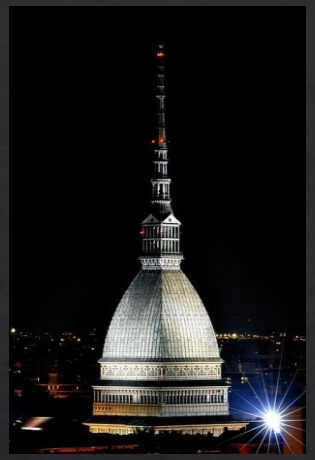

# LA CHIRURGIA MINI-INVASIVA DELLE NEOPLASIE DEL CARDIAS E DELL'ESOFAGO

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# Minimally Invasive Surgery for cardia and esophageal cancer

Background:

Surgical resection with radical lymphadenectomy, usually after the administration of neoadjuvant chemotherapy or chemoradiotherapy, remains the key component in the multimodality treatment of cardia/esophageal cancer.

The 5-year survival is 10 to 25% among all patients but increases to 40% among patients who undergo curative surgery.

Esophagectomy is a complex surgical procedure for which the mortality rates have historically been significant.

In modern practice, in high-volume centers with appropriate multidisciplinary teams, the mortality rate after esophageal resection has been reduced significantly. Despite this, it remains an operation associated with substantial rates of morbidity:

- Surgery-related
- Cardiovascular
- Pulmonary

In studies with large cohort of patients receiving esophagectomy, mortality ranged between 2.7 % and 9.8 % with a morbidity of 17.9–57 %.



MEDICAL
respiratory 21-27%
arrhythmias

SURGICAL
leaks 3,7-14%
chylotorax
necrosis of gastric conduit

# HIGH VOLUME CENTERS

# MULTIDISCIPLINARY TEAM

Ann Surg. 2009 Nov;250(5):798-807. doi: 10.1097/SLA.0b013e3181bdd5a8.

**Postoperative complications after transthoracic esophagectomy for cancer of the esophagus and gastroesophageal junction are correlated with early cancer recurrence: role of systematic grading of complications using the modified Clavien classification.**

Lerut T[1], Moons J, Coosemans W, Van Raemdonck D, De Leyn P, Decaluwé H, Decker G, Nafteux P.

World J Surg (2015) 39:216–222
DOI 10.1007/s00268-014-2754-1

World Journal of Surgery

ORIGINAL SCIENTIFIC REPORT

**Major Post-Operative Complications Predict Long-Term Survival After Esophagectomy in Patients with Adenocarcinoma of the Esophagus**

Guillaume Luc · Marlène Durand · Laurence Chiche · Denis Collet

By the early 1990s, some surgeons had developed and used protocols for thoracoscopic esophagectomy, initially restricting its use to T1 and T2 esophageal cancer without neoadjuvant chemoradiation.
With time indications for minimally invasive esophageal resection have been expanded to include more advanced disease, irrespective of whether patients have received neoadjuvant treatments.

## THORACOSCOPIC EN BLOC TOTAL ESOPHAGECTOMY WITH RADICAL MEDIASTINAL LYMPHADENECTOMY

Takashi Akaishi, MD
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Norio Higuchi, MD
Yoshiki Kuriya, MD
Jun-ichi Kuramoto, MD
Tsuneo Toyoda, MD
Akio Wakabayashi, MD

*Objective:* Total esophagectomy with en bloc mediastinal lymphadenectomy for cancer carries a substantial morbidity and mortality rate. To investigate the feasibility of thoracoscopic technique, we carried out an extensive laboratory study. Encouraged by our excellent results, we conducted a clinical trial. *Methods:* From September 1994 to September 1995, 39 patients thoracic esophageal cancer lesions not invading surrounding organs underwent total esophagectomy with mediastinal lymphadenectomy by means of thoracoscopy. Ages ranged from 47 to 86 years. The procedures were conventional except for the thoracic portion, which was performed as a thoracoscopic procedure with six trocar holes instead of thoracotomy. All harvested lymph nodes were counted for each station. Spirometric data and plethysmographically determined vital capacity were measured before and after operation for all patients. *Results:* All procedures were accomplished as scheduled, and none was converted to open thoracotomy. The operating time was 200 ± 41 minutes (mean ± standard deviation). Estimated blood loss was 270 ± 157 ml. The harvested lymph nodes numbered 19.7 ± 11.1 per patient. Seventeen patients (45%) had positive lymph nodes. There were no in-hospital deaths within 30 days. Twenty-two patients did not require postoperative ventilatory support. Vital capacity decreased to 85% ± 11% of the preoperative values, and forced expiratory volume in 1 second decreased to 82% ± 16%. *Conclusions:* Thoracoscopic mediastinal lymphadenectomy is technically feasible, and its completeness is comparable to that of the open technique. The decline in pulmonary function is significantly less than that seen in our previous experience with the open technique.
(J Thorac Cardiovasc Surg 1996;112:1533-41)

Endosc Surg Allied Technol. **1994** Feb;2(1):21-5.

## Thoracoscopic subtotal oesophagectomy.

Cuschieri A[1].

Author information

**Abstract**

A technique for endoscopic-assisted oesophagectomy is described using either a lateral or prone position for the oesophageal dissection. In a consecutive series of 34 patients, two were found to have hepatic deposits at preliminary laparoscopy, and four were inoperable at **thoracoscopic** staging. A further two had fibrous obliteration of the pleural cavity. Of the 26 procedures, 20 were performed in the lateral position and six in the prone position. There was one conversion to open thoracotomy due to massive aortic bleeding. There were no deaths. Postoperative complications included pneumonia (n = 3), recurrent laryngeal nerve palsy (n = 2) and one anastomotic leak. The median postoperative stay was 12 days (range 9-30 days). It is suggested that the prone position has technical advantages and reduces the postoperative respiratory complications.



## Thoracoscopic Esophagectomy: Technique and Initial Results

Dominique Gossot, MD, Pierre Fourquier, MD, and Michel Celerier, MD

Department of Surgery, Saint-Louis Hospital, Paris, France

To reduce the high morbidity rate associated with esophageal surgery, we have developed a technique of thoracoscopic esophagectomy. A feasibility study was first carried out in an animal model and a specific instrument was developed for this purpose. Esophagectomy using a right thoracoscopic approach was attempted in 15 patients, 13 males and 2 females whose average age was 48 years. Indications consisted of squamous cell carcinoma in 10 patients, adenocarcinoma in 1, and caustic stenosis in 4. We used a technique that consisted of double-lumen tracheal intubation and the creation of five ports. The whole esophagus was mobilized thoracoscopically and the esophagectomy was completed through the abdomen. The reconstruction was achieved using a gastric pull-through, and the anastomosis was made in the neck. There were three failures: in 1 patient there was a large tumor, making the exposure unsafe, and, in 2 patients, incomplete lung collapse made exposure of the posterior mediastinum difficult. These 3 cases were converted into a thoracotomy. The thoracoscopic dissection was successful in the remaining 12 patients. The average time of the thoracoscopic stage was 125 minutes. The postoperative course was uneventful in 10 patients. Two patients had a left atelectasis. Although our series is limited, these initial results indicate that thoracoscopic esophagectomy is feasible. However, further evaluation of the technique is needed to assess its benefit in terms of respiratory morbidity.

(*Ann Thorac Surg 1993;56:667–70*)

Unlike other minimally invasive procedures, minimally invasive esophagectomy (MIE) has not been broadly adopted. No matter what approach is used, MIE remains a very complex operation

Advanced desease

Morbidity and mortality

Oncological radicality

Reproducibility

Cost

TOPICS UNDER DEBATE

# The primary goal of MIE is to decrease surgical morbidity associated with the open approach.

- At present, the majority of data derives from retrospective nonrandomized series and suggests that mortality rates appear equivalent with some suggestion of benefit in terms of overall morbidity favoring a minimally invasive approach

## Clinical outcomes of video-assisted thoracoscopic surgery esophagectomy for esophageal cancer: a propensity score-matched analysis

Duk Hwan Moon[1], Jong Mog Lee[2], Jae Hyun Jeon[2], Hee Chul Yang[2], Moon Soo Kim[2]

Indian J Surg (August 2017) 79(4):319–325
DOI 10.1007/s12262-016-1519-5

ORIGINAL ARTICLE

## Minimally Invasive Ivor-Lewis Esophagectomy (MIILE): A Single-Center Experience

Jun Wang[1] · Mei-qing Xu[1] · Ming-ran Xie[1] · Xin-yu Mei[1]

Surgical Endoscopy (2018) 32:4957–4965
https://doi.org/10.1007/s00464-018-6257-2

## Total minimally invasive esophagectomy for esophageal adenocarcinoma reduces postoperative pain and pneumonia compared to hybrid esophagectomy

Felix Berlth[1] · Patrick S. Plum[1] · Seung-Hun Chon[1] · Christian A. Gutschow[2] · Elfriede Bollschweiler[1] · Arnulf H. Hölscher[3]

Received: 22 March 2018 / Accepted: 29 May 2018 / Published online: 21 June 2018


Surg Endosc (2015) 29:2614–2619
DOI 10.1007/s00464-014-3978-8

## Open versus minimally invasive esophagectomy: clinical outcomes for locally advanced esophageal adenocarcinoma

Juha Kauppi · Jari Räsänen · Eero Sihvo · Riikka Huuhtanen · Kaisa Nelskylä · Jarmo Salo

Review Article

## Minimally invasive esophagectomy for Barrett's adenocarcinoma

Emanuele Asti, Daniele Bernardi, Marco Sozzi, Luigi Bonavina

Surg Endosc (2010) 24:1621–1629
DOI 10.1007/s00464-009-0822-7

## Is minimally invasive surgery beneficial in the management of esophageal cancer? A meta-analysis

Kamal Nagpal · Kamran Ahmed · Amit Vats · Danny Yakoub · David James · Hutan Ashrafian · Ara Darzi · Krishna Moorthy · Thanos Athanasiou

