-wide gastric conduit and remove specimen.
12. Deliver the conduit atraumatically into the neck incision, with proper orientation within the chest.
13. Perform cervical anastomosis.
14. Create feeding jejunostomy.
15. Close laparotomy and neck incision.

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Note These Variations

- Left decubitus vs. modified left decubitus (original McKeown) position
- Pyloromyotomy vs. pyloroplasty vs. Botox injection

Complications

- Anastomotic leak
- Anastomotic stricture
- Gastric necrosis
- Delayed gastric emptying
- Injury to the tracheobronchial tree
- Recurrent laryngeal nerve injury
- Splenic injury
- Chylothorax
- Hiatal hernia
- Reflux and dumping syndrome

Template Operative Dictation

Preoperative Diagnosis *Carcinoma/high-grade dysplasia* of the *upper/middle/distal esophagus/other*

Procedure McKeown esophagectomy

Postoperative Diagnosis Same

Indications This ___-year-old *male/female* with *carcinoma/high-grade dysplasia of the esophagus extending from ___ to ___ cm/other. (If carcinoma, details of preoperative staging and any neoadjuvant chemotherapy and radiation therapy are given.)* Esophagectomy was indicated.

Description of Procedure Time-outs were performed using both preinduction and pre-incision safety checklists to verify correct patient, procedure, site, and additional critical information prior to beginning the procedure. After induction of general anesthesia, the patient was intubated with a double-lumen endotracheal tube. The patient was then positioned in the left decubitus position. The *patient was placed in a modified left decubitus position with right arm "free draped," and the table is later turned to allow for abdominal and cervical incisions without repositioning of the patient (original McKeown approach).*

A right posterolateral thoracotomy was performed through the *fifth* intercostal space with division of latissimus dorsi muscle and preservation of the serratus anterior. Single-lung ventilation was established, allowing for anterior retraction of the lung and exposure of the posterior mediastinum. The inferior pulmonary ligament was divided. The azygous vein was dissected and divided. The esophagus was then dissected circumferentially from the level of the hiatus into the thoracic inlet. Paraesophageal and subcarinal lymph nodes were dissected and incorporated with the specimen. Finger dissection was further performed to mobilize the esophagus to the level of the thoracic inlet.

A thoracostomy tube was placed. After adequate re-expansion of the lung, the thoracotomy was closed with figure of eights pericostal absorbable sutures followed by a running __ sutures in layers.

The patient was repositioned supine. The abdomen was explored for metastatic disease, and *none was noted/describe other findings*. The left triangular ligament was divided and the left lobe of the liver was retracted.

The stomach was inspected and the right gastroepiploic artery determined to have a palpable pulse. The gastrohepatic ligament was divided. A *replaced/accessory left hepatic artery was identified and preserved/divided*. The right gastric artery was preserved. The left gastric vascular pedicle was identified and divided proximally, including all adjacent lymph nodes in the specimen.

Attention was then directed to the hiatus. The phrenoesophageal ligament was divided. The distal esophagus was encircled with a Penrose drain for retraction. The hiatus was enlarged and circumferential mediastinal esophageal dissection was carried up to the level of the inferior pulmonary ligament.

The gastrocolic ligament was incised in its avascular portion and divided toward the hiatus, dividing the short gastric vessels with care taken to preserve the right gastroepiploic vessels. A *portion of the greater omentum was preserved on the greater curvature for subsequent buttressing around the anastomosis.* The greater curvature of the stomach was then mobilized toward the pylorus, and posterior adhesions of the stomach to the retroperitoneum were taken down.

A Kocher maneuver was performed (very rarely needed).

A *pyloromyotomy/Heineke-Mikulicz pyloroplasty/injection of Botox* was performed to improve gastric emptying postoperatively.

At approximately the level of the third large vein ("crow's foot") along the lesser curvature, lymphatic tissue and vessels were mobilized and divided. Starting from the lesser curvature of the stomach, several stapler loads were sequentially applied toward the fundus of the stomach, thus creating a 4–5 cm-wide gastric conduit and ensuring a 5 cm margin distal to the tumor. The gastric conduit stapler line was then oversewn with a running absorbable suture of ___.

Attention was then turned to the left neck. A skin incision was made along the anterior border of the left sternocleidomastoid muscle, starting at the sternal notch and extending slightly above the cricoid cartilage. The platysma was divided and dissection continued medially to the sternocleidomastoid muscle and carotid sheath and laterally to the thyroid. The omohyoid and strap muscles were divided with electrocautery. The middle thyroid vein and the inferior thyroid artery were ligated and divided. Care was taken to protect the recurrent laryngeal nerve. The deep cervical fascia was incised, and with further dissection toward the vertebral bodies, the esophagus was identified, gently mobilized circumferentially, and encircled with a Penrose drain. The cervical esophagus is further mobilized from the superior mediastinum with gentle traction and finger dissection.

The nasogastric tube was withdrawn and cervical esophagus divided with a linear cutting stapler. *The specimen was removed and sent to pathology to confirm that both margins are adequate and free of tumor.*

The gastric conduit was delivered through the mediastinum into the neck without torsion. The gastroesophageal anastomosis was then performed.

