

Minimally Invasive Esophagectomy for Cancer - Short Up-to-Date

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Abstract

Surgery remains the main treatment for localized resectable esophageal cancer. Open esophagectomy is still the standard surgical approach for esophageal cancer but it has a lower patient satisfaction when compared with other treatment options. In the era of "key-hole" surgeries, minimally invasive esophagectomy (MIE) stands as a solution to improve the results after standard open esophagectomies. The aim of the present paper is to provide a short update regarding the minimally invasive esophagectomy, with special emphasis on its indications, results and current controversies.

Keywords: Esophagectomy; Minimally Invasive Surgery; Open Esophagectomy; Thoracotomy; Thoracoscopy

Introduction

Esophageal cancer, with its two main histopathological subtypes-squamous cell carcinoma (SCC) and adenocarcinoma (AK) is not included among the most common cancers. However, each year 462,000 people are diagnosed with esophageal cancer worldwide and 386,000 people die from it [1-4]. Despite improvements in oncology therapies and the increasing acceptance of multimodality treatment which both seem to enhance resectability and survival rates, esophageal cancer is still a deadly disease [5]. Most patients die within two years after the diagnosis and more than half of them are discovered with non-resectable cancer at the time of diagnosis [4].

Surgery remains the main treatment for localized resectable esophageal cancer. Open esophagectomy (OE) is an extensive and traumatic procedure, with mortality ranging from 1.4% to 23% and with a lower patient satisfaction when compared with other treatment options [6]. Transhiatal esophagectomy decreases operative trauma when compared to a transthoracic approach, but is palliative due to the impossibility of removing the lymph nodes in the middle and upper mediastinum [4]. In the era of "key-hole" surgeries, minimally invasive esophagectomy (MIE) stands as a solution to improve the results after standard open esophagectomies. Few attempts have been made until now with the intent to compare both procedures i.e. MIE vs OE in the form of meta-analyses and randomized control trials (RCTs).

The aim of the present paper is to provide a short update regarding the minimally invasive esophagectomy, with special emphasis on its indications, results and current controversies.

Classification of MIE

Under the term of MIE several procedures are included (Table I) [7].

Total MIE (tMIE) implies a combined thoracoscopic and laparoscopic approach as opposed with hybrid MIE (hMIE) which is an esophagectomy using either the thoracoscopic or laparoscopic approach. According to a systematic review of the MIE cases published in English language up to June 2012, complete MIE is the most common procedure (58%), followed by hybrid MIE (29%). Hybrid MIE thoracoscopic approach has been performed in 17% of the patients and hybrid MIE laparoscopic approach counted for another 12% [4,8].

As far as we know, the largest series of tMIE is reported by JD Luketich, with more than 1000 operated patients [4,9]. Laparoscopic transhiatal approach was first reported as a case series by De Paola in 1995 [4,10].

Even if it could be performed using laparoscopy alone, there are centers where transcervical mediastinoscopic approach is added as a safety measure for mediastinal dissection. Robot-assisted MIE using the DaVinci system has only been introduced in a limited number of institutions [4,11,12]. Although the feasibility and safety of robot-assisted MIE has been validated, comparative studies between robot-assisted MIE and conventional MIE are still needed to clarify the benefits [4,13].

Open versus Minimally Invasive Esophagectomy, A Current Dilemma

Several attempts have been made to determine whether these new minimally invasive procedures have results at least as good as the ones following "classical" open esophagectomy. Three meta-analyses published by Biere et al [14], Sgourakis et al [15] and Nagpal et al [16] showed at least comparable results in terms of postoperative outcomes between these treatment options, if not improvements in favor of MIE. Minimally invasive procedures were performed with less blood loss than open approaches [14] and the length of hospital stay and stay in the intensive care unit (ICU) were reduced in total MIE and thoracoscopic-assisted groups when compared to open surgery group, suggesting earlier recovery in the case of MIE [14]. Similarly with other minimally invasive procedures (laparoscopic colecystectomies or colectomies, bariatrics, etc.), MIE were followed by less pain and narcotic use. As regards the incidence of respiratory complications, some authors claimed that the results were similar [14,15] while others favored MIE [16].

