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# Minimally invasive surgery for oesophageal cancer

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A B S T R A C T

Worldwide an increasing part of oncologic oesophagectomies is performed in a minimally invasive way. Over the past decades multiple reports have addressed the perioperative outcomes and oncologic safety of minimally invasive oesophageal surgery. Although many of these (retrospective) case–control studies identified minimally invasive oesophagectomy as a safe alternative to open techniques, the clear benefit remained subject to debate. Recently, this controversy has partially resolved due to the results of the first randomized controlled trial that compared both techniques. In this trial short-term benefits of minimally invasive oesophagectomy were demonstrated in terms of lower incidence of pulmonary infections, shorter hospital stay and better postoperative quality of life. However, the current lack of long-term data on recurrence rate and overall survival precludes a comprehensive comparison of minimally invasive and open oesophagectomy. Proclaiming minimally invasive oesophagectomy as the standard of care for patients with resectable oesophageal cancer would therefore be a premature decision.



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## Introduction

Due to a steadily increasing incidence, oesophageal cancer is by now the eighth most common malignancy in the world amounting to nearly half a million new patients annually [1]. Since the majority has advanced, inoperable or metastatic disease at the time of diagnosis, less than 50% of patients are eligible for curative treatment [2,3]. Oesophagectomy is the mainstay of this curative treatment, but the procedure is associated with a considerable risk of (severe) complications and the highest mortality rate among all elective gastrointestinal surgical interventions [4]. In an attempt to reduce complication- and mortality rates progress has been made in patient selection, perioperative care and surgical techniques. Among the technical advances minimally invasive oesophagectomy represents the most important one in terms of utilization and scientific foundation.

Minimally invasive oesophagectomy was introduced in 1992, when the first report on thoracoscopic oesophagectomy was published by Cuschieri et al [5]. From that moment, new developments in the field of oesophageal surgery rapidly succeeded each other. A laparoscopic transhiatal approach was introduced in 1994 by Sadanga et al [6] and in 1999 Kawahara et al demonstrated the feasibility of combining an oesophageal resection with an extended lymphadenectomy in a video-assisted thoracoscopic surgical (VATS) setting [7]. By now, multiple minimally invasive ways to perform an oesophageal resection have been developed for both the transthoracic and the transhiatal approach. The extent to which they are used has increased dramatically, as was clearly shown by a nationwide study from England in 2010. This review of 18,673 oesophagectomies performed over 12 years revealed that the use of minimally invasive techniques had risen from 0.6% in 1996 to 24.7% in 2009 [8]. In the Netherlands, the national upper gastrointestinal cancer registry has shown that in 2012 41% (37% in 2011) of the oncologic oesophageal resections was performed in a minimally invasive way [9]. Along with this rise in utilization came a steady increase in scientific output on this topic resulting in the embracement of minimally invasive techniques in national guidelines on oesophageal cancer [10,11].

Despite the growing interest in minimally invasive oesophagectomy, concern about clinical safety and oncologic efficacy are still under discussion. In this review we address this concern by providing an overview of the literature on minimally invasive surgery for oesophageal cancer with respect to commonly used techniques, patient selection and (post)operative outcomes.

## Techniques

Traditionally, a distinction in open techniques is drawn between the transhiatal oesophagectomy and the two main transthoracic oesophagectomies: the 2-incisional 'Ivor-Lewis' approach and the 3-incisional 'McKeown' approach [3,12]. Choice of technique depends on tumour location, extent of lymphadenectomy and surgeon's preference. Despite the theoretical advantage of transthoracic resection regarding extended (mediastinal) lymphadenectomy and a wider circumferential resection margin, consensus on the ideal approach has not been reached yet. In the largest randomized trial on this issue Hulscher et al assigned 220 patients with an adenocarcinoma of the mid/distal oesophagus or gastric cardia (involving the gastroesophageal junction) to open transhiatal oesophagectomy or open transthoracic oesophagectomy with extended en-bloc lymph node dissection [13,14]. Transhiatal resection was associated with a shorter operative time, lower median blood loss, fewer pulmonary complications, decreased chylous leaks, shorter duration of mechanical ventilation and shorter stay in the intensive care unit and hospital. No significant difference in in-hospital mortality was observed [13]. In a follow-up study of this trial including the complete five-year survival data no significant survival benefit of the transthoracic resection was observed. However, in subgroup analyses based on tumour location and number of positive lymph nodes a five-year survival benefit of 14% (51% vs. 37%, $P = 0.33$) and 41% (23% vs. 64%, $P = 0.02$) was seen with the transthoracic approach for patients with mid/distal oesophageal malignancies and patients with 1–8 positive lymph nodes in the resection specimen, respectively [14]. Based on these results we currently consider transthoracic resection as the standard surgical treatment for all oesophageal tumours with the exception of gastroesophageal junction tumours without intrathoracic lymphadenopathy or patients that are unfit to undergo a transthoracic dissection.