Current issue for surgical treatment of esophageal cancer

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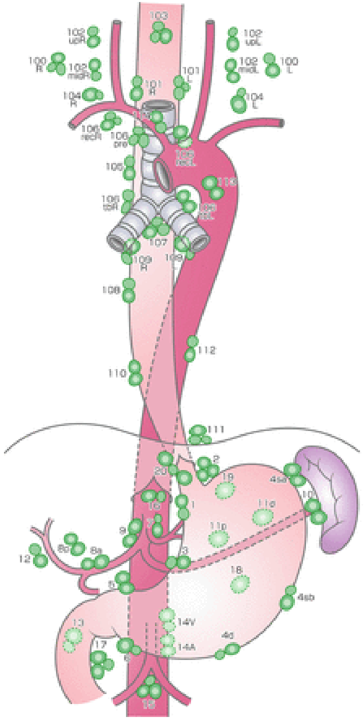
I. Lymphadenectomy

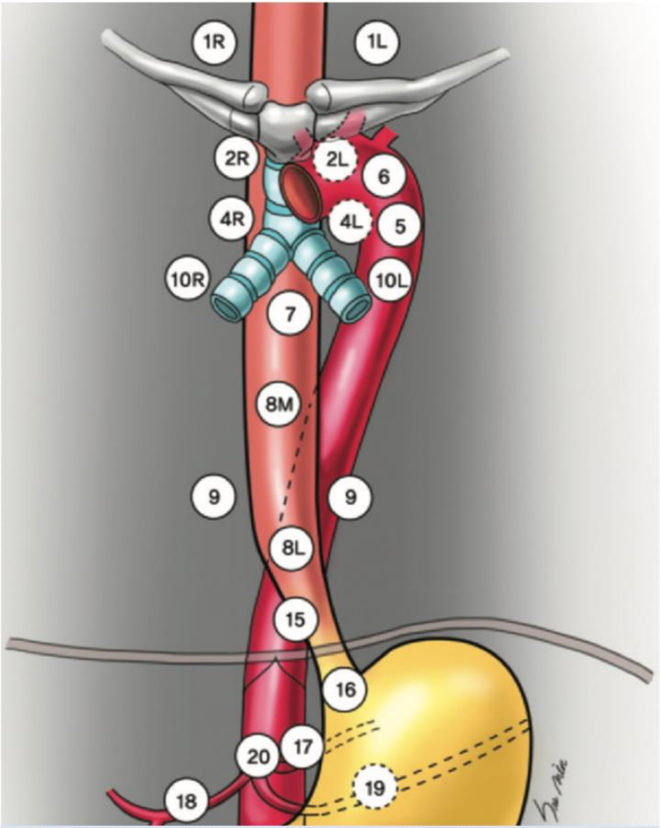


1) Cervical lymph nodes
No. 101 Cervical paraesophageal lymp nodes
No. 104 Superclavicular lymph nodes

2) Thoracic lymph nodes
No. 105 Upper thoracic paraesophageal lymph nodes
No. 106 Thoracic paratracheal lymph nodes
- No. 106rec Recurrent nerve lymph nodes
- No. 106pre Pretracheal lymph nodes
- No. 106tb Trancheobronchial lymph nodes

No. 107 Subcarinal lymph nodes
No. 108 Middle thoracic paraesophageal lymph nodes
No. 109 Main bronchus lymph nodes
No. 110 Lower thoracic paraesophageal lymph nodes
No. 111 Superadiaphragmatic lymph nodes
No. 112 Posterior mediastinal lymph nodes

3) Abdominal lymph nodes
No. 1 Right cardiac lymph nodes
No. 2 Left cardiac lymph nodes
No. 3 Lymph nodes along the lesser curvature
No. 7 Lymph nodes along the left gastric artery
No. 8 Lymph nodes along the common hepatic artery
No. 9 Lymph nodes along the celiac artery



New TNM Staging System for Esophageal Cancer: What Chest Radiologists Need to Know. *Su Jin Hong,MD ; Tae Jung Kim,MD,PhD; Kyung Bum Nam,MD; In Sun Lee,MD; Hee ChulYang,MD; Sukki Cho, MD; Kwhanmien Kim, MD; Sanghoon Jheon, MD; Kyung Won Lee, MD, PhD.* **RadioGraphics 2014;** 34:1722–1740; **Published online** 10.1148/rg.346130079

I. Lymphadenectomy

Principles of Surgical Treatment for Carcinoma of the Esophagus

Analysis of Lymph Node Involvement

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From the Department of Surgery, Toranomon Hospital, Tokyo, Japan

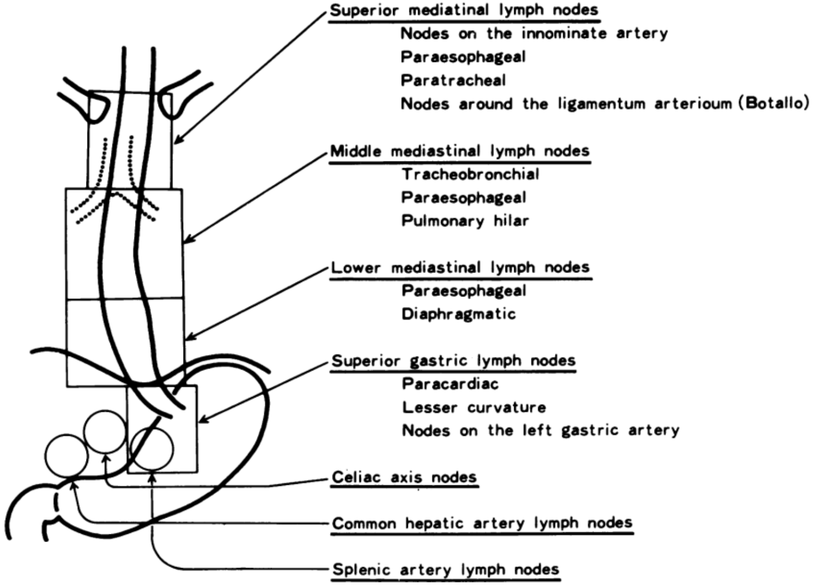
Extensive lymph node dissections in the posterior mediastinum and abdomen were performed during resections of esophageal carcinomas. Analysis of lymph nodes demonstrated a widespread distribution of positive lymph nodes regardless of the location of the tumor. The distribution of positive lymph nodes was noticed in the area between the superior mediastinum and the celiac region. The studies were also made on the distribution of positive lymph nodes in the superior gastric region, particularly in the region of the lesser curvature of the stomach. The following principles should be followed when carcinoma of the esophagus is surgically treated. 1) Lymph node dissection of the whole length of the posterior mediastinum, superior gastric region, and celiac region must be performed. 2) Total thoracic and abdominal esophagectomy with

of patients who had been treated for esophageal carcinoma, and the extent to which surgical resection can be safely accomplished must be assured.

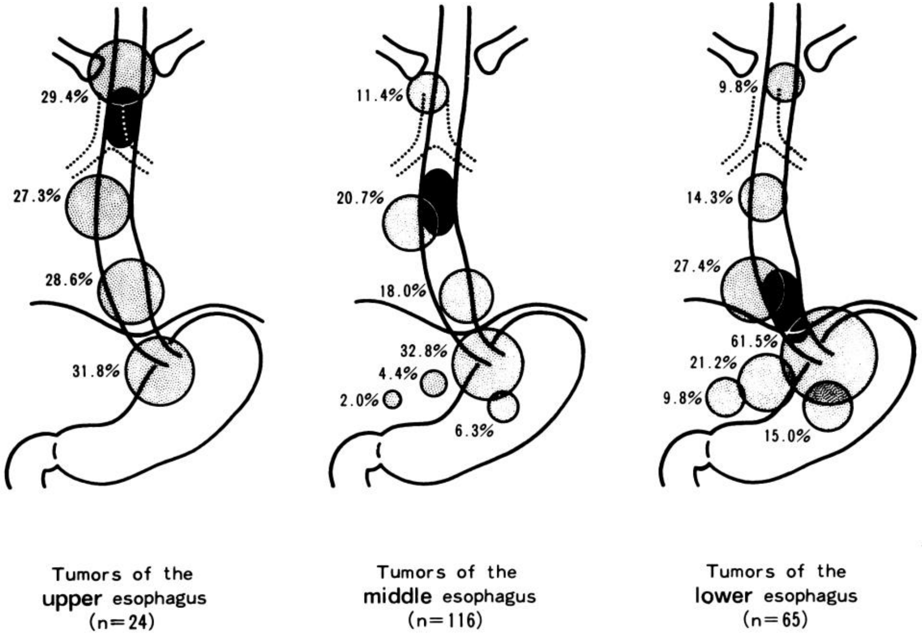
This paper describes the principles of surgery for resectable carcinoma of the esophagus, and its relation to tumor spread and successful esophageal replacement.

Akiyama et al. Ann Surg 1981

I. Lymphadenectomy



Lymph nodes that may be involved in metastases



Rate of positive lymph nodes per number of cases resected

Akiyama et al. Ann Surg 1981

I. Lymphadenectomy

Radical Lymph Node Dissection for Cancer of the Thoracic Esophagus

Hiroshi Akiyama, M.D., F.A.C.S.(Hon.), F.R.C.S.(Eng., Hon.), Masahiko Tsurumaru, M.D., F.A.C.S., Harushi Udagawa, M.D., F.A.C.S., and Yoshiaki Kajiyama, M.D.

From the Department of Surgery, Toranomon Hospital, Tokyo, Japan

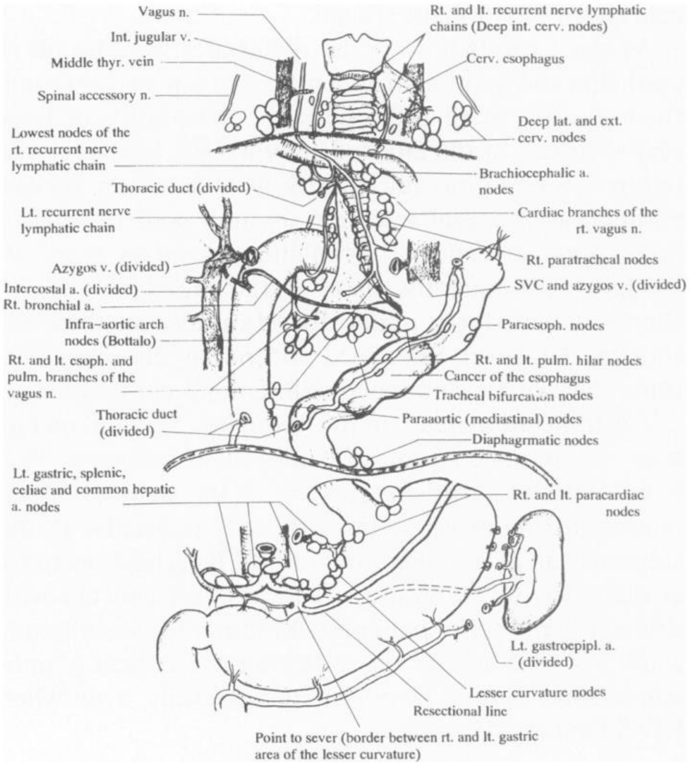


Figure 1. Extent of esophageal and gastric resection and systematic radical lymph node dissection. Extent of extensive three-field dissection is shown. In two-field dissection, no cervical dissection is carned out.