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Thus, in the meta-analysis undertaken in 2010 by Nagpal et al. [16] the authors analyzed 12 studies and a total of 672 patients on whom tMIE or hybrid MIE was performed and compared these lots with an open esophagectomy control cohort of 612 subjects. The authors concluded that MIE is a safe alternative to open procedures, with few clear benefits such as the shorter hospital stay, lower respiratory complications and overall morbidity, but the necessity of further randomized control trials (RCTs) was also emphasized. Most authors agree that duration of MIE is longer than OE, especially at the early stages of experience. However, Nguyen et al [17] reported a non-statistical difference between duration of MIE vs OE, if the procedure is performed by experienced surgeons. Furthermore, Fabian and co-workers [18] performed the thoracic mobilization of the esophagus with the patient in prone position in less time than OE.

Table I Variations of the MIE (Watanabe et al [7])

Total MIE Thoracoscopic and Laparoscopic Esophagectomy
Hybrid MIE either Thoracoscopic or Laparoscopic Approach
Video-assisted Mediastinoscopic Transhiatal Esophagectomy
Laparoscopic-assisted Transhiatal Esophagectomy
Robot-assisted MIE

When oncological outcomes and survival rates come into account, the authors noted that MIE are not inferior to OE in all of the retrieved studies [4,19-22]. It is well established that the quality of lymph node dissection influences survival, the majority of loco-regional recurrences after esophagectomy being in fact lymph node metastases [23]. The number of the retrieved lymph nodes was higher after MIE procedures than in OE, suggesting a possible oncologic advantage of MIE over open procedures. This aspect needs further confirmation by RCTs.

The clear differences between MIE and OE are further emphasized when the quality of life following the surgery is analyzed. Every surgical intervention significantly reduces the quality of life. By analyzing two short series of patients, Zeng et al. [24] and Biere et al. [22] note significant differences between the two techniques. With regards to the patients operated on with the classic procedure, the quality of life is profoundly affected, with the patient requiring approximately 24 weeks to reach a standard of life quality similar to the one provided by the MIE in just 6 weeks. This finding shows that the patients operated on with a minimally invasive procedure are not only benefiting from a faster recovery, but are also able to recommence their social activities faster and are able to benefit from the adjuvant chemotherapy treatment earlier following the surgery. All these data which suggest the advantages of MIE should be confirmed by RCTs. At the moment, there are two RCTs, comparing outcomes after MIE and OE. The first one is TIME trial, conducted in Netherlands by Biere et al. [22]; the results of this trial have been published in 2012 showing a significantly lower rate of pulmonary complications 2 weeks after the surgery and during the stay in hospital in MIE group as compared with OE group. In the past decade MIE has been increasingly performed to treat locoregional esophageal cancer. In the UK, there has been a steady increase in the uptake of MIE, with 24.7% of esophageal cancer resections in 2009 being performed using a hybrid or completely minimally invasive approach [4,26].

The second study is MIRO trial, conducted in France by Briez et al [25]; this study aimed to compare OE with hybrid minimally invasive esophagectomy as regards the 30-day incidence of major postoperative pulmonary complications. The results, also published in 2012, showed that laparoscopic abdominal approach combined with open right thoracotomy for esophageal cancer is followed by fewer major pulmonary complications as compared with the standard approach.

This fact expresses attitude in favor of acceptance and distribution of minimally invasive procedures for esophageal carcinoma treatment worldwide.

Finally, one of the advantages of MIE is better cost-effectiveness. Lee et al [27] reported that MIE is cost-effective compared to open esophagectomy in the management of patients with resectable esophageal cancer. Due to its less invasiveness and safety, percent of MIE done for esophageal carcinoma is on rise in all world leading centers dealing with this pathology.

Conclusion

As long as MIE is oncologically equivalent to OE in the short-term and long-term results, the cost savings and potential increased effectiveness, associated with MIE, should make it the preferred approach in high-volume esophageal centers that are experienced in minimally invasive procedures. Indeed, at the Department of Minimally Invasive Upper Digestive Surgery in the Clinic for Digestive Surgery in Belgrade, hybrid MIE (laparoscopic approach) is a standard of care for the patients with resectable esophageal cancer. The first procedure had been performed in 2009.

Conflict of interest

Authors have no conflict of interests to disclose.

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