Contemporary Surgical Management of Esophageal Cancer
Journey to Minimally Invasive Robotic Esophagectomy

FLASCO 2025 Clinical Oncology Series
February 8th
Westin Waterside Tampa

Gary Chmielewski, MD, FACS
Medical Director of Robotic Thoracic Surgery
AdventHealth Orlando

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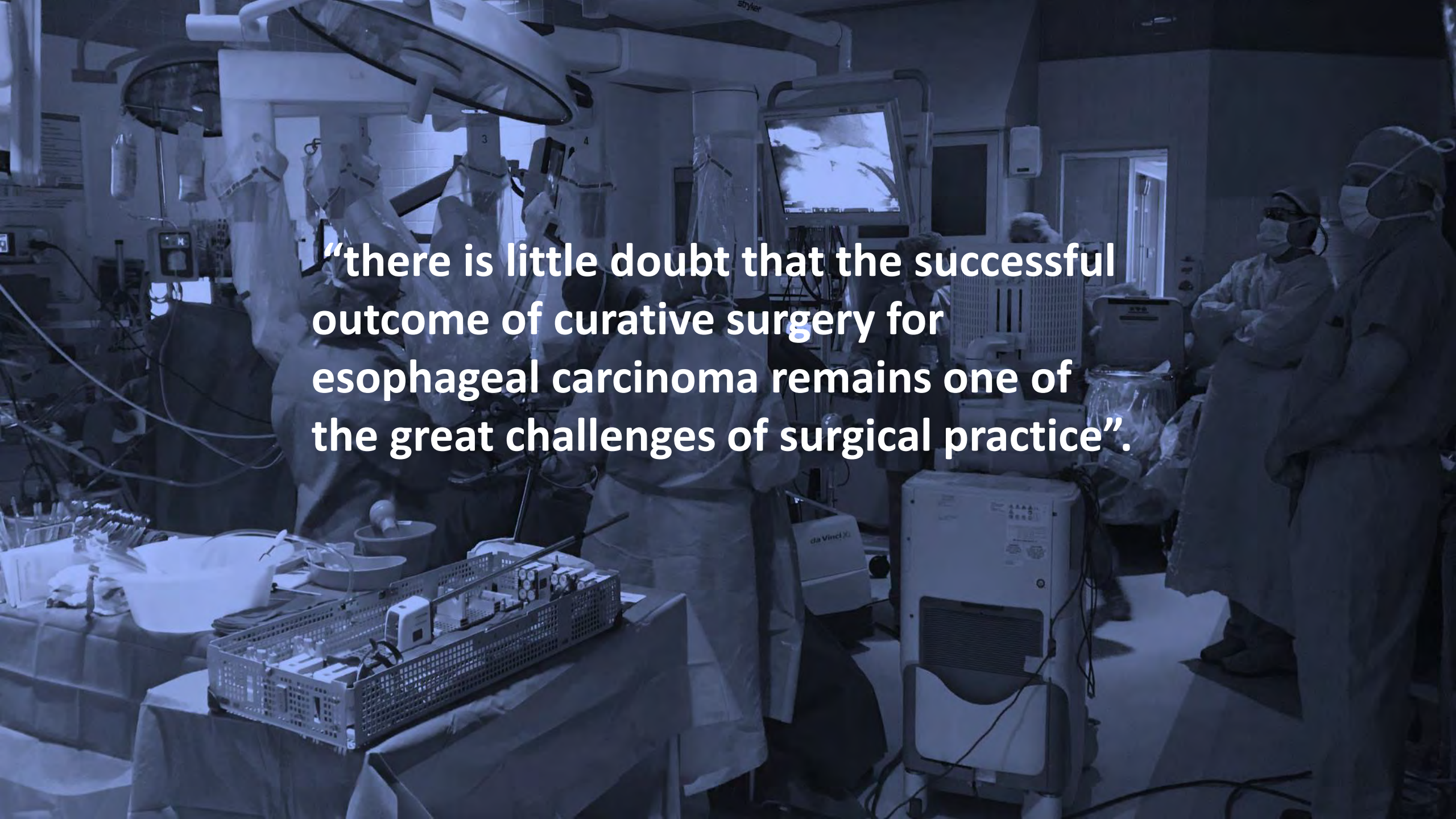
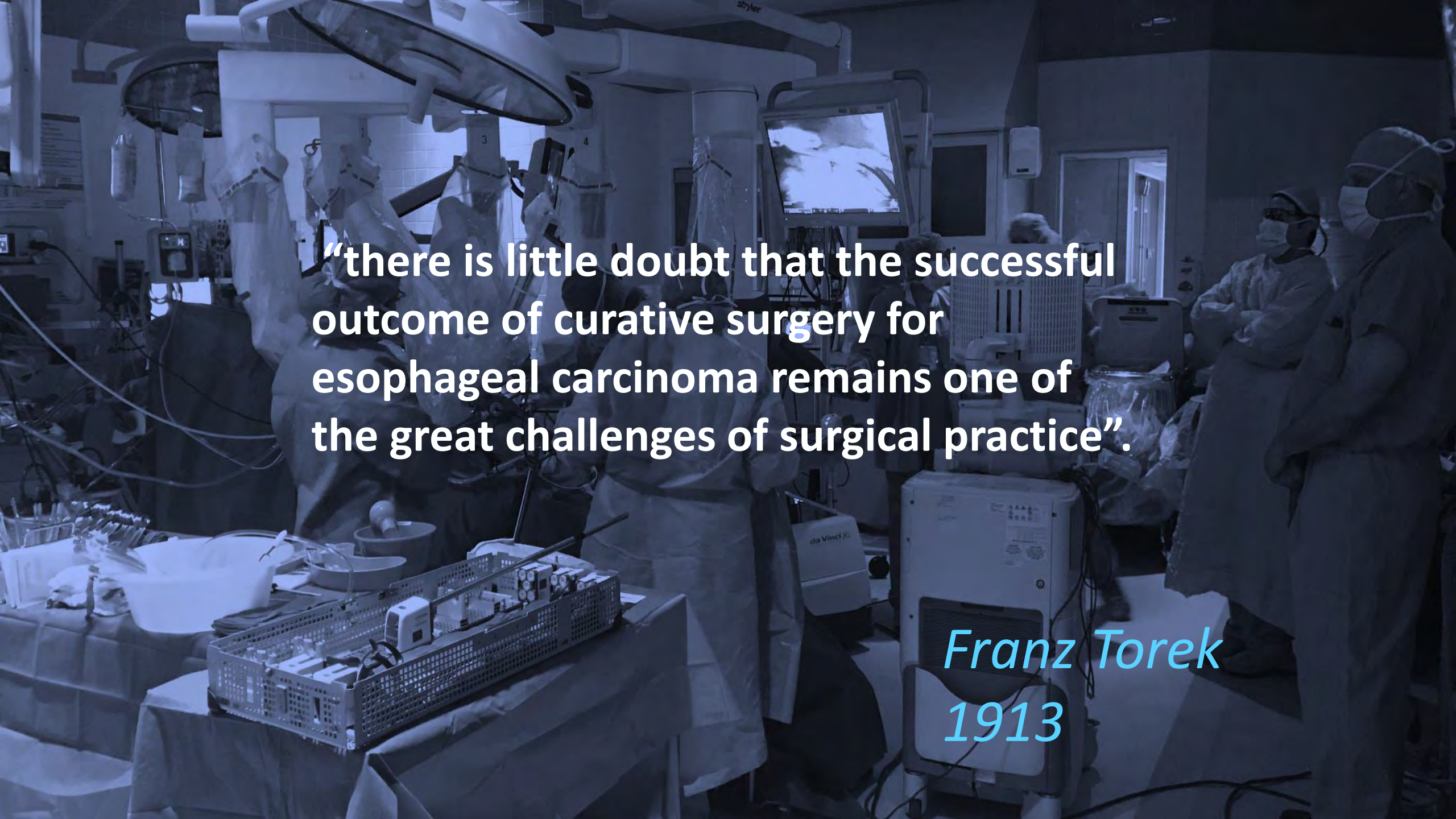
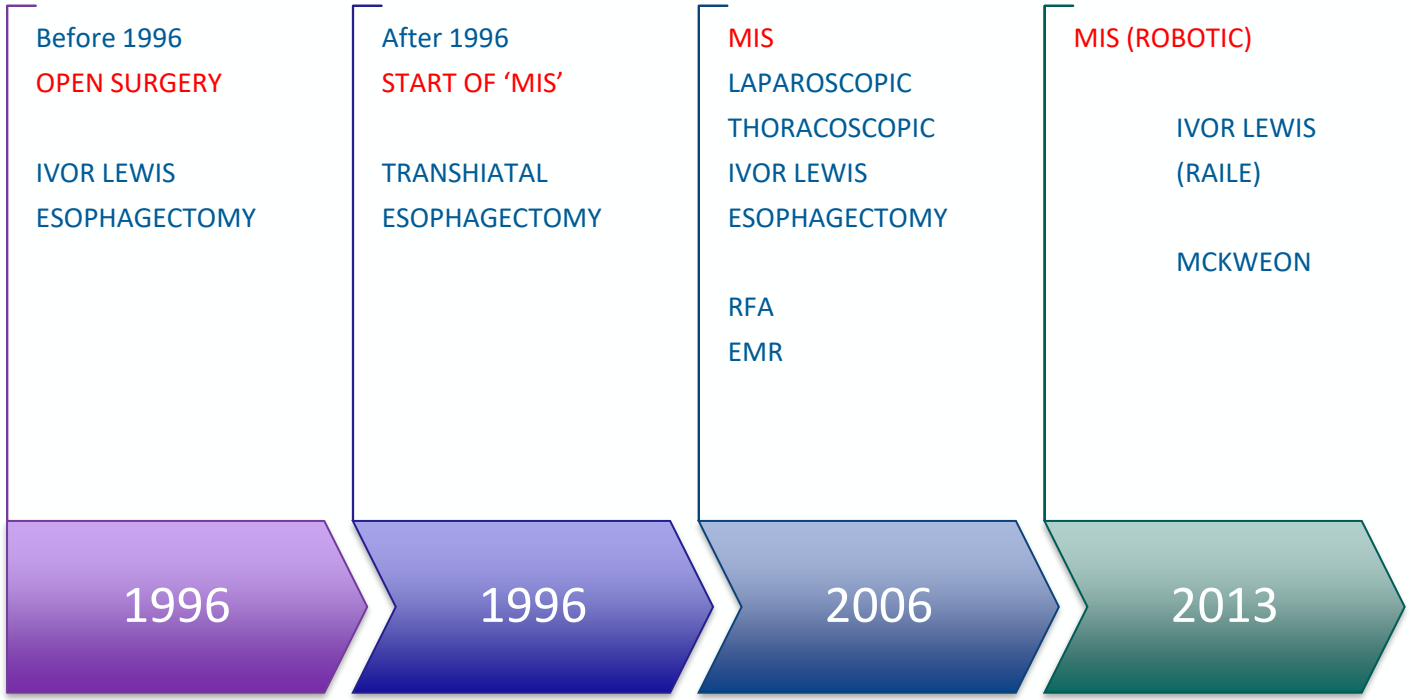
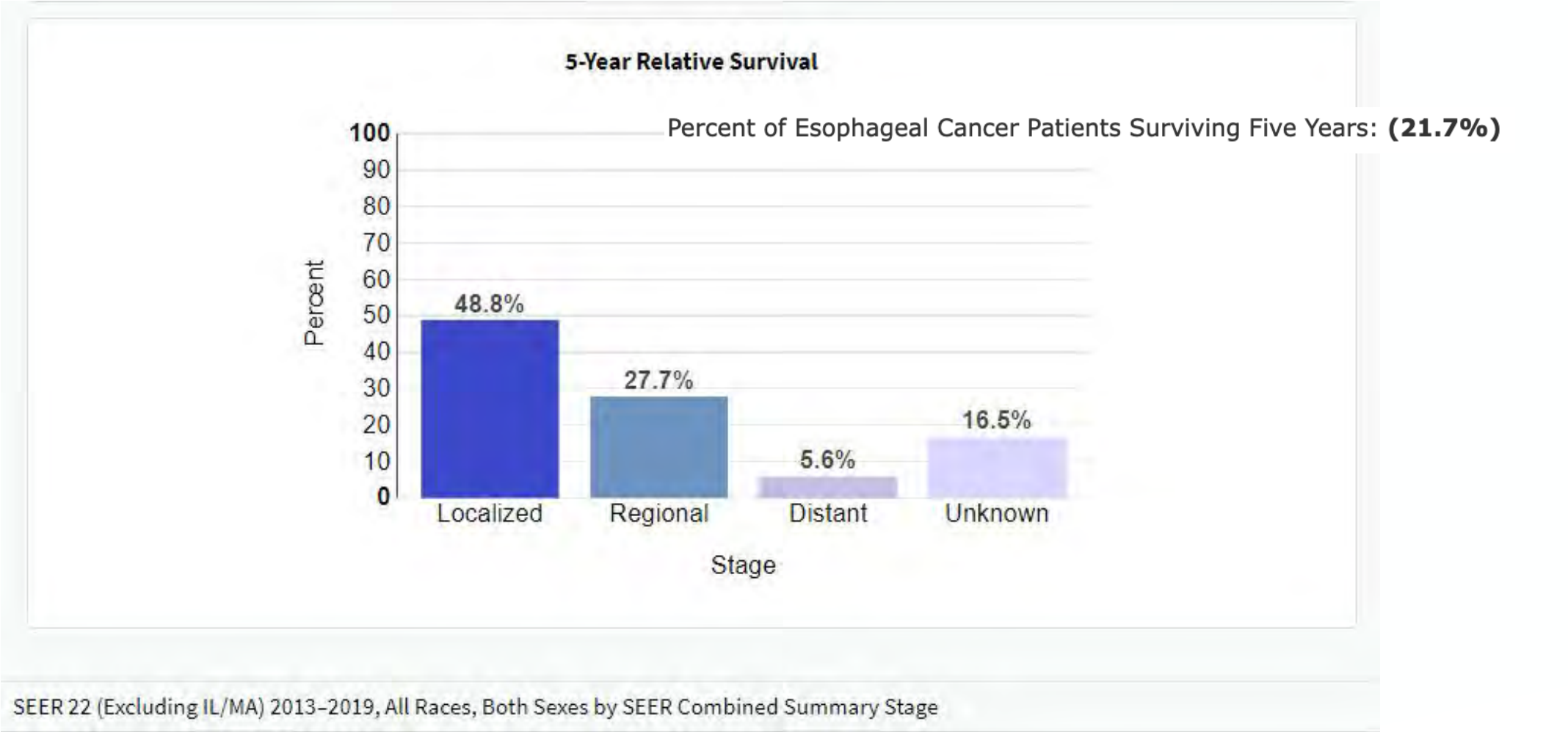