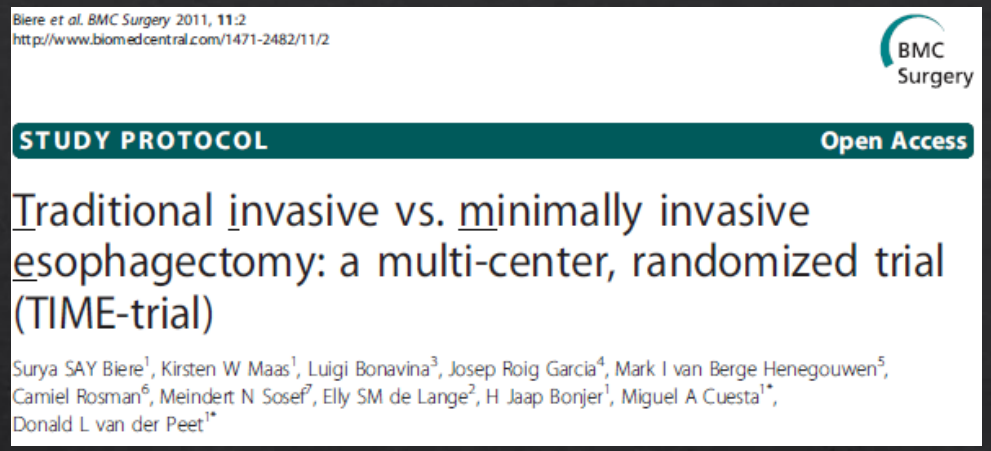
**Table 2** Results of meta-analysis comparing MIE versus open and HMIE versus open esophagectomy

| Outcome | No. of studies | No. of patients | OR/WMD | 95% CI | *P*-value | HG $\chi^2$ | HG *P*-value |
|---|---|---|---|---|---|---|---|
| MIE versus open | | | | | | | |
| Operative time | 5 | 312 | 5.91 | −39.53, 51.34 | 0.80 | 29.13 | **<0.001** |
| Blood loss | 5 | 312 | −268.53 | −369.91, −167.16 | **<0.001** | 12.14 | **0.02** |
| ICU stay | 3 | 216 | −0.97 | −1.31, −0.63 | **<0.001** | 1.16 | 0.56 |
| Length of stay | 4 | 267 | −2.75 | −4.65, −0.86 | **0.004** | 2.01 | 0.57 |
| GI bleeding | 2 | 171 | 0.32 | 0.04, 2.81 | 0.30 | 0.01 | 0.91 |
| Anastomotic leak | 5 | 447 | 0.58 | 0.28, 1.20 | 0.14 | 3.43 | 0.49 |
| Anastomotic stricture | 4 | 379 | 1.58 | 0.30, 8.40 | 0.59 | 15.07 | **0.002** |
| Gastric conduit ischemia | 3 | 236 | 1.80 | 0.34, 9.60 | 0.49 | 1.88 | 0.39 |
| Respiratory complications | 5 | 447 | 0.58 | 0.35, 0.98 | **0.04** | 2.91 | 0.57 |
| Cardiac complications | 3 | 368 | 1.11 | 0.51, 2.45 | 0.79 | 0.42 | 0.81 |
| Chyle leak | 5 | 447 | 1.37 | 0.35, 5.47 | 0.65 | 2.73 | 0.44 |
| Vocal cord palsy | 5 | 447 | 0.76 | 0.19, 3.10 | 0.71 | 0.12 | 0.94 |
| Total morbidity | 5 | 447 | 0.52 | 0.32, 0.84 | **0.007** | 4.36 | 0.36 |
| 30-day mortality | 5 | 447 | 0.55 | 0.19, 1.57 | 0.26 | 0.04 | 0.98 |
| Number of LN retrieved | 4 | 240 | 1.02 | −0.84, 2.88 | 0.28 | 2.76 | 0.43 |
| HMIE versus open | | | | | | | |
| Operative time | 3 | 653 | 5.64 | −31.77, 43.05 | 0.77 | 18.60 | **<0.001** |
| Blood loss | 3 | 653 | −147.87 | −297.40, 1.67 | **0.05** | 8.58 | **0.01** |
| Anastomotic leak | 4 | 806 | 0.51 | 0.28, 0.91 | **0.02** | 0.50 | 0.92 |
| Respiratory complications | 4 | 806 | 0.68 | 0.48, 0.96 | **0.03** | 1.12 | 0.77 |
| Cardiac complications | 4 | 806 | 0.67 | 0.42, 1.07 | 0.09 | 2.44 | 0.49 |
| Chyle leak | 2 | 562 | 1.48 | 0.23, 9.53 | 0.68 | 1.81 | 0.18 |
| Vocal cord palsy | 4 | 806 | 1.54 | 0.89, 2.67 | 0.13 | 1.45 | 0.69 |
| Total morbidity | 3 | 725 | 0.62 | 0.31, 1.25 | 0.18 | 5.17 | 0.08 |
| 30-day mortality | 4 | 806 | 0.56 | 0.19, 1.60 | 0.28 | 0.92 | 0.34 |
| Number of LN retrieved | 3 | 632 | −1.44 | −6.61, 3.73 | 0.58 | 19.37 | **<0.001** |

*MIE* minimally invasive esophagectomy, *HMIE* hybrid minimally invasive esophagectomy, *LN* lymph node, *ICU* intensive care unit, *OR* odds ratio, *WMD* weighted mean difference, *CI* confidence interval, *HG* heterogeneity

| Authors (year) | *n* | Approaches | Mortality *n* (%) | Overall morbidity *n* (%) |
|---|---|---|---|---|
| Law et al. (1997) [10] | 22 | MIE (TSO) | 0 | 18 (81.8) |
| | 63 | Open | 0 | 63 (100) |
| Nguyen et al. (2000) [11] | 18 | MIE (TLSO) | 0 | 7 (38.9) |
| | 36 | Open | 0 | 19 (52.8) |
| Osugi et al. (2003) [12] | 77 | MIE (VATS) | 0 | 31 (40.3) |
| | 72 | Open | 0 | 32 (44.4) |
| Kunisaki et al. (2004) [13] | 15 | MIE (VATS + HALS) | 0 | NS |
| | 30 | Open | 0 | NS |
| Van den Broek et al. (2004) [14] | 25 | MIE (THO) | 0 | 14 (70) |
| | 20 | Open | 0 | 18 (72) |
| Bresadola et al. (2006) [15] | 14 | MIE (THO and TLSO) | 0 | 8 (57.1) |
| | 14 | Open | 0 | 6 (42.9) |
| Bernabe et al. (2005) [16] | 17 | MIE (THO) | 0 | NS |
| | 14 | Open | 0 | NS |
| Shiraishi et al. (2006) [17] | 116 | MIE (TLSO) | 3 (2.6) | NS |
| | 37 | Open | 3 (8.1) | NS |
| Braghetto et al. (2006) [18] | 47 | MIE (VATS/LSO) | 3 (6.3) | 18 (38.2) |
| | 119 | Open | 13 (10.9) | 72 (60.5) |
| Smithers et al. (2007) [19] | 332 | MIE (TLSO) | 7 (2.1) | 207 (62.3) |
| | 114 | Open | 3 (2.6) | 76 (66.7) |
| Fabian et al. (2008) [9] | 22 | MIE (TLSE) | 1 (4.5) | 15 (68.2) |
| | 43 | Open | 4 (9.8) | 31 (72.1) |
| Zingg et al. (2009) [20] | 56 | MIE (TLSO) | 2 (3.6) | 19 (34.5) |
| | 98 | Open | 6 (6.1) | 20 (23.5) |
| Perry et al. (2009) [21] | 21 | MIE (LIO) | 0 | 13 (62) |
| | 21 | Open | 1 (5) | 17 (81) |
| Parameswaran et al. (2009) [22] | 50 | MIE (TLSO) | 1 (2) | 24 (48) |
| | 30 | Open | 1 (3) | 15 (50) |
| Pham et al. (2010) [23] | 44 | MIE (TLSO) | 3 (6.8) | NS |
| | 46 | Open | 2 (4.3) | NS |
| Schoppman et al. (2010) [24] | 31 | MIE (TLSO) | 0 | 11 (35.5) |
| | 31 | Open | 0 | 23 (74.2) |
| Singh et al. (2010) [25] | 33 | MIE (TLSO) | Values NS | Values NS |
| | 31 | Open | $p=0.34$ | $P=0.06$ |
| Mamidanna et al. (2012) [26] | 1155 | MIE (TLSO,HMIO) | 46 (4.0) | NS |
| | 6347 | Open | 274 (4.3) | NS |
| Ben-David et al. (2012) [27] | 100 | MIE (TLSO) | 1 (1) | NS |
| | 32 | Open | 2 (5) | NS |
| Briez et al. (2012) [28] | 140 | MIE (HMIO) | 2.1 | 35.7 |
| | 140 | Open | 12.9 | 59.3 |
| Xie et al. (2014) [29] | 106 | MIE (TLSO) | 2 (1.9) | 28 (26.4) |
| | 163 | Open | 4 (2.5) | 56 (34.4) |
| Hsu et al. (2014) [30] | 66 | MIE (TLSO) | 5 (7.6) | NS |
| | 63 | Open | 5 (7.9) | NS |

# The TRIALS



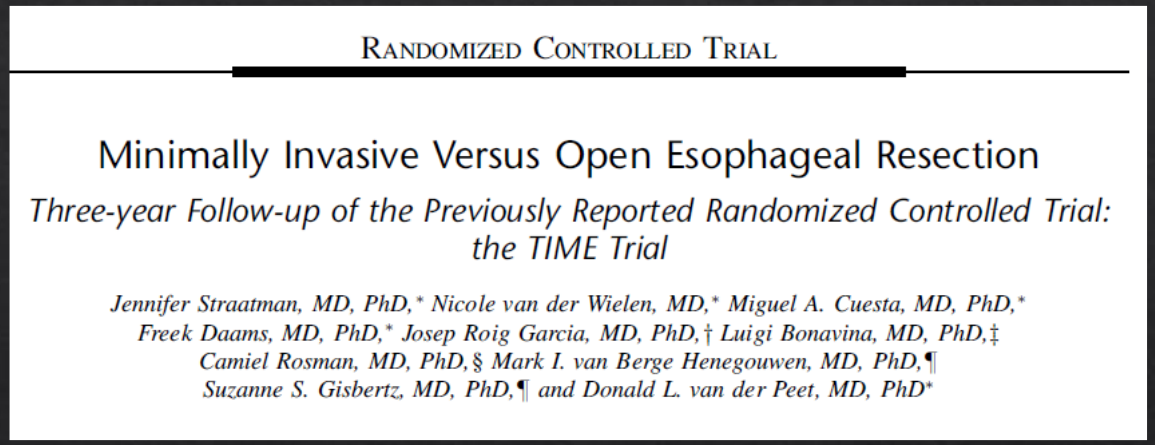
Biere *et al. BMC Surgery* 2011, **11**:2
http://www.biomedcentral.com/1471-2482/11/2

BMC Surgery

**STUDY PROTOCOL** **Open Access**

## Traditional invasive vs. minimally invasive esophagectomy: a multi-center, randomized trial (TIME-trial)

Surya SAY Biere[1], Kirsten W Maas[1], Luigi Bonavina[3], Josep Roig Garcia[4], Mark I van Berge Henegouwen[5], Camiel Rosman[6], Meindert N Sosef[7], Elly SM de Lange[2], H Jaap Bonjer[1], Miguel A Cuesta[1*], Donald L van der Peet[1*]



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**

## 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*

The TIME trial is prospective, multi-center, randomized study comparing traditional transthoracic esophageal resection with minimally invasive resection for esophageal cancer.