Akiyama et al. Ann Surg 1994

I. Lymphadenectomy

Frequency of lymph node metastases according to the depth of tumor invasion

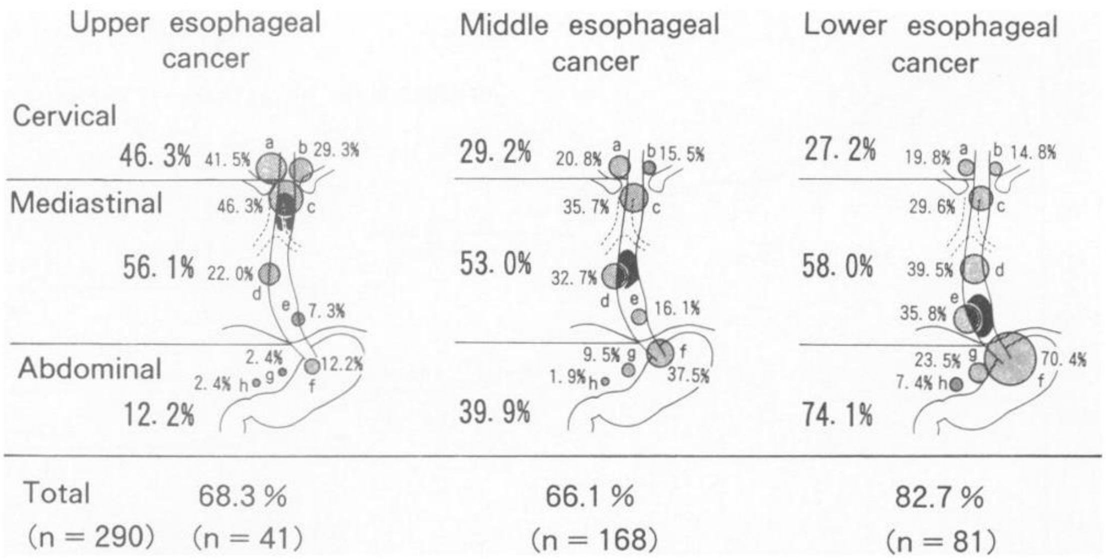
Depth of tumor invasion	Frequency of lymph node metastases: no. of patients with positive nodes / no. of patients with 3 – field dissection	
Epithelium (ep)	0/5*	0%
Lamina propria mucosae (lpm)	0/2*	0%
Muscularis mucosae (mm)	2/7*	28.6%
Submucosa (sm)	33/61	54.1%
Muscularis propria (pm)	23/33	69.7%
Adventitia (a)	149/183	81.4%
Total	207/291	71.4%

0 50 100%

Akiyama et al. Ann Surg 1994

I. Lymphadenectomy

<u>Frequency of positive lymph nodes according to the location of the primary tumor</u>



- ✓ Involvement of distal regional nodes, regardless of location of tumor, was unpredictable.
- ✓ The clearance of nodes in all three fields is logical wherever the primary cancer is located in the mediastinum.

Akiyama et al. Ann Surg 1994

I. Lymphadenectomy

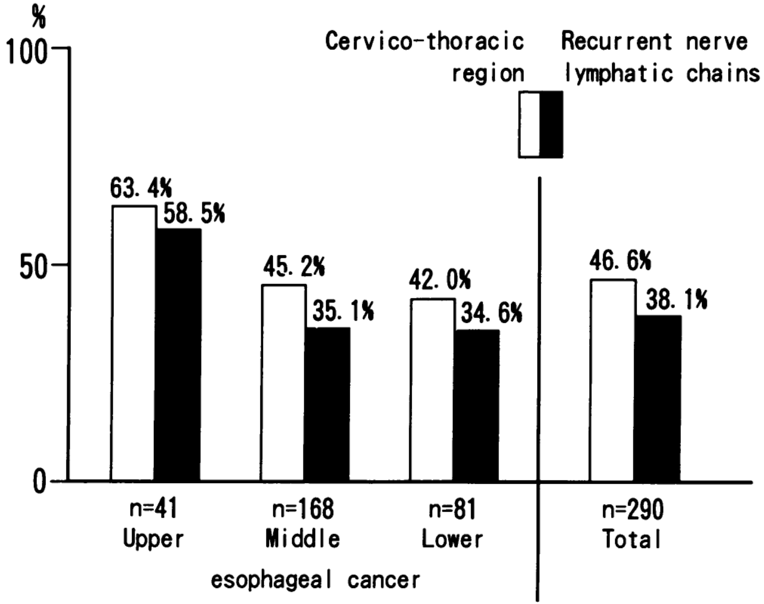
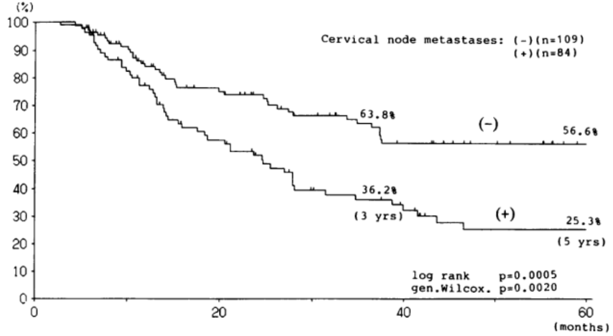


Figure 5. Frequency of lymph node metastases to the cervicothoracic region and specifically, recurrent nerve lymphatic chains (three-field dissection).

- ✓ The importance of nodal dissection of cervical and superior mediastinal regions, specifically with regard to the recurrent nerve lymphatic chains for the upper thoracic esophageal cancers and cancers of lower levels of thoracic esophagus

Akiyama et al. Ann Surg 1994

I. Lymphadenectomy



Figue 8. Metastases to the cervical nodes and survival after three-field dissection.

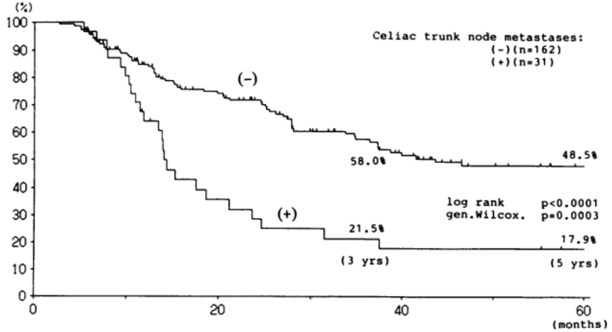


Figure 9. Metastases to the celiac trunk nodes and survival after three-field dissection.

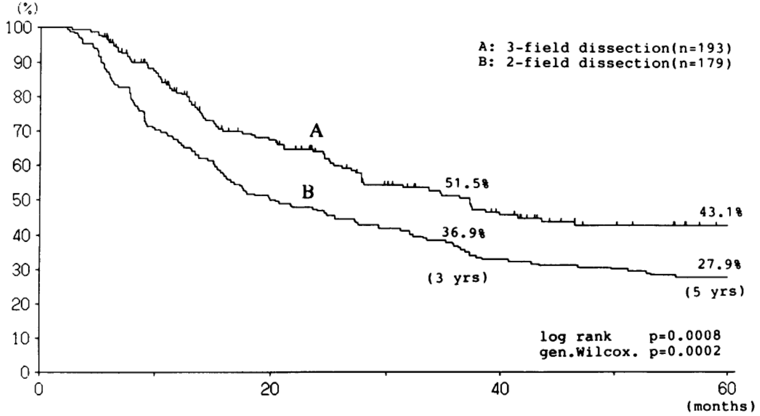


Figure 7. Comparison of survival in patients with positive nodes between two- and three-field dissections.

- ✓ The survival of patients after extensive 3-field dissection was significantly better than those after less extensive 2-field dissection.

Akiyama et al. Ann Surg 1994

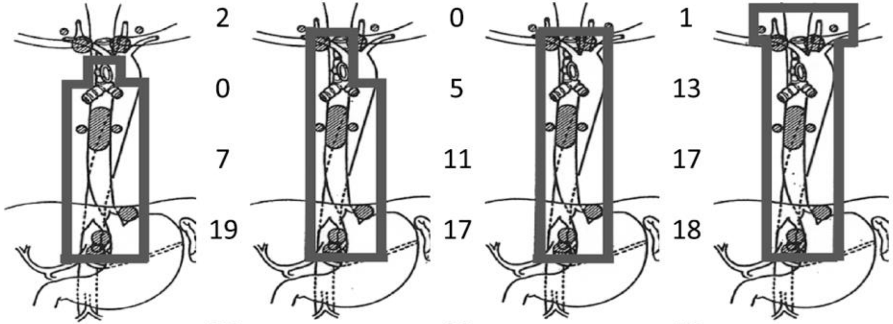
I. Lymphadenectomy

Extent of lymphadenectomy

- Transhiatal esophagectomy
- One-field lymphadenectomy
- Two-field lymphadenectomy
  - Standard two field lymphadenectomy
  - Extended two field lymphadenectomy
  - Total two field lymphadenectomy
- Three field lymphadenectomy

I. Lymphadenectomy

Extent of lymphadenectomy



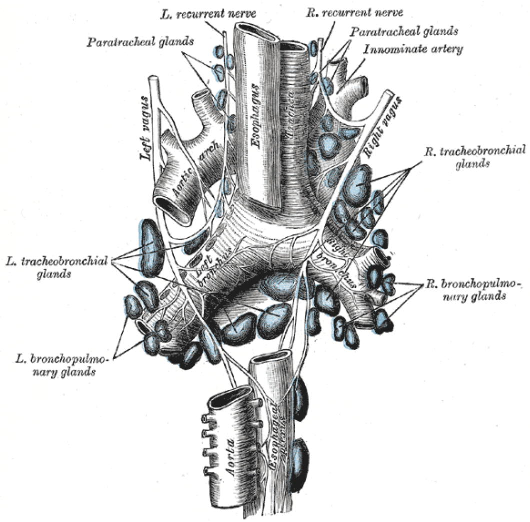
2-field: Standard	2-field: Extended	2-field: Total mediastinal	3-field	Location of the lymph nodes
2	0	1	25	Neck
0	5	13	15	Upper mediastinum
7	11	17	17	Middle and lower mediastinum
19	17	18	16	Abdomen
28	**33**	**49**	**73**	Total

Western standard (Standard 2-field)

Japanese standard (Total mediastinal 2-field and 3-field)