[Choose One:]

If stapled with a linear stapler: A gastrotomy was performed 3 cm distal to the staple line. Interrupted sutures were placed to align the gastric conduit and esophagus. A 35 mm long linear cutting stapler was placed into the cervical esophagus and gastric conduit to create the anastomosis. A nasogastric tube was advanced through the anastomosis and toward the pylorus under direct visualization. The anastomosis was then completed with a full thickness running inner layer of __ suture and an outer interrupted __ suture seromuscular layer.

If sutured: A gastrotomy was performed 2 cm distal to the staple line.

A two-layered anastomosis was constructed between the distal esophagus and the stomach using an inner layer of running ___ and an outer interrupted layer of ___.

A drain was placed by the anastomosis and hemostasis achieved. The platysma was reapproximated with a running/interrupted ___ suture. The cervical incision was closed with interrupted/*running* ___ suture.

Feeding *Stamm/Witzel* jejunostomy was placed 20 cm distal to ligament of Treitz and secured to abdominal wall with multiple tacking sutures.

Hemostasis in the abdomen was assured. The fascia was closed with *a running suture of* ____. The skin was closed with *skin staples/subcuticular sutures.*

A debriefing checklist was completed to share information critical to postoperative care of the patient. The patient tolerated the procedure well and was taken to the postanesthesia care unit in stable condition.

Transhiatal Esophagectomy

3

Mohammad A. Bashir

Indications

- *Carcinoma/high-grade dysplasia* of the *lower third of the esophagus/gastric cardia*
- Rarely: benign stricture, severe neuromuscular dysfunction, or perforation

Essential Steps

1. Midline abdominal incision.
2. Divide the gastrocolic ligament.
3. Preserve the right gastroepiploic artery, ligate the left gastroepiploic artery, and ligate the short gastric arteries.
4. Dissect the lesser curvature.
5. Preserve the right gastric and *aberrant left hepatic artery if present.*
6. Ligate the left gastric vessels.
7. Dissect the hiatus, mobilizing the esophagus from below.
8. Kocher maneuver.
9. *Gastric drainage procedure to prevent delayed emptying or Botox injection.*
10. Oblique neck incision.
11. Dissect anterior to the sternocleidomastoid muscle.
12. Avoid traction injury or cautery injury to the recurrent laryngeal nerve.
13. Mobilize the cervical esophagus.
14. Divide the esophagus in the neck and stomach in the abdomen.
15. Pull the specimen down through the abdomen and remove.
16. Create the gastric conduit.
17. Pull the stomach up into cervical incision.
18. Cervical anastomosis: *sutured/stapled.*
19. Place drain adjacent to the anastomosis in the neck.
20. Close the hiatus around the stomach.
21. Check hemostasis and close wounds.

Complications

- Major hemorrhage
- Injury to the tracheobronchial tree
- Recurrent laryngeal nerve injury
- Splenic injury
- Gastric necrosis
- Pneumothorax
- Chylothorax
- Anastomotic leak
- Empyema/mediastinitis

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Template Operative Dictation

Preoperative Diagnosis *Carcinoma/high-grade dysplasia* of the *lower third of the esophagus/ gastric cardia/other*

Procedure Transhiatal esophagectomy

Postoperative Diagnosis Same

Indications This ___-year-old *male/female* had developed dysphagia and on workup was found to have *dysplasia/carcinoma of the esophagus extending from ___ to ___ cm/other. (If carcinoma, detail preoperative staging and any neoadjuvant chemotherapy and radiation therapy given.)* Esophagectomy was indicated.

Description of Procedure The patient was taken to the operating room. Time-outs were performed using both preinduction and pre-incision safety checklists to verify correct patient, procedure, site, and additional critical information prior to beginning the procedure. General anesthesia was induced. He was positioned on the operating table with arms tucked and pressure points padded. The abdomen, chest, and left neck were prepped and draped in the usual sterile fashion. An upper midline incision was made and the abdomen explored. *No evidence of metastatic disease was found/other.*

Attention was then turned to the greater curvature of the stomach, where a palpable gastroepiploic vessel was identified. The left gastroepiploic and short gastric vessels were *ligated with 2-0 silk and divided/or utilizing the Ligasure device*. The right gastroepiploic pedicle was carefully preserved. When the greater curvature was fully mobilized, attention was turned to the lesser curvature. Gentle cephalad traction was placed on the stomach and the lesser sac was entered. The right gastric artery was preserved and the left gastric artery was similarly identified. No anomalous left hepatic artery was identifiable; therefore, the left gastric artery was ligated and divided/*stapled*. The dissection of the lesser curvature was continued to the pylorus. An extensive Kocher maneuver was performed.

Attention was then turned to dissection of the hiatus. The phrenic vein was doubly ligated and divided/ *avoided*; the phrenoesophageal ligament was divided using sharp and blunt dissection. The mediastinum was entered anterior to the esophagus. The left triangular ligament was divided and the esophagus mobilized circumferentially.

The pylorus was identified *and 2-0 silk traction sutures placed on either side. Using needle tip electrocautery, the serosa was incised and the muscle was divided carefully all the way to the mucosa avoiding injury to it/alternately a total of 200 units of Botox were injected in all four quadrants of the pylorus.*

Attention was turned to the neck. The skin was incised obliquely along the medial border of the left sternocleidomastoid muscle extending from the level of the thyroid cartilage to the sternal notch. Dissection was then carried out dividing the platysma and omohyoid and ligating the middle thyroid vein. Blunt dissection was extended to the prevertebral fascia and tracheoesophageal groove. The sternocleidomastoid muscle and carotid artery were gently retracted laterally; care was taken to avoid medial retraction to the recurrent laryngeal nerve. The cervical esophagus was then bluntly mobilized, taking care to avoid injury to the trachea and the right recurrent laryngeal nerve.

