APPROACH TO MANAGEMENT OF ANASTOMOTIC BREAK DOWN AFTER OESOPHAGECTOMY

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Introduction: Anastomotic Breakdown after Oesophagectomy

- Oesophagectomy is the most invasive operative procedure which breaches two body cavities with resulting high morbidity and mortality
- One major contributor to the high morbidity and mortality is anastomotic breakdown
- Original practice was two stage oesophagectomy with intra-thoracic anastomosis (Ivor-Lewis)
- High morbidity and mortality of intra-thoracic anastomotic breakdown lead to cervical anastomosis necessitating a three-stage operation (Mckeown)
- Cervical anastomosis associated with higher frequency of breakdown but less morbidity and mortality
- The other major contributor to high morbidity and mortality is respiratory insufficiency and pneumonia
- Transhiatal oesophagectomy seeks to avoid thoracotomy without compromise of the oncological resection for cancer. The anastomosis is cervical
- Newer video assisted “minimally invasive” oesophagectomy seeks to minimise some of this high morbidity and mortality but not anastomotic breakdown

Definition of Post-Oesophagectomy Anastomotic Breakdown

Anastomotic break down is said to have occurred when clinical or radiographic leak is demonstrated

Risk Factors for Oesophagogastric Anastomotic Break Down

- **Patient factors**
  - Nutrition, loss of weight
  - Poor respiratory function
  - Intra-operative blood loss
  - Hypotension and
  - Hypoxia
- **Technical factors**
  - Excessive mobilisation and “denuding” of blood supply
  - The lack of serosal layer
  - Longitudinal muscles are poor enchoring tissue for sutures/staplers
  - Technical difficulty and awkwardness

Table 1

Variables compared between patients with and without anastomotic leak

Variable	Leak		
	No (%)	Yes (%)	*P* value
Albumin <3.5	54.3	100	0.002
Hypotension	50	76.9	0.08
Pulmonary complication	20.8	61.5	0.013
Weight loss >20%	17	69.2	0.001
FEV <2 lit	31.3	69.2	0.013
Blood loss (cc)	130.76 ± 486.45	197.41 ± 588.76	0.04
Weight loss (kg)	5.04 ± 9.68	4.4 ± 12.3	0.026
Albumin (g)	0.66 ± 3.20	0.32 ± 2.51	0.0001

Tabatabai A Ann Thor Med 2009

TABLE I

Etiologic Factors for Postesophagectomy Esophagogastrostomy Anastomotic Leak

Local	Systemic	"Inherent"
Arterial insufficiency (gastric fundus)	Malnutrition	No serosa
Venous insufficiency (gastric fundus)	Hypotension	Extraperitoneal
Tension	Hypoxia	Longitudinal muscle (holds sutures poorly)
Technical errors		Technically awkward
Gastric distention		
Infection		
Extrinsic compression		

Urschel JD Am J Surg 1995

Pathology of Oesophageal Anastomotic Breakdown

- Oesophagogastric anastomotic line breakdown
- Breakdown of gastric tube suture line
- Oesophago-jejunal anastomosis is least frequent to break down
  while oesophago-colic is most frequent
- Oesophago-gastric is the most convenient and commonly used conduit
- Intrathoracic breakdown may lead to leak that is
  - confined to mediastinum → abscess
  - freely dissipated within the pleural cavity → empyema
- Cervical breakdown may result in
  - contained leak into the wound site
  - tracking of the leak into upper mediastinum
  - free atmospheric leak or via the drain

Table 4. Leakage for resection and bypass with respect to site of anastomosis, substitute used, and route of substitute.

	Resection		Bypass	
	n	Leakage (%)	n	Leakage (%)
Site				
Neck	420	79 (18.8)	185	83 (44.9)
Chest	111	18 (16.2)	14	2 (14.3)
Substitute				
Jejunum	96	7 (7.3)	46	12 (26.1)
Whole stomach	324	51 (15.7)	126	57 (45.2)
Distal stomach	87	29 (33.3)	12	6 (50.0)
Colon	24	10 (41.7)	15	10 (66.7)
Route				
Subcutaneous	42	14 (33.3)	136	57 (41.9)
Retrosternal	72	9 (12.5)	49	26 (53.1)
Right chest	267	48 (18.0)	3	1 (33.3)
Left chest	69	14 (20.3)	11	1 (9.1)
Orthotopic	81	12 (14.8)	–	–

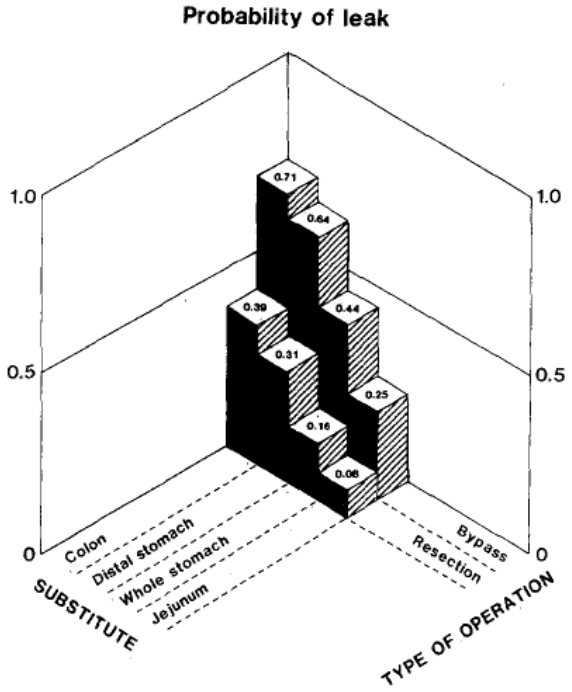
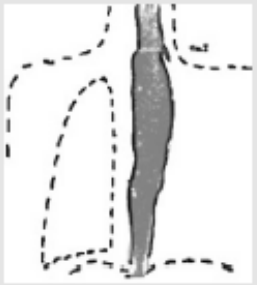
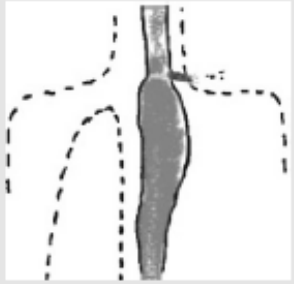
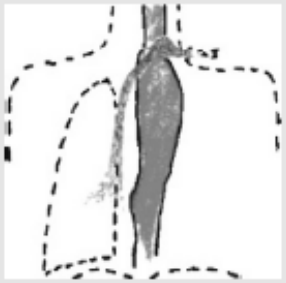
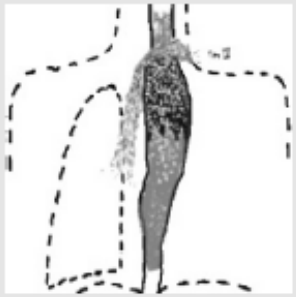