# TIME TRIAL

June 1,2009 - March 31,2011

Amsterdam, Milan, Girona

18-75 years; cT1-3, N0-1, M0

At least 10 MIE

More than 30 oesophagectomies per year

56 open (laparotomy/thoracotomy); 59 MIE (thoracoscopy/laparoscopy)

Primary outcome: postoperative pulmory infection whitin first 2 weeks of surgery and during the whole stay in hospital

Secondary outcomes: other complications (leaks, chylotorax, reoperation,…); intraoperative data (blood loss,…); postoperative data (ICU, VAS,…); histological data (lymhonodes, pStage, resection margins, …); mortality

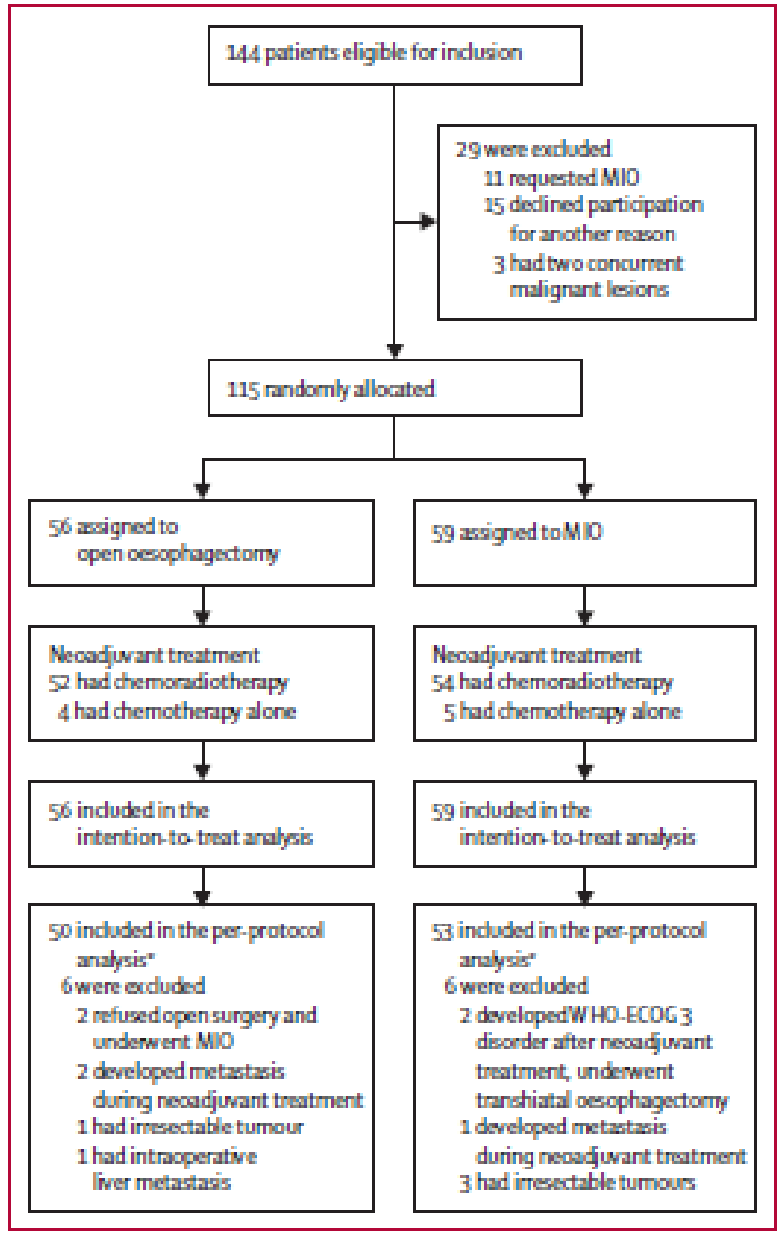



**Figure: Trial profile**
MIO=minimally invasive oesophagectomy. ECOG=Eastern Cooperative Oncology Group. *See appendix for per-protocol analysis of primary and secondary outcome parameters.

# Short-term outcomes

| | 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%) | – |

Data are n (%), median (range), or mean (SD, 95% CI), unless otherwise indicated. OO=open oesophagectomy. MIO=minimally invasive oesophagectomy. SF 36=Short Form 36 Health Survey (version 2). EORTC=European Organization for Research and Treatment of Cancer Quality of Life Questionnaires. *Skewed distribution, Mann-Whitney test applied. †Measures general aspects of health; scores range from 0 to 100, with higher scores representing better well-being. ‡Assesses several aspects of oesophageal function; scores range from 0 to 100, with lower scores indicating better function. Only statistically significant domains presented. §Defined as >1 mm from a resection margin. ¶Staging based on the American Joint Committee on Cancer, 6th edn; four patients in each group did not undergo resection due to metastasis or irresectability of the tumour. ‖Death from any cause.

*Table 2:* Primary and secondary outcomes for the intention-to-treat population

| | 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 |

Data are median (range), n (%), or mean (SD), unless otherwise indicated. OO=open oesophagectomy. MIO=minimally invasive oesophagectomy. NA=not applicable. ICU=intensive-care unit. VAS=Visual Analogue Scale pain score. *Time from skin incision to skin closure. †Skewed distribution, Mann-Whitney test applied. ‡Six patients were converted to thoracotomy and two to laparotomy. §Four patients in the OO group and four in the MIO group did not undergo resection with subsequent anastomosis because of metastasis or irresectability of the tumour. ¶Linear mixed model. ‖In the first 2 days after surgery. **Thoracic complications not related to leakage were mediastinitis, empyema, chylous leakage needing reoperation, and hiatal herniation. ††Confirmed by laryngoscopy.

*Table 3:* Other outcomes of the intention-to-treat population

- Lower incidence of pulmonary infection
- Shorter hospital stay
- Better short-term QoL
- No compromise in the quality of resected specimen
- No significant differences in complications
- Less intraoperative bleeding

# Final endpoints: long-term survival analysis: three-year follow-up

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**

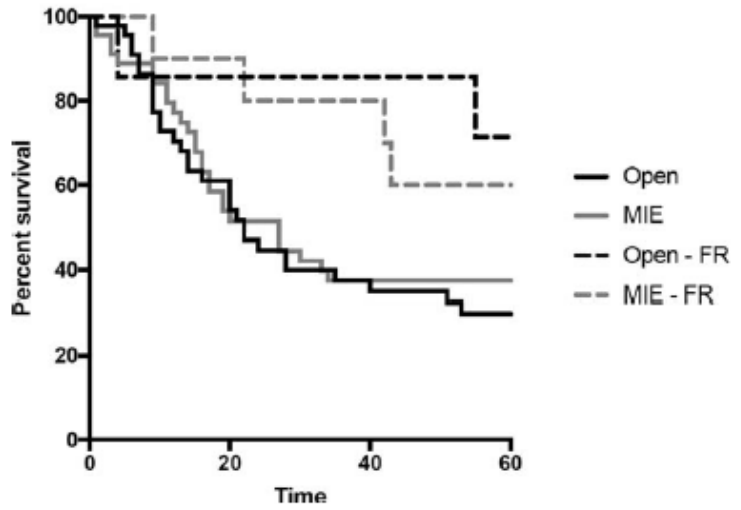
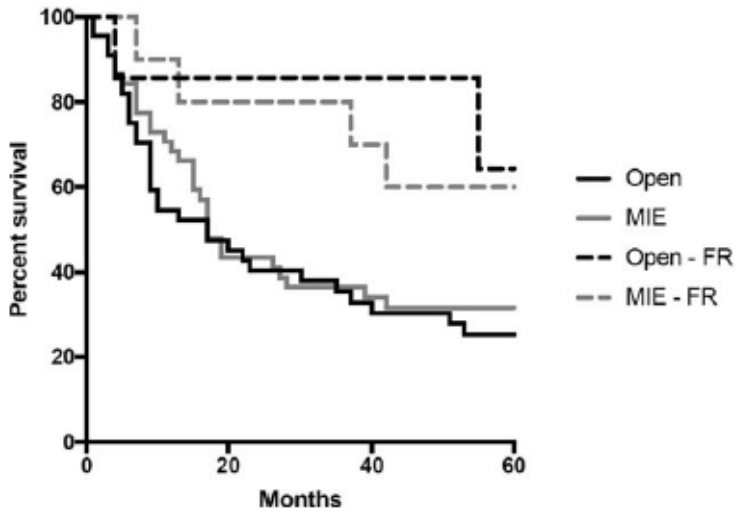



FIGURE 2. Kaplan-Meier curves for comparison of overall sur vival between open and minimally invasive esophagectomy (FR, full responders with no residual tumor).