At that point we started our mediastinal dissection bluntly from the hiatus and from the neck incision to divide all the esophageal attachments anteriorly and posteriorly.

With the esophagus now free of its attachments, a linear cutting stapler was fired in the neck to create the proximal margin. The entire esophagus was advanced into the abdomen. A *linear cutting stapler* was used to divide the stomach below the gastroesophageal junction, establishing the distal margin. Creation of a the gastric conduit was performed by resecting the GE junction and the lesser curvature of the stomach down to the level of crow's foot of veins using ___ staplers. A suction drain was placed from the neck into the mediastinum and attached to a Penrose drain. The Penrose drain was fixed to the stomach and oriented. The entire apparatus was advanced through the hiatus, bringing the

gastric fundus out through the cervical incision with care taken to avoid torsion of the stomach.

[Choose One:]

***If stapled anastomosis*:** The esophagus and gastric conduit were then aligned and a gastrotomy performed. A limb of a linear cutting stapler was placed down both the cervical esophagus and gastric fundus. The stapler was fired, creating a side-to-side functionally end-to-end anastomosis. A nasogastric tube was advanced through the anastomosis with the end resting distal to the pylorus. The remaining enterotomy was closed in two layers with interrupted 4-0 PDS and 3-0 Vicryl.

If sutured: A two-layer anastomosis was constructed between the distal esophagus and stomach using an inner layer of running 4-0 PDS and an outer layer of 3-0 Vicryl. The nasogastric tube was advanced through the anastomosis and down through the pylorus.

A closed suction drain was placed in the cervical bed and the incision irrigated and closed in the usual fashion. *The pyloromyotomy/pyloroplasty site was reinforced with omentum in a patch fashion.* The hiatus was reapproximated around the stomach and secured with interrupted 2-0 silk suture. *A feeding jejunostomy was created approximately 20 cm from the ligament of Treitz in the usual fashion utilizing a Witzel tunnel and multiple abdominal wall tacking sutures* (Chap. 39).

Attention was then turned to closure. The abdominal fascia was closed with *number 1 PDS suture*. The skin was closed with *skin staples/subcuticular sutures of ___/other.*

A debriefing checklist was completed to share information critical to postoperative care of the patient. The patient tolerated the procedure well and was taken to the postanesthesia care unit in stable condition.

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Transhiatal Esophagogastrectomy with Colonic Interposition

4

Evgeny V. Arshava and Kalpaj R. Parekh

Indications

- Carcinoma of the esophagus and end-stage benign conditions where gastric conduit is not available/suitable
- Salvage operation for prior failed esophageal replacement

Contraindications

- Colonic malignancy or extensive diverticulosis
- Extensive diverticulosis and active diverticulitis

Essential Steps

1. Upper midline abdominal incision and abdominal exploration.
2. Identify the segment of the colon for reconstruction and assess the mesenteric vessels.
3. Measure the length of the colon needed for interposition (from the left ear lobe to the xiphoid process using an umbilical tape).
4. Divide colon and mobilize mesenteric pedicle.

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Transhiatal esophagogastrectomy

5. Divide the gastrocolic ligament and divide the gastroepiploic and short gastric vessels to mobilize the greater curvature for subtotal versus total gastrectomy.
6. Assure adequate lymphadenectomy for carcinoma.
7. Divide the gastrohepatic ligament and divide the left/right gastric vessels to mobilize the lesser curvature.
8. Dissect hiatus and circumferentially mobilize the distal esophagus within the mediastinum.
9. Perform cervical incision along the sternocleidomastoid muscle and divide strap muscles.
10. Perform transhiatal mobilization of the intrathoracic esophagus.
11. Mobilize and divide cervical esophagus.
12. Divide distal *stomach/duodenum* to complete gastrectomy and remove entire specimen.
13. *Gastric drainage procedure (pyloromyotomy or pyloroplasty) or Botox injection to prevent delayed emptying.*

Colonic reconstruction

14. Deliver the conduit in an isoperistaltic fashion into the neck.
15. Perform stapled/sutured esophagocolonic anastomosis.

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16. Perform stapled/sutured anastomosis of the colon to antrum, duodenum, or proximal jejunum.
17. Restore colon continuity with stapled/sutured anastomosis.
18. Close hiatus around the colon.
19. Place the chest tubes and close the chest.
20. Create feeding jejunostomy.
21. Close laparotomy and neck incisions.

