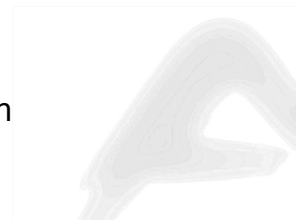


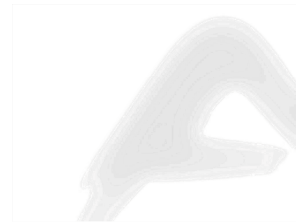
Complications after esophageal surgery

- pulmonary complications
- conduit-related complication
 - anastomotic leak
 - anastomotic stricture
 - conduit ischemia
 - functional conduit disorders
- recurrent laryngeal nerve injury
- chylothorax
- diaphragm hernia
- cardiovascular complication



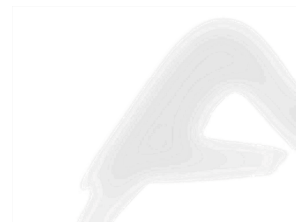
Complications after esophageal surgery

- **patients**
performance, medical illness, neoadjuvant therapy
- **esophagectomy**
approach, radicality, lymphadenectomy
- **reconstruction**
conduit, anastomosis, route
- **surgeon**
experience, hospital volume



Pulmonary complication

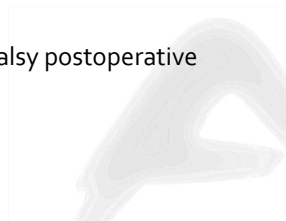
- most important contributor to morbidity and mortality
- **Complication**
 - Aspiration pneumonia
 - pneumonitis
 - acute lung injury or ARDS
 - pulmonary sepsis with multiple organ-system failure



Pulmonary complication

■ Contributing factors

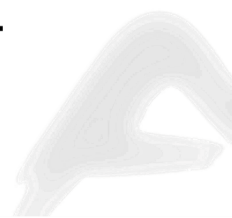
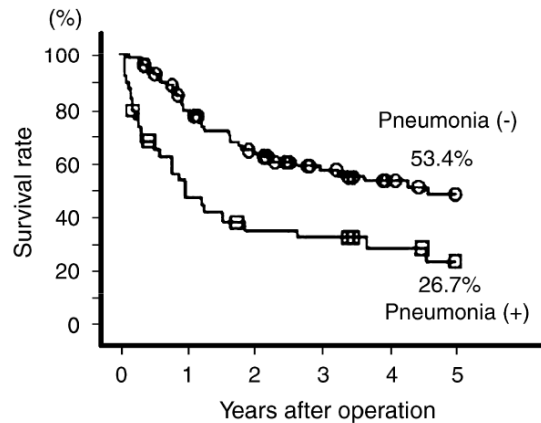
- preoperative status
age, nutrition, induction therapy, baseline PFT, alcohol, smoking history, poor performance status
- intraoperative details
stage/location of tumor, surgical approach, estimated blood loss, length of surgical procedure, disruption of bronchial innervation, lymphatic circulation
- postoperative details
pulmonary toilet, vocal-cord paralysis or RLN palsy postoperative respiratory muscle dysfunction



Pulmonary complication

Study	Number in study	Overall mortality (%)	Pulmonary complications (%)	Deaths with pulmonary complications (%)	Associated factors
Atkins et al	379	5.8	28.5	88%	Age, abnormal swallowing scores
Bailey et al	1777	9.8	21.8	Not determined	Not determined
Kinugasa et al	118	6.8	50	88	Age, smoking, COPD, blood transfusion, prolonged operation, RLN palsy
Dumont et al	309	9	18.1	64	Proximal tumor location
Tandon et al	168	17	44	71	Smoking, low BMI, anastomotic leak
Avendano et al	61	8.6	32.8	100	FEV ₁ < 65% predicted
Ferguson & Durkin	292	13.7	26.7	62.5	Age, poor performance status, FEV ₁
Law et al	421	4.8	15.9	55	Age, proximal tumor location, prolonged operation
Griffin et al	228	4	17	Not determined	Age, smoking, abnormal FEV ₁ /FVC
Sauvanet et al	1192	6	23	22.4	ASA score ≥ 3; age > 60 years; anastomotic leak

Pulmonary complication



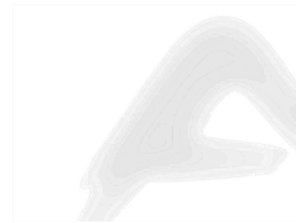
Strategy to reduce pulmonary complication

- **intraoperative techniques**
 preservation of RLN, lessening the operative time
 reduction of blood loss, minimize perioperative fluid administration
- **cardiopulmonary rehabilitation**
 including pulmonary toilet, pain control with epidural analgesia
- **evaluation of swallowing disorders**
 VFSS, FEESST
- **Vocal cord medialization after RLN injury**



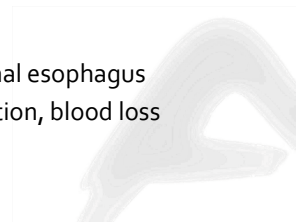
Conduit-related complication

- anastomotic leak
- anastomotic stricture
- conduit ischemia
- functional conduit disorders



