

Postoperative Esophageal Leak(Fistula)

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조재일

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Introduction

- Esophageal leak is one of the most serious complications with significant morbidity and mortality in esophageal surgery
- Historically leak rate was 3–12% (thoracic), 10–25% (cervical), and mortality rate was 50–71%(thoracic), less than 20%(cervical), however , recently lower mortality (3.3–8.5%) with improved treatment.
- Multiple predisposing factors were evaluated.
- Many leak can be managed conservatively, significant patients still require re-exploration.

Definition of Anastomotic leakage

Surgical Infection Study Group.1991

Leak grade	Definition	Outcome
Radiological (I)	No clinical sign	Usually nonfatal
Clinical minor(II)	Local inflammation cervical wound X-ray contained leak(thoracic anastomosis) Fever, ↑ WBC, ↑CRP	Low mortality
Clinical major(III)	Severe disruption on endoscopy Sepsis	High mortality
Conduit necrosis (IV)	Endoscopic confirmation	Usually fatal

Typical pattern of presentation

JD Urschel Am J Surg 1995

Category of leak	Time	Etiology	Presentation
Early fulminant	<48hr	Gastric necrosis Technical error	Septic shock Foul C-tube drainage
Clinical apparent thoracic	2-7 days	Multiple factors	Septic deterioration C-tube drain GI contents Pleural effusion
Clinical apparent cervical	2-10 days	Multiple factors	Fever Inflamn neck wound Drainage via neck drain
Clinical silent	7 days	Multiple factors	Asx. Small contained Leak on esophagography

Predisposing factors

Inherent risk factors

- Absence of serosal layer
- Longitudinal orientatation of muscle fibers
- Extra-peritoneal position of anastomosis
- Cyclical negative intrathoracic pressures
- Technically difficult anastomosis in thorax

Predisposing factors

Preoperative factors (Patient related factors)

- DM
- Malnutrition
- Serum albumin < 3g, Weight loss
- Cardiovascular disease
- Respiratory insufficiency
- Preoperative chemotherapy +/- Radiation
- Salvage esophagectomy

Predisposing factors

Operative factors

- Positive resection margin
- Technical difficulty
- Arterial insufficiency of conduit
- Venous stasis
- Splenectomy

Predisposing factors

Postoperative factors

- Gastric distension
- Re-exploration due to bleeding
- Peri-operative hypotension/ use of vasoconstrictors
- Respiratory failure; Epidural analgesia, Smoking
- Prolonged ventilator support
- Sustained hypoxia; ARDS

Technical point

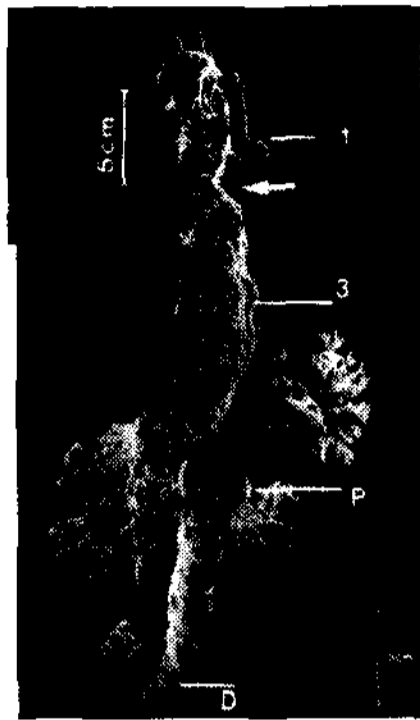
- Atraumatic mobilization of gastric fundus
- Avoid traction sutures or suction device
- Water tight anastomosis without excessive sutures
- Adequate mobilization of conduit
- Correct orientation of conduit
- Compression free passage of conduit in thoracic inlet
- Familiarity of vascular anatomy of different conduit

Blood supply of Stomach (1)



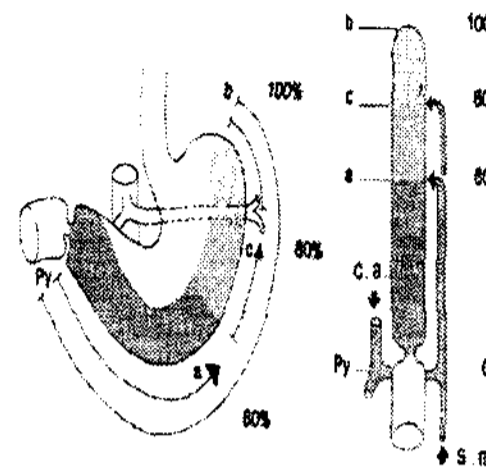
- celiac axis & sup. mesenteric a.
- Rt. gastroepiploic a. anastomosis with Lt. gastroepiploic a
- mucosal & submucosal network
- Rt. gastric a does not contribute gastric tube