I. Lymphadenectomy

Impact of RLN lymph node



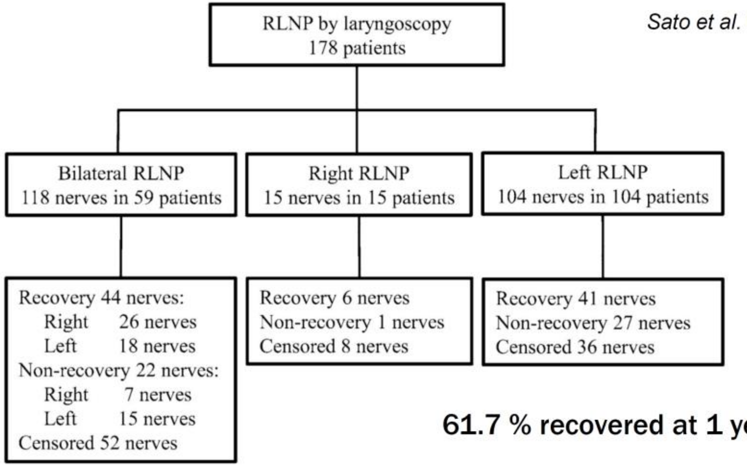
- Anatomically, the lymph nodes near the recurrent laryngeal nerve are located at the junction of the neck and chest where the cervical and mediastinal lymph nodes frequently intersected.
- RLN lymph nodes are the most frequent site of lymph node metastasis.
- The rate of LN metastasis near the bilateral recurrent laryngeal nerve was 34.2%, in which 15.8% involving the left LNs and 20.8% involving the right LNs.
- Rate of skip metastasis to the LNs near the recurrent laryngeal nerve was 4.2%

Ye K et al. Genet Mol Res 2014;13:6411-9

I. Lymphadenectomy

Recurrent laryngeal nerve palsy

RLNP	Total (n = 299)	THE (n = 93)	TTE and VATS-E (n = 206)
Absent	121 (40.5 %)	53 (57.0 %)	68 (33.0 %)
Present	178 (59.5 %)	40 (43.0 %)	138 (67.0 %)
Right	74	4	70
Left	163	38	125

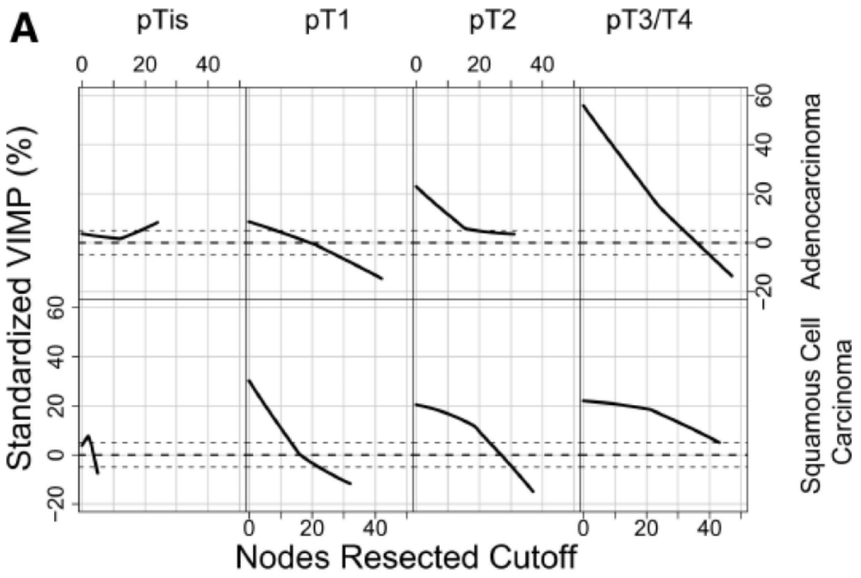


Sato et al. World J Surg 2016;40:129–136

61.7 % recovered at 1 year after op.

I. Lymphadenectomy

- WECC data (N=4,627)
- T1 more than 10
- T2 more than 20
- T3 more than 30



Risk NP et al. Ann Surg 2010;251:46-50

I. Lymphadenectomy : Recommendation

Japanese Classification of Esophageal Cancer, 11th ed

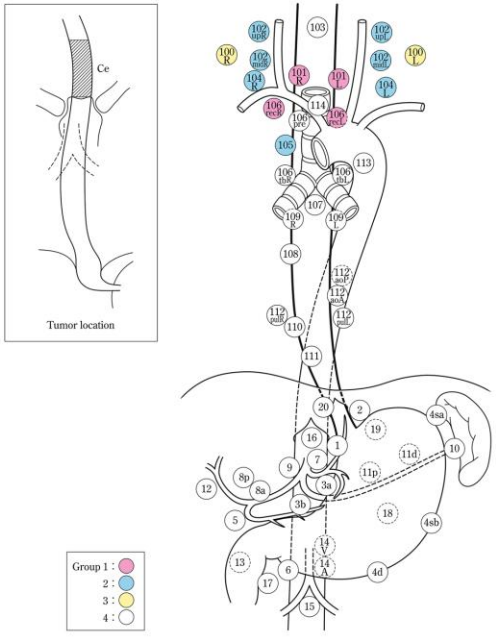


Fig. 1-8 Lymph node groups for tumors located in Ce

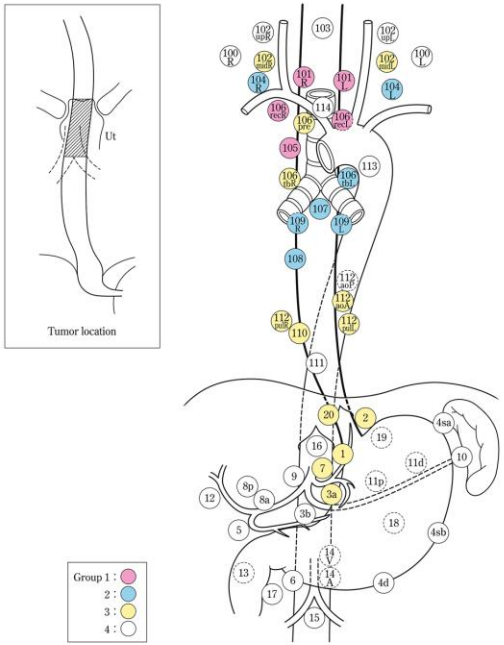


Fig. 1-9 Lymph node groups of tumors located in Ut

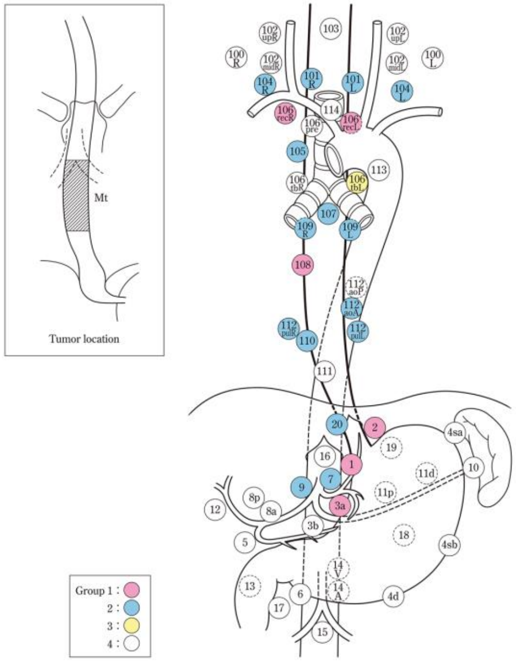


Fig. 1-10 Lymph node groups for tumors located in Mt

I. Lymphadenectomy : Recommendation

Japanese Classification of Esophageal Cancer, 11th ed

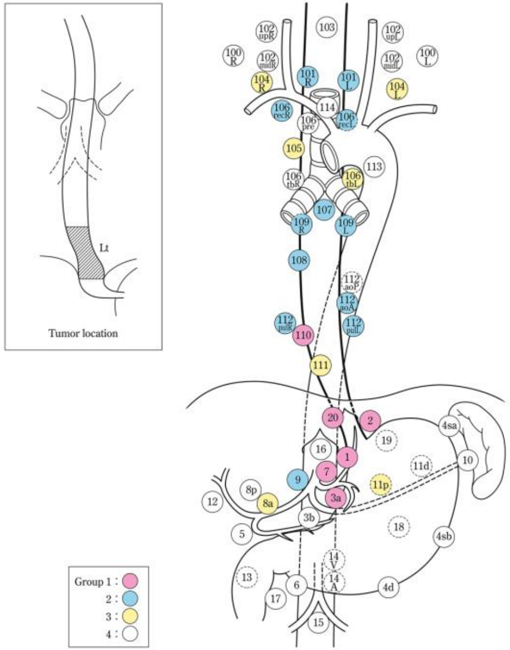


Fig. 1-11 Lymph node groups for tumors located in Lt

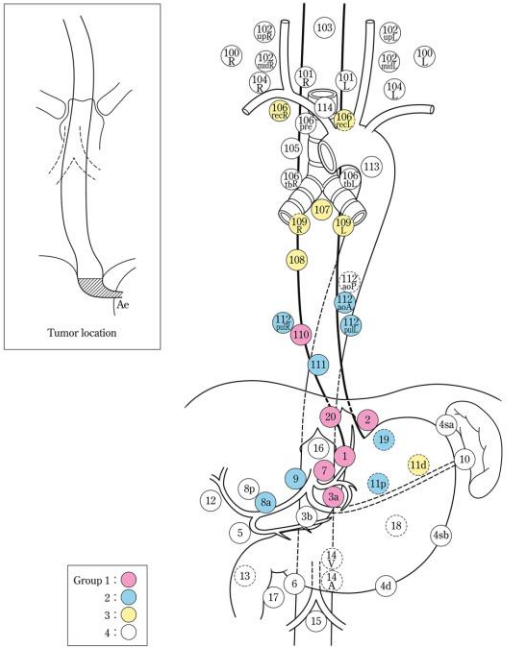


Fig. 1-12 Lymph node groups for tumors located in Ae (EG)

II. Multimodality treatment

Ann Surg Oncol (2012) 19:68–74
DOI 10.1245/s10434-011-2049-9

Annals of
SURGICAL ONCOLOGY
OFFICIAL JOURNAL OF THE SOCIETY OF SURGICAL ONCOLOGY

ORIGINAL ARTICLE – THORACIC ONCOLOGY

A Randomized Trial Comparing Postoperative Adjuvant Chemotherapy with Cisplatin and 5-Fluorouracil Versus Preoperative Chemotherapy for Localized Advanced Squamous Cell Carcinoma of the Thoracic Esophagus (JCOG9907)

Nobutoshi Ando, MD, FACS[1], Hoichi Kato, MD[2], Hiroyasu Igaki, MD[2], Masayuki Shinoda, MD[3], Soji Ozawa, MD, FACS[4], Hideaki Shimizu, MD[5], Tsutomu Nakamura, MD[6], Hiroshi Yabusaki, MD[7], Norio Aoyama, MD[8], Akira Kurita, MD[9], Kenichiro Ikeda, MD[10], Tatsuo Kanda, MD[11], Toshimasa Tsujinaka, MD[12], Kenichi Nakamura, MD[13], and Haruhiko Fukuda, MD[13]