No differences between OS (41,2% open vs 42,9 MIS) and DFS (37,3% open vs 42,9% MIS)




Recurrence or death, were observe (p=0,602)

In the minimally invasive group, 7 metastasis. In the open group, 8 p metastasis. No differences were obser

TABLE 4. Multivariable Cox Regression Analysis for Overall Survival and Disease-free Survival

| | Overall Survival | | | Disease-free Survival | | |
|---|---|---|---|---|---|---|
| | HR | 95% CI | | HR | 95% CI | |
| Procedure | | | | | | |
| Open vs MI | 0.961 | 0.583 | 1.579 | 0.946 | 0.583 | 1.531 |
| Stage | | | | | | |
| I-II vs 0 | 2.620 | 1.100 | 6.243 | 2.699 | 1.136 | 6.415 |
| III-IV vs 0 | 3.202 | 1.294 | 7.922 | 3.586 | 1.461 | 8.802 |
| Gender | | | | | | |
| Man vs women | 1.557 | 0.815 | 2.974 | 1.592 | 0.841 | 3.013 |
| Age | | | | | | |
| Per year increase | 1.016 | 0.987 | 1.045 | 1.018 | 0.991 | 1.047 |

# MIRO TRIAL

The MIRO trial is a prospective multicentre controlled randomised phase III trial

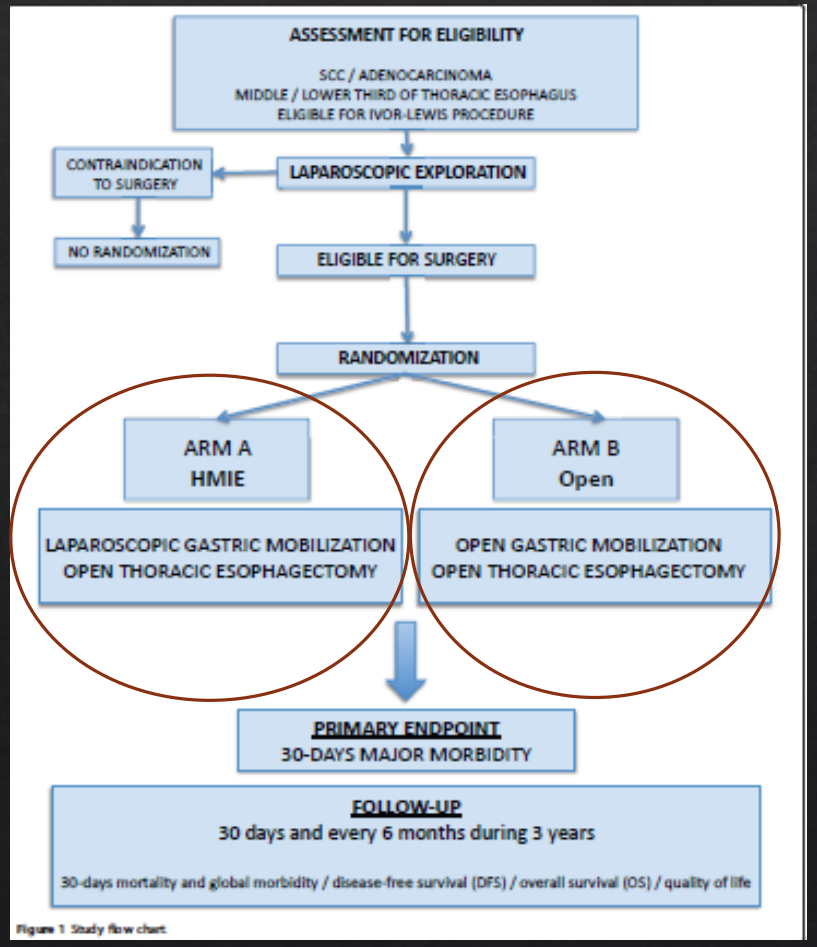


Figure 1 Study flow chart.

Briez *et al. BMC Cancer* 2011, **11**:310
http://www.biomedcentral.com/1471-2407/11/310

BMC Cancer

STUDY PROTOCOL Open Access

## Open versus laparoscopically-assisted oesophagectomy for cancer: a multicentre randomised controlled phase III trial - the MIRO trial

Nicolas Briez[1,2], Guillaume Piessen[1,2], Franck Bonnetain[3], Cécile Brigand[4], Nicolas Carrere[5], Denis Collet[6], Christophe Doddoli[7], Renaud Flamein[8], Jean-Yves Mabrut[9], Bernard Meunier[10], Simon Msika[11], Thierry Perniceni[12], Frédérique Peschaud[13], Michel Prudhomme[14], Jean-Pierre Triboulet[1,2] and Christophe Mariette[1,2*]

13 centers in France
at least 25 procedures

"…We hypothesise that HMIO based on the laparoscopic procedure and an open thoracic approach may provide a significant decrease in major postoperative complications
without leading to any negative impact on oncological outcomes…"

Secondary end points: 30 days mortality; 30 days overall complications; major pulmonary complictions; DFS; OS.

# RESULTS

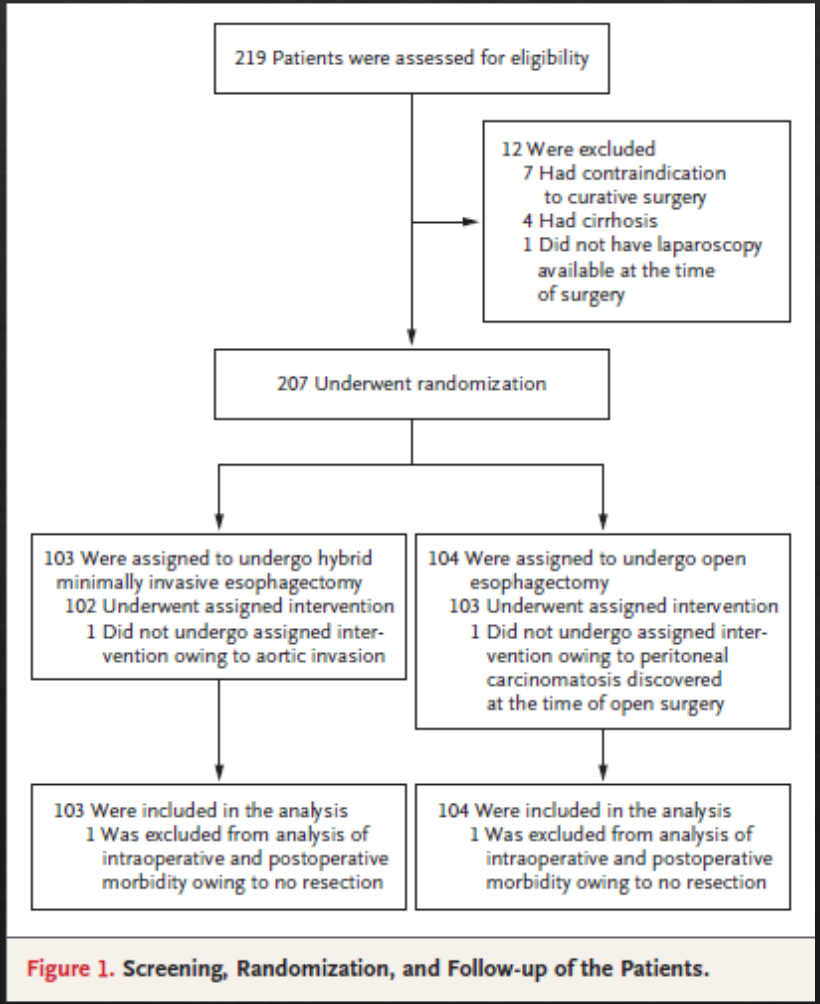



**Figure 1. Screening, Randomization, and Follow-up of the Patients.**

The NEW ENGLAND JOURNAL of MEDICINE 01/2019

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†

- Primary end-point (major intraoperative and postoperative morbidity at 30 days): 36% HMIE vs 64% open (p<0,001). 77% lower risk of major intraoperative and postoperative complications after esophagectomy
- Secondary end-point: no differences in:
  - ✓ mortality at 30 days
  - ✓ intraoperative and postoperative overall morbidity BUT…

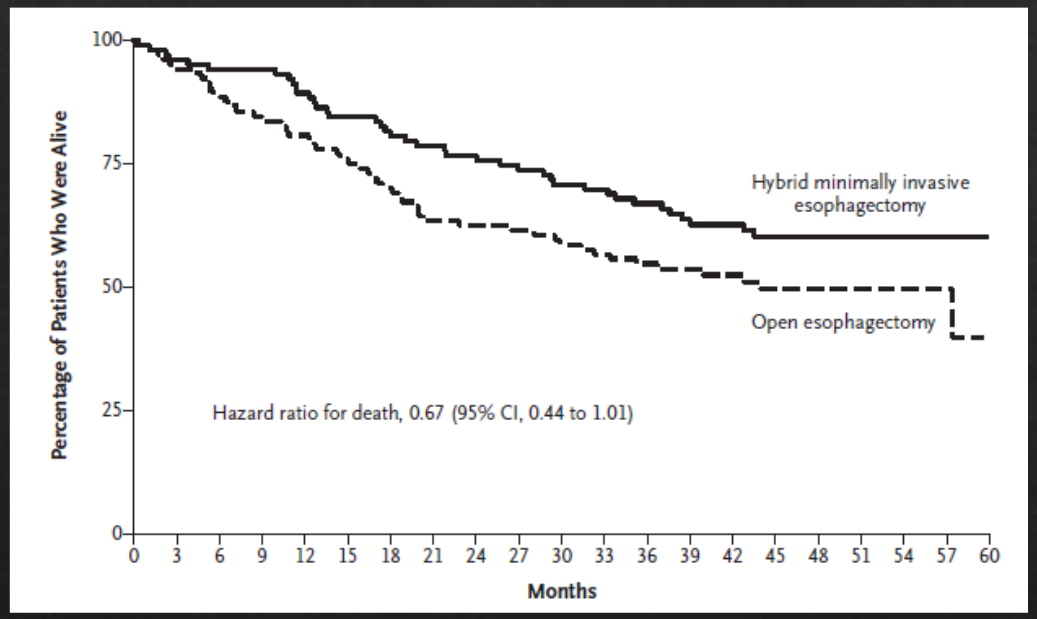
HYBRID MINIMALLY INVASIVE SURGERY WAS ASSOCIATED WITH A LOWER INCIDENCE OF MAJOR PULMONARY COMPLICATIONS WITHIN 30 DAYS (18% vs 30%). 50% lower risk of major pulmonary complications.