“there is little doubt that the successful outcome of curative surgery for esophageal carcinoma remains one of the great challenges of surgical practice”.


"there is little doubt that the successful outcome of curative surgery for esophageal carcinoma remains one of the great challenges of surgical practice".
Franz Torek
1913

EVOLUTION OF SURGICAL TECHNIQUES in my practice 1996-2021



Esophageal Cancer:
5-Year Relative Survival Rates



SEER 22 (Excluding IL/MA) 2013–2019, All Races, Both Sexes by SEER Combined Summary Stage

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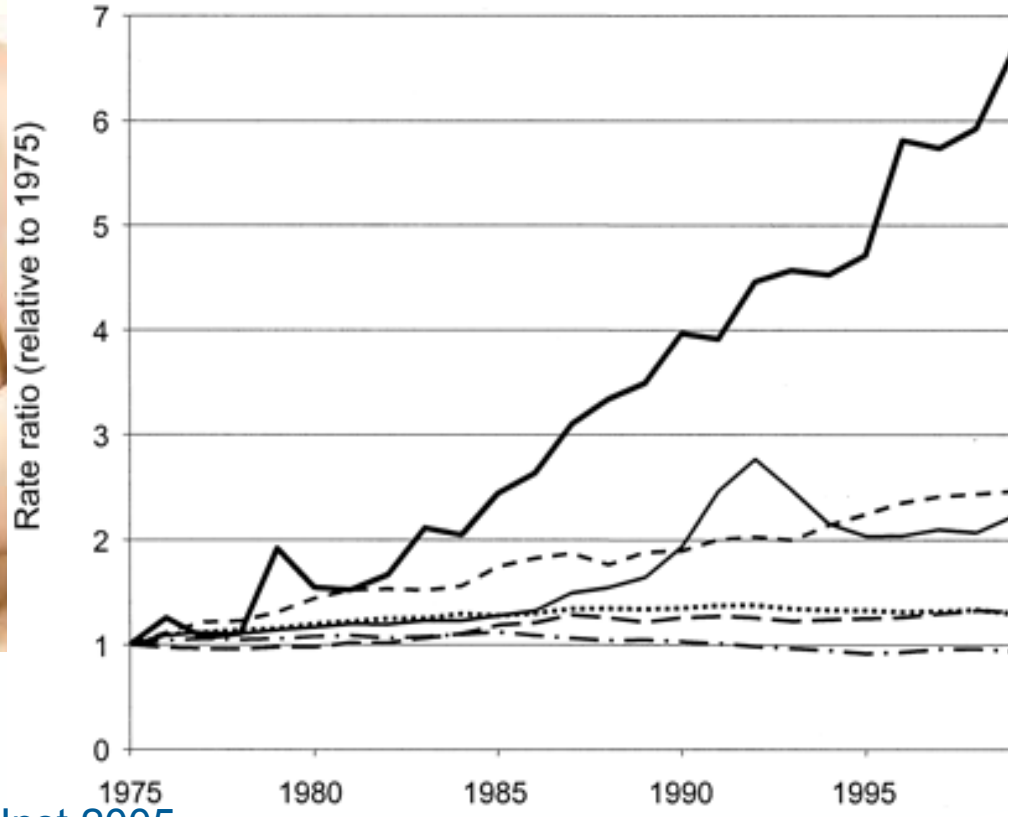
Here to stay and getting worse