Venous Drainage of Stomach (2)



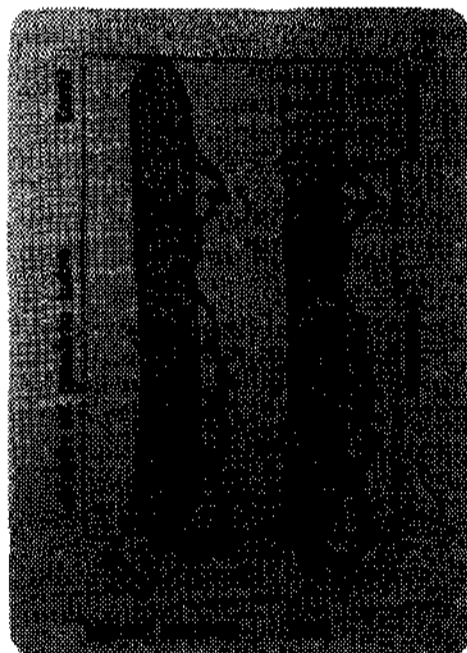
- Follows the pattern of arterial vascular supply

Blood supply of Stomach (3)



- Distal 60%: right gastroepiploic a.
- Another 20%: reversed flow of left gastroepiploic a.
- Cranial 20%: dense mucosal & submucosal network

Blood supply of Stomach (4)



- Safe blood supply : 4-5cm margin from greater curvature side
- Avoid squeezing, bruising, kinking, tension to prevent interruption of submucosal network, ischemia, leakage, dehescence, stricture

Detection

- Insufflating conduit with air after saline filling chest
- Scanning laser Doppler flowmetry (NH Boyle. J Am Coll Surg. 1999)
- Gastric fundus oximetry measurement (JA Salo. Am J Surg. 1995)

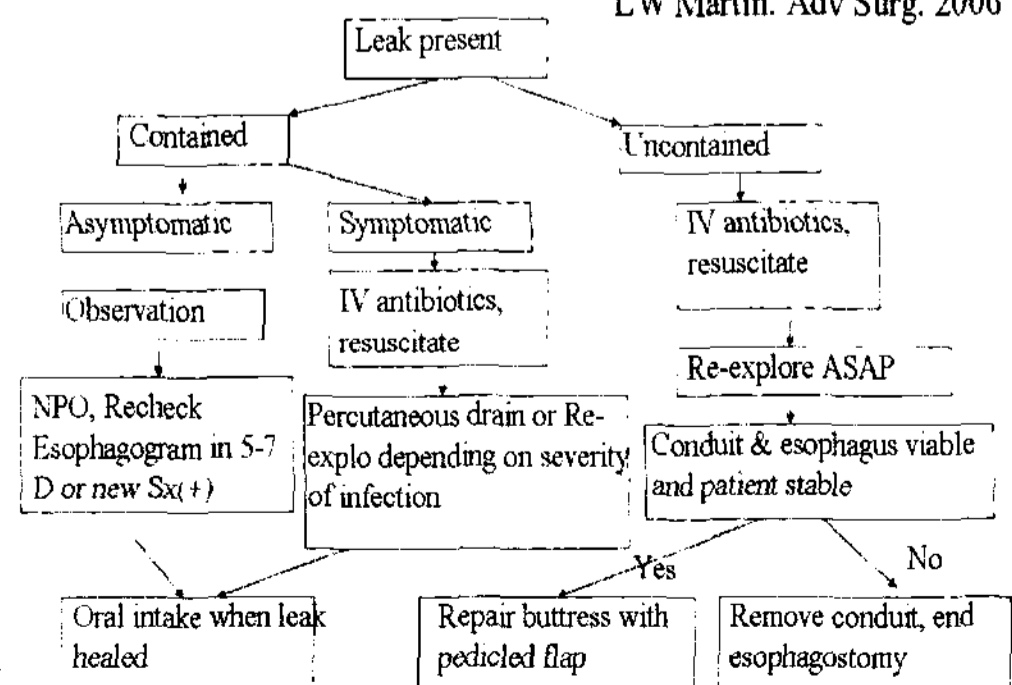
Detection

Postoperative

- Clinical symptom and sign
Fever, Sign of sepsis, abnormal drainage, Wound infection, GI hemorrhage, New pleural effusion, Pneumothorax, TE fistula symptom
- Esophagography
- Intramucosal gastric pH monitoring
- Endoscopy; experienced endoscopist with pediatric endoscope
- CT of the chest