Complications

- Anastomotic leak
- Anastomotic stricture
- Conduit necrosis
- Late redundancy of the transposed colon
- Reflux
- Injury to the tracheobronchial tree
- Recurrent laryngeal nerve injury
- Splenic injury
- Chylothorax
- Hiatal hernia

Note These Variations

- Transhiatal versus transthoracic mobilization of the esophagus
- Subtotal versus total gastrectomy
- "Supercharged colon conduit" (vascular reimplantation – not described here)
- Position of colon in posterior mediastinum versus substernal location for cervical anastomosis
- Intrathoracic (as described in Chap. 1) versus cervical anastomosis (transhiatal esophagectomy as described in Chap. 3)
- Distal anastomosis of the colon to antrum versus jejunum versus duodenum (rarely)
- Pyloromyotomy vs. pyloroplasty vs. Botox injection

Template Operative Dictation

Preoperative Diagnosis *Carcinoma/high-grade dysplasia* of the *upper/middle/distal esophagus/other*

Procedure Transhiatal esophagectomy with colon interposition

Postoperative Diagnosis Same

Indications This ___-year-old *male/female* with large gastroesophageal junction carcinoma/synchronous esophageal and gastric carcinoma. *(If carcinoma, details of preoperative staging and any neoadjuvant chemotherapy and radiation therapy given.)*

Esophagectomy with colon interposition is indicated.

Description of Procedure Patient was brought to the operating room. Time-outs were performed using both preinduction and pre-incision safety checklists to verify correct patient, procedure, site, and additional critical information prior to beginning the procedure. General anesthesia was induced. Patient was positioned with arms tucked and neck slightly hyperextended with a shoulder roll and rotated to the right with all bony prominences appropriately padded.

An upper midline laparotomy was performed from the xiphoid process to the umbilicus. The abdomen was explored for metastatic disease, paying close attention to the liver. The left triangular ligament was divided and the left lobe of the liver was retracted. The tumor was identified and assessed for resectability.

The colon was approached and mobilized first to assure its adequate perfusion before reconstruction. The greater omentum was dissected off the transverse colon and the splenic and hepatic flexures were mobilized.

[Choose One:]
If left colon interposition: The descending colon is mobilized along the white line of Toldt. The mesentery was transilluminated to identify the middle colic vessels, the ascending branch of the middle colic artery, and the inferior mesenteric vein.

The middle colic artery and vein were dissected at their origin to preserve the right and left colonic branches. Vascular clamps were applied at

the origin of the middle colic vessels. Pulsation of the marginal artery and perfusion of the colon was assessed throughout the case. This was confirmed later at the beginning of the reconstruction prior to dividing the middle colic vessels at their origin.

The distal transverse colon was retracted cephalad (typically reaching the xiphoid) and was marked with the stitch at the point of the ascending left colic branch. Using an umbilical tape, the distance between the left ear lobe and the xiphoid process was measured. The same distance was measured on the colon heading proximally (typically to mid ascending colon) where a second marking stitch was placed. Branches of the right colic and ileocolic vessels within this segment were dissected and temporarily occluded with clamps.

If right colon interposition: The ascending colon, cecum, and terminal ileum were mobilized. The ileocolic and right colic vessels were dissected at their origin and temporary occluded with vascular clamps to assure adequate perfusion via the middle colic vessels.

The transverse colon was retracted cephalad (typically reaching the xiphoid) and was marked with the stitch at the tether point of the middle colic vessel. Using an umbilical tape, the distance between the left ear lobe to the xiphoid process was measured. The same distance was measured on the colon proximally and a second marking stitch placed (typically at the region of terminal ileum).

The esophagogastrectomy was performed. The left triangular ligament was divided and the left lobe of the liver was retracted.

A Kocher maneuver was performed.

The phrenoesophageal ligament was divided to dissect the right and left crus of the diaphragm. The distal esophagus was encircled with a Penrose drain to aid in retraction. Dissection was continued circumferentially around the esophagus into the mediastinum, as high as possible.

The greater curvature of the stomach was mobilized, and dissection was continued toward the pylorus. The gastrohepatic ligament was incised. The short gastric, left gastroepiploic, right gastroepiploic vessels, and left and right gastric vessels were divided. The stomach was then retracted superiorly with a liver retractor. Posterior adhesions of the stomach to the retroperitoneum were divided. *Posterior gastric artery was divided.*

Note *All gastric vessels were divided at their origin to assure adequate lymphadenectomy (for synchronous gastric malignancy).*

Note *Dissection toward pylorus the distal stomach was performed just passed the planned line of gastrectomy.*

[Choose One:]

Subtotal gastrectomy*:* The stomach was divided with the linear cutting stapler across the antrum.

Total gastrectomy*:* A total gastrectomy was performed, dividing the proximal duodenum just past the pylorus with the linear cutting stapler.

Attention was then turned to the left neck. A skin incision was made along the anterior border of the sternocleidomastoid muscle starting in the sternal notch and extending slightly above the cricoid cartilage. The platysma was divided and dissection continued medially to the sternocleidomastoid muscle, carotid sheath, and lateral to the thyroid. The omohyoid and strap muscles were divided with electrocautery. The middle thyroid vein and the inferior thyroid artery were ligated and divided. Care was taken to protect the recurrent laryngeal nerve. The deep cervical fascia was incised, and with further dissection toward the vertebral bodies, the esophagus was identified. The esophagus was circumferentially mobilized and encircled with a Penrose drain. It was then mobilized out of the superior mediastinum with gentle traction and finger dissection.

Through the abdomen, the hiatus was enlarged to allow a hand entry. Through both the hiatal and neck incisions, the posterior and anterior esophageal attachments were divided using gentle blunt finger dissection.