[1]Department of Surgery, Tokyo Dental College Ichikawa General Hospital, Ichikawa, Japan; [2]Esophageal Surgery Division, National Cancer Center Hospital Tokyo, Tokyo, Japan; [3]Department of Thoracic Surgery, Aichi Cancer Center Hospital, Nagoya, Japan; [4]Department of Surgery, Keio University School of Medicine, Tokyo, Japan; [5]Department of Surgery, Tochigi Cancer Center, Utsunomiya, Japan; [6]Institute of Gastroenterology, Tokyo Women's Medical University, Tokyo, Japan; [7]Department of Surgery, Niigata Cancer Center Hospital, Niigata, Japan; [8]Department of Surgery, Kanagawa Cancer Center, Yokohama, Japan; [9]Department of Surgery, Shikoku Cancer Center, Matsuyama, Japan; [10]Department of Surgery, Iwate Medical University School of Medicine, Morioka, Japan; [11]Department of Surgery, Niigata University Medical and Dental Hospital, Niigata, Japan; [12]Department of Surgery, National Hospital Organization, Osaka National Hospital, Osaka, Japan; [13]Japan Clinical Oncology Group Data Center, Tokyo, Japan

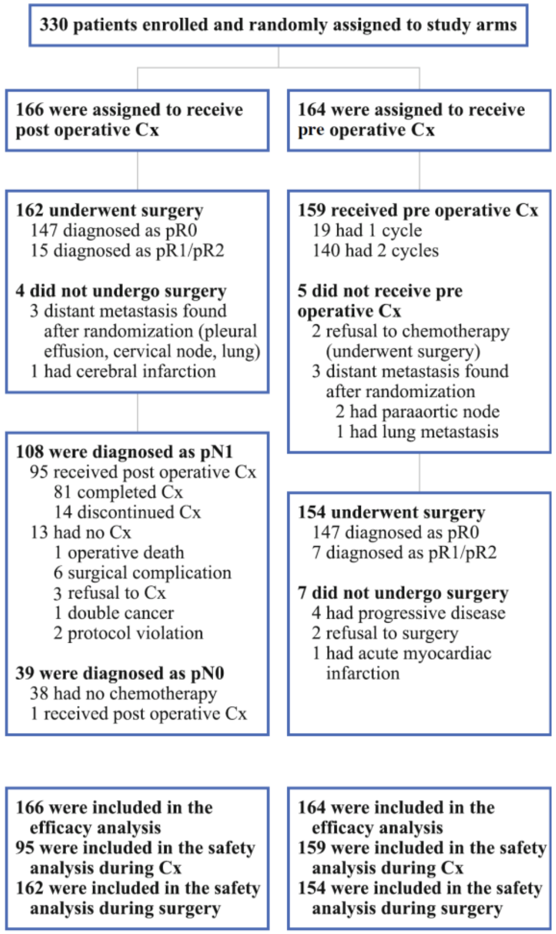


FIG. 1 Disposition of patients. *Cx* chemotherapy

II. Multimodality treatment

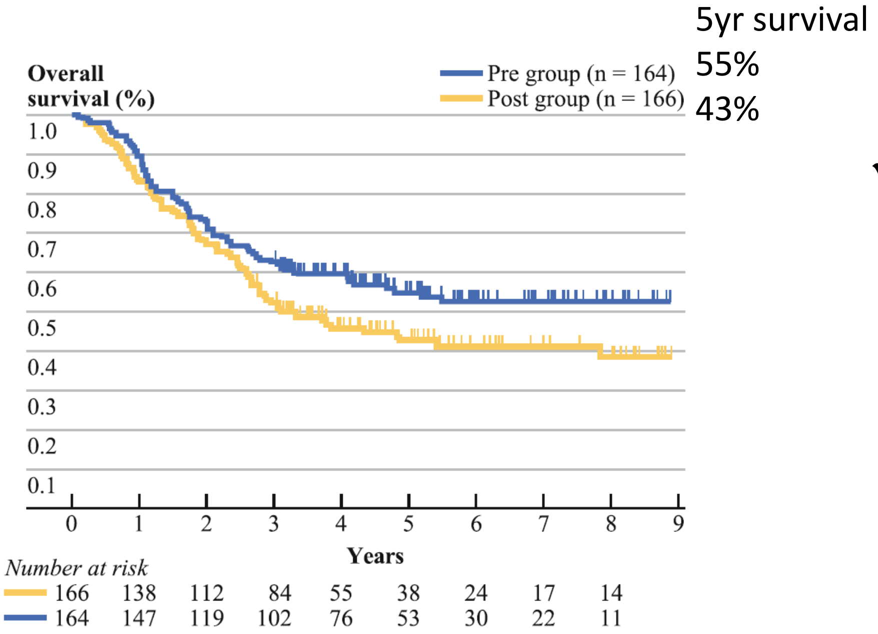
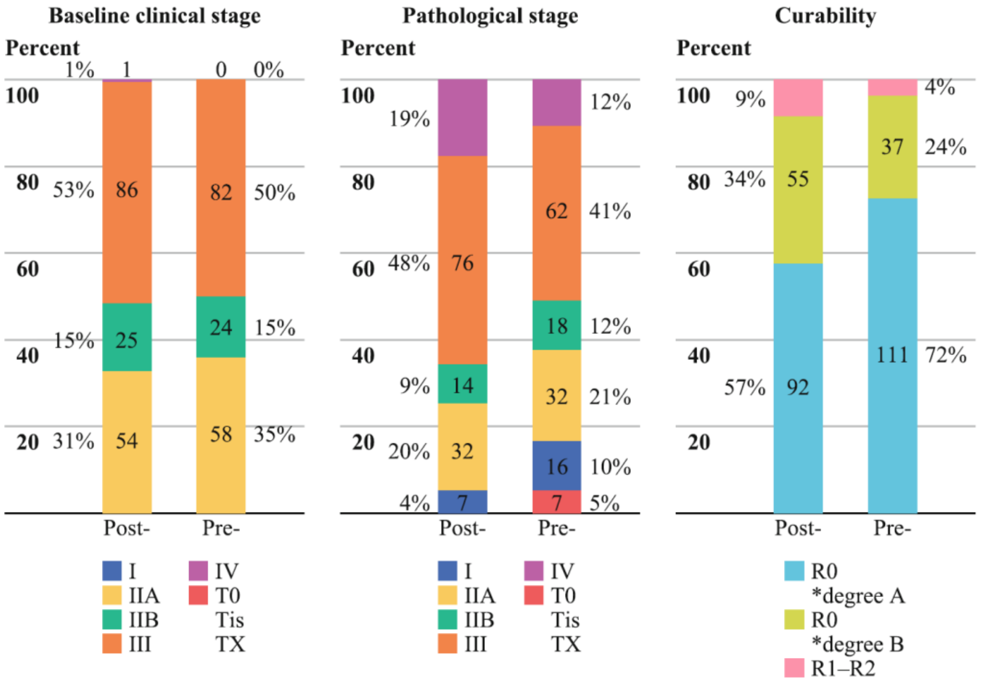


FIG. 3 Overall survival. *Pre* preoperative chemotherapy (group 2), *Post* postoperative chemotherapy (group 1)

✓ Preoperative chemotherapy with cisplatin plus 5-fluorouracil followed by surgery improved overall survival without additional serious adverse events.

II. Multimodality treatment



*R0 sub-classification by Japanese Society for Esophageal Diseases[15]:
Degree A, D > pN; Degree B, other R0.

1. Downstaging was achieved in some patient by preoperative chemotherapy.
2. Complete resection(R0) was slightly more frequent in preoperative chemotherapy group.

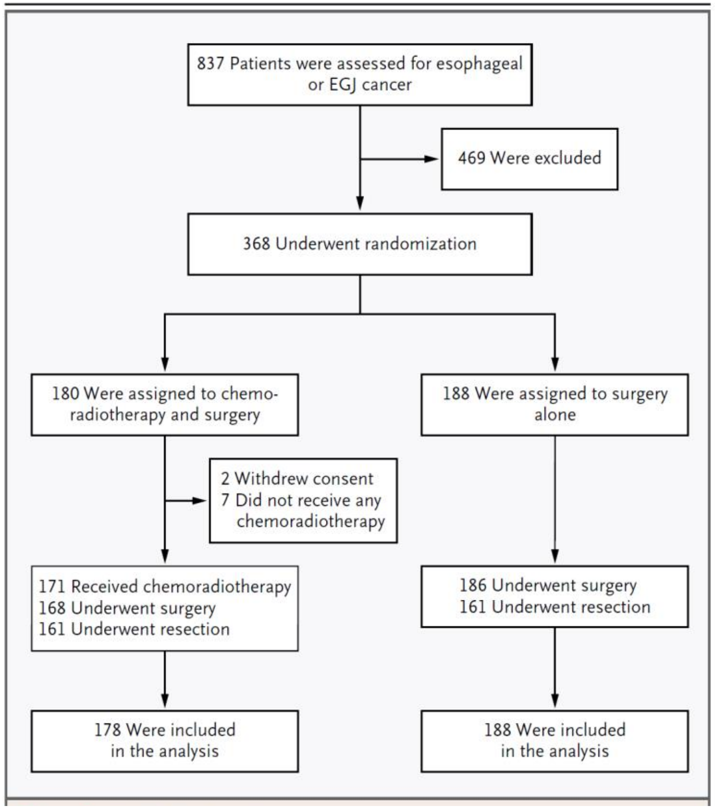
II. Multimodality treatment

The NEW ENGLAND JOURNAL of MEDICINE

ORIGINAL ARTICLE

Preoperative Chemoradiotherapy for Esophageal or Junctional Cancer

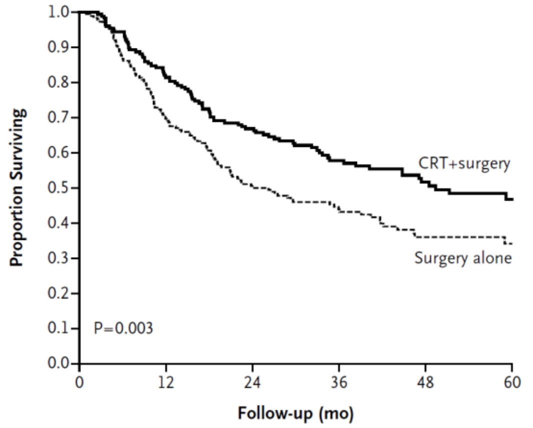
P. van Hagen, M.C.C.M. Hulshof, J.J.B. van Lanschot, E.W. Steyerberg, M.I. van Berge Henegouwen, B.P.L. Wijnhoven, D.J. Richel, G.A.P. Nieuwenhuijzen, G.A.P. Hospers, J.J. Bonenkamp, M.A. Cuesta, R.J.B. Blaisse, O.R.C. Busch, F.J.W. ten Kate, G.-J. Creemers, C.J.A. Punt, J.T.M. Plukker, H.M.W. Verheul, E.J. Spillenaar Bilgen, H. van Dekken, M.J.C. van der Sangen, T. Rozema, K. Biermann, J.C. Beukema, A.H.M. Piet, C.M. van Rij, J.G. Reinders, H.W. Tilanus, and A. van der Gaast, for the CROSS Group*