Leak Management algorithm

LW Martin. Adv Surg. 2006



Management

General leak Mx. without symptom

- NPO
- Observation for sign of deterioration
- Nutritional support
- Antibiotics

Invasive Mx. with symptom

- Adequate IV volume, Antibiotics
- Chest CT ,Image-guided drainage
- Chest tube drainage
- Endoscopy; conduit ischemia
- Re-operation

Management

Uncertain leakage Mx

- Adequate IV volume, Antibiotics
- Reoperation- BFS, GFS
 1. Debridement and decortication
 2. Primary repair
 3. Tissue flap reinforcement
 4. Take down and cervical esophagostomy
- Supportive care

Management

When to divert

- Too unstable to repair or reconstruct
- Questionable conduit viability or necrotic
- Local complication of leak; TEF, Esophago-vascular fistula
- Failure of primary repair

Management

Tracheo-esophageal fistula Mx.

; acute, non-controlled fistula

- Primary repair
- Repair with muscle flap interposition
- Airway stenting
- Esophageal diversion with airway repair
- Repair with pedicled pericardium

Management

Alternative Mx.

- Stent insertion
 1. Polyflex esophageal stent(RK Freeman JTCS 2007)
 2. Self-expandable covered metal tracheal type stent (J Lindermann Ann TS 2008)
 3. Covered Mushroom-shaped metallic stent(XW Han, Ann TS 2006)
 4. Silicone covered self-expanding metal stent(WKH Kauer. Surg Endosc. 2008)

Esophageal surgery in Korea

KTCS 2005

Eso. Op lx.		Esophagectomy & Reconstruction
Eso. ca	635	555
Eso. perf	93	16
Benign neoplasm	60	4
Eso stricture	52	36
Motility disorders	40	2
B-E fistula	27	0
Others	36	4
Total eso. op	943	617

NCC Experience

- No. of esophagectomy; 426
- Duration; 2001.4-2007.12
- Postop. Leakage No.; 25(5%)
- Mortality ; 4/25(16%)
- Leak grade; Gr I; 3
Gr II; 10
Gr III; 6
Gr IV; 6 (4)

NCC Experience

Resection type	No. of patient	Mortality
Palliative	1/28 (3%)	
Curative	24/398 (6%)	4
LN dissection		
2-field LN	11/303 (3%)	1
3-field LN	14/123 (11%)	3
Anastomosis site		
Thoracic	4/352 (1%)	1
Cervical	21/74 (28%)	3
Substitute		
Stomach	23/399 (5%)	4
Colon	1/20 (5%)	
Free jejunum	1/7 (14%)	

NCC Experience

Mx

- Grade I(3); Conservative Mx.
- Grade II(10);
 1. Conservative Tx. Only: 6
 2. Cons.Tx. + ARDS Tx. ;2
 3. Cons.Tx.+ Anastomosis repair: 1
 4. Cons.Tx.+ ARDS Tx. +Anastomosis repair: 1
- Grade III(6)
 1. Cons. Tx.+ PCD drainage thoracic:1
 2. Cons. Tx. + Cervical leakage repair; 4
 3. Cons.Tx. + ALI Tx. +Cervical leakage repair: 1

NCC Experience

Mx.

- Grade IV (6)
 1. PJCG. ; ARDS. Graft failure. Tracheal necrosis
 2. RAC ;Take-down+ Esophagostomy. ECG(2month)
 3. AR ; Re E-G+ Closure of TEF with pericardium
 4. AR ; ARDS. Take-down + Esophagostomy.
 5. RAC ; Take-down+ Closure of TEF with pericardium. Mediastinitis. Reclosure of Tracheal defect. ARDS
 6. RAC s/p CCRT; Take-down+ Esophagostomy. Pneumonia. ARDS