Fig. 1. Probability of leakage for resection and bypass using different substitutes for esophageal replacement.

Lorentz T et al World J Surg 1989

Table 2 – Classification of Cervical Anastomotic Leaks.

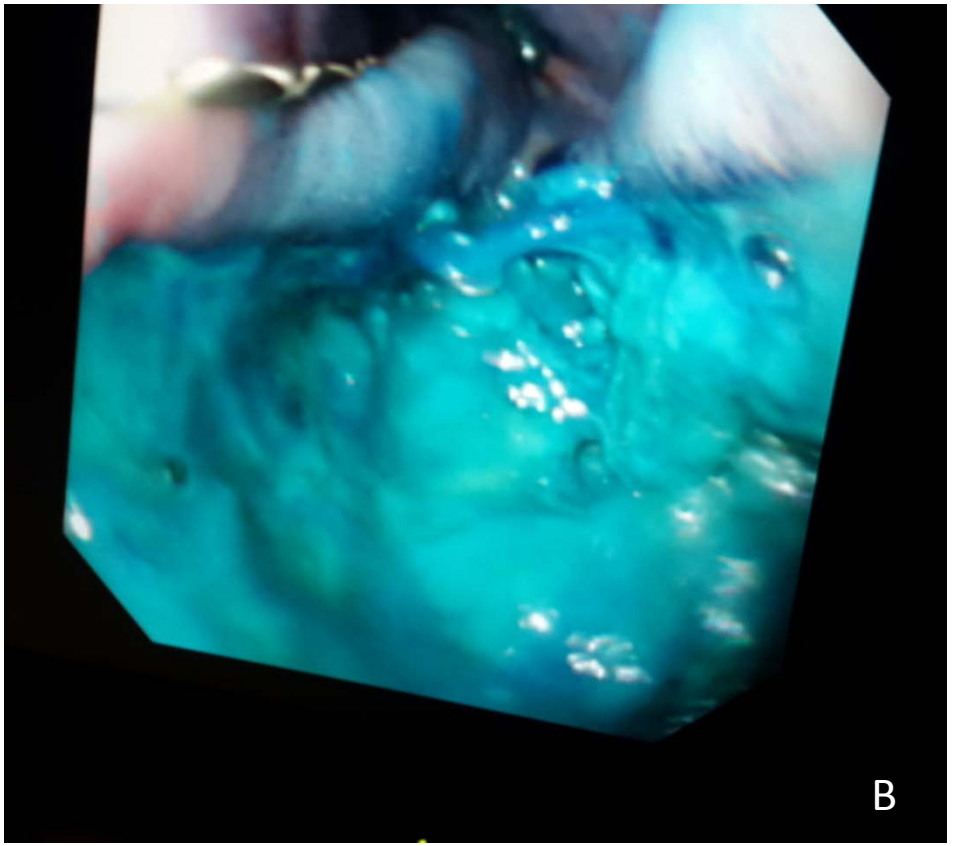
Type of Criteria	Classification			
	Type I	Type II	Type III	Type IV
Clinical	No	Local	Local yes/no Pulmonary. Sepsis	Local yes/no Pulmonary yes/no Alert symptoms Distress. Sepsis
Oesophagogram	Localised leak	Neck leak	Neck leak yes/no Chest leak	Neck leak yes/no Chest leak yes/no
Chest CT	–	Normal	Pathological	Normal/pathological
Endoscopy	–	Fistula Normal plasty	Fistula Normal plasty	Fistula yes/no Necrosis plasty
				

Etxaniz SL et al Cir Esp 2013

Diagnosis of Post-Oesophagectomy Anastomotic Leak

I. Methylene blue swallow test
II. Contrast study with water soluble material eg urograffin or gastrograffin. Barium should **not** be used.
III. Contrast CT scan.
IV. Flexible oesophagogastroscopy to assess extent of anastomosis break down and/or stomach tube integrity or necrosis.
V. Demonstration of gastro-intestinal contents through the drains.

Use of Oral Methylene Blue Test for Anastomotic Breakdown



A. Methylene Blue swallow.
B. Endoscopic view of breakdown

Figure 1 Oral contrast computed tomography was applied diagnosis of anastomotic leak. Oral contrast-enhanced transverse computed tomography at day 9. Anastomotic leak with extraluminal contrast and air next to the right wall of anastomosis. An anastomotic leak was viewed at day 12 by endoscopy.