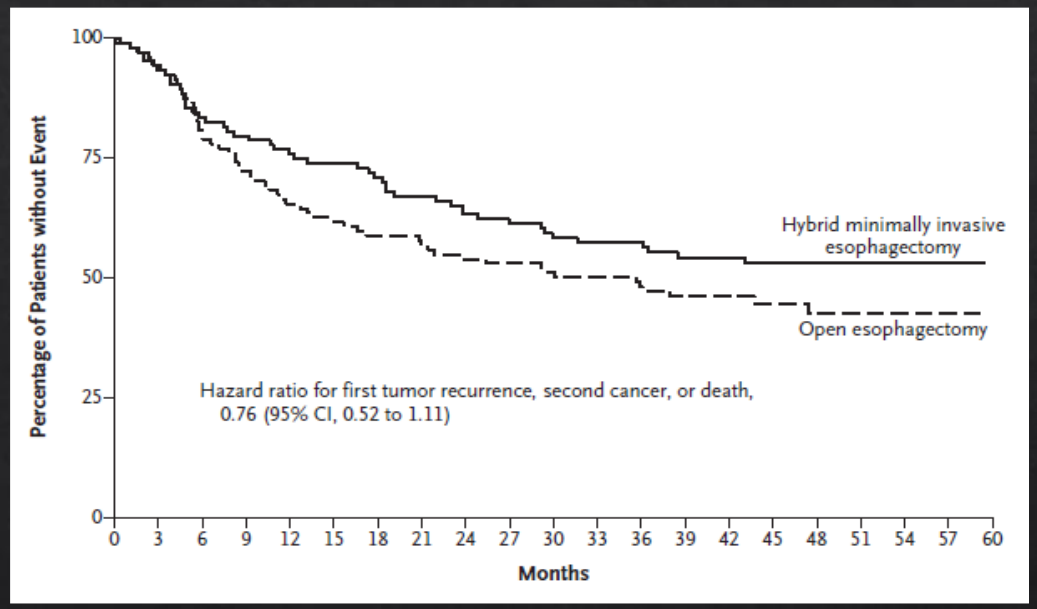
…MIRO TRIAL

Besides no differences in :

- ✓ histologic findings; pathological tumor or node stage
- ✓ total number of nodes resected or positive
- ✓ Resection margin involvement

LONG- TERM RESULTS:




Median Overall Survival:
52,2 months among the 103 patients in hybrid-procedure vs 47,6 among the 104 patients in open-procedure (not significant difference).
OS 3 years: 67% hybrid vs 55% open
OS 5 years: 60% hybrid vs 40% open

Desease-free survival:
no differ significantly between two groups
DFS 3 years: 57% hybrid vs 48% open
DFS 5 years: 53% hybrid vs 43 % open

Surgeon console

Surgical Arm Cart

InSite™Image
Processing Equipment

EndoWrist™ Instruments

InSite™ High-resolution 3-D Endoscope

Robotic surgery benefits from a stable 3-dimensional, magnified view and articulated instruments enabling precise dissection with 7 degrees of freedom of movement.

# First experience with robot-assisted thoracoscopic esophagolymphadenectomy for esophageal cancer

R. van Hillegersberg,[1] J. Boone,[1] W. A. Draaisma,[1] I. A. M. J. Broeders,[1] M. J. M. M. Giezeman,[2] I. H. M. Borel Rinkes[1]

[1] Department of Surgery, University Medical Center Utrecht, P.O. Box 85500, 3508 GA Utrecht, The Netherlands
[2] Department of Anaesthesiology, University Medical Center Utrecht, P.O. Box 85500, 3508 GA Utrecht, The Netherlands

Received: 4 October 2005/Accepted: 27 January 2006/Online publication: 15 May 2006

# Robotic-assisted minimally invasive esophagectomy versus the conventional minimally invasive one: a meta-analysis and systematic review

Dacheng Jin, MMed[1,2,3,4†], Liang Yao, MMed[6†], Jun Yu, MMed[2], Rong Liu, MD[5], Tiankang Guo, MD[3], Kehu Yang, MD[3,4*], Yunjiu Gou, MD[2*]

Original article

# Robot-assisted thoracoscopic oesophagectomy for cancer

J. Boone[1], M. E. I. Schipper[2], W. A. Moojen[1], I. H. M. Borel Rinkes[1], G. J. E. Cromheecke[3] and R. van Hillegersberg[1]

Departments of [1]Surgery, [2]Pathology and [3]Anaesthesiology, University Medical Centre Utrecht, Utrecht, The Netherlands
*Correspondence to:* Professor R. van Hillegersberg, University Medical Centre Utrecht, Department of Surgery (G04·228), Heidelberglaan 100, 3584 CX Utrecht, The Netherlands (e-mail: r.vanhillegersberg@umcutrecht.nl)

*Clinical Study*

# Robot-Assisted Hybrid Esophagectomy Is Associated with a Shorter Length of Stay Compared to Conventional Transthoracic Esophagectomy: A Retrospective Study

Hans C. Rolff, Rikard B. Ambrus, Mohammed Belmouhand, Michael P. Achiam, Marianne Wegmann, Mette Siemsen, Steen C. Kofoed, and Lars B. Svendsen

THE INTERNATIONAL JOURNAL OF MEDICAL ROBOTICS AND COMPUTER ASSISTED SURGERY
*Int J Med Robotics Comput Assist Surg* 2016; 12: 421–426.
Published online 29 September 2015 in Wiley Online Library (wileyonlinelibrary.com) DOI: 10.1002/rcs.1705

ORIGINAL ARTICLE

# Robot-sewn Ivor-Lewis anastomosis: preliminary experience and technical details

van der Sluis et al. Trials 2012, 13:230
http://www.trialsjournal.com/content/13/1/230

TRIALS

STUDY PROTOCOL Open Access

# Robot-assisted minimally invasive thoraco-laparoscopic esophagectomy versus open transthoracic esophagectomy for resectable esophageal cancer, a randomized controlled trial (ROBOT trial)

Pieter C van der Sluis[1*], Jelle P Ruurda[1], Sylvia van der Horst[1], Roy JJ Verhage[1], Marc GH Besselink[1], Margriet JD Prins[1], Leonie Haverkamp[1], Carlo Schippers[1], Inne HM Borel Rinkes[1], Hans CA Joore[2], Fiebo JW ten Kate[3], Hendrik Koffijberg[4], Christiaan C Kroese[5], Maarten S van Leeuwen[6], Martijn PJK Lolkema[7], Onne Reerink[8], Marguerite EI Schipper[3], Elles Steenhagen[4], Frank P Vleggaar[9], Emile E Voest[7], Peter D Siersema[9] and Richard van Hillegersberg[1*]

RANDOMIZED CONTROLLED TRIAL

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

*A Randomized Controlled Trial*

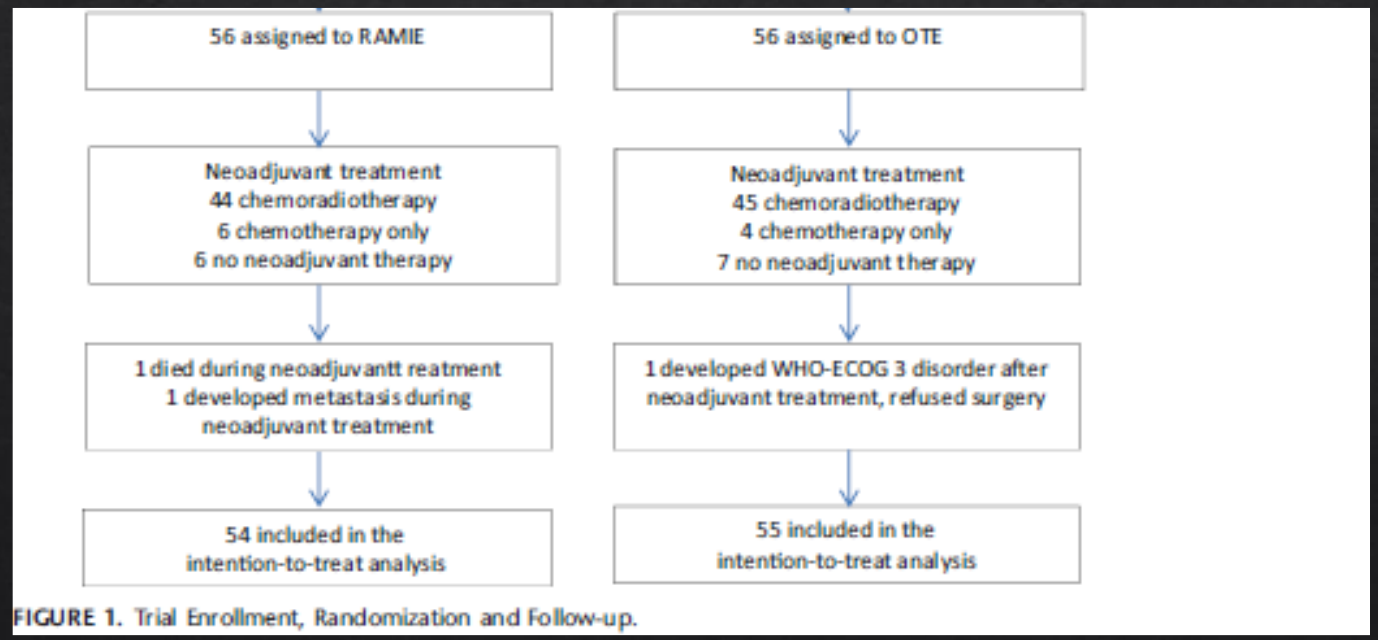



FIGURE 1. Trial Enrollment, Randomization and Follow-up.