CROSS Trial NEJM 2012

II. Multimodality treatment

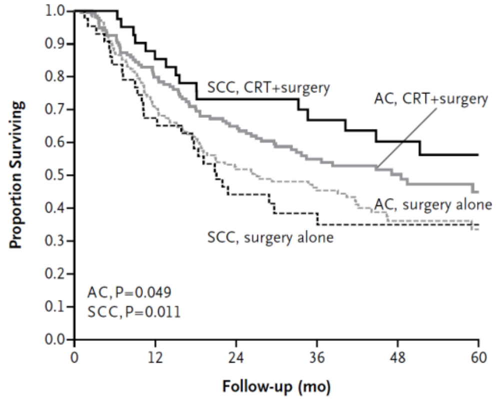
A Survival According to Treatment Group



No. at Risk

	0	12	24	36	48	60
CRT+surgery	178	145	119	75	49	28
Surgery alone	188	131	94	62	33	17
Total	366	276	213	137	82	45

B Survival According to Tumor Type and Treatment Group

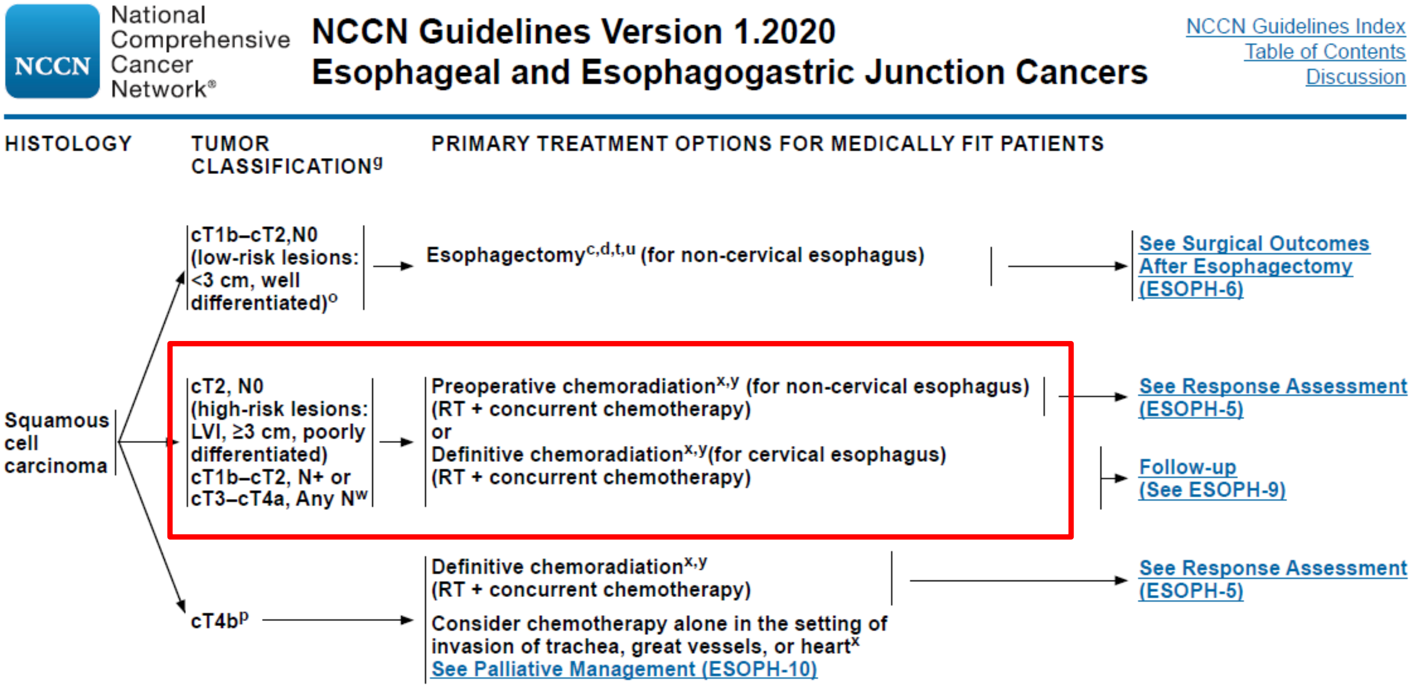


No. at Risk

	0	12	24	36	48	60
AC, CRT+surgery	134	107	87	53	34	18
AC, surgery alone	141	99	73	50	25	10
SCC, CRT+surgery	41	35	30	21	15	8
SCC, surgery alone	43	29	19	11	8	4
Total	359	270	209	135	82	40

✓ Preoperative chemoradiotherapy improved survival among patients with potentially curable esophageal or esophagogastric-junction cancer.

II. Multimodality treatment



III. Minimally Invasive Esophagectomy

Surgical Video Clip: VATS Ivor Lewis operation

III. Minimally Invasive Esophagectomy

Minimally invasive versus open oesophagectomy for patients with oesophageal cancer: a multicentre, open-label, randomised controlled trial

Surya S A Y Biere, Mark I van Berge Henegouwen, Kirsten W Maas, Luigi Bonavina, Camiel Rosman, Josep Roig Garcia, Suzanne S Gisbertz, Jean H G Klinkenbijl, Markus W Hollmann, Elly S M de Lange, H Jaap Bonjer, Donald L van der Peet, Miguel A Cuesta

Summary

Background Surgical resection is regarded as the only curative option for resectable oesophageal cancer, but pulmonary complications occurring in more than half of patients after open oesophagectomy are a great concern. We assessed whether minimally invasive oesophagectomy reduces morbidity compared with open oesophagectomy.

Methods We did a multicentre, open-label, randomised controlled trial at five study centres in three countries between June 1, 2009, and March 31, 2011. Patients aged 18–75 years with resectable cancer of the oesophagus or gastro-oesophageal junction were randomly assigned via a computer-generated randomisation sequence to receive either open transthoracic or minimally invasive transthoracic oesophagectomy. Randomisation was stratified by centre. Patients, and investigators undertaking interventions, assessing outcomes, and analysing data, were not masked to group assignment. The primary outcome was pulmonary infection within the first 2 weeks after surgery and during the whole stay in hospital. Analysis was by intention to treat. This trial is registered with the Netherlands Trial Register, NTR TC 2452.

Findings We randomly assigned 56 patients to the open oesophagectomy group and 59 to the minimally invasive oesophagectomy group. 16 (29%) patients in the open oesophagectomy group had pulmonary infection in the first 2 weeks compared with five (9%) in the minimally invasive group (relative risk [RR] 0·30, 95% CI 0·12–0·76; p=0·005). 19 (34%) patients in the open oesophagectomy group had pulmonary infection in-hospital compared with seven (12%) in the minimally invasive group (0·35, 0·16–0·78; p=0·005). For in-hospital mortality, one patient in the open oesophagectomy group died from anastomotic leakage and two in the minimally invasive group from aspiration and mediastinitis after anastomotic leakage.

TIME Trial Lancet 2012

RANDOMIZED CONTROLLED TRIAL

Minimally Invasive Versus Open Esophageal Resection

Three-year Follow-up of the Previously Reported Randomized Controlled Trial: the TIME Trial

Jennifer Straatman, MD, PhD, Nicole van der Wielen, MD,* Miguel A. Cuesta, MD, PhD,* Freek Daams, MD, PhD,* Josep Roig Garcia, MD, PhD,† Luigi Bonavina, MD, PhD,‡ Camiel Rosman, MD, PhD,§ Mark I. van Berge Henegouwen, MD, PhD,¶ Suzanne S. Gisbertz, MD, PhD,¶ and Donald L. van der Peet, MD, PhD**

Objective: The aim of this study was to investigate 3-year survival following a randomized controlled trial comparing minimally invasive with open esophagectomy in patients with esophageal cancer.

Esophageal cancer is rapidly becoming a global problem with an increasing incidence worldwide. Despite the advanced techniques in diagnostics and treatment, there is still a poor survival with 5-year survival rates varying between 15% and 25%.[1,2] The only curative

TIME Trial Ann Surg 2017

III. Minimally Invasive Surgery

	OO (N=56)	MIO (N=59)	p value
Primary outcomes			
Pulmonary infection within 2 weeks	16 (29%)	5 (9%)	0·005
Pulmonary infection in-hospital	19 (34%)	7 (12%)	0·005
Secondary outcomes			
Hospital stay (days)*	14 (1–120)	11 (7–80)	0·044
Short-term quality of life†			
SF 36†			
Physical component summary	36 (6; 34–39)	42 (8; 39–46)	0·007
Mental component summary	45 (11; 40–50)	46 (10; 41–50)	0·806
EORTC C30†			
Global health	51 (21; 44–58)	61 (18; 56–67)	0·020
OES 18‡			
Talking	37 (39; 25–49)	18 (26; 10–26)	0·008
Pain	19 (21; 13–26)	8 (11; 5–11)	0·002
Total lymph nodes retrieved*	21 (7–47)	20 (3–44)	0·852
Resection margin§			0·080
R0	47 (84%)	54 (92%)	..
R1	5 (9%)	1 (2%)	..
pStage¶			0·943
0	0 (0%)	1 (2%)	..
I	4 (7%)	4 (7%)	..
IIa	16 (29%)	17 (29%)	..
IIb	6 (11%)	9 (15%)	..
III	14 (25%)	11 (19%)	..
IV	5 (9%)	4 (7%)	..
No residual tumour or lymph-node metastasis	7 (13%)	9 (15%)	..
Mortality‖			0·590
30-day mortality	0 (0%)	1 (2%)	..
In-hospital mortality	1 (2%)	2 (3%)	..

	OO (N=56)	MIO (N=59)	p value
Intraoperative data			
Operative time (min)*†	299 (66–570)	329 (90–559)	0·002
Blood loss (mL)†	475 (50–3000)	200 (20–1200)	<0·001
Conversions‡	NA	8 (14%)	..
Level of anastomosis§			0·970
Cervical	37 (66%)	38 (64%)	
Thoracic	15 (27%)	17 (29%)	
Postoperative data			
ICU stay (days)†	1 (0–106)	1 (0–50)	0·706
VAS (10 days)¶	3 (2)	2 (2)	0·001
Epidural failure‖	11 (20%)	10 (17%)	0·734
Other complications			
Anastomotic leakage	4 (7%)	7 (12%)	0·390
Thoracic complications without anastomotic leakage**	2 (4%)	2 (3%)	0·958
Vocal-cord paralysis††	8 (14%)	1 (2%)	0·012
Pulmonary embolism	0 (0%)	1 (2%)	0·328
Reoperations	6 (11%)	8 (14%)	0·641

TIME Trial Lancet 2012

III. Minimally Invasive Surgery

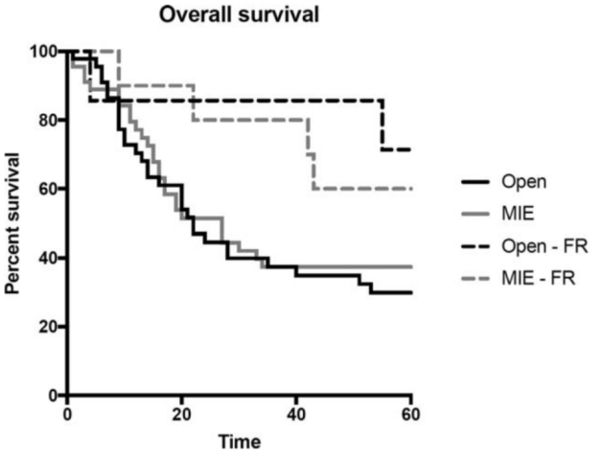


FIGURE 2. Kaplan-Meier curves for comparison of overall survival between open and minimally invasive esophagectomy (FR, full responders with no residual tumor).