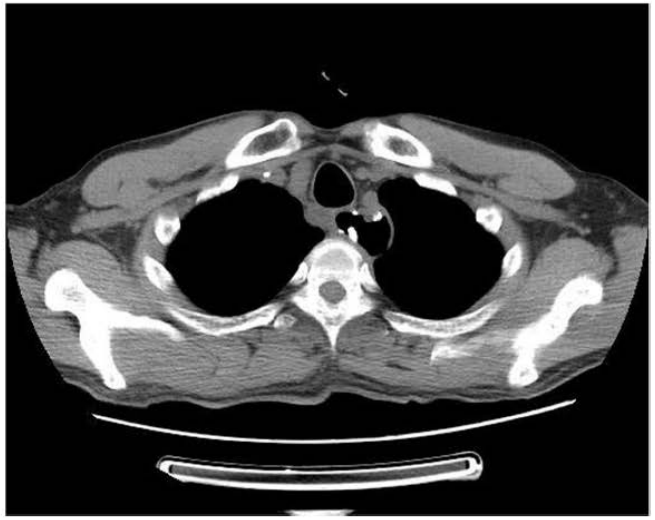


Figure 2 Oral contrast computed tomography was repeated after 5 weeks. No extraluminal contrast and air were found. Closure of the anastomotic leak was confirmed by the following oral feed.

Guo J et al World J Surg Oncol 2014

Management of Post-Oesophagectomy Anastomotic Breakdown

A. Intrathoracic Anastomotic Leaks

I *Contained mediastinal leak*

- Small contained mediastinal leak managed non-operatively with broad spectrum antibiotics and adequate nutritional support.
- GI fluids must be kept away from the anastomotic site by active suction via NGT.
- Large collection leaks will need draining. This can be achieved by percutaneous CT guided drainage (pigtail or similar device).
- If the defect is large but not a near total disruption of the anastomosis an endoluminal self-expanding stent may be placed.

Management of Anastomotic Breakdown II

II *Free Pleural Leak*

- Small leaks may be managed conservatively with intercostal tube drainage.
- GI fuilds should be kept away through NGT suction and feeding should be by jejunostomy (better) if already *in situ* or TPN.
- Large leaks require immediate attention to the anastomotic break down site.
- If only part of suture line has broken down self-expanding endoluminal stent may suffice.
- If the anastomotic disruption involves a large part of its circumference or the gastric tube suture line is disrupted or there is necrosis operative management is mandatory.

Management of Anastomotic Breakdown III

- Gastric tube necrosis the best option is to:
  - debride and staple off the stomach remnant
  - staple off the oesophageal remnant as well, create a cervical diverting oesophagostomy
- Place a feeding jejunostomy if this had not been done.
- Pleural cavity is cleaned of all sepsis or decorticated as necessary.
- Continuity is re-established after the patient has recovered from effects of sepsis.
- In practice this may need oesophagogastric jejunal interposition graft or retrosternal colonic cervical oesophagogastric interposition graft.

Management of Anastomotic Breakdown IV

B. Cervical Anastomitc Leaks

I. Contained leaks

- Managed conservatively with broad spectrum antibiotics,
- Nasogastric tube suction and nil by mouth.
- Nutritional support, preferably by feeding jejunostomy if already created or TPN is crucial.
- Large leak should be drain percutaneously.

Management of Post-Oesophagectomy Anastomotic Breakdown V

II. Free drainage via the neck drain

- This is managed by keeping the drain *in situ* to form a fistula.
- If leak tracks down into the superior part of the mediastinum a suitable drain should be placed perhaps on high volume low pressure suction pump system.
- Some have described the use of T-tube designed to create a controlled fistula.
- Complete disruption or gastric tube suture line disruption or necrosis needs surgical management and revision.
- If gastric tube necrosis to extensive, this should be take down and the remnant stapled off and the oesophagus brought out as a oesophagostomy for delayed later reconstruction with colon interposition graft.

TABLE III

Postesophagectomy Esophagogastrostomy Anastomotic Leaks—Treatment and Outcome

Category of Leak	Treatment*	Outcome
Early fulminant	Immediate thoracotomy "Take down" of anastomosis Resection of nonviable portions of stomach Débridement and drainage Cervical end esophagostomy Abdominal gastrostomy	Usually fatal (90%) Survivors reconstructed with retrosternal colon
Clinically apparent thoracic	Document leak (contrast study) Thoracotomy, drainage Attempt repair Cover repair with viable tissue	High mortality (60%)
Clinically apparent cervical	Open neck incision Contrast study If true cervical fistula, pack wound If mediastinal fistula, place suction drain	Low mortality (<20%)
Clinically silent	If small and drains back, conservative If large or not responding, drain	Usually nonfatal Risk of fistulization into trachea or aorta

*All patients require antibiotics and nutritional support (preferably via enteral route).