Primary end-point: % of overall surgery related postoperative complications

Secondary end-points: pulmonary complications, cardiac complications and post-operative bledding

Were recorded: in-hospital mortality; mortality within 30 and 60 days, length of ICU, hospital stay; operation time, blood loss

OS; DFS; post-operative functional recovery; QoL questionnaire

Robot-assisted thoraco-laparoscopic esophagectomy

*VS*

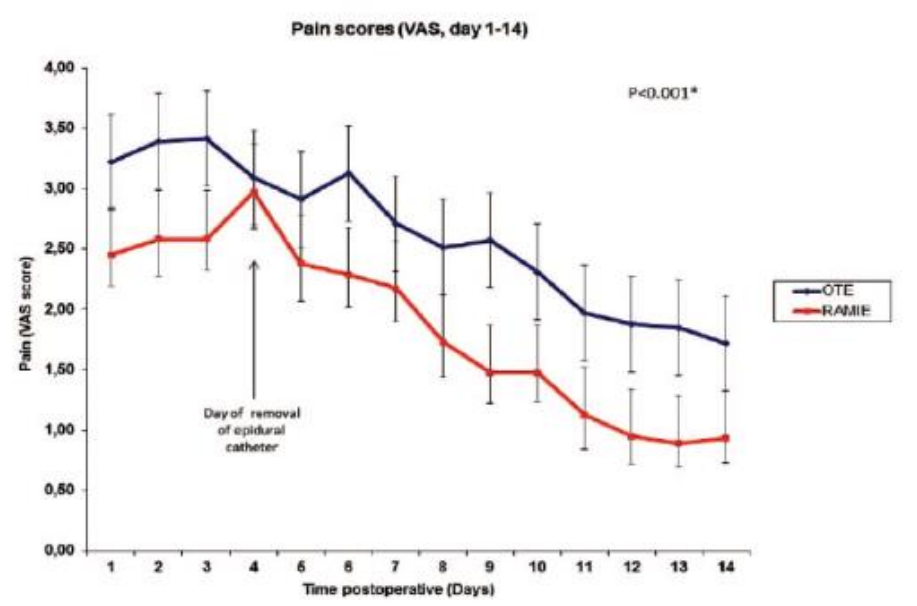
Open transthoracic esophagectomy

# ROBOT TRIAL: RESULTS

Primary endpoint (overall surgery-related complications): 32/54 (59%) after RAMIE *vs* 44/55 (80%) after OTE (*p=0,02*)

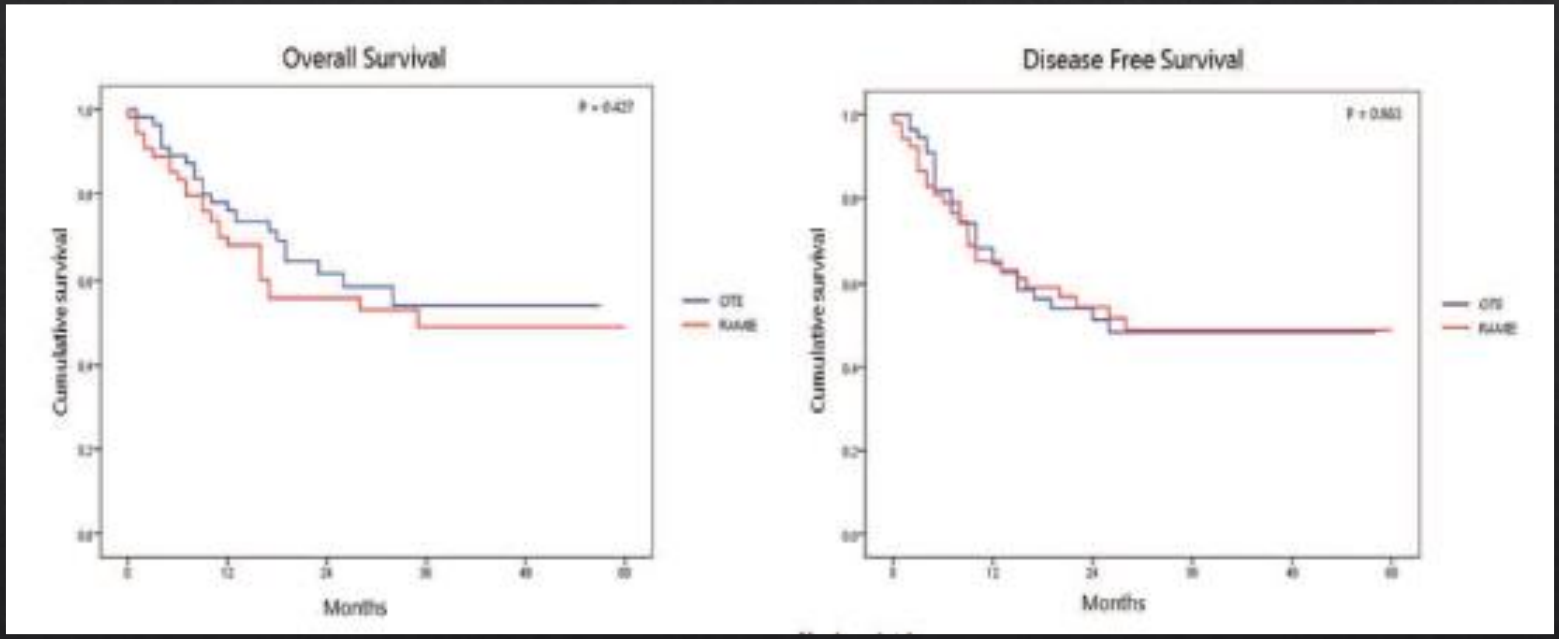
Others:

- Pulmonary complcations: 32% RAMIE *vs* 58% OTE (*p=0,005*)
- Cardiac complications: 22% RAMIE *vs* 47% OTE (*p=0,006*)
- No significant differences in mortality and in all other complications
- Functional recovery at postoperative day 14 significantly better in RAMIE group (70%) vs OTE group (51%) *p=0.04*
- Short-temr QoL higher in RAMIE both at discharge and 6 weeks post-discharge
-




Mean postoperative pain (VAS) during first 14 days significantly lover after RAMIE (*p<0,001*)

- Intraoperative outcomes:
  - operative time : *p <0,001*
  - blood loss: *p <0,001*
- No differences in radical resection, linph nodes retrieved and all pathologic outcomes
-




No differences in OS and in DFS

# Robot-assisted minimally invasive esophagectomy (RAMIE) compared to conventional minimally invasive esophagectomy (MIE) for esophageal cancer: a propensity-matched analysis

E. Tagkalos,[1,*] L. Goense,[2,*] M. Hoppe-Lotichius,[1] J.P. Ruurda,[2] B. Babic,[1] E. Hadzijusufovic,[1] W. Kneist,[1] P.C. van der Sluis,[1] H. Lang,[1] R. van Hillegersberg,[2] P. P. Grimminger[1]

[1] *Department of General, Visceral and Transplant Surgery, University Medical Center of the Johannes Gutenberg University, Mainz, Germany and* [2] *Department of Surgery, University Medical Center Utrecht, Utrecht, the Netherlands*

*SUMMARY.* **Robot-assisted minimally invasive esophagectomy (RAMIE) is increasingly being applied as treatment for esophageal cancer. In this study, the results of 50 RAMIE procedures were compared with 50 conventional minimally invasive esophagectomy (MIE) operations, which had been the standard treatment for esophageal cancer prior to the robotic era. Between April 2016 and March 2018, data of 100 consecutive patients with esophageal carcinoma undergoing modified Ivor Lewis esophagectomy were prospectively collected. All operations were performed by the same surgeon using an identical intrathoracic anastomotic reconstruction technique with the same perioperative management and pain control regimen. Intra-operative and postoperative complications were graded according to definitions stated by the Esophagectomy Complications Consensus Group. Data analysis was carried out with and without propensity score matching. Baseline characteristics did not show significant differences between the RAMIE and MIE group. Propensity score matching of the initial group of 100 patients resulted in two equal groups of 40 patients for each surgical approach. In the RAMIE group, the median total lymph node yield was 27 (range 13–84) compared to 23 in the MIE group (range 11–48), $P = 0.053$. Median intensive care unit (ICU) stay was 1 day (range 1–43) in the RAMIE group compared to 2 days (range 1–17) in the MIE group ($P = 0.029$). The incidence of postoperative complications was not significantly different between the two groups ($P = 0.581$). In this propensity-matched study comparing RAMIE to MIE, ICU stay was significantly shorter in the RAMIE group. There was a trend in improved lymphadenectomy in RAMIE.**

*KEY WORDS*: **esophageal cancer, Ivor Lewis, MIE, minimally invasive, RAMIE.**

| | MIE | | RAMIE | | |
|---|---|---|---|---|---|
| | *N* | | *N* | | *P*-value |
| Cumulative op time | 321 | (224–519) | 383 | (255–488) | **0.001** |
| Duration of the abdominal part | 126 | (66–335) | 151 | (80–250) | **0.007** |
| Duration of the thoracic part | 202 | (158–304) | 223 | (163–320) | 0.068 |
| Blood loss | 350 | ±196 | 331 | ±207 | 0.670 |
| Anastomotic leakage | 9 | 18% | 6 | 12% | 0.575 |
| Pneumonia | 9 | 18% | 6 | 12% | 0.575 |
| Wound infection | 2 | 4% | 0 | 0% | 0.448 |
| 30-d mortality | 1 | 2% | 0 | 0% | 0.315 |
| 90-d mortality | 1 | 2% | 2 | 4% | 0.560 |
| ICU stay | 2.5 | (1–25) | 1 | (1–43) | **0.020** |
| Hospital stay | 19 | (9–55) | 12 | (7–59) | 0.413 |
| T status | | | | | **0.001** |
| T0 | 14 | 28% | 5 | 10% | |
| T1 | 14 | 28% | 5 | 10% | |
| T2 | 10 | 20% | 10 | 20% | |
| T3 + T4 | 12 | 24% | 30 | 60% | |
| N status | | | | | 0.169 |
| N0 | 27 | 54% | 21 | 42% | |
| N1 | 10 | 20% | 9 | 18% | |
| N2 | 10 | 20% | 10 | 20% | |
| N3 | 3 | 6% | 10 | 20% | |
| M status | | | | | 0.992 |
| M0 | 49 | 98% | 48 | 96% | |
| M1 | 1 | 2% | 2 | 4% | |
| R0 status | 49 | 98% | 46% | 92% | 0.359 |
| Number of resected lymph nodes | 23 | (11–48) | 27 | (13–84) | 0.043 |
| (b) After propensity matching | | | | | |
| Cumulative op time | 321 | (224–519) | 388 | (255–475) | 0.001 |
| Time of the abdominal part | 125 | (66–335) | 151 | (80–250) | 0.001 |
| Time of the thoracic part | 201 | (158–295) | 223 | (170–320) | 0.052 |
| Blood loss | 343 | ± 181 | 339 | ±198 | 0.930 |
| Anastomotic leakage | 5 | 12.5% | 5 | 12.5% | 0.966 |
| Pneumonia | 7 | 17.5% | 6 | 15% | 0.763 |
| Wound infection | 1 | 2.5% | 0 | 0% | 0.298 |
| 30-d mortality | 1 | 2.5% | 0 | 0% | 0.311 |
| 90-d mortality | 1 | 2.5% | 2 | 5% | 0.479 |
| ICU stay | 2 | (1–17) | 1 | (1–43) | 0.029 |
| Hospital stay | 12,5 | (9–54) | 12 | (7–59) | 0.685 |
| T status | | | | | 0.004 |
| T0 | 13 | 32.5% | 4 | 10% | |
| T1 | 11 | 27.5% | 4 | 10% | |
| T2 | 6 | 15% | 9 | 22.5% | |
| T3 + 4 | 10 | 25% | 22 | 57.5% | |
| N status | | | | | 0.210 |
| N0 | 23 | 57.5% | 16 | 40% | |
| N1 | 6 | 15% | 8 | 20% | |
| N2 | 9 | 22.5% | 8 | 20% | |
| N3 | 2 | 5% | 8 | 20% | |
| M status | | | | | |
| M0 | 39 | 97.5% | 40 | 100 | 0.990 |
| M1 | 1 | 2.5% | 0 | 0% | |
| R0 status | 39 | 97.5% | 38 | 95% | 1.000 |
| Number of resected lymph nodes | 23 | (11–48) | 27 | (13–84) | 0.053 |