The nasogastric tube was withdrawn and esophagus divided with a linear cutting stapler. The circumferentially mobilized esophagus was then pulled into the abdomen, division of the remaining

lateral attachments completed, and the specimen removed. The proximal esophageal margin was sent for frozen section to assure absence of malignancy.

Once the perfusion of the colon conduit was assured, the colon was divided at the sites marked by the stitches with a cutting stapler to assure optimal reach without redundancy for the anastomosis.

A posterior mediastinal tunnel was used for final placement of the conduit.

For substernal route *(in cases where the region of posterior mediastinum was not appropriate for placement of the conduit): a 5 cm substernal tunnel was created extrapleurally. The diaphragm was incised on its anterior midline aspect and resected back several centimeters on each side of the substernal window to prevent compressive obstruction of the colon. The thoracic inlet was enlarged by removing the medial aspect of the left clavicle, the left half of the manubrium, and the medial segment of the first rib.*

The *transverse colon (for left colon conduit)/*the *ascending colon (for right colon conduit) was delivered* atraumatically, in an isoperistaltic fashion into the cervical incision. It was checked to be tension free and without torsion before creation of the coloesophageal anastomosis.

The coloesophageal anastomosis was then performed.

Note For right colon interposition, the terminal ileum may be anastomosed to the esophagus.

[Choose One:]

If stapled with linear stapler: A colotomy was performed 3 cm distal to the staple line. Interrupted sutures were placed to align the colon and esophagus. A linear cutting stapler was placed into the cervical esophagus and colonic conduit *to create* the anastomosis.

The anastomosis was then completed with a full thickness running inner layer of __ suture and an outer interrupted __ suture seromuscular layer.

If stapled with circular stapler: Sizers were used for the esophagus to select a ___-mm circular stapler (use at least 25 mm). A full thickness purse-string suture was placed on the esophagus and tied after the anvil was inserted. The stapler was passed through the open end of intra-abdominal colon. The spike was advanced through the antimesenteric side of the colon at the staple line and engaged with the anvil. The stapler was closed and fired and two complete donuts were noted/describe other findings.

If sutured: The stapled line of the colon was excised. End-to-end *single/two-layered* hand-sewn anastomosis was constructed between the distal esophagus and the colon using an inner layer of *running/interrupted* ___ and an outer interrupted layer of ___.

A nasocolonic tube was advanced through the anastomosis prior to its completion.

After completion of the anastomosis, the colon was gently withdrawn into the abdomen to straighten it. It was then sutured to the hiatus (or *to diaphragm* – for retrosternal position) to prevent its herniation.

A stapled (or *sutured) cologastric/colojejunal* anastomosis was then completed. Specify end-to-end or side-to-end fashion.

If cologastric anastomosis: To decrease postoperative reflux, the anastomosis was performed on the posterior aspect of the stomach near the greater curvature at the 1/3 point distal to the cardia.

If colojejunal anastomosis*: Approximately 15 cm distal to the ligament of Treitz, a 40 cm long* Roux-en-Y jejunal loop was created. It was anastomosed proximally to the distal end of the colon and distally to the proximal jejunum.

The colon continuity was restored with a hand-sewn end-to-end/*stapled side-to-side* anastomosis: Ascending colon to left colon (for left conduit)/*ileum to transverse colon* (for right conduit).

A feeding *Stamm/Witzel* jejunostomy was placed 20 cm distal to ligament of Treitz and secured to the abdominal wall with multiple tacking sutures.

A drain was placed by the coloesophageal anastomosis and the cervical wound was closed with interrupted/*running* ___ sutures.

Hemostasis in the abdomen was assured. The fascia was closed with *a running suture of* ____. The skin was closed with *skin staples/subcuticular sutures.*

A debriefing checklist was completed to share information critical to postoperative care of the patient. The patient tolerated the procedure well and was taken to the postanesthesia care unit in stable condition.

Minimally Invasive Esophagectomy

5

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Indications

- Surgically resectable esophageal cancer
- High-grade dysplasia of the esophagus
- Massive esophageal dilatation due to benign disease (end-stage achalasia, Chagas' disease)

Essential Steps

1. Esophagogastroduodenoscopy *and bronchoscopy*
2. Double-lumen endotracheal tube

Stage I: Thoracoscopic Mobilization of the Intrathoracic Esophagus

3. Left lateral decubitus position with the right arm secured above the head.
4. Deflate the right lung.
5. Insert thoracoscopic ports in the right chest.
6. Thoracoscopic exploration of the chest *and mediastinal lymphadenectomy for frozen section*.
7. Place suture in the central tendon of the right diaphragm.
8. Divide the inferior pulmonary ligament.
9. Dissect around the esophagus; pass Penrose drain around the esophagus for retraction.
10. Divide the azygos vein.
11. Dissect the esophagus cephalad toward the thoracic inlet, including all lymph nodes en bloc, and caudad to the crus of the diaphragm.
12. Free the esophagus from the thoracic duct and aorta, dividing branches as needed.
13. Place Penrose in thoracic inlet for later retrieval during cervical dissection.
14. Inject local anesthetic into intercostal spaces; place chest tube for drainage.
15. Close thoracoscopic port sites.