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Urschel JD Am J Surg 1995

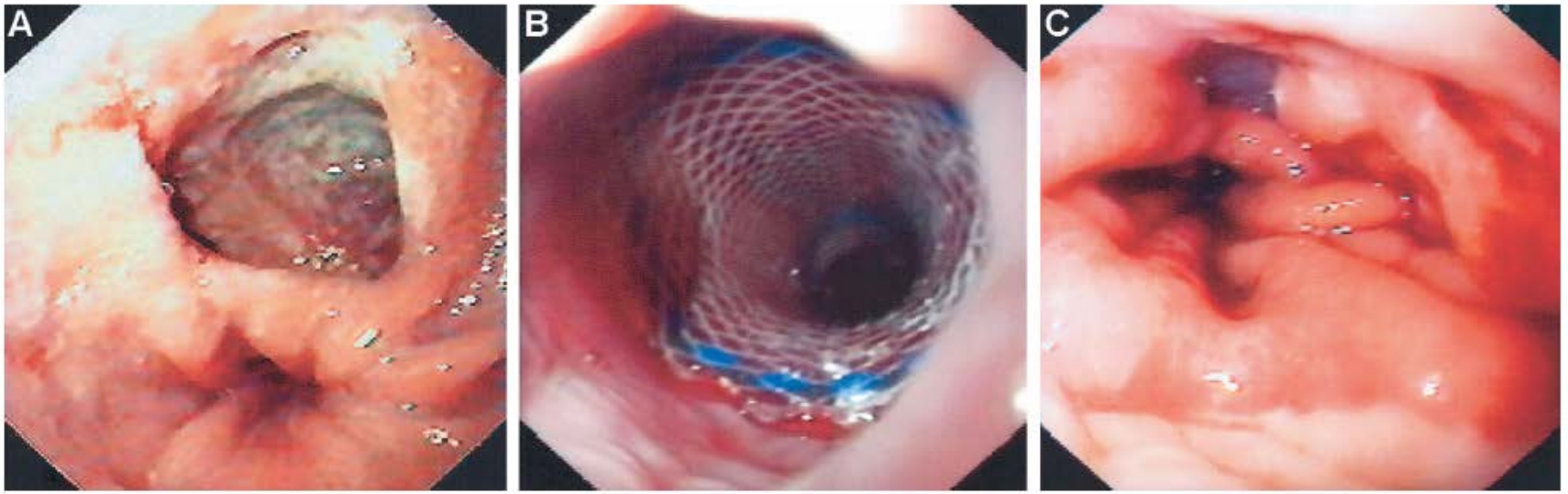
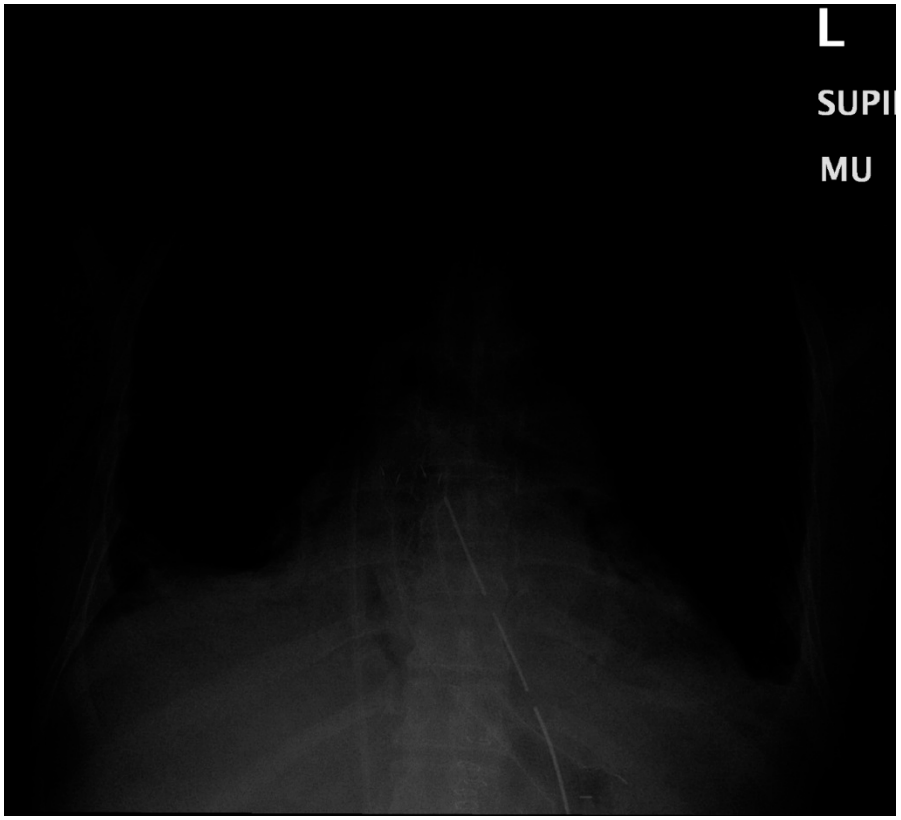
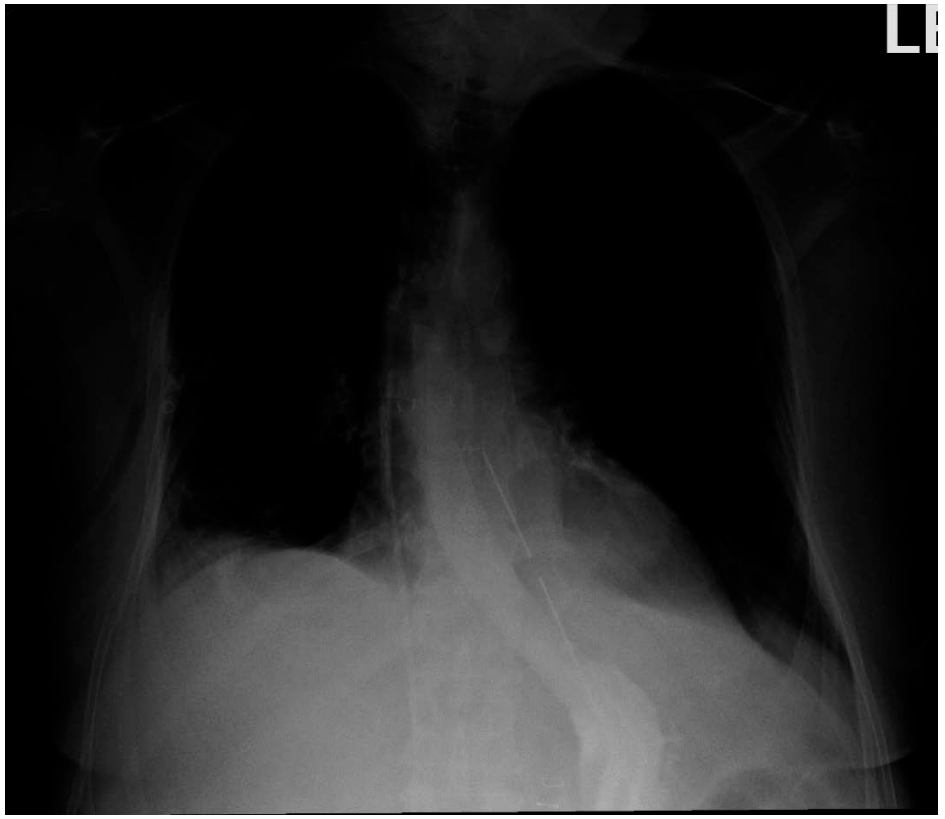


FIGURE 2. A: Endoscopic view of a large mediastinal leak. B: Occlusion of the leak by a self-expanding plastic stent. C: Stent retrieval and almost complete healing after 4 weeks

Hünerbein M et al Ann Surg 2004

Endoluminal self-expanding stent across oesophageal anastomotic breakdown





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*All patients require antibiotics and nutritional support (preferably via enteral route).