F/U Duration(median) : 22month [IQR 10-59]
3yr OS MIE vs OE = 42.9% VS 41.2% (p=0.633)

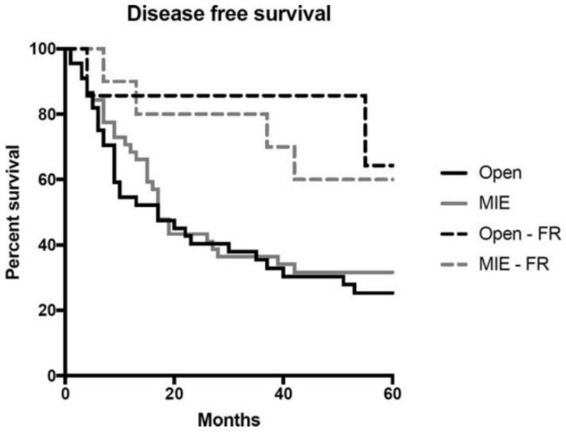


FIGURE 3. Kaplan-Meier curves for comparison of disease free survival between open and minimally invasive esophagectomy (FR, full responders with no residual tumor).

F/U Duration(median) : 22month [IQR 10-59]
3yr OS MIE vs OE = 42.9% VS 37.3% (p=0.602)

- ✓ The study presented here depicted no differences in disease-free and overall 3-yr survival for open and MIE.

TIME Trial Ann Surg 2017

III. Minimally Invasive Surgery

The NEW ENGLAND JOURNAL of MEDICINE

ORIGINAL ARTICLE

Hybrid Minimally Invasive Esophagectomy for Esophageal Cancer

C. Mariette,* S.R. Markar, T.S. Dabakuyo-Yonli, B. Meunier, D. Pezet, D. Collet, X.B. D'Journo, C. Brigand, T. Perniceni, N. Carrère, J.-Y. Mabrut, S. Msika, F. Peschaud, M. Prudhomme, F. Bonnetain,* and G. Piessen, for the Fédération de Recherche en Chirurgie (FRENCH) and French Eso-Gastric Tumors (FREGAT) Working Group†

ABSTRACT

BACKGROUND

Postoperative complications, especially pulmonary complications, affect more than half the patients who undergo open esophagectomy for esophageal cancer. Whether hybrid minimally invasive esophagectomy results in lower morbidity than open esophagectomy is unclear.

NEJM 2019;380:152-62

III. Minimally Invasive Surgery

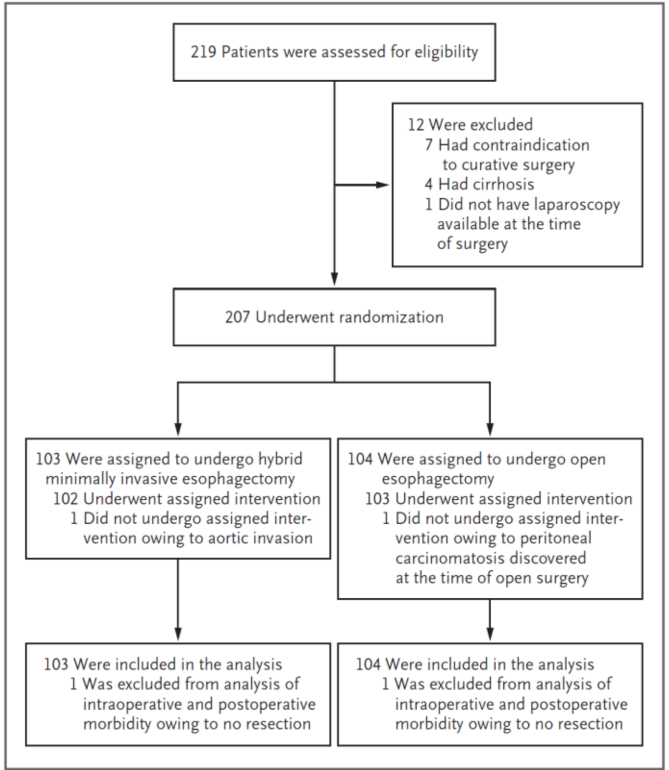


Figure 1. Screening, Randomization, and Follow-up of the Patients.

- Hybrid minimally invasive esophagectomy
  : laparoscopic stomach mobilization + open thoracotomy

- Inclusion period: 2009-2012
- Participating centers: 13 centers from France
- Surgical quality assurance was implemented by the credentialing of surgeons, standardization of technique, and monitoring of performance.

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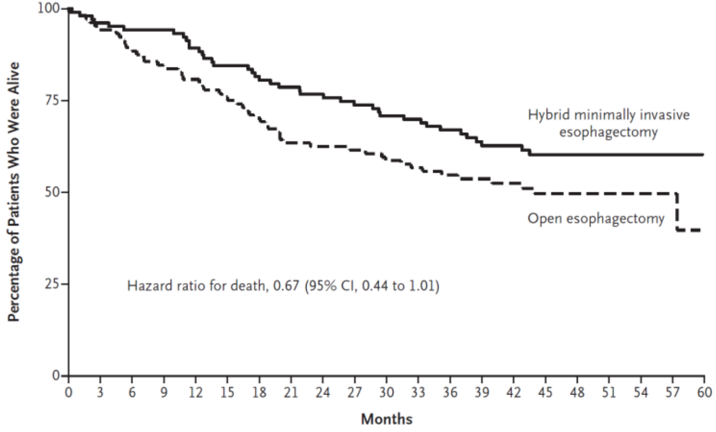
Table 2. **Primary and Secondary End Points (Intention-to-Treat Population).***

End Points	Total Trial Population (N=207)	Hybrid Minimally Invasive Esophagectomy (N=103)	Open Esophagectomy (N=104)
Primary end point			
Major complication at 30 days — no. (%)	104 (50)	37 (36)	67 (64)
Secondary end points			
Postoperative death — no. (%)			
At 30 days	3 (1)	1 (1)	2 (2)
At 90 days	10 (5)	4 (4)	6 (6)
Major pulmonary complication at 30 days — no./total no. (%)†	49/205 (24)	18/102 (18)	31/103 (30)

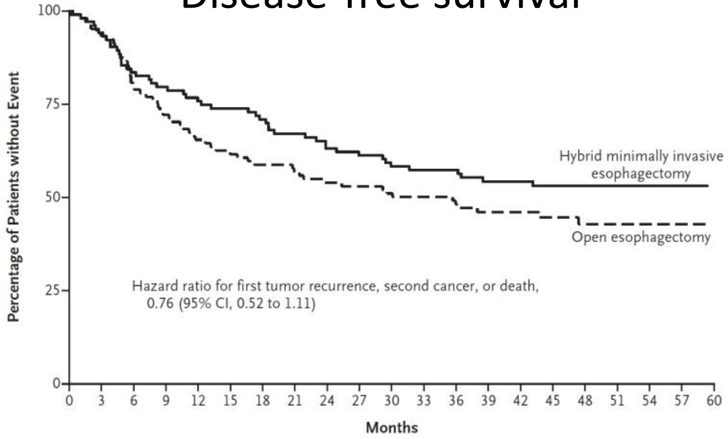
III. Minimally Invasive Surgery

Overall survival



No. at Risk																					
Hybrid minimally invasive esophagectomy	103	99	97	97	92	87	84	81	79	76	73	72	69	58	54	43	37	33	27	20	7
Open esophagectomy	104	98	93	87	84	79	73	66	65	64	61	59	57	48	40	33	22	17	13	5	1

Disease-free survival



No. at Risk																					
Hybrid minimally invasive esophagectomy	103	97	86	82	78	76	73	69	65	63	60	59	59	50	47	39	33	29	24	17	6
Open esophagectomy	104	97	83	75	68	64	61	59	56	55	53	52	50	40	34	28	19	15	12	4	1

- ✓ Hybrid MIE resulted in a lower incidence of major complications during or after esophagectomy for cancer than did open surgery.
- ✓ Hybrid procedure resulted in overall survival and disease-free survival that were similar to those observed with open esophagectomy.

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RANDOMIZED CONTROLLED TRIAL

Robot-assisted Minimally Invasive Thoracolaparoscopic Esophagectomy Versus Open Transthoracic Esophagectomy for Resectable Esophageal Cancer

A Randomized Controlled Trial

Pieter C. van der Sluis, MD, PhD, MSc, Sylvia. van der Horst, MSc,* Anne M. May, PhD,† Carlo Schippers, MSc,* Lodewijk A. A. Brosens, MD, PhD,‡ Hans C. A. Joore, MD,§ Christiaan C. Kroese, MD,¶ Nadia Haj Mohammad, MD, PhD,|| Stella Mook, MD, PhD,** Frank P. Vleggaar, MD, PhD,†† Inne H. M. Borel Rinkes, MD, PhD,* Jelle P. Ruurda, MD, PhD,* and Richard van Hillegersberg, MD, PhD**

Background: The standard curative treatment for patients with esophageal cancer is perioperative chemotherapy or preoperative chemoradiotherapy followed by open transthoracic esophagectomy (OTE). Robot-assisted minimally invasive thoracolaparoscopic esophagectomy (RAMIE) may reduce complications.

Conclusions: RAMIE resulted in a lower percentage of overall surgery-related and cardiopulmonary complications with lower postoperative pain, better short-term quality of life, and a better short-term postoperative functional recovery compared to OTE. Oncological outcomes were comparable and in concordance with the highest standards nowadays.