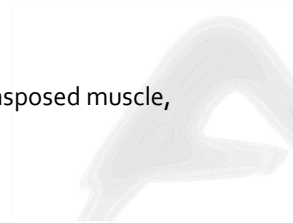
Anastomotic leakage

- Incidence of leakage
 - Intrathoracic anastomosis; 0-7% (<2%)
 - Cervical anastomosis; 8-15%
- Contributing factor
 - Anastomotic technique
hand-sewn vs stapling, single vs two layer, running vs interrupt suture
 - Induction therapy
 - Other factors
slim gastric tube, excessive dissection of proximal esophagus
twisting of conduit, Substernal route, malnutrition, blood loss



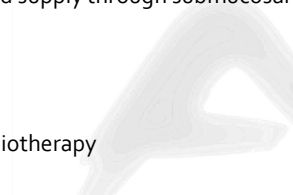
Management of anastomotic leakage

- **fulminant leaks**
 - immediate surgical intervention, broad spectrum antibiotics
 - cervical esophagostomy, gastrostomy
 - retrosternal colon interposition later
- **cervical leaks**
 - often require no operative intervention for small leaks
 - open evacuation / direct closure for larger leaks
- **intrathoracic leaks**
 - open drainage
 - often direct repair of the leak will be possible
 - buttressed with a vascularized tissue flap of transposed muscle, omentum, or pericardial fat
 - covered stent for contained leak



Anastomotic stricture

- **Incidence of leakage:**
 - varies from 0% to 63%
 - Most anastomotic strictures present in the first 2 to 6 months after esophagectomy
- **Contributing factor**
 - **Anastomotic size and technique**
 - hand-sewn vs stapling, two layer, cervical, 25mm or less stapler, running vs interrupt
 - **Anastomotic leaks**
 - **Ischemia**
 - The proximal 20% of the gastric conduit receives its blood supply through submucosal and mucosal vascular networks.
 - **Other factors**
 - cardiac disease, supra-anastomotic esophagitis, delayed gastric emptying, use of neoadjuvant chemoradiotherapy



Management of anastomotic stricture

■ Dilation

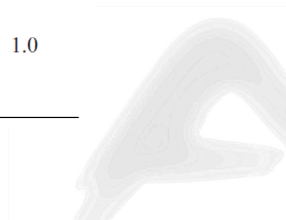
- Balloon dilation
 - An average of two to five dilations are required
- Endoscopic stricturotomy
- bougienage



Conduit necrosis

Stomach conduit results

Series	# Patients	Deaths (%)	Leak (%)	Ischemia (%) ^a
Orringer	1085	4	13	2.6
Peracchia	242	0.8	5.8	1.2
Davis	959	10.6	3.9	0.5
Schuchert	222	1.4	n.s.	3.2
Briel	230	3.5	14.3	10.4
Moorehead and Wong	760	3.8	n.s.	1.0



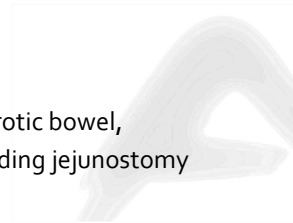
Conduit necrosis

■ Risk factors

- improper technique in the creation
- handling of the stomach tube
- external beam irradiation,
- low perioperative cardiac output
- postoperative hypotension
- previous upper abdominal surgery
- underlying gastric ulcer disease
- twisting the stomach conduit as it passes up into the mediastinum
- a tight, restrictive hiatus

■ Treatment

take-down of the gastric pull-up, resection of the necrotic bowel, cervical esophageal diversion, and placement of a feeding jejunostomy



Functional conduit disorders

■ disorders

- Dumping
- Delayed gastric emptying
- Reflux
- Dysphagia

Long-term digestive function after esophagectomy for cancer and Barrett's metaplasia with high-grade dysplasia

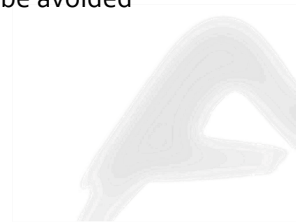
	Resection for Cancer	Resection for High-grade Dysplasia
Number of patients	107	48
Asymptomatic	16%	13%
Dumping	50%	15%
Reflux	60%	68%
Dysphagia	46%	37.5%
Postoperative dilation	43%	51%
Small meals	37%	N/R
Inability to gain weight	25%	65%



Functional conduit disorders

■ Prevention

- 5-cm-wide greater-curvature gastric tube brought up
- through the posterior mediastinum
- higher than the level of the azygous vein
- drainage procedures, especially when using the whole stomach
- early erythromycin therapy
- proton-pump inhibitors
- Simple sugars and fluid at mealtime should be avoided



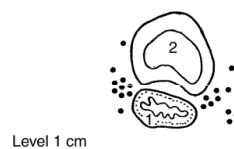
RLN injury

■ Consequences

- transhiatal esophagectomy
- cervical anastomosis
- three-field LND

■ Assessment

- Voice
- Swallowing
- Laryngeal injury



Level 1 cm



Level 4 cm



Management of RLN injury

- Laryngoplastic phonosurgery
- Adduction arytenopexy
- PTFE as a medialization implant
- Cricothyroid sublaxation
- Injection medialization