Stage II: Laparoscopic Construction of the Gastric Conduit

16. Reposition patient supine and reprep the chest and abdomen for laparoscopy.
17. *Exchange double-lumen endotracheal tube for single-lumen tube*.
18. Insert abdominal laparoscopic ports.
19. Insert self-retaining liver retractor to retract the left lobe of the liver.
20. Divide the hepatogastric ligament exposing the right crus and dissect to the left crus.
21. Continue dissection in retroesophageal window cephalad, taking care not to enter the thoracic cavity.
22. Divide the phrenogastric attachments.

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23. Divide the short gastric vessels along the greater curvature.
24. Divide the hepatoduodenal ligaments.
25. Perform Kocher maneuver to fully mobilize the pylorus.
26. Divide retrogastric attachments.
27. Identify and mobilize lymph nodes and fatty tissue of the celiac axis.
28. Divide left gastric vessels with endovascular stapler or LigaSure vessel sealing device.
29. Place additional 11-mm port in the right lower quadrant to facilitate the retraction of the stomach during creation of gastric tube.
30. Create gastric tube by stapling parallel to greater curvature while gently retracting the stomach cephalad and caudad.
31. Perform a pyloroplasty or pyloromyotomy by dividing the pylorus along the anterior wall, suction the gastric tube, then close the incision transversely.
32. Create jejunostomy tube by needle catheter technique or using 14-French catheter.
33. Suture the tip of the gastric tube to the lesser curvature of the specimen.

Stage III: Cervical Anastomosis

34. Make a low cervical incision with dissection down through the platysma to the deep prevertebral fascia.
35. Dissect the cervical esophagus laterally and retrieve the Penrose drain.
36. While insufflating the abdomen to maintain direct visualization, pull the gastric tube through the hiatus into the neck using the Penrose drain, maintaining appropriate orientation.
37. Perform esophageal anastomosis using an EEA stapler or hand-sewn technique.
38. Insert nasogastric tube across the anastomosis with end in the gastric tube.
39. Resect the distal end of the gastric tube with a linear stapler.
40. Retract the distal end of the gastric tube to align the conduit while observing the neck anastomosis.
41. Affix gastric tube to diaphragmatic hiatus.
42. Close laparoscopic port sites and neck incision.
43. *Toilet bronchoscopy*.

Note These Variations

- Type of suture and use of pledgets.
- Type and size of stapling device.
- Laparoscopic or thoracoscopic staging prior to operation.
- Confirmation of jejunostomy tube placement with contrast X-ray.
- If the hiatal opening appears narrowed, incisions may be made in the crura to relieve tension on the gastric tube.
- Esophageal anastomosis with alternative technique: hand-sewn or side-to-side stapled.
- Bronchoscopy before and after the operation.
- Decision to start with laparoscopic portion prior to thoracoscopic.
- Decision to create a narrow gastric tube vs. leave stomach intact.
- Pyloroplasty vs. pyloromyotomy as gastric drainage procedure.

Complications

- Injury to the lungs, esophagus, aorta, spleen, transverse colon, trachea, bronchi, vagus, and recurrent laryngeal nerves
- Chylothorax from thoracic duct injury
- Damage to, twisting of, or devascularization of the gastric tube
- Anastomotic leak either in the neck or in the thoracic cavity

Template Operative Dictation

Preoperative Diagnosis Esophageal cancer *or end-stage achalasia*, *Chagas' disease*

Postoperative Diagnosis Same

Procedure Minimally invasive esophagectomy

Indications This is a ___-year-old *male/female* who presented with _____ and was subsequently diagnosed with esophageal cancer/*end-stage achalasia*. A staging workup was undertaken with *CT scan/PET scan/endoscopic ultrasound/needle biopsy* that demonstrated surgically resectable disease. After a discussion of the risks, benefits, and alternatives to surgery, the patient elected to undergo minimally invasive esophagectomy.

Description of Procedure *A thoracic epidural catheter was placed by anesthesia for postoperative pain control.* Time-outs were performed using both preinduction and preincision safety checklists to verify correct patient, procedure, site, and additional critical information prior to beginning the procedure. Esophagogastroduodenoscopy was performed to assess the extent of the tumor. *Given the mid-thoracic location of the tumor*, *bronchoscopy was also performed.* Following induction of general anesthesia, the patient was intubated with a double-lumen endotracheal tube and placed in the left lateral decubitus position with the right arm raised and all pressure points padded appropriately. The right chest was prepped and draped in the usual sterile fashion.

A 10-mm camera port was inserted in the *eighth/ninth* intercostal space anterior to the midaxillary line. Another 10-mm port was placed at the *eighth/ninth* intercostal space in the posterior axillary line. Two 5-mm ports were placed inferior to the tip of the scapula and anterosuperiorly in the fifth intercostal space. Single lung ventilation was established, allowing for medial retraction of the lung and exposure of the mediastinum. A 30° laparoscope was used to explore the chest and no abnormalities were found (*detail abnormalities* and *biopsies taken*). A suture was placed in the costophrenic recess anteriorly to provide traction on the diaphragm and provide exposure of the distal thoracic esophagus. The inferior pulmonary ligament was divided and the lung retracted cephalad. Care was taken to avoid injury to the inferior pulmonary vein.

The mediastinal pleura overlying the esophagus was incised to the level of the azygos vein. The esophagus was then encircled with a Penrose drain to assist with retraction. The azygos vein was divided using a vascular load stapler. A lymph node dissection was performed and remained en bloc with the surgical specimen.