Urschel JD Am J Surg 1995

Table 2

Complications which were statistically significant in patient with anastomotic leak

Variables	Leak		
	No (%)	Yes (%)	*P* value
Re-intubation	14.6	53.8	0.006
Stricture	6.3	41.7	0.006
Complications	35.4	92.3	0.0001
Mortality	6.4	23.1	0.07
Reoperation	16.7	69.2	0.001

Tabatabai A Ann Thor Med 2009

Prevention and Anticipatory Management of Anastomotic Leaks after Oesophagectomy

- There is no manner or mechanism by which anastomotic breakdown may be completely eliminated.
- Stapled and hand sewn anastomoses are accompanied by similar rates of break down.
- However a few anticipatory steps to minimise the effects of break down or provide effective management are prudent.

  *Nasogastric tube suction for 6-7 days post-op is assured by securing the NGT with nasal halter before the “routine” check contrast oesophagogram.

  *A pyloroplasty is fashioned to allow free gastric fluid drainage into the duodenum to prevent “vomiting” from postvagotomy gastric paresis and pyloric hypertonicity and aspiration during the early phase of oral feeding.

  *A feeding jejunotomy is fashioned as an insurance should leak occur
  *Placement of the oesophagogastric anastomosis in the neck is to be preferred since morbidity and mortality after anastomotic break down is less than intrathoracic leak.

Summary of Approach to Management of Post-Oesophagectomy Anastomotic Breakdown

- Anastomotic break downs after oesophagectomy may be devastating and associated with significant mortality particularly the intrathoracic anastomosis.
- Therefore many surgeons strive to place the anastomosis in the neck.
- Minor or contained leaks may be managed conservatively with or without direct drainage depending of the size of the collection together with antibiotics.
- Major intrathoracic disruptions may be amenable to endoluminal self-expanding stent placement but near complete break down requires operative management.
- Surgery in fulminant leaks should follow the principle of damage control
- GI continuity postponed until the patient has fully recovered from the inevitable sepsis.
- Establishment of continuity may entail colon interposition graft .
- Nutrition is paramount and anticipatory feeding jejunostomy should be fashioned during the intitial operation since enteral feeding is the preferred route.

Thank you, Dankie, Rea Leboa

References

Available on request (see proceedings booklet)

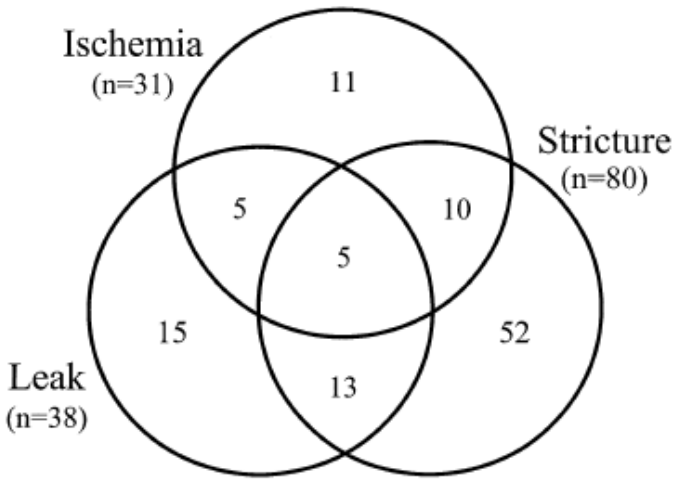


Figure 3. Venn diagram showing inter-relationship between ischemia, leak, and stricture.

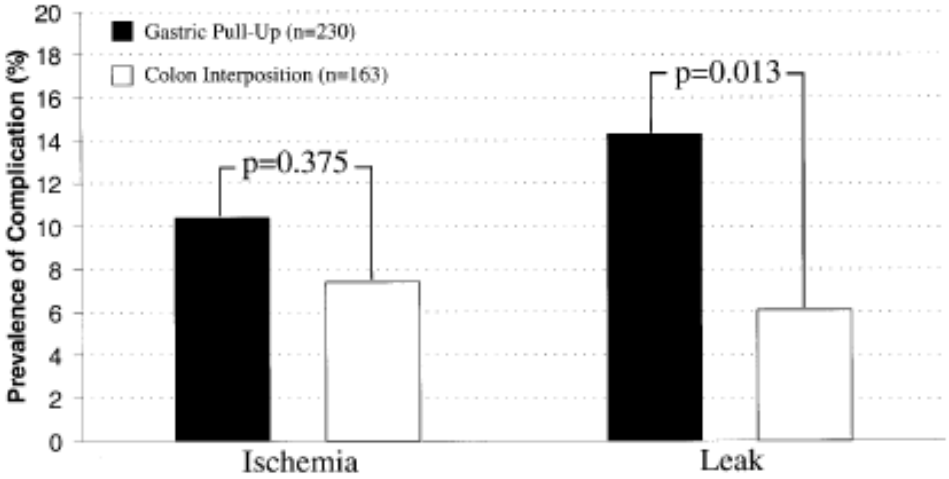


Figure 4. Prevalence of early complications of conduit ischemia and anastomotic leak after esophagectomy with gastric pull-up or colon interposition.