Ann Surg 2019;269:621-630

III. Minimally Invasive Surgery

TABLE 2. Postoperative Statistics (n = 109)

	RAMIE (n = 54)	OTE (n = 55)	*P*
Primary endpoint [n (%)]			
Related complications (MCDC 2, 3, 4, and 5)*	32 (59)	44 (80)	0.02
No related complications (MCDC 0,1)	22 (41)	11 (20)	
Secondary endpoints [n (%)]			
Pulmonary complications	17 (32)	32 (58)	0.005
Pneumonia	15 (28)	30 (55)	0.005
Pneumothorax	0 (0)	3 (6)	0.24¶
Pulmonary embolism	3 (6)	1 (2)	0.36¶
ARDS	0 (0)	1 (0)	1.00¶
Cardiac complications	12 (22)	26 (47)	0.006
Atrial fibrillation	12 (22)	25 (46)	0.01
Cardiac asthma	1 (2)	1 (2)	1.00¶
Wound infections	2 (4)	8 (14)	0.09¶
Cervical	2 (4)	1 (2)	0.61¶
Thoracic	0 (0)	5 (9)	0.06¶
Abdominal	0 (0)	2 (4)	0.50¶
Anastomotic leakage†			0.57
Type I (conservative)	0 (0)	0 (0)	
Type II (nonsurgical intervention)	1 (2)	0 (0)	
Type III (surgical intervention)	12 (22)	11 (20)	

III. Minimally Invasive Surgery

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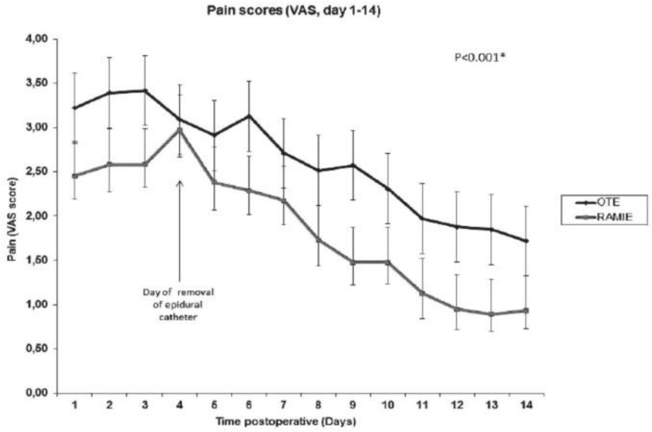
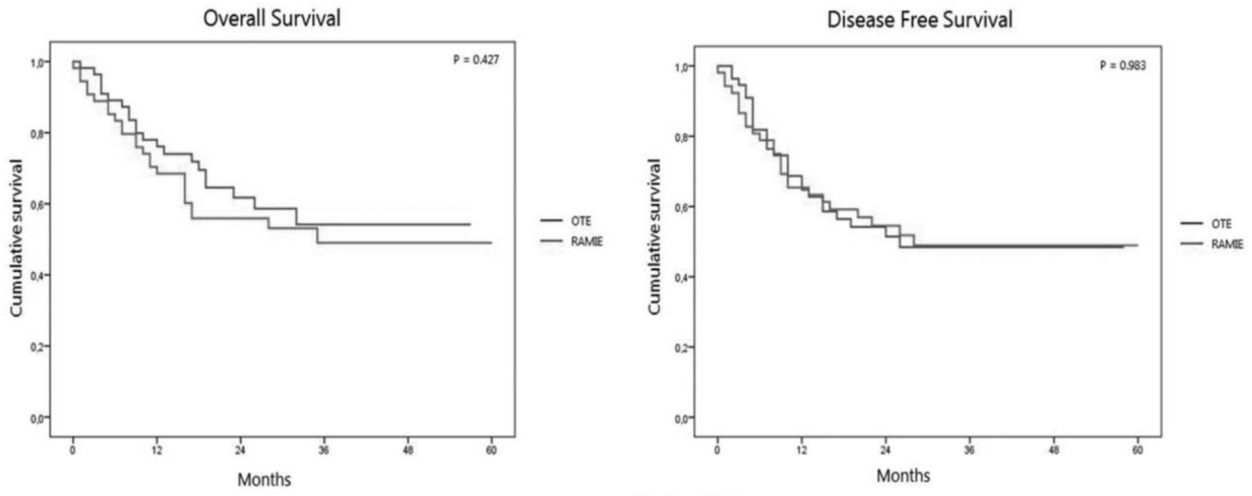


	VAS Day 1	VAS Day 2	VAS Day 3	VAS Day 4	VAS Day 5	VAS Day 6	VAS Day 7	VAS Day 8	VAS Day 9	VAS Day 10	VAS Day 11	VAS Day 12	VAS Day 13	VAS Day 14	Overall
RAMIE (n=54)	2.45	2.58	2.58	2.97	2.38	2.29	2.18	1.73	1.48	1.48	1.13	0.95	0.89	0.93	1.86
OTE (n=55)	3.22	3.39	3.41	3.09	2.91	3.13	2.71	2.51	2.58	2.31	1.97	1.88	1.85	1.72	2.62
SE#	0.40	0.40	0.40	0.40	0.40	0.40	0.39	0.39	0.39	0.39	0.39	0.40	0.40	0.40	0.13
P-value	0.05	0.04	0.04	0.76	0.18	0.03	0.15	0.05	0.01	0.03	0.03	0.02	0.02	0.05	<0.001

* During the first 14 days, overall postoperative pain (VAS) was significantly lower for RAMIE compared to OTE using a mixed effects linear model adjusted for baseline pain scores.

SE denotes standard error of the mean

III. Minimally Invasive Surgery



Number at risk

Months	0	12	24	36	48	60
RAMIE	54	33	19	11	6	1
OTE	55	34	18	9	3	0

A

Number at risk

Months	0	12	24	36	48	60
RAMIE	52	30	18	10	6	1
OTE	55	31	17	9	3	0

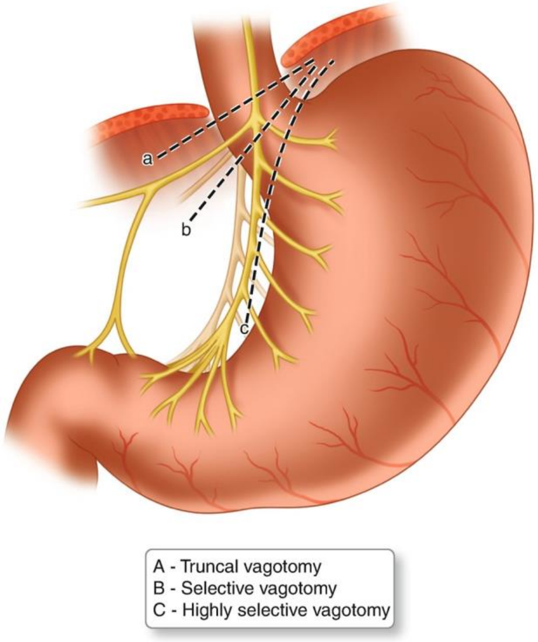
B

FIGURE 3. Kaplan–Meier Plots of overall and disease free survival.

Thank you for your attention

IV. Other procedure

Pylorus drainage procedure



- Vagotomy
  - Cut vagus nerve
  - Eliminate acid secretion stimulus

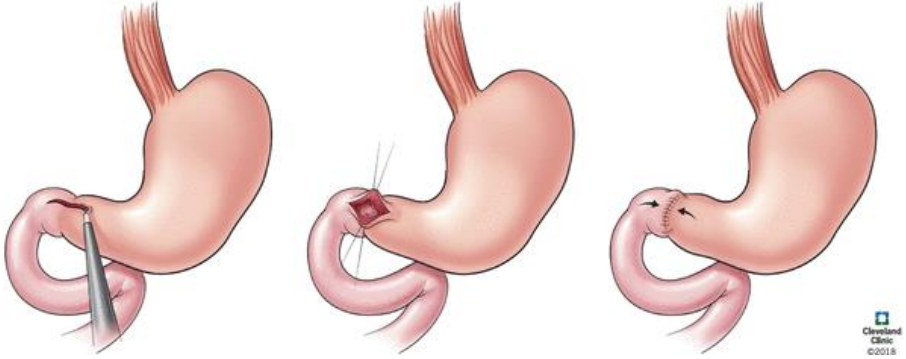
- Pylorus drainage procedure

  : widens the pylorus to gaurantee stomach emptying even w/o vagus nerve stimulation

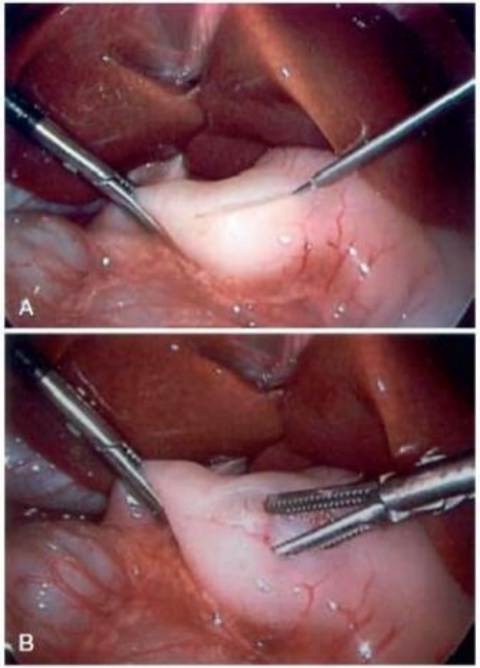
IV. Other procedure

Pylorus drainage procedure

Pyloroplasty



Pyloromyotomy

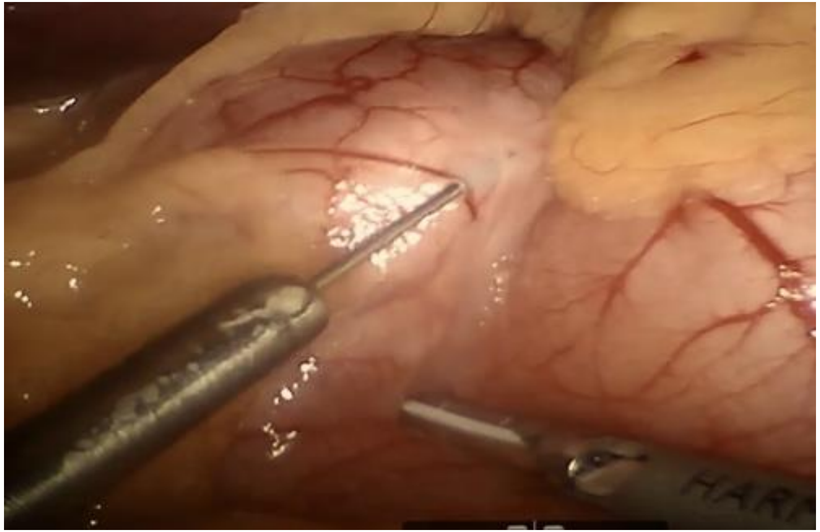


IV. Other procedure

Pylorus drainage procedure

Pyloric Finger Fracture

Botox Injection



IV. Other procedure

Pylorus drainage procedure: systemic review

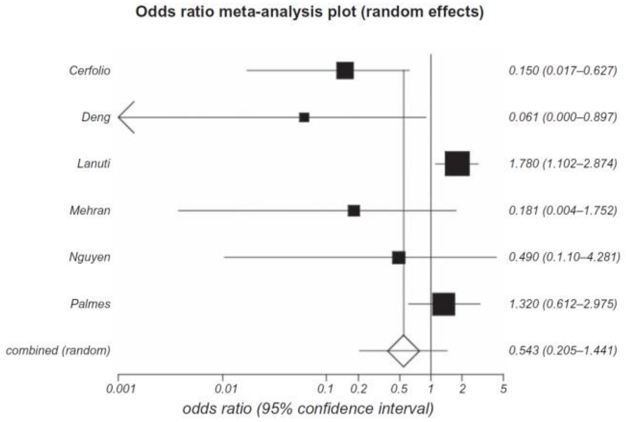
The impact of pyloric drainage on clinical outcome following esophagectomy: a systematic review