The recurrent laryngeal nerves were identified superiorly and protected. The thoracic duct was identified and lymphatic attachments to the esophagus were clipped and divided. Branches between the aorta and esophagus were also clipped and divided (*or coagulated with a harmonic scalpel*). The remainder of the thoracic esophagus was mobilized circumferentially from the thoracic inlet to the level of the diaphragm. No bleeding, air leaks, or chyle leaks were visualized. The Penrose drain was placed in the thoracic inlet for later retrieval. __ mL of bupivacaine was injected into the intercostal space, and a *28 French* thoracostomy tube placed. The right lung was reinflated and the airway and lung were examined for air leaks. The thoracic ports were closed.

The patient was turned to the supine position. *The double-lumen endotracheal tube was exchanged for a single-lumen endotracheal tube.* The abdomen was reprepped and draped in the standard surgical manner. An 11-mm port was placed in the right epigastrium. Two 5-mm ports were placed along the right costal margin for liver retraction, one 5-mm port in the left costal margin, and one 5-mm port in the left epigastrium opposite the 11-mm port. The left lobe of the liver was retracted using a self-retaining system.

The hepatogastric ligament was divided toward the right crus of the diaphragm, with dissection of the right and left crura. Dissection of the esophageal hiatus was continued to the top of the left crus and the phrenogastric attachments were divided in this area. Care was taken not to enter the thoracic cavity and to maintain the phrenoesophageal attachments to preserve abdominal pneumoperitoneum.

The stomach was mobilized by the division of the short gastric vessels along the greater curve and the gastrocolic omentum. Care was taken to

avoid the gastroepiploic vessels and arcade, and attention was paid to avoid injury to the transverse colon. The hepatoduodenal attachments were divided along the lateral duodenum and the stomach was mobilized superiorly. Care was taken not to handle the stomach directly to avoid damaging the vascular supply. The lymph nodes and fat around the celiac axis were dissected and mobilized. The left gastric artery was divided with a vascular stapler (*or LigaSure*).

Another 11-mm port was inserted in the right lower quadrant, and an atraumatic grasper was used to retract the pylorus inferiorly. An endoscopic stapler was placed above the right gastric artery and fired perpendicular to the lesser curve with attention paid to preserving the first arterial arcades. __ staple loads were used to create the gastric tube as the stapling progressed cephalad parallel to the greater curve. Throughout the stapling, cephalad and caudad traction was maintained to limit inadvertent twisting or shortening of the gastric tube.

After creation of the gastric tube, a *pyloroplasty/pyloromyotomy* was performed. Stay sutures were first placed above and below the anterior aspect of the muscle. The muscle was opened from the duodenal side along the length of the pyloric channel using harmonic scalpel. The gastric tube was suctioned clean through the pyloroplasty, and the incision was then closed __ stitches, in two layers.

A feeding jejunostomy was placed using a *needle catheter system/14-French catheter*. A loop of jejunum was identified approximately 30 cm distal to the ligament of Treitz. The jejunum was tacked to the abdominal wall in the left *mid/lower* quadrant using intracorporeal suturing (*or automated suturing device*). The needle and guidewire were inserted through the abdominal wall into the jejunum, with insufflation of 10 mL of air confirming proper placement of the catheter. The loop of jejunum was tacked to the abdominal wall circumferentially covering the entry site. An additional stitch was placed several centimeters away to secure the bowel loop and avoid torsion.

The phrenoesophageal membrane was circumferentially mobilized at the hiatus, and the end of the gastric tube was sutured to the lower edge of the specimen. The abdomen was deflated and the laparoscopic equipment was withdrawn.

A cervical collar incision was made at this point and taken down through the platysma to the prevertebral fascia. The Penrose drain that had previously been left in the thoracic inlet was retrieved and the cervical esophagus was dissected free. The recurrent laryngeal nerves were again visualized and care was taken not to damage them.

The laparoscope was reinserted and the abdomen was re-insufflated. The esophageal specimen was withdrawn through the neck, while the gastric tube was pulled into the hiatus under direct laparoscopic vision. The appropriate alignment of gastric tube was confirmed with the gastroepiploic arcade toward the left crus. *Incisions were made in the left and right crura to relieve tension on the gastric tube through the hiatal opening*.

The esophageal anastomosis was performed in the neck by dividing the cervical esophagus 2 cm below the cricopharyngeus using an automatic purse-string device. An end-to-side anastomosis was performed with a 25-mm EEA stapler between the cervical esophageal stump and the fundic tip of the gastric tube (*anastomotic techniques may vary*). The EEA rings were inspected and found to be intact. A nasogastric tube was inserted and passed across the anastomosis with its tip in the gastric tube. The distal tip of the gastric tube was resected with a linear stapler.

The laparoscope was reinserted and the gastric tube was gently retracted to ensure that there was no redundancy of the conduit. The anastomosis was carefully observed through the cervical incision as the tube was retracted and no tension or dehiscence of the anastomosis was noted. The gastric tube was sutured to the hiatus laparoscopically to prevent later development of a hiatal hernia and to maintain orientation. The greater curve of the stomach was secured to the left crus, the anterior aspect of the tube was secured to the anterior crus, and the lesser curve of the tube was secured to the right crus.