Briel JW et al J Am Coll Surg 2004

Table 4. Complications After Esophagectomy

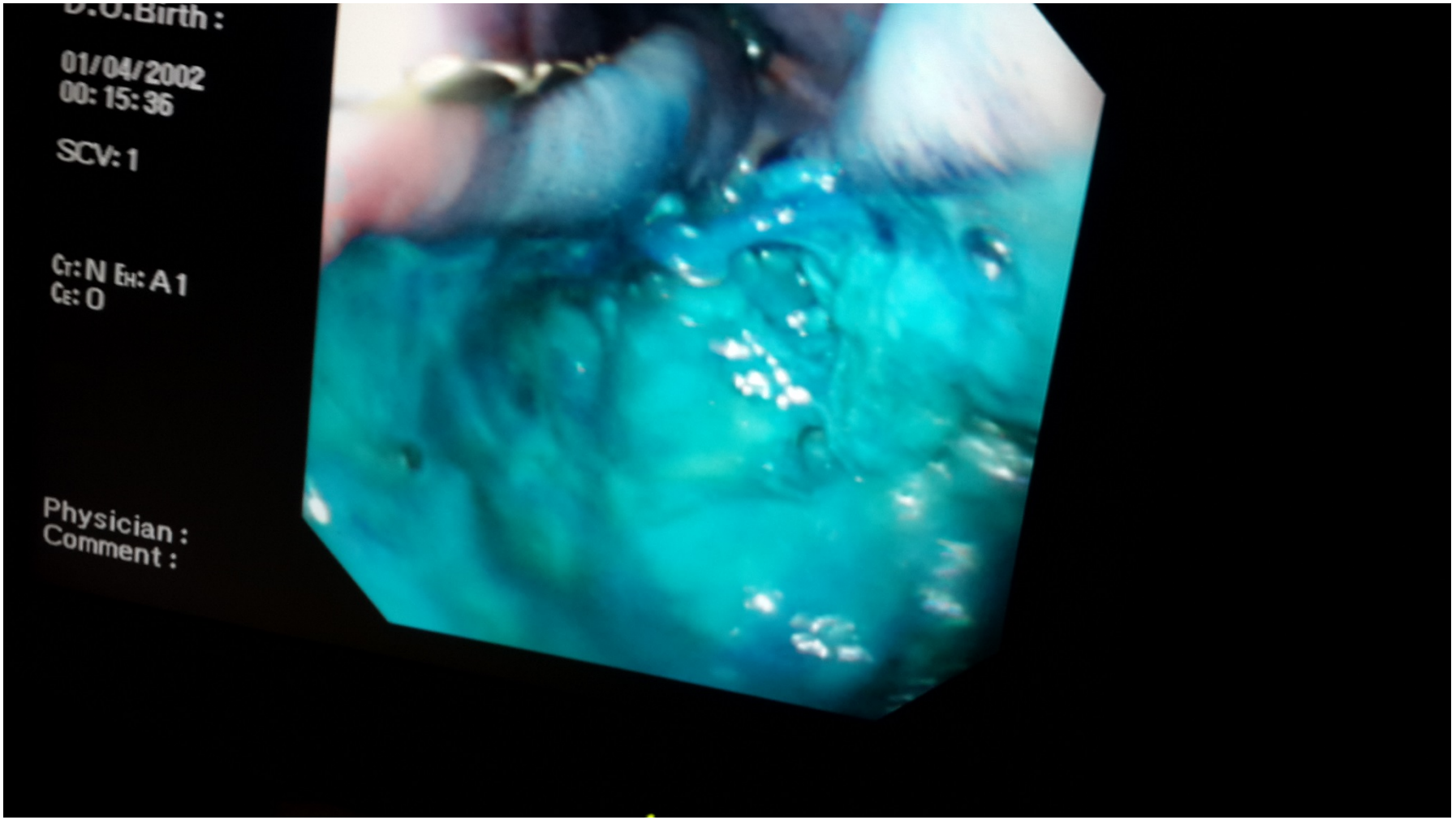
Complications*	No. (%) of Patients: Stomach Group (n = 959)	No. (%) of Patients: Colon Group (n = 42)	*P* Value
Cardiovascular	238 (24.8)	14 (33.3)	.21
Major pulmonary	177 (18.5)	10 (23.8)	.42
Other medical	197 (20.5)	11 (26.2)	.44
Anastomotic leakage	37 (3.9)	6 (14.3)	.007
Gangrene of loop	5 (0.5)	1 (2.4)	.26
Delayed gastric emptying	31 (3.2)	. . .	. . .
Vocal cord paralysis	76 (7.9)	3 (7.1)	>.99
Hemorrhage	30 (3.1)	2 (4.8)	.39
Chylothorax	16 (1.7)	1 (2.4)	.52
Empyema thoracis	22 (2.3)	2 (4.8)	.67
Mediastinitis	16 (1.7)	1 (2.4)	.52
Intraperitoneal sepsis	2 (0.2)	4 (9.5)	<.001

Davis PA et al Arch Surg 2003

Table 5. Theoretical Advantages and Disadvantages of Stomach and Colon Used as Esophageal Replacement

Conduit	Advantages	Disadvantages
Stomach	Easy to prepare Sufficient length to reach neck Lower morbidity and mortality Dependable vascularity Low rate of necrosis (1%-2%) Single anastomosis	Loss of normal gastric reservoir (functional?) Reflux complications, eg, risk of aspiration, Barrett esophagus Shorter distal margins for distal esophageal or cardia tumors Within field of irradiation for distal esophageal cancers if radiotherapy given preoperatively
Colon	Better long-term function Longer length Lack of acid reflux Preservation of gastric reservoir (if present) Permits generous resection margins of tumors Outside field of irradiation for distal esophageal cancers if radiotherapy given preoperatively	Complex procedure Longer operative time Preoperative bowel preparation needed Requires 3 anastomoses Higher morbidity and mortality rates Higher rate of necrosis (3%-10%) Redundancy of conduit