# Robot-assisted minimally invasive esophagectomy (RAMIE) compared to conventional minimally invasive esophagectomy (MIE) for esophageal cancer: a propensity-matched analysis

E. Tagkalos,[1,*] L. Goense,[2,*] M. Hoppe-Lotichius,[1] J.P. Ruurda,[2] B. Babic,[1] E. Hadzijusufovic,[1] W. Kneist,[1] P.C. van der Sluis,[1] H. Lang,[1] R. van Hillegersberg,[2] P. P. Grimminger[1]

[1] *Department of General, Visceral and Transplant Surgery, University Medical Center of the Johannes Gutenberg University, Mainz, Germany and* [2] *Department of Surgery, University Medical Center Utrecht, Utrecht, the Netherlands*

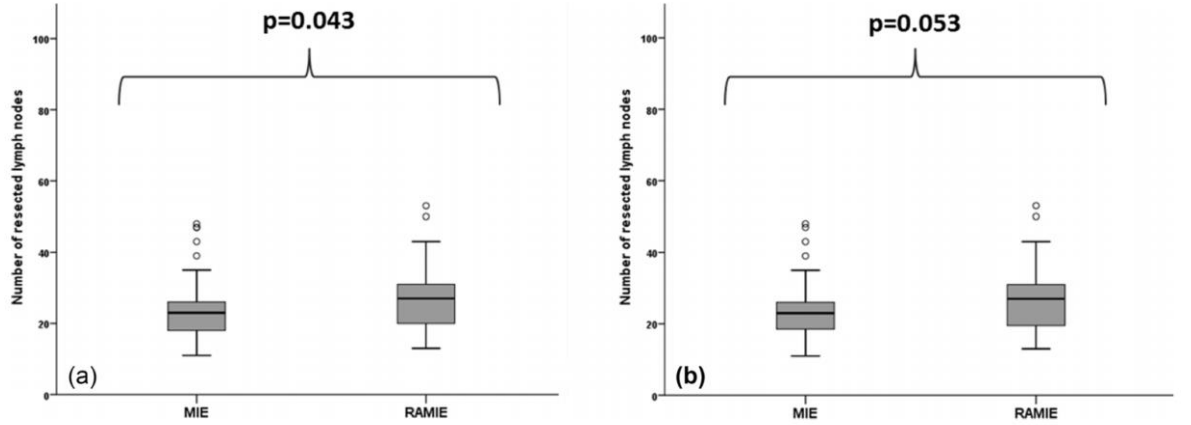



**Fig. 1** Box-plot chart presenting the number of resected lymph nodes of MIE and RAMIE; (a) prior to pair matching; (b) after pair matching. The unmatched group (a) reveals a statistical significance in favor of the RAMIE group ($P = 0.043$). Nonetheless the match-paired group (b) shows a trend ($P = 0.053$) for the RAMIE group.

Hagens et al. BMC Cancer (2019) 19:662
https://doi.org/10.1186/s12885-019-5761-7

BMC Cancer

STUDY PROTOCOL Open Access

# Distribution of lymph node metastases in esophageal carcinoma [TIGER study]: study protocol of a multinational observational study


## Abstract

**Background:** An important parameter for survival in patients with esophageal carcinoma is lymph node status. The distribution of lymph node metastases depends on tumor characteristics such as tumor location, histology, invasion depth, and on neoadjuvant treatment. The exact distribution is unknown. Neoadjuvant treatment and surgical strategy depends on the distribution pattern of nodal metastases but consensus on the extent of lymphadenectomy has not been reached. The aim of this study is to determine the distribution of lymph node metastases in patients with resectable esophageal or gastro-esophageal junction carcinoma in whom a transthoracic esophagectomy with a 2- or 3-field lymphadenectomy is performed. This can be the foundation for a uniform worldwide staging system and establishment of the optimal surgical strategy for esophageal cancer patients.

(Continued on next page)

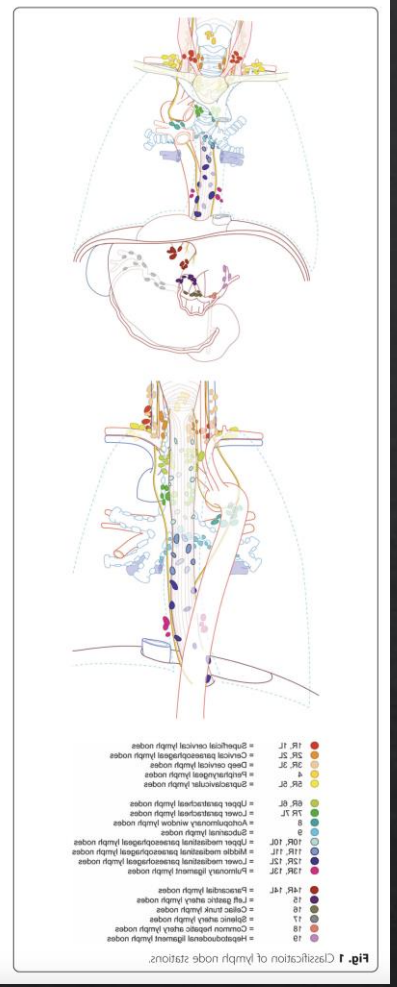
(Continued from previous page)

**Methods:** The TIGER study is an international observational cohort study with 50 participating centers. Patients with a resectable esophageal or gastro-esophageal junction carcinoma in whom a transthoracic esophagectomy with a 2- or 3-field lymphadenectomy is performed in participating centers will be included. All lymph node stations will be excised and separately individually analyzed by pathological examination. The aim is to include 5000 patients. The primary endpoint is the distribution of lymph node metastases in esophageal and esophago-gastric junction carcinoma specimens following transthoracic esophagectomy with at least 2-field lymphadenectomy in relation to tumor histology, tumor location, invasion depth, number of lymph nodes and lymph node metastases, pre-operative diagnostics, neo-adjuvant therapy and (disease free) survival.

**Discussion:** The TIGER study will provide a roadmap of the location of lymph node metastases in relation to tumor histology, tumor location, invasion depth, number of lymph nodes and lymph node metastases, pre-operative diagnostics, neo-adjuvant therapy and survival. Patient-tailored treatment can be developed based on these results, such as the optimal radiation field and extent of lymphadenectomy based on the primary tumor characteristics.

**Trial registration:** NCT03222895, date of registration: July 19th, 2017.


**Keywords:** Esophageal cancer, Lymph node metastases, Lymphadenectomy, Esophagectomy,



# OUR EXPERIENCE in Minimally Invasive Esophagectomy

# Chirurgia Robotica

## Dipartimento di Scienze Chirurgiche – Università di Torino

## *Clinica Chirurgica I prof. M. Morino*

# Gennaio 2002 – Gennaio 2005

# 65 pazienti – 68 procedure

**27 M - 38 F – Età media 46.2 (range 18 - 72)**

| *Procedure Robotiche* | *N° pazienti* | *N° conversioni* |
|---|---|---|
| **Plastica anti-reflusso** | **26*** | **1 (4.3%)** |
| **Surrenalectomia** | **22 (6right-8left)** | **4 (28.6%)** |
| **Cholecistectomia** | **10** | **0** |
| **Miotomia sec. Heller + plastica antirefluscco sec Dor** | **4** | **0** |
| **Emicolectomia dx** | **3** | **1 (33%) *open*** |

** +3 colecistectomie associate*

DIPARTIMENTO DI SCIENZE CHIRURGICHE
Clinica Chirurgica I – Università di Torino (Prof. M. Morino)

# BY-PASS GASTRICO LAPAROSCOPICO ROBOT-ASSISTITO

novembre 2007 – luglio 2019

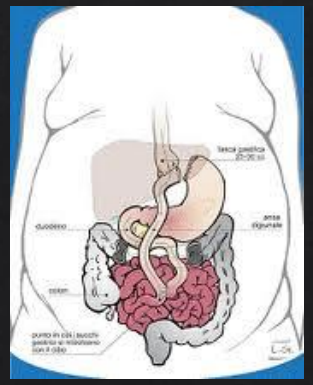
358 pazienti (306 F/ 52 M)