Esophageal CA



From: Pohl H, Welch HG. Natl Cancer Inst 2005

Incidence and Mortality of Esophageal Cancer in the United States (1999-2024):

Year	Incidence (Diagnosis)	Mortality (Deaths)
2024	22,370	16,130
2023	21,560	16,120
2022	20,640	16,410
2021	19,260	15,530
2020	18,440	16,170
2019	17,650	16,080
2018	17,290	15,850
2017	16,940	15,690
2016	16,910	15,690
2015	16,980	15,590
2014	18,170	15,450
2013	17,990	15,210
2012	17,460	15,070
2011	15,914	14,44
2010	15,813	14,490
2009	16,487	13,908
2008	16,299	13,714
2007	15,706	13,592

ESOPHAGECTOMY APPROACHES

- Thoraco-abdominal
- McKeown (3 Hole)
- Ivor Lewis
- Transhiatal

All associated with larger incisions that result in pulmonary compromise
Mortality 2-20% Morbidity 25-60% OPEN
Longer recovery times

- Minimally Invasive Esophagectomy

Mortality 0-2% Morbidity 5-20 % MIS

- GOALS:
  - Resect all cancer
  - Adequate nodal staging
  - No anastomotic leak
  - Eat and return to daily living
  - Tolerate any needed adjuvant therapy

First description 1946

GOLD STANDARD for the next 50 years

OPEN SURGERY:

Laparotomy

Thoracotomy

Intra-thoracic anastomosis

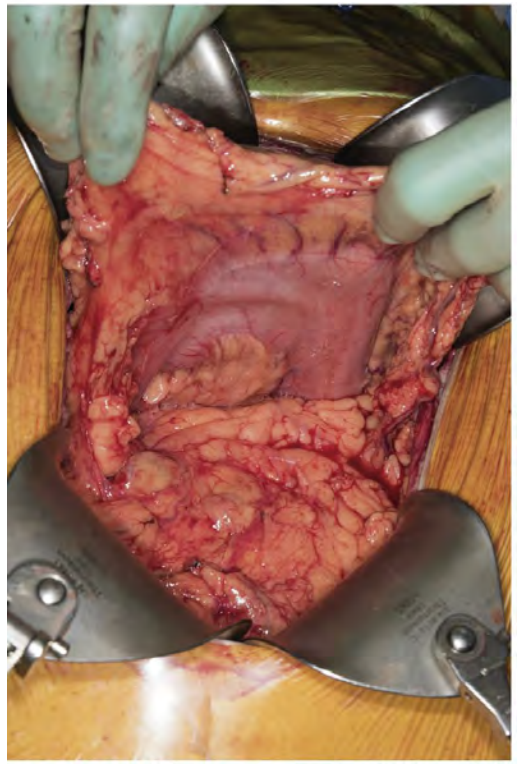
COMPLICATIONS:
Mortality 2- 20%
MI 1%
SVT 13%
DVT 19%
LEAK 11-20%
STRICTURE 5-40%
RESP 25-47%

HOW I TEACH IT

Open Modified En Bloc Ivor Lewis Esophagectomy: How I Teach It

Wayne Hofstetter, MD

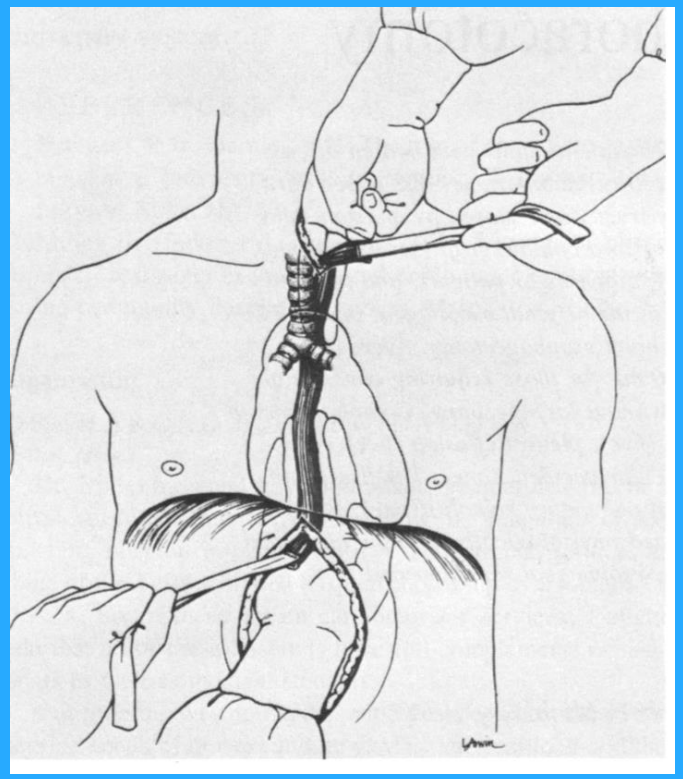
Department of Thoracic and Cardiovascular Surgery, University of Texas, MD Anderson Cancer Center, Houston, Texas



Ann Thorac Surg
2018;105:1583–8

TRANSHIATAL ESOPHAGECTOMY

- Denk described in cadavers (1913)
- Turner (1933) first successful
- Orringer and Sloan (1978) 28 patients



Esophagectomy without thoracotomy

Blunt esophagectomy without thoracotomy has been performed in 26 patients: four with benign disease and 22 with carcinomas involving various levels of the esophagus (10 cervicothoracic, one upper third, five middle third, and six distal third). Continuity of the alimentary tract was restored by anastomosing the pharynx or cervical esophagus either to stomach (19 patients) or to a colonic graft (seven patients). Esophageal resection and reconstruction were performed in a single stage in 25 patients, and the esophageal substitute was positioned in the posterior mediastinum in the original esophageal bed in 24 patients. There were no deaths directly related to the technique of blunt esophagectomy. Average intraoperative blood loss was 1,350 ml. for the entire group, 1,650 ml. for those requiring concomitant laryngectomy and 1,050 ml. for those undergoing esophagectomy without laryngectomy. Complications in these patients included pneumothorax (eight), transient hoarseness (five), pleural effusion (five), anastomotic leak (four), subphrenic abscess (one), and cerebrovascular accident (one). The five deaths were due to pneumonia (two), innominate artery rupture (two), and pulmonary embolus (one). Blunt esophagectomy without thoracotomy is safe and is far better tolerated physiologically than the combined transthoracic and abdominal operations more traditionally used for esophageal resection and reconstruction.

Mark B. Orringer, M.D., and Herbert Sloan, M.D., *Ann Arbor, Mich.*

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Transhiatal Esophagectomy: Clinical Experience and Refinements

Mark B. Orringer, MD, Becky Marshall, and Mark D. Iannettoni, MD

From the Section of General Thoracic Surgery, Department of Surgery, University of Michigan Medical Center, Ann Arbor, Michigan