Davis PA et al Arch Surg 2003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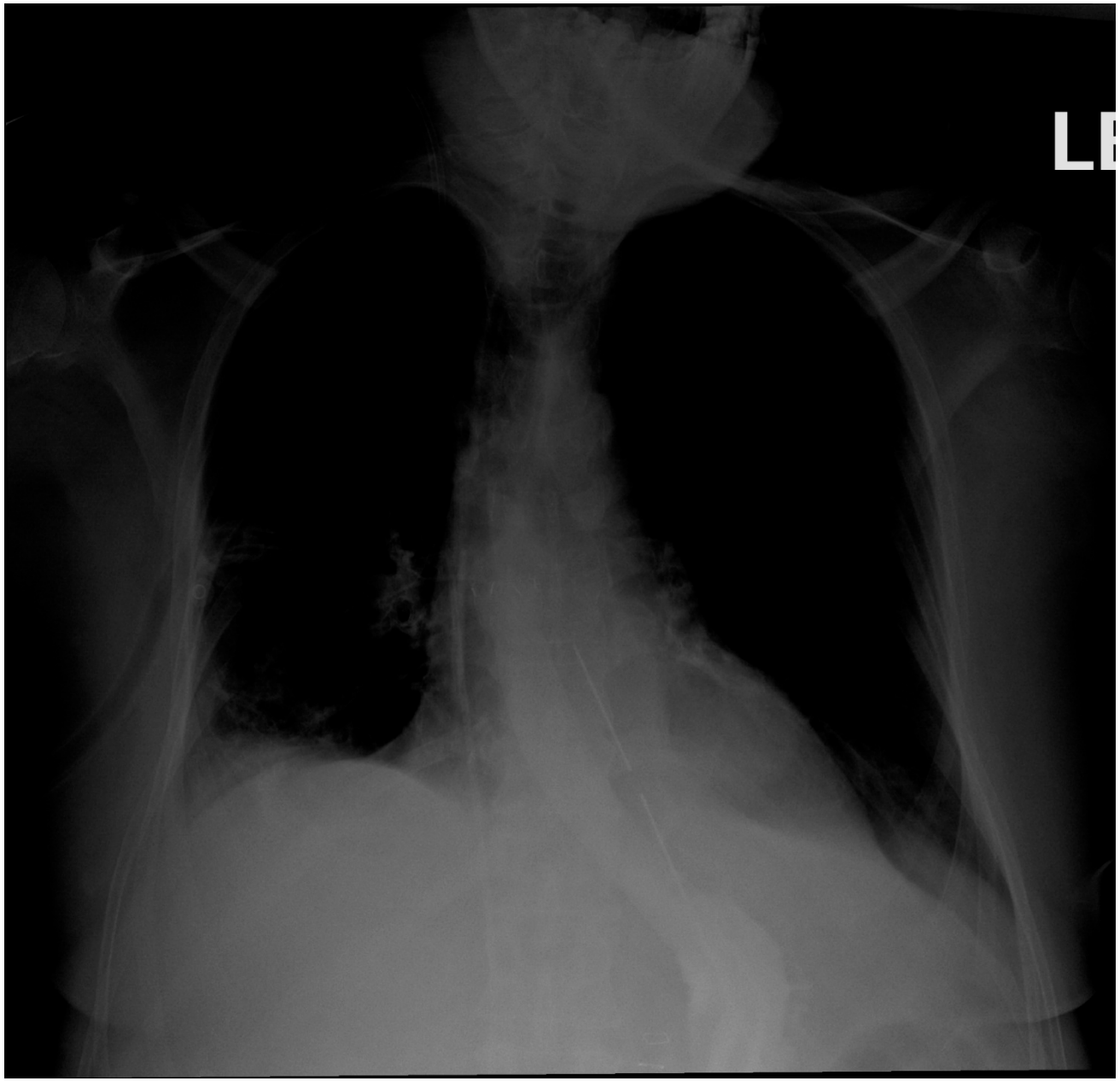
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