The liver retractor was withdrawn and the 11-mm port defects were closed under direct

vision. The abdomen was deflated and the skin was closed with a *subcuticular suture of* ___. The skin of the cervical incision was reapproximated without closure of the platysma. *Bronchoscopy was performed prior to extubation*. A debriefing checklist was completed to share information critical to postoperative care of the patient. The patient tolerated the procedure well and was taken to the postanesthesia care unit in satisfactory condition.

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Transabdominal Nissen Fundoplication

6

Riley K. Kitamura and Linda P. Zhang

Indications

- Chronic gastroesophageal reflux in patients unresponsive to optimal medical management
- Chronic gastroesophageal reflux with Barrett's esophagus, severe esophagitis, or peptic stricture
- Chronic gastroesophageal reflux with extra-esophageal manifestations such as asthma, chest pain, or aspiration
- Gastroesophageal caused by paraesophageal hernia (Nissen fundoplication is performed concurrently with the paraesophageal hernia repair)
- Children with gastroesophageal reflux causing severe esophagitis, pulmonary compromise, or failure to thrive
- Lung transplant recipients with gastroesophageal reflux
- Any of the above, but unsuitable for laparoscopic repair

Essential Steps

1. Decompress the stomach with an orogastric tube.
2. Upper midline incision.
3. Explore the abdomen and confirm pathology.
4. Incise the phrenoesophageal membrane.
5. Dissect both crura, encircling the esophagus.
6. Identify and preserve both vagus nerves.
7. Close the hiatus if enlarged.
8. Divide the short gastric vessels to mobilize the fundus.
9. Calibrate the wrap with esophageal bougie.
10. Create wrap involving the anterior and posterior aspects of the fundus.
11. Check hemostasis.
12. Close the abdomen.

Note These Variations

- Hiatal closure with or without mesh
- Vagus nerves encircled in wrap or excluded from wrap
- Use of bougie
- Use of pledgets during wrap
- Modification
  - Rossetti: Wrap using the anterior wall of the fundus alone
- Partial fundoplication
  - Dor: 180° to 200° wrap
  - Toupet: 270° posterior wrap
  - Belsey Mark IV: Transthoracic 240° wrap

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Complications

- Esophageal or gastric perforation
- Dysphagia/obstruction
- Wrap too loose, tight, or long
- Hiatal closure too tight (causing dysphagia) or loose (recurrent paraesophageal hernia)
- Vagus nerve injury
- Splenic injury
- Vena cava or left hepatic vein injury
- Undiagnosed motility disorders (achalasia, spasm, scleroderma)

Preoperative Diagnosis Chronic GERD refractory to medical management

Postoperative Diagnosis Same

Procedure Transabdominal Nissen fundoplication

Indications This is a ____-year-old *male/female* with *reflux/biopsy proven reflux esophagitis* that had been medically managed previously. The patient was seen in office and elected for surgical management of *his/her* gastric reflux to minimize the need for long-term medication in the future.

Description of the Procedure After informed consent was obtained, the patient was brought to the operating room and placed in the supine position. Time-outs were performed using both preinduction and pre-incision safety checklists to verify correct patient, procedure, site, and additional critical information prior to beginning the procedure. Venodyne boots were applied and an orogastric tube was inserted. A Foley catheter was placed under sterile conditions. All pressure points were padded and the patient was prepped and draped using aseptic technique.

A vertical midline incision was made from the umbilicus to just left of the xiphoid. The subcutaneous tissue and fascia were divided with electrocautery and the abdomen was entered under direct vision. The patient was placed in reverse Trendelenburg and the hiatus of the abdominal esophagus and the bilateral crura were visualized. The hiatus appeared *enlarged/abnormal*. A fixed retractor was then used to elevate the inferior sternum and retract the left lobe of the liver. This exposed the esophagogastric junction and hiatal crus completely.

The cephalad portion of the gastrohepatic ligament was incised taking care to identify and preserve any aberrant left hepatic artery. Next, the phrenoesophageal membrane was opened transversely, and this incision was extended to the left and right margins of the diaphragmatic hiatus. The esophagus was circumferentially freed with blunt dissection taking care to identify and avoid injury to the anterior and posterior vagus nerves. A P*enrose drain/nylon tape* was used to encircle the esophagus at the GE junction.

[Choose One:]
There was adequate intra-abdominal esophageal length (approximately 2–3 cm) .

The esophagus was retracted caudally to assist in dissecting the distal 5–6 cm of the intrathoracic esophagus.

The superior most short gastric vessels were divided with a vessel-sealing device. This was continued until the short gastric vessels were divided to the level of the angle of *His*, completely mobilizing the gastric fundus.

The crural opening was closed with interrupted _____ (silk or Ethibond) sutures, approximately 1 cm apart. At the end of this approximation, the crus was snug around the esophagus, allowing less than one fingerbreadth of space between the diaphragm edges and esophagus.

The orogastric tube and all esophageal monitors/probes were removed, and a 56-French bougie was passed through the esophagogastric junction. The crura closure was noted to be appropriately tight. To create a 360° wrap around the esophagus, the fundus was brought around the posterior aspect of the esophagus to form the medial aspect of the wrap. The wrap was able to rest behind the stomach without slippage or tension. The wrap edges were approximated with 2-0 _____ (silk or Ethibond) sutures and *included a muscular bite of the esophagus anteriorly*. A total of __sutures were used, spaced approximately 1 cm apart, so the length of the