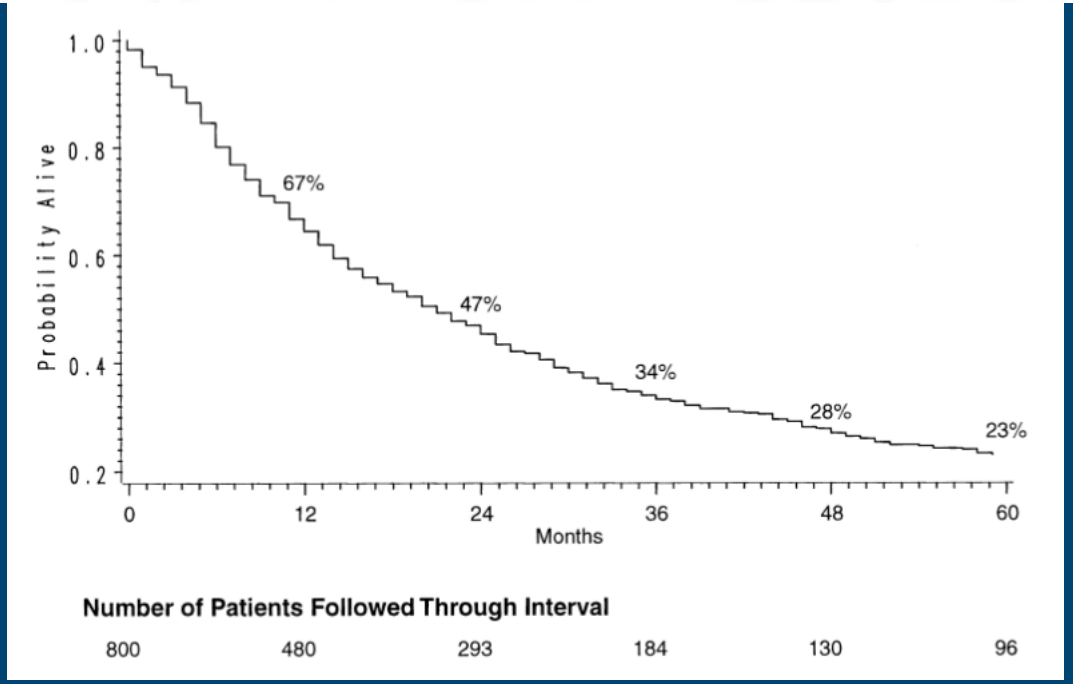


Table 1. INDICATIONS FOR TRANSHIATAL ESOPHAGECTOMY (1085 PATIENTS)

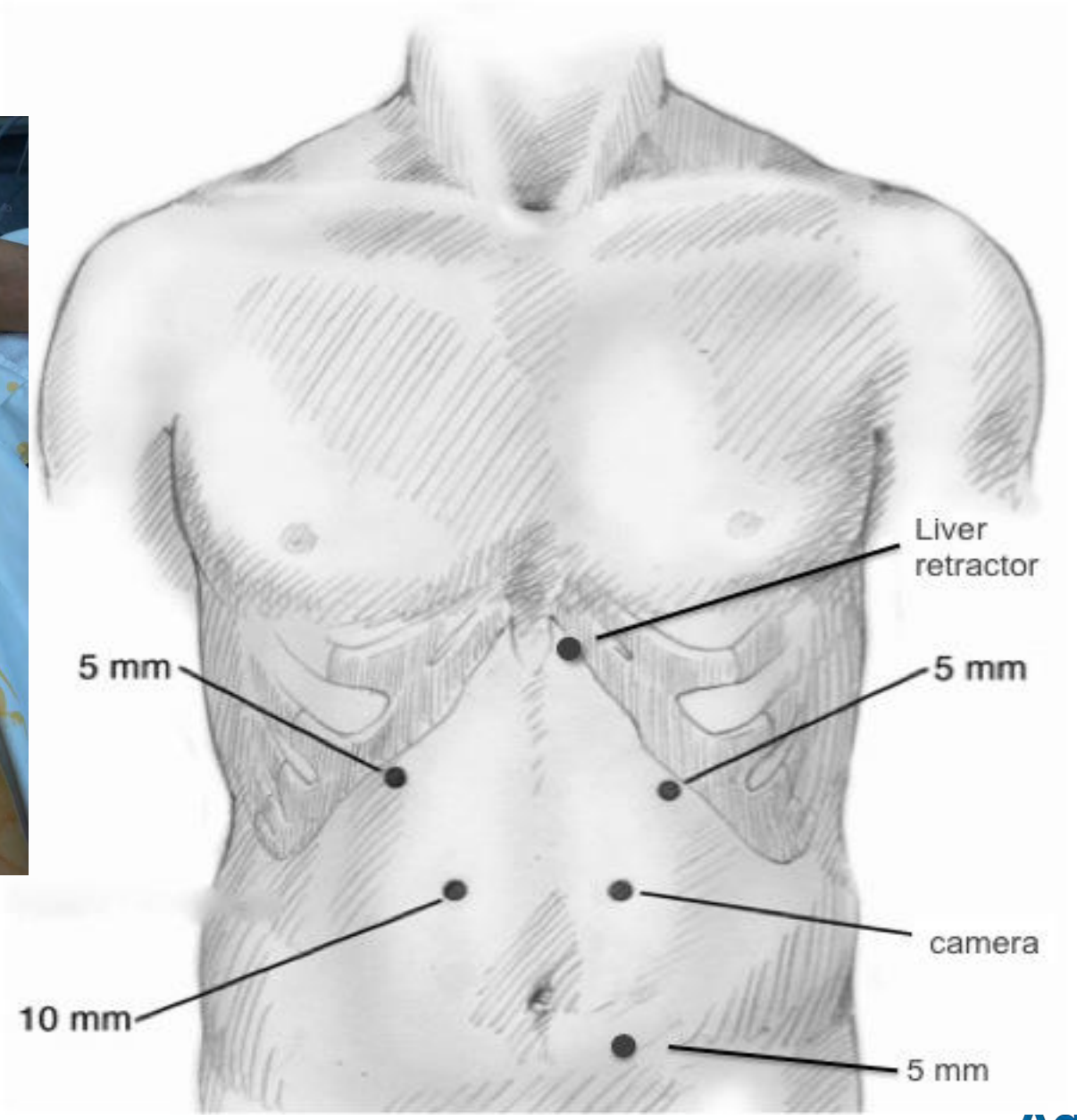
		Number (%)
Benign Conditions		**285 (26%)**
Neuromotor dysfunction		93 (33%)
Achalasia	70	
Spasm/dysmotilty	22	
Scleroderma	1	
Stricture		75 (26%)
Gastroesophageal reflux	42	
Caustic ingestion	19	
Radiation	4	
Other	10	
Barrett's mucosa with high-grade dysplasia		54 (19%)
Recurrent gastroesophageal reflux		21 (7%)
Recurrent hiatus hernia		14 (5%)
Acute perforation		14 (5%)
Acute caustic injury		6
Other		8
Carcinoma of Intrathoracic Esophagus		**800 (74%)**
Upper third		36 (4.5%)
Middle third		177 (28.0%)
Lower third thoracic and/or cardia		587 (73.5%)

MIS IVOR LEWIS ESOPHAGECTOMY

James Luketich, MD
UPMC

Complete Laparoscopic and Thoracoscopic approach

Minimally Invasive Esophagectomy



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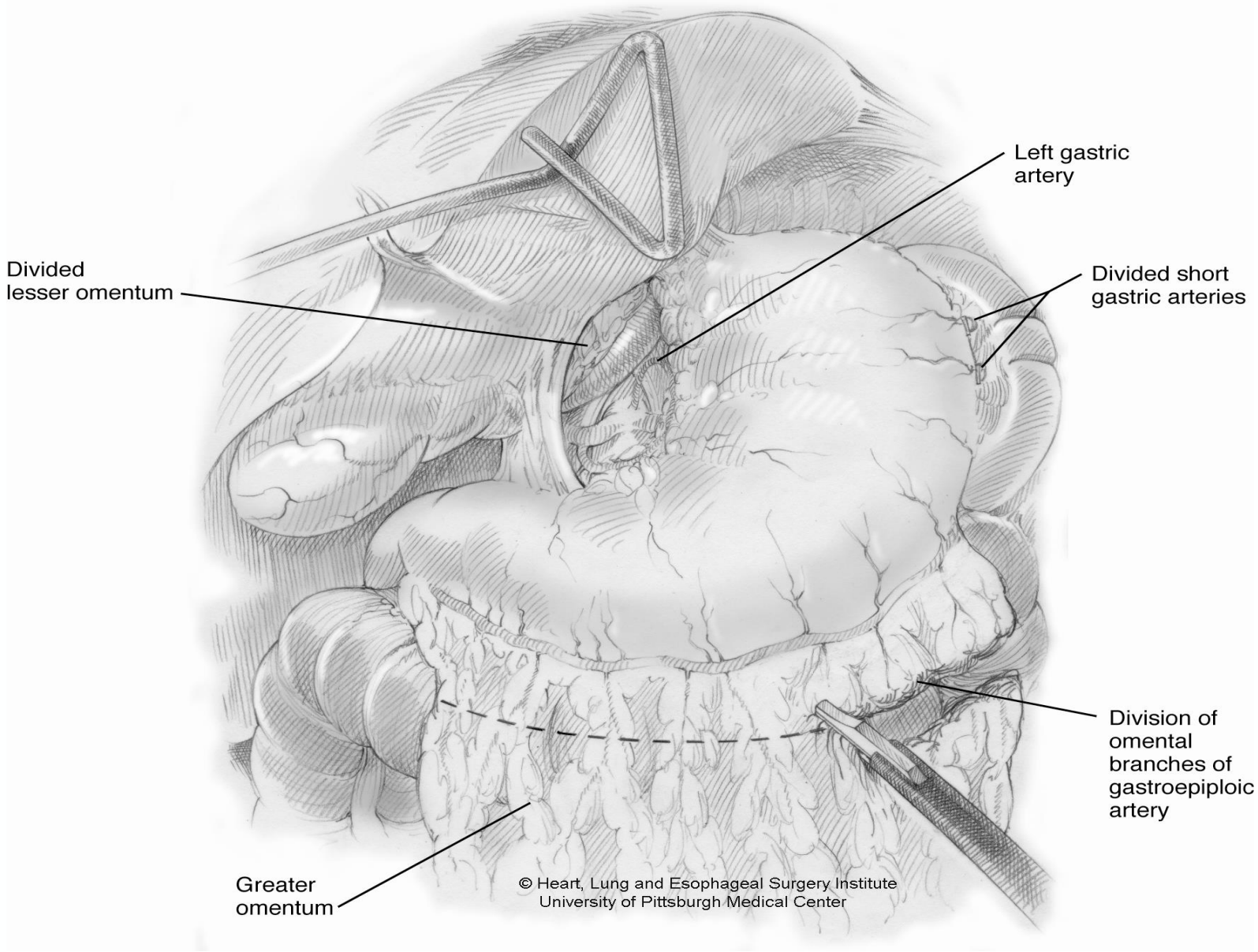

