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Review

Minimally invasive esophagectomy: Lateral decubitus vs. prone positioning; systematic review and pooled analysis

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ABSTRACT

The uptake of minimally invasive esophagectomy (MIE) has increased vastly over the last decade, with proven short-term benefits over an open approach. The aim of this pooled analysis was to compare clinical outcomes of Minimally Invasive Esophagectomy (MIE) performed in the prone and lateral decubitus positions.

A systematic literature search (2000–2015) was undertaken for publications that compared patients who underwent MIE in the lateral decubitus (LD) or prone (PR) positions. Weighted mean difference (WMD) was calculated for the effect size of LD positioning on continuous variables and Pooled odds ratios (POR) for discrete variables.

Ten relevant publications comprising 723 patients who underwent minimally invasive esophagectomy were included; 387 in the LD group and 336 in the PR group. There was no significant difference between the groups in terms of in-hospital mortality, total morbidity, anastomotic leak, chylothorax, laryngeal nerve palsy, average operative time, and length hospital stay. LD MIE was associated with a non-significant increase in pulmonary complications (POR = 1.65; 95% C.I. 0.93 to 2.92; P = 0.09), and significant increases in estimated blood loss (WMD = 36.03; 95% 14.37 to 57.69; P = 0.001) and a reduced average mediastinal lymph node harvest (WMD = −2.17; 95% C.I. −3.82 to −0.52; P = 0.01) when compared to prone MIE.

Pooled analysis suggests that prone MIE is superior to lateral decubitus MIE with reduced pulmonary complications, estimated blood loss and increased mediastinal lymph node harvest. Further studies are needed to explain performance-shaping factors and their influence on oncological clearance and short-term outcomes.

Contents

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1. Introduction

The incidence of esophageal cancer is rapidly increasing, and this disease annually affects 482,300 people worldwide [1]. Currently the main curative option for esophageal cancer is surgical resection and this traditionally requires an open approach, commonly involving a thoracotomy. Transthoracic open esophagectomy carries a high risk of pulmonary complications that are reported to occur in up to 57% of cases [2]. However, in recent years the development of minimally invasive esophagectomy (MIE) has been associated with a significant reduction in post-operative pulmonary complications, as well as reducing hospital stay, and improving short-term quality of life when compared to the open-approach [3]. Moreover from the surgeon's perspective, the ergonomics conferred by a thoracoscopic approach and in particular the prone position, have improved the operative field exposure [4].

Minimally invasive esophagectomy was originally performed with the patient in the lateral decubitus position but the use a prone approach was first described in 1994 [5]. This position is felt to be associated with reduced pulmonary complications compared to the lateral decubitus approach and there is a large body of evidence that prone ventilation improves pulmonary function in other conditions such as acute respiratory distress syndrome [6]. Following traditional transthoracic esophagectomy ventilating patients in a prone position has been shown to improve arterial oxygenation [7] and this effect is believed to be due to improved recruitment of collapsed alveoli, as well as improved lung perfusion and reduction in intrapulmomary shunt [8,9].

The uptake of MIE has increased vastly over the last decade [10]. However, there has been no definitive consensus as to whether this procedure should be performed with the patient in the lateral decubitus or prone position [11] adding to the observed wide variability in the performance of MIE [12]. A systematic review of the literature between 1994 and 2010 showed no convincing evidence that prone position is superior to lateral decubitus although most authors comment that the prone position is associated with superior surgical ergonomics and theoretically offers a number of physiological benefits [11]. Further clinical studies were recommended to examine patient outcomes. With more clinical studies being available, we carried out this review and pooled analysis to compare clinical outcomes of MIE performed in the prone and lateral decubitus positions to examine which of these approaches offers the best patient outcome.

2. Methods

2.1. Literature search strategy

An electronic literature search was undertaken using Embase, Medline, and Web of Science databases up to January 2015. The search terms 'thoracoscopy', 'laparoscopy', 'esophagectomy', 'prone', 'decubitus' and Medical Subject Headings (MeSH) 'laparoscopy' (MeSH), 'thoracoscopy' (MeSH) and 'esophagectomy' (MeSH), were used in combination with the Boolean operators AND or OR. Two authors (TW and SRM) performed the electronic search independently in January 2015. The electronic search was supplemented by a hand-search of published abstracts from meetings of the Society of Academic and Research Surgery, the International Society for Diseases of the Esophagus, the European Society for Diseases of the Esophagus, Digestive Disease Week, the Association of Upper Gastro-Intestinal Surgeons of Great Britain and Ireland, Society of American Gastro-Intestinal and Endoscopic Surgeons and European Association of Endoscopic Surgeons from 2005 to 2014. The reference lists of articles obtained were also searched to

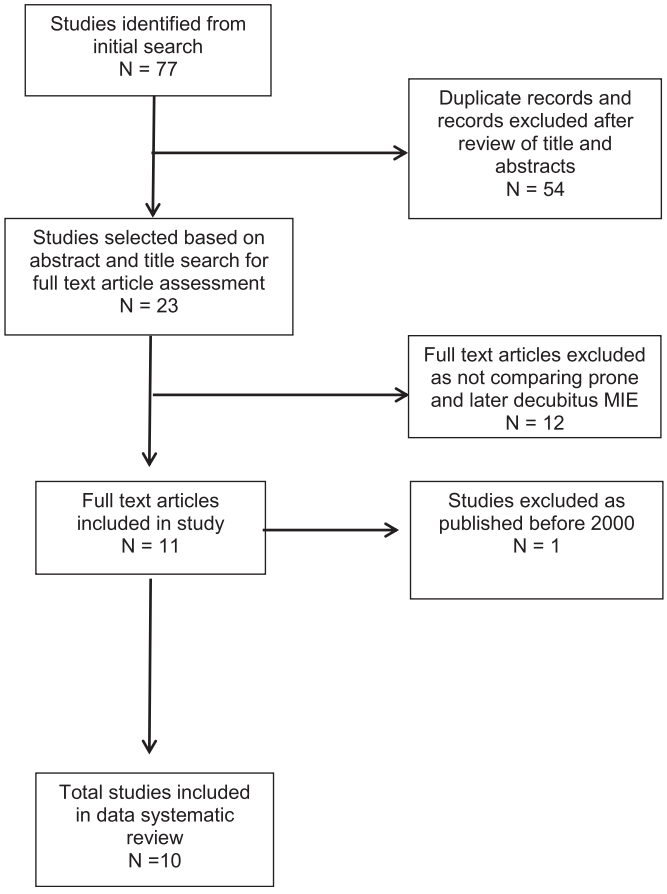

Fig. 1. PRISMA flow chart describing literature search strategy.