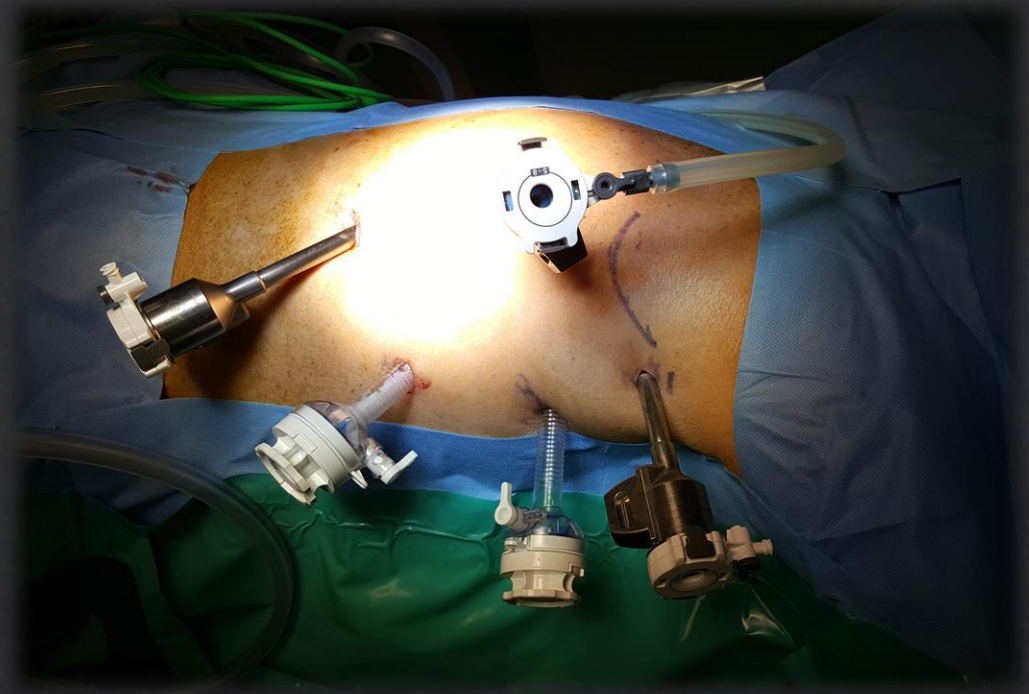
ETÀ 41.2 ± 8.2 (22 – 62) anni

PESO 115.3 ± 13.9 (83 – 146) Kg

BMI 43.4 ± 3.4 (33.7 – 49.8) kg/m²

EW% 98.2 ± 18.1 (55.1 – 129.1) %



From 23th April 2018 we performed 25 esophagectomies with minimally invasive approach.

**CLINICA CHIRURGICA I – DIPARTIMENTO DI SCIENZE CHIRURGICHE**
**UNIVERSITA' di TORINO**
**Prof. Morino M.**

# CASISTICA ESOFAGECTOMIA MINI-INVASIVA (MIE)

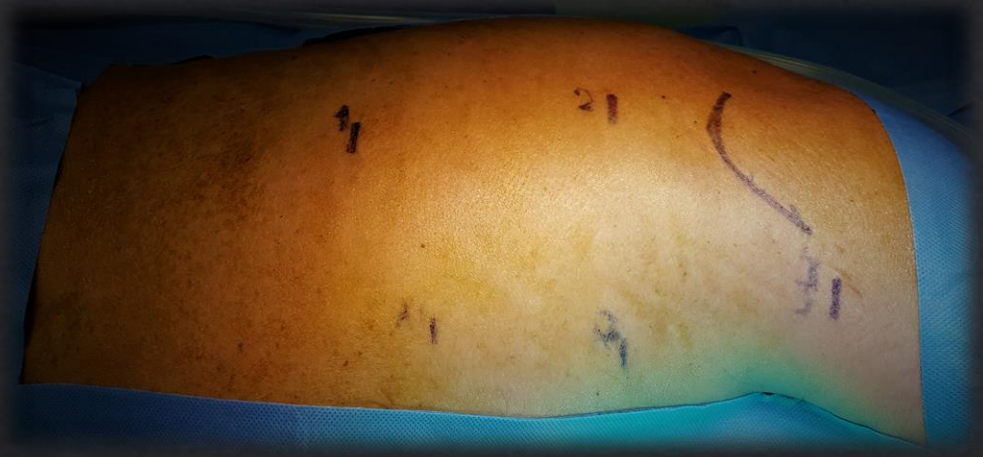
| Aprile 2018 – Luglio 2019 | | | |
|---|---|---|---|
| N° pazienti | 25 | | |
| Maschi/Femmine | 22/3 | | |
| Età | 69.5 (range 45-82) | | |
| Tipo istologico | AdenoCa 22 | Ca squamoso 3 | |
| Sede: Cardias<br>Esofago prossimale<br>Esofago medio<br>Esofago distale | Siewert 1 **8 casi** | Siewert 2 **6 casi**<br>**2 casi**<br>**4 casi**<br>**4 casi** | Siewert 3 **1 caso** |
| Trattamenti preoperatori:<br>Chemio:<br>Rx<br>Chemio + Rx | 19<br>8<br>2<br>9 | | |

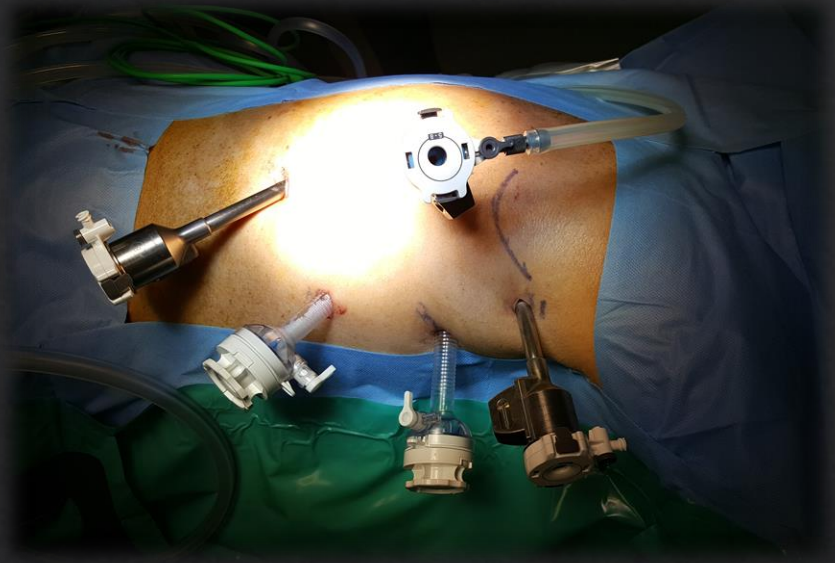
**CLINICA CHIRURGICA I – DIPARTIMENTO DI SCIENZE CHIRURGICHE**
**UNIVERSITA' di TORINO**
**Prof. Morino M.**

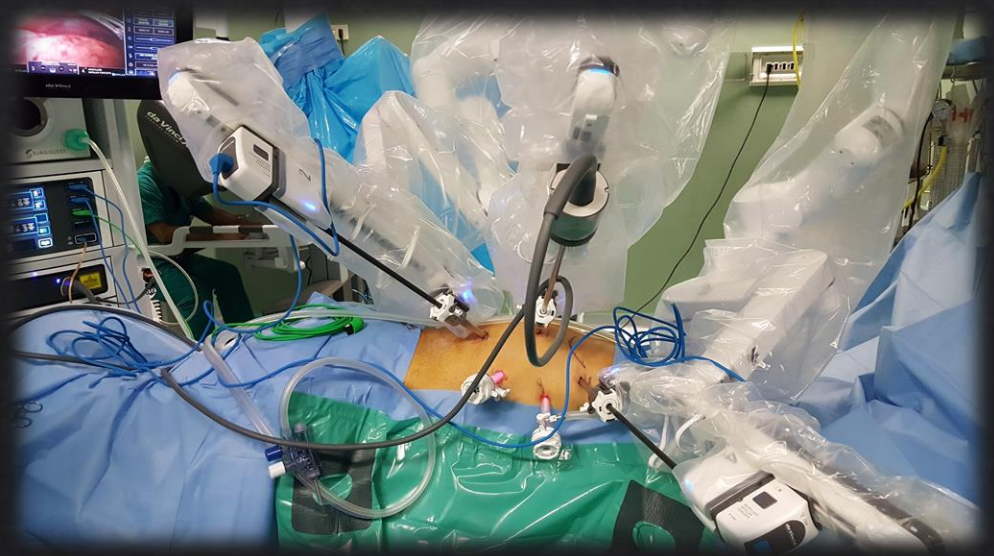
# CASISTICA ESOFAGECTOMIA MINI-INVASIVA (MIE)

| Aprile 2018 – Luglio 2019 | |
|---|---|
| Tipo di intervento: | |
| Ivor Lewis (laparo addome + robotica toracica) | 23 |
| Mc Keown (robotica toracica, laparo addominale, cervicotomica) | 3 |
| Tempi operatori | |
| Conversioni: | tempo addominale: 1 caso di conversione open<br>tempo toracico : 0 |

# PORT PLACEMENT IN ROBOT-ASSISTED THORACOSCOPY IN IVOR-LEWIS PROCEDURE







CLINICA CHIRURGICA I – DIPARTIMENTO DI SCIENZE CHIRURGICHE
UNIVERSITA' di TORINO
Prof. Morino M.

# CASISTICA ESOFAGECTOMIA MINI-INVASIVA (MIE)

| Aprile 2018 – Luglio 2019 | |
|---|---|
| Tempi operatori: | 320 (244-520) min |
| Complicanze maggiori | Fistola anastomotica: 1<br>Emotorace dx: 1 |
| Complicanze minori | 2 casi FA cardiovertita farmacologicamente<br>1 ritenzione urinaria |
| Mortalità a 30 gg | 0 |
| Reinterventi: | 2 |
| Degenza in ICU: | 2,3 gg (range 1-7) |
| Degenza totale: | 15.5 gg (range 10-38) |
| Dolore post-operatorio (mean score VAS): | 1,8 |

**CLINICA CHIRURGICA I – DIPARTIMENTO DI SCIENZE CHIRURGICHE**
**UNIVERSITA' di TORINO**
**Prof. Morino M.**

# CASISTICA ESOFAGECTOMIA MINI-INVASIVA (MIE)

| Aprile 2018 – Luglio 2019 | |
|---|---|
| Stadio TNM: | PT1N0 3 casi<br>pT2N0 5 casi<br>pT3N0 8 casi<br>pT3N1 5 casi<br>pT3N2 4 casi |
| N° linfonodi asportati | 23.9 (range 10-32) |
| | |
| Margini di resezione: | Indenni: 24<br>Margine circonferenziale < 1 mm: 1 |