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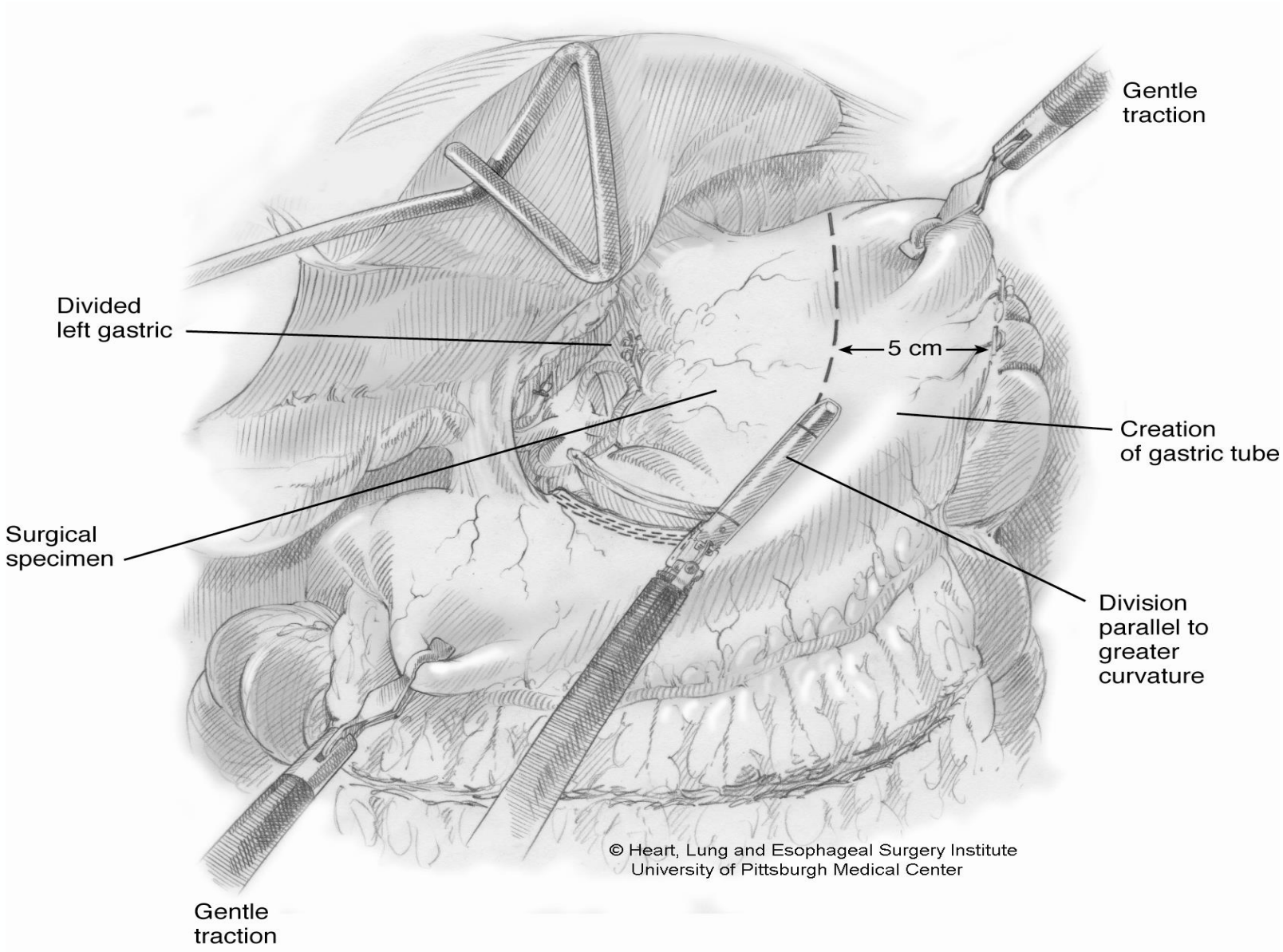

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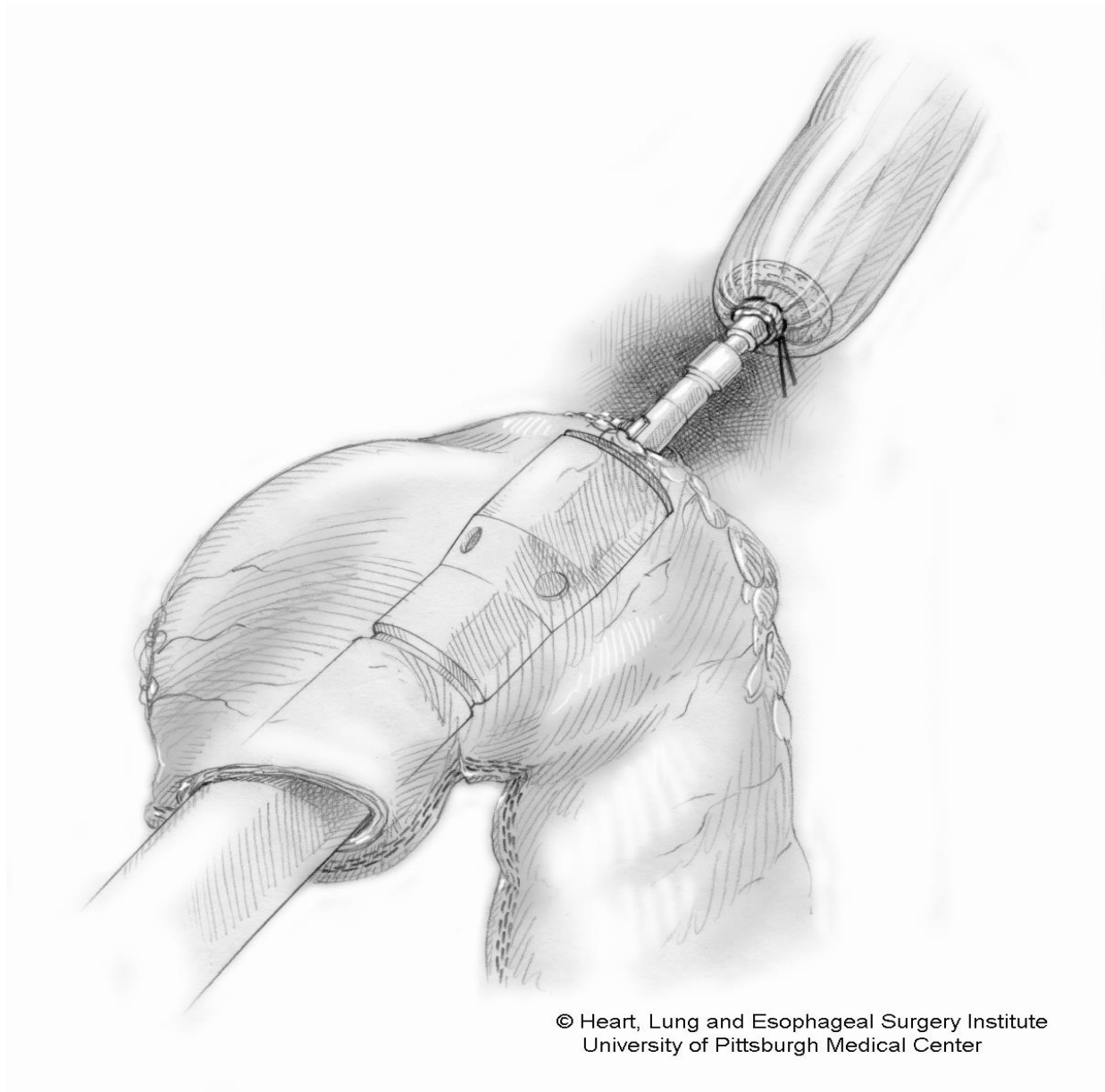