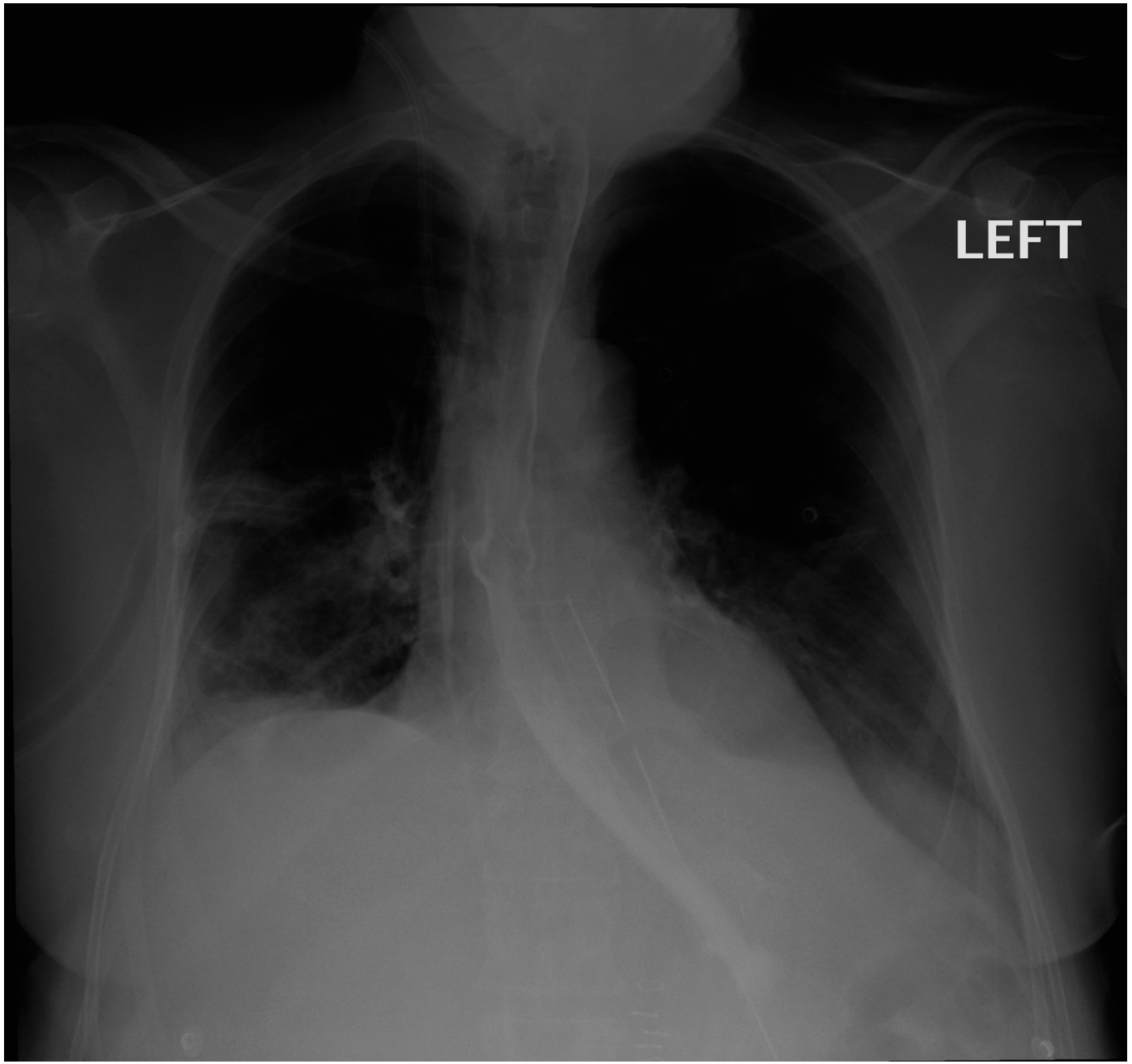
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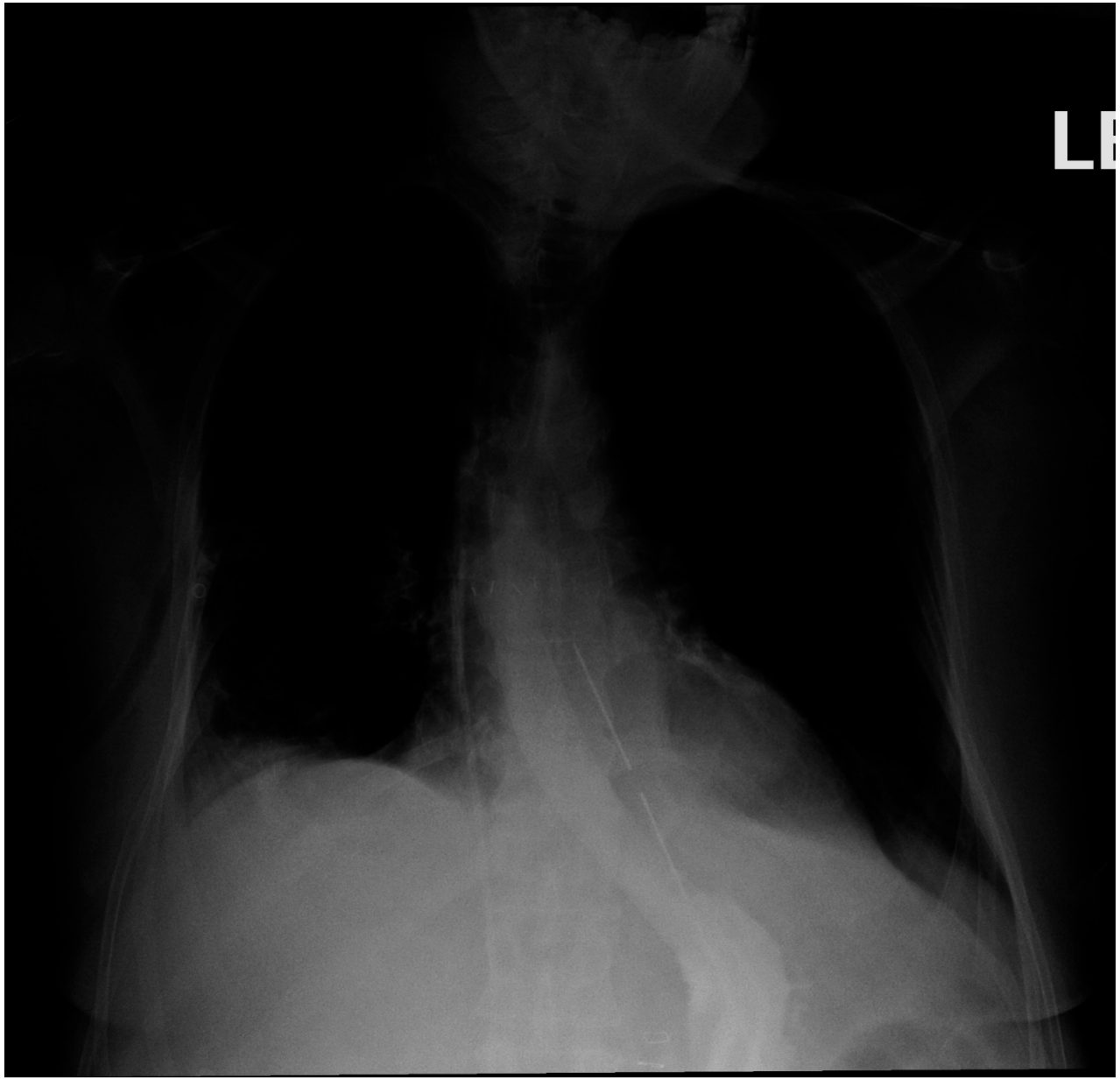
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