S. Arya,[1] S. R. Markar,[1] A. Karthikesalingam,[2] G. B. Hanna[1]

[1]*Division of Surgery, Department of Surgery and Cancer, Imperial College London, St Mary's Hospital, and* [2]*Department of Outcomes Research, St George's Hospital, London, UK*

SUMMARY. Delayed emptying of the gastric conduit following esophagectomy can be associated with an increased incidence of complications including aspiration pneumonia and anastomotic leak. The aim of this systematic review is to evaluate the current modalities of pyloric drainage following esophagectomy and their impact on anastomotic integrity and postoperative morbidity. Medline, Web of Science, Cochrane library, trial registries, and conference proceedings were searched. Five pyloric management strategies following esophagectomy were evaluated: no intervention, botulinum toxin (botox) injection, finger fracture, pyloroplasty, and pyloromyotomy. Outcomes evaluated were hospital mortality, anastomotic leak, pulmonary complications, delayed gastric emptying, and the late complication of bile reflux. Twenty-five publications comprising 3172 patients were analyzed. Pooled analysis of six comparative studies published after 2000 revealed pyloric drainage to be associated with a nonsignificant trend toward a reduced incidence of anastomotic leak, pulmonary complications, and delayed gastric emptying. Overall, the current level of evidence regarding the merits of individual pyloric drainage strategies remains very poor. There is significant heterogeneity in the definitions of clinical outcomes, in particular delayed gastric emptying, which has prevented meaningful assessment and formulation of consensus regarding the management of the pylorus during esophagectomy. Pyloric drainage procedures showed a non-significant trend toward fewer anastomotic leaks, pulmonary complications, and reduced gastric stasis when employed following esophagectomy. However, the ideal technique remains unproven suggesting that further collaborative investigations are needed to determine the intervention that will maximize the potential benefits, if any, of pyloric intervention.

KEY WORDS: botulinum toxin, esophageal cancer, finger fracture, pyloromyotomy, pyloroplasty, pylorus.



No significant difference in pulmonary complications, anastomotic leaks, reduced gastric stasis between pyloric drainage and nonintervention

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IV. Other procedure

Whole stomach vs Gastric tube

RESEARCH ARTICLE

Gastric-tube versus whole-stomach esophagectomy for esophageal cancer: A systematic review and meta-analysis

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Department of Cardiothoracic Surgery, The Second Affiliated Hospital of Nanchang University, Nanchang, China

* weiyiping2015@163.com

Study or Subgroup	Gastric Tube Events	Gastric Tube Total	Whole stomach Events	Whole stomach Total	Weight	Odds Ratio M-H, Random, 95% CI	Year
Collard 1995	6	112	4	100	19.7%	1.36 [0.37, 4.96]	1995
Peng 2009	6	120	31	120	26.6%	0.15 [0.06, 0.38]	2009
Shu 2013	23	453	44	397	34.7%	0.43 [0.25, 0.72]	2013
Zhang 2015	3	52	11	52	19.0%	0.23 [0.06, 0.87]	2015
Total (95% CI)		**737**		**669**	**100.0%**	**0.36 [0.16, 0.81]**	
Total events	38		90				

Heterogeneity: Tau² = 0.41; Chi² = 8.38, df = 3 (P = 0.04); I² = 64%
Test for overall effect: Z = 2.49 (P = 0.01)

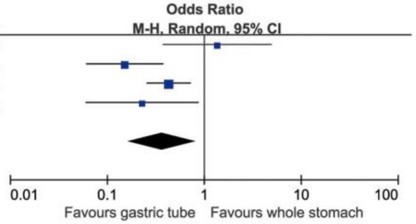


Fig 4. Forest plot of reflux esophagitis in the whole-stomach and gastric-tube groups.

Study or Subgroup	Gastric Tube Events	Gastric Tube Total	Whole stomach Events	Whole stomach Total	Weight	Odds Ratio M-H, Fixed, 95% CI	Year
Shu 2013	15	453	39	397	92.1%	0.31 [0.17, 0.58]	2013
Zhang 2015	0	52	3	52	7.9%	0.13 [0.01, 2.67]	2015
Total (95% CI)		**505**		**449**	**100.0%**	**0.30 [0.17, 0.55]**	
Total events	15		42				

Heterogeneity: Chi² = 0.30, df = 1 (P = 0.59); I² = 0%
Test for overall effect: Z = 3.95 (P < 0.0001)

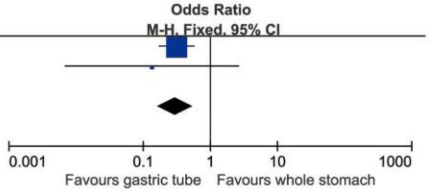
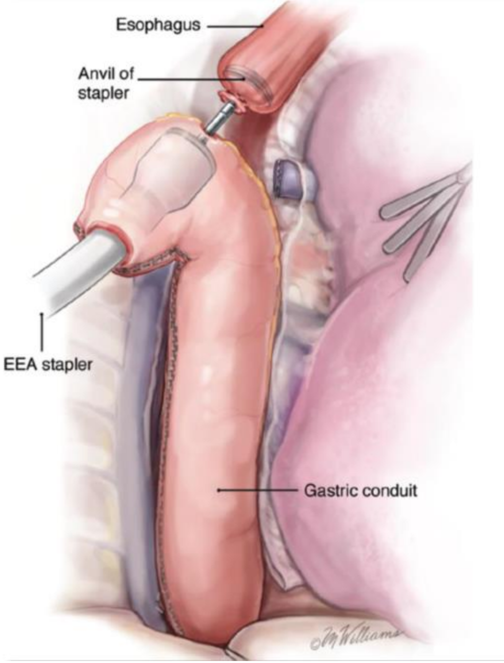


Fig 7. Forest plot of thoracic stomach syndrome in the whole-stomach and gastric-tube groups.

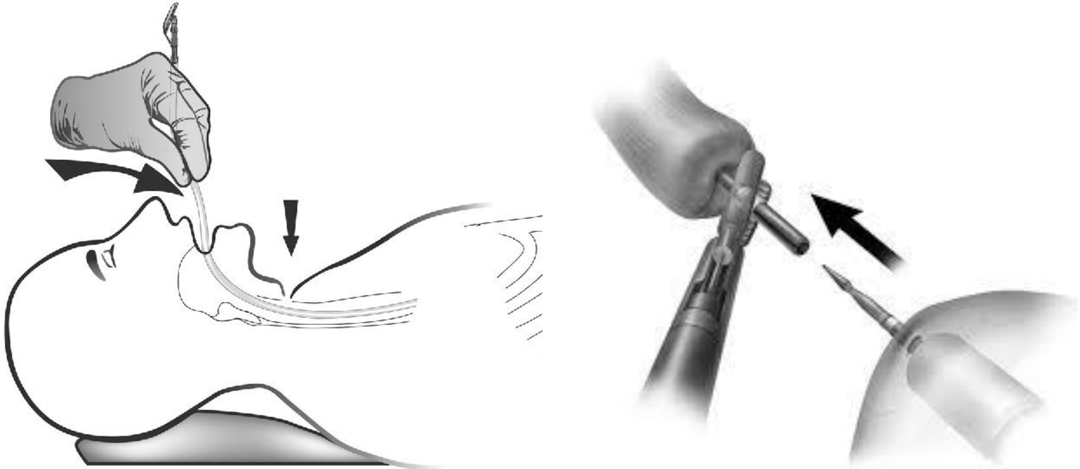
IV. Other procedure

Esophago-gastostomy

Transthoracic EEA



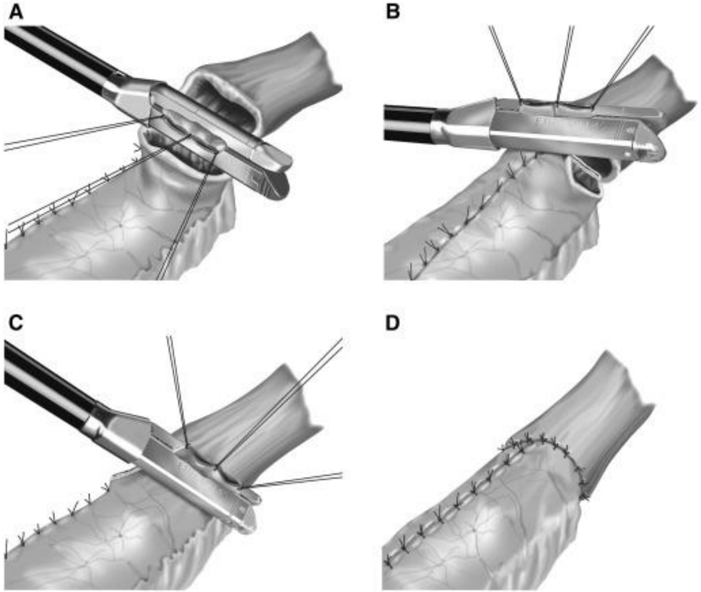
Transoral OrVil EEA



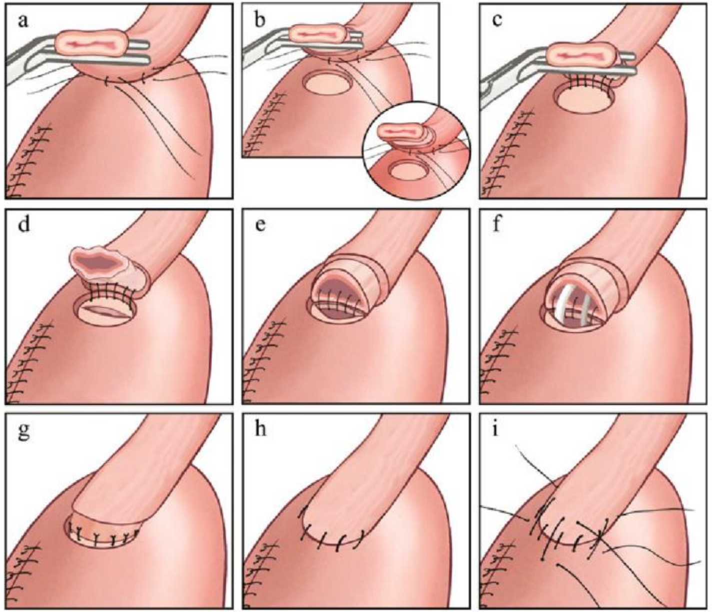
IV. Other procedure

Esophago-gastostomy

Triangulating stapling technique



Hand-sewn



e stitches were placed between the outer layer of the mucosa layer was opened transversely. e The rear muc

IV. Other procedure

Esophago-gastostomy

Side To Side anastomosis