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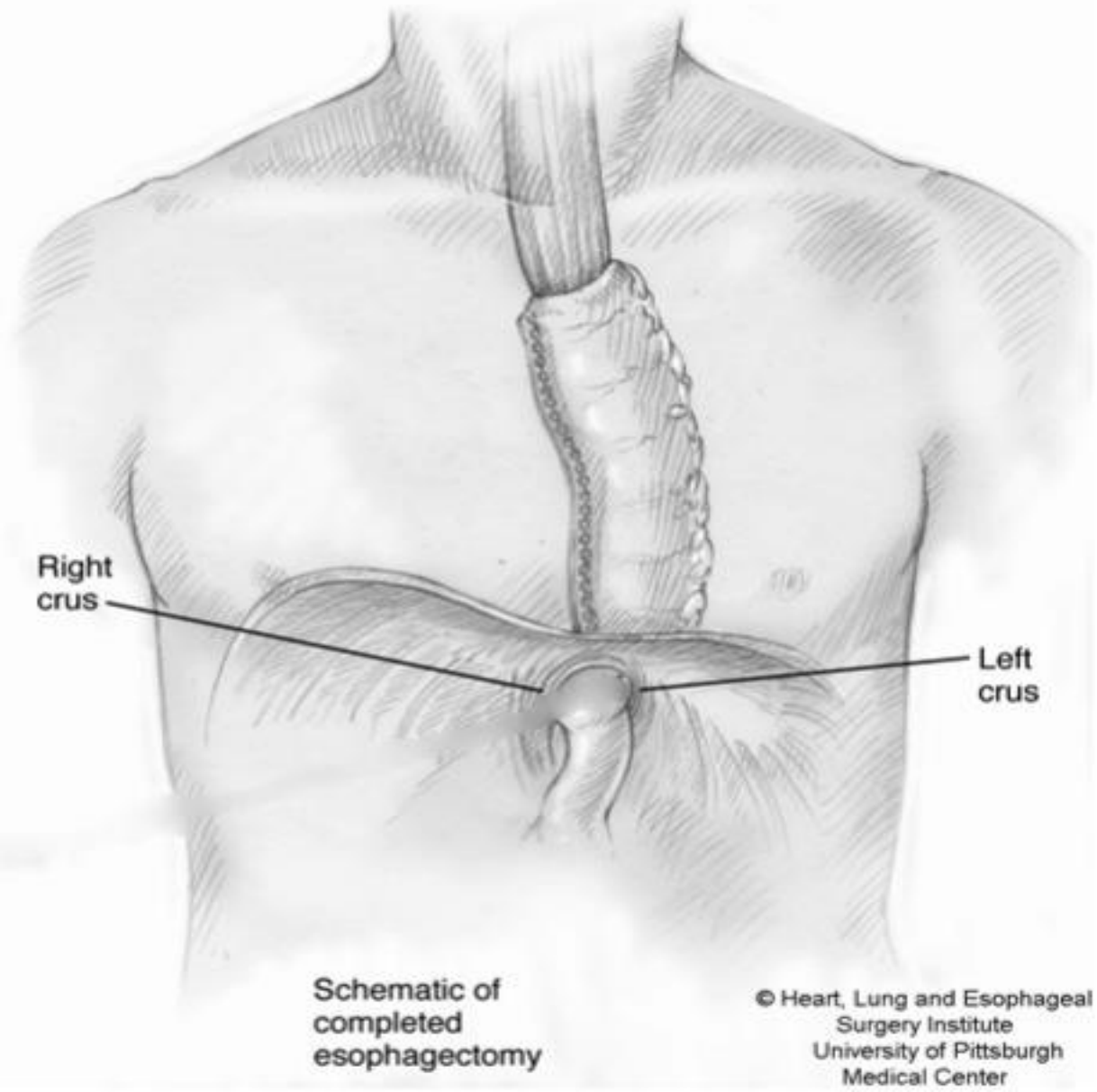

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Minimally invasive esophagectomy in the elderly.

Perry Y. Fernando HC. Buenaventura PO. Christie NA. Luketich JD.

J Soc Laparoendoscopic Surgeons. 6(4):299-304, 2002 Oct-Dec.

MIE was Ivor Lewis Type (laparoscopy and thoracoscopy)

41 pts > 75 yo

No perioperative deaths

Major Morbidity 19%

1 pneumonia, 1 tracheal tear, 1 chylothorax,
1 MI, 3 leaks

VERY FAVORABLE RESULTS

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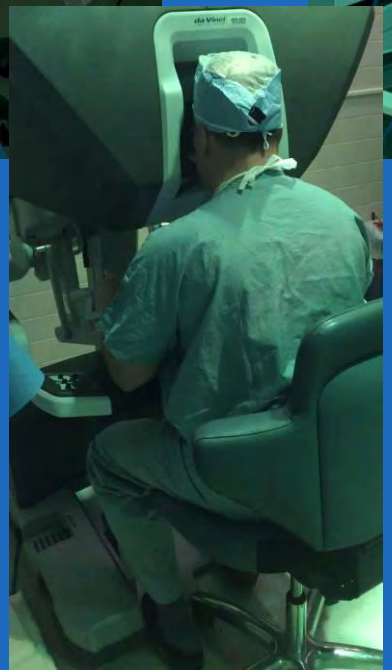


Robotic Platform consists of:

- Patient/Bedside tower
- Power Cart
- Surgeon console

Advantages
ROBOTIC ESOPHAGECTOMY

- Complete control of the operative field
- Better visualization- 3D and high definition
- Better lymph node harvest
- Easier dissection of greater curve spleen
- Increased dexterity and precision in dissection
- Replicate my open 2-layered hybrid anastomosis
- Evaluate the conduit vascularity w Firefly
- My bias ‘Quicker back to life’

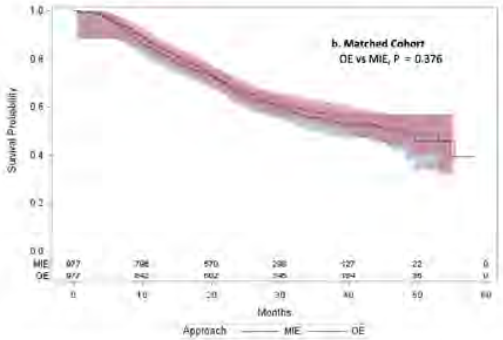
Minimally Invasive Esophagectomy Provides Equivalent Survival to Open Esophagectomy: An Analysis of the National Cancer Database

Brian Mitzman, MD, Waseem Lutfi, BS,† Chi-Hsiung Wang, PhD,† Seth Krantz, MD,‡ John A. Howington, MD,§ and Ki-Wan Kim, MD‡*

The use of minimally invasive esophagectomy (MIE) is increasing despite limited evidence to support its efficacy. We compared overall survival and perioperative mortality for MIE vs open esophagectomy (OE). We queried the National Cancer Database for all patients having esophagectomy as the primary procedure for primary squamous cell cancer and adenocarcinoma from 2010 through 2012. A propensity score analysis was performed. Postoperative pathology and quality, as well as overall patient survival outcomes, were compared between OE and MIE. The use of MIE increased from 26.9% in 2010 to 36.3% in 2012 ($P < 0.001$). Of 3032 patients (2050 OE and 982 MIE) who were identified, propensity score matching (1:1) yielded 977 patients in each group. Mean lymph nodes examined were higher in the MIE group (16.3 vs 14.5, $P < 0.001$). However, final pathologic nodal stage was not significantly different in the matched sample. There was also no difference in pathologic upstaging or margin status between the groups. All other postoperative variables were equivalent, including an average length of stay of 14 days, unplanned readmission rate of 6.5%, and 30-day and 90-day mortality rates of 3% and 7%, respectively. There was no survival difference, with a median survival of 48.7 months for OE and 46.6 months for MIE (Kaplan-Meier analysis, $P = 0.376$). During the 3-year period analyzed, there were no significant differences in postoperative outcomes and quality metrics between OE and MIE. Although short-term outcomes are limited in the National Cancer Database, MIE appears to have equivalent oncological outcomes and survival when compared with the open approach.

Semin Thoracic Surg 29:244–253

Keywords: esophagus, minimally invasive surgery, surgery, thoracoscopic, esophageal cancer, laparoscopic



Kaplan-Meier curve showing overall survival for matched cohort of open esophagectomy vs minimally invasive esophagectomy.

Central Message

Minimally invasive esophagectomy has equivalent oncological outcomes and overall survival when compared with open esophagectomy.

Perspective Statement

Open approaches for resectable esophageal cancer have high morbidity. Minimally invasive techniques have been shown to have similar survival and improved morbidity in many surgical fields, including colorectal and lung cancer. Minimally invasive esophagectomy has equivalent oncological and overall survival outcomes when compared with open esophagectomy, and may be the preferred approach for esophageal cancer.

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Table 4. The DHMC experience

Patient demographics	Robotic esophagectomy, *n* = 40
Age, Mean (SD)	63.3 (8.6)
Male, (%)	36 (90.0)
Pack years, Mean (SD)	46.5 (38.5)
Smoking status, (%)	
Current	6 (15.0)
Former	24 (60.0)
Never	10 (25.0)
Alcohol status, (%)	
None	9 (22.5)
Current use[1]	19 (47.5)
Prior use[1]	2 (5.0)
Prior heavy use[2]	10 (25.0)
Induction therapy, (%)	33 (82.5)
Operative time, mins, Mean (SD)	512.7 (70.2)
Length of stay, days, Median (range)	9 (5-38)
Complications[3], (%)	
Anastomotic Leak[4]	6 (15.0)
Pneumonia	4 (10.0)
Atrial fibrillation[5]	6 (15.0)
Chyle leak[6]	4 (10.0)
30-day mortality, (%)	0

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TABLE 2 Case series of Ivor-Lewis RAMIE

				Pathology (%)						Complications (%)				
Author	Year	n	Country	SCC	Adeno	Other	Op time	EBL	HLN	Pneumonia	RN injury	Anast leak	Chyle leak	Mortality[a]
Cerfolio[39]	2013	16	USA	19	81	0	367[b]	60[b]	18[b]	0	0	0	0	0
de la Fuente[38]	2013	50	USA	6	92	2	445	146	20	10	NA	2.0	4.0	0
Hernandez[34]	2013	52	USA	6	88	6	442	NA	19	9.6	NA	1.9	3.8	0
Trugeda[37]	2014	14	Spain	36	64	0	222[b]	75[b]	18[b]	0	0	7.1	14	0
Hodari[36]	2015	54	USA	6	85	9	362	74	16	14	NA	5.5	2.3	1.9
Wee[35]	2016	20	USA	10	75	15	455[b]	275[b]	23	10	NA	0	10	0
Egberts[32]	2017	75	Germany	0	96	4	392[b]	172[b]	29	NA	NA	9.6	NA	3.9
Zhang[31]	2018	61	China	95	0	5	316	189	19	6.6	8.2	9.8	1.6	0
Meredith[40]	2018	147	USA	10	86	4	415	158	20	6.8	NA	2.7	3.4	1.4
Pötscher[41]	2019	11	Austria	NA	NA	NA	389[b]	NA	NA	NA	NA	18	NA	NA
Wang[42]	2019	31	China	71	26	3	387	110[b]	17	3.2	NA	6.5	NA	0
var der Sluis[33]	2020	100	Germany	19	79	2	415	311	29	12	3.0	8.0	4.0	3.0
Average										8.5	4.2	5.6	3.7	1.5

Ann Gastroenterol Surg. 2020;4:608–617

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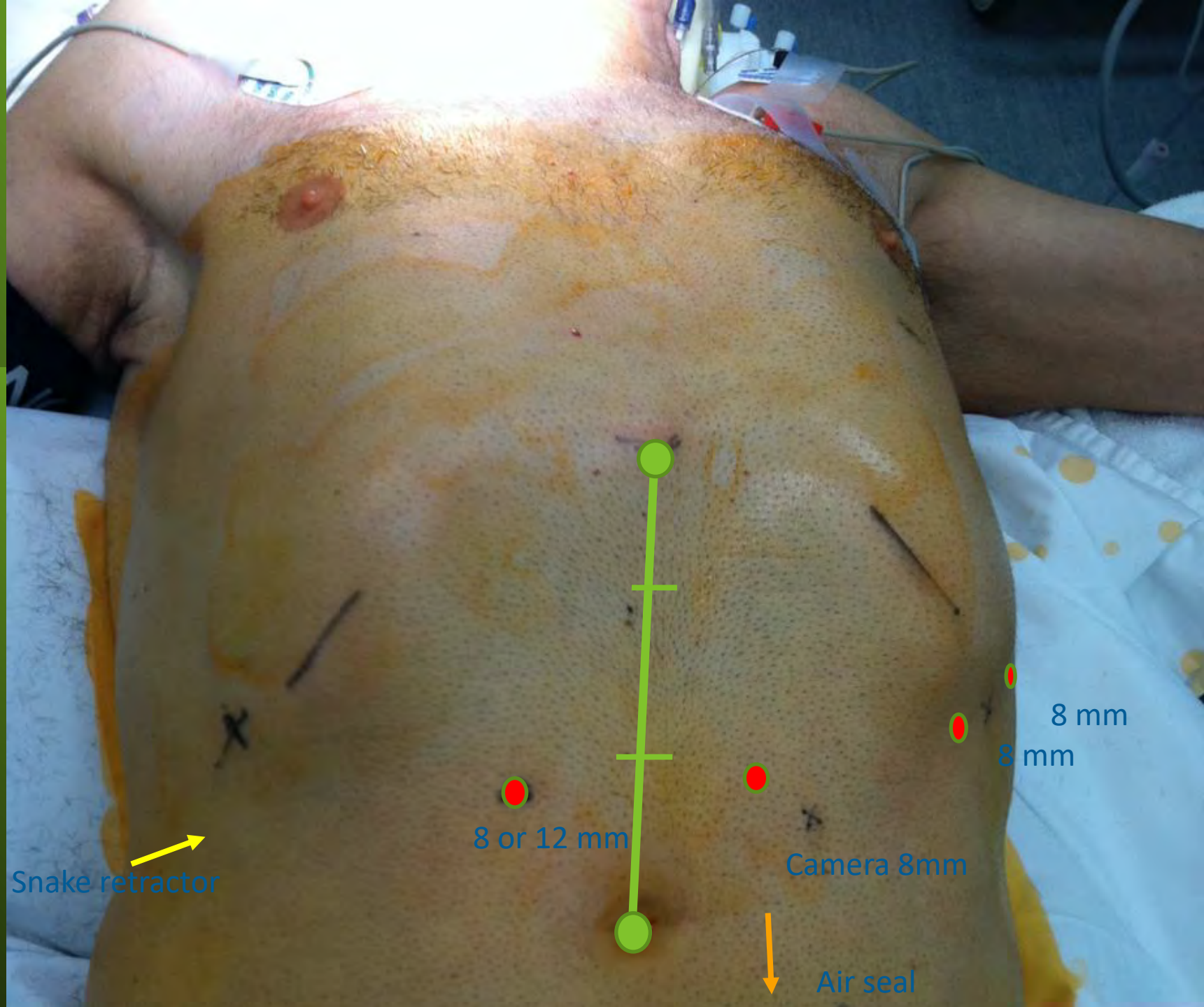
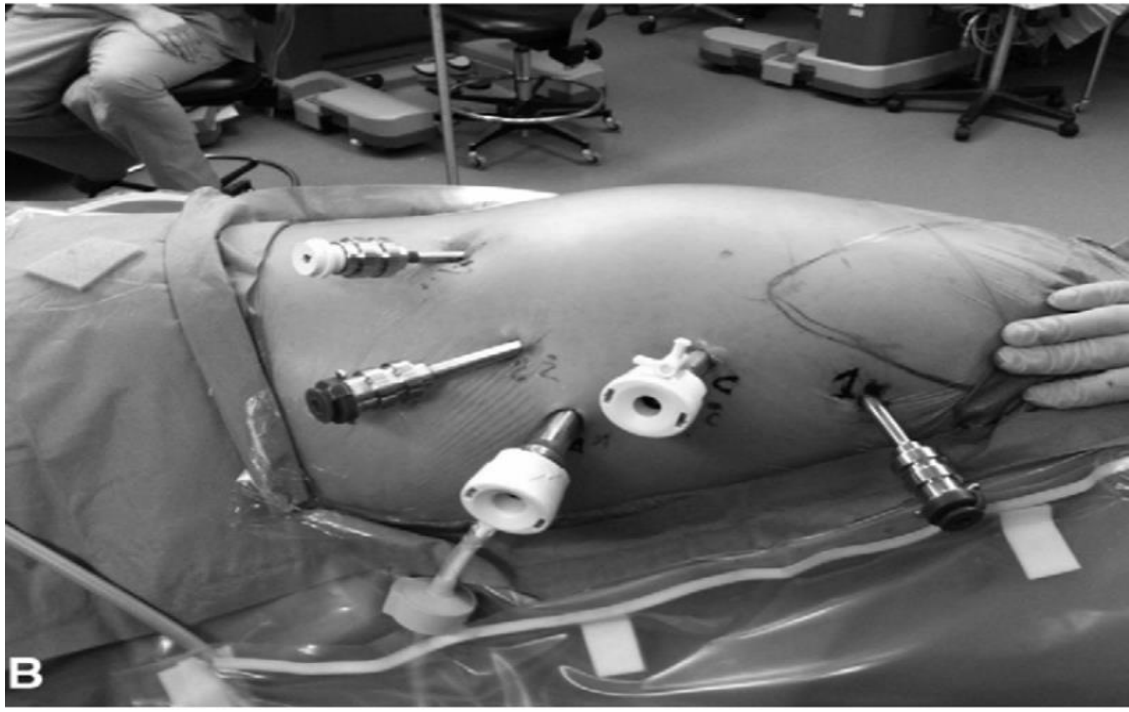
RULE OF THIRDS (xiphoid to umbilicus)



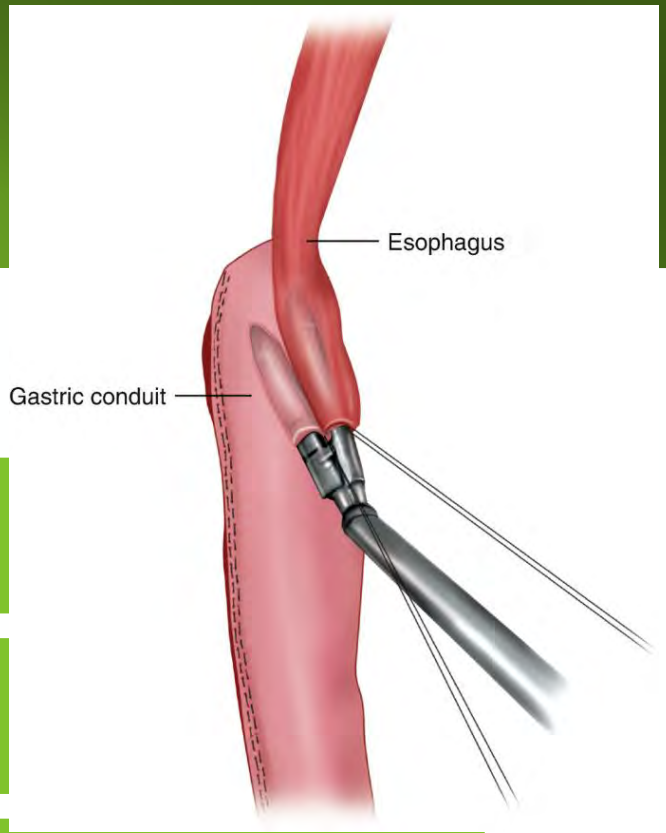
Technical aspects and early results of robotic esophagectomy with chest anastomosis

Robert James Cerfolio, MD, FACS, FCCP,[a,b] Ayesha S. Bryant, MSPH, MD,[b] and Mary T. Hawn, MD, MPH, FACS[c]

CHEST PORT SETUP



ANASTOMOTIC TECHNIQUE



Hybrid Orringer anastomosis

45 mm blue load back wall

2 layer outer wall closure

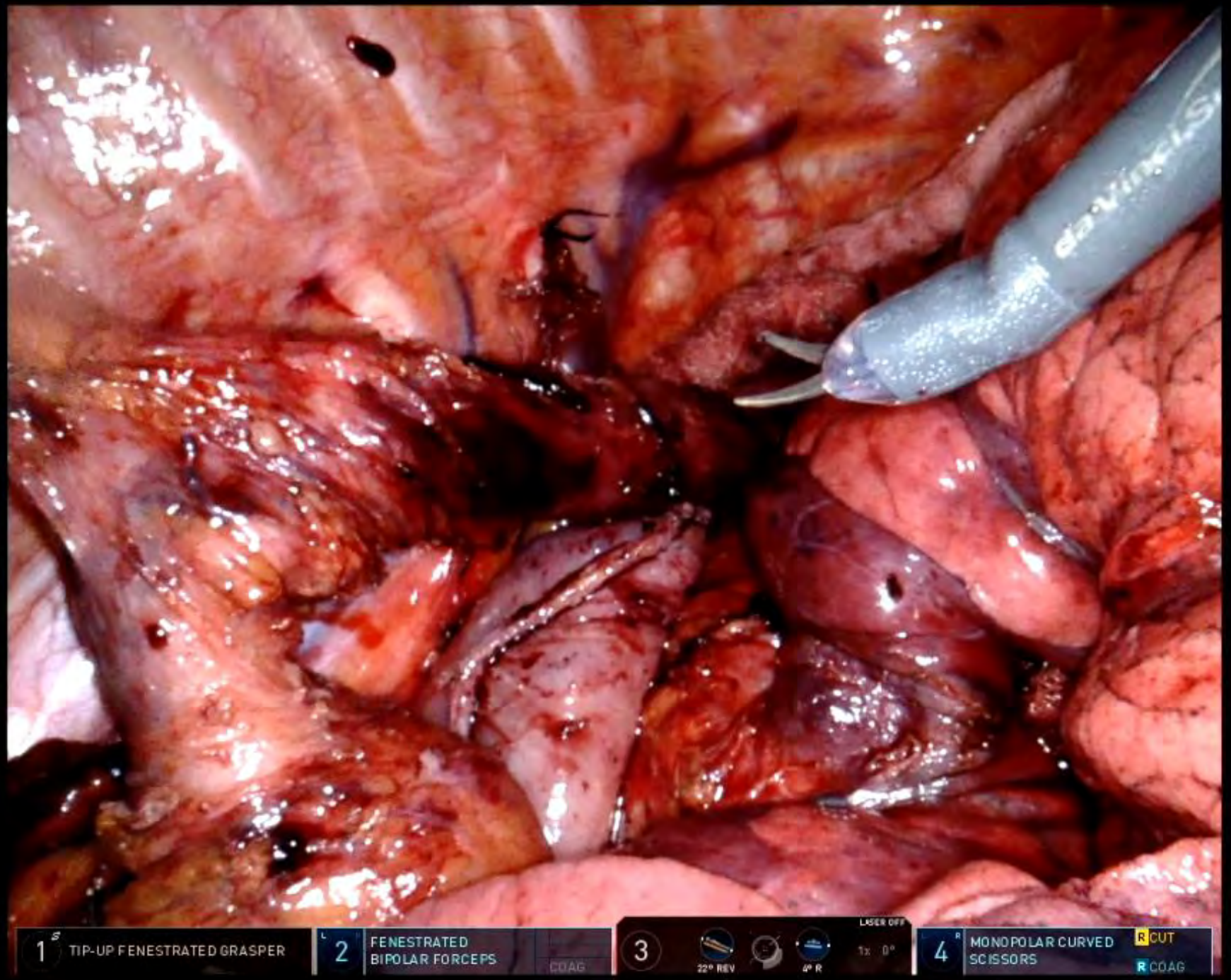
- 3-0 PDS (Connel stitch) currently switch to 3-0 Stratafix (continuous)
- 3-0 silk Lembert

El Zaeedi, M., Geraci, T. (2024). Esophagectomy: Approaches and Surgical Techniques. In: Ng, T., Geraci, T. (eds) Thoracic Surgery Clerkship. Contemporary Surgical Clerkships. Springer, Cham. https://doi.org/10.1007/978-3-031-44645-0_33

FIREFLY USE

Check pulse on gastroepiploic arcade
After conduit creation
After conduit pull up
During revisional surgery

ICG- Indocyanine-green fluorescence imaging


1 S TIP-UP FENESTRATED GRASPER
2 L FENESTRATED BIPOLAR FORCEPS
COAG
3
22° REV
4° R
LASER OFF
1x 0°
4 R MONOPOLAR CURVED SCISSORS
R CUT
R COAG

CONCLUSIONS:

- Robotic platform is the preeminent MIS tool to perform esophagectomy for patients with cancer
- Robotic esophagectomy combined with neoadjuvant chemo/ IO treatment has the potential for improved patient survival
- Patients with esophageal cancer require a team approach
- MIS esophagectomy results in better patient outcomes

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