Minimally invasive versus open esophagectomy for cancer: a systematic review and meta-analysis

Biere SS, Cuesta MA, van der Peet DL

CRD summary
This review concluded that minimally invasive esophagectomy offered a reduction in postoperative recovery and morbidity compared with open esophagectomy for cancer. The authors' conclusions were not consistent with the meta-analyses presented and relied on the results of individual studies, and there was the potential for error and bias in the review. The authors' conclusions may not be reliable.

Authors' objectives
To evaluate the effectiveness of minimally invasive esophagectomy (MIE) compared with open esophagectomy for cancer of the oesophagus and cardia.

Searching
MEDLINE, EMBASE and The Cochrane Library were searched up to September 2008 for published English-language articles. Search terms were reported. Reference lists of relevant articles were searched. The related articles feature of PubMed was used.

Study selection
Comparative studies of MIE versus open esophagectomy for cancer of the oesophagus and cardia were eligible for inclusion. Primary outcomes assessed were major morbidity, pulmonary complications, mortality, length of stay and anastomotic leakage. A range of secondary outcomes was defined in the review.

Included studies were in patients treated with laparoscopy MIE or thoracoscopy MIE versus open esophagectomy. Underlying indications within studies were carcinoma of oesophagus, Barrett’s high grade dysplasia, thyroid cancer distal oesophageal obstruction and aerodigestive tract carcinoma.

The authors did not state how many reviewers performed the study selection.

Assessment of study quality
Study quality assessment was assessed using the Dutch Cochrane Centre checklist of six criteria including randomisation, allocation concealment and blinding.

Two reviewers assessed study quality.

Data extraction
Data were extracted into predefined forms. Primary outcomes were mortality, morbidity pulmonary complications, length of hospital stay and anastomotic leakage.

Studies were grouped according to type of procedure: total MIE versus open transthoracic esophagectomy (TTE); thoracoscopy and laparoscopy MIE versus open TTE; and laparoscopy versus transhiatal esophagectomy (THE).

The authors did not state how many reviewers performed data extraction.

Methods of synthesis
Pooled weighted mean differences (WMD) or odds ratios (OR) and 95% confidence intervals (CI) were calculated using random-effects meta-analysis. Study heterogeneity was assessed using the $I^2$ statistic and $X^2$ statistic.

Results of the review
Ten studies (n=1,061 patients) were included in the review: one controlled trial and the rest were case-control studies. The number of participants within studies ranged from four to 309. Quality assessment was not narratively discussed, but tabulated findings indicated that most studies undertook intention-to-treat analysis and six studies had study groups that were similar at baseline. There was no heterogeneity.

**Major morbidity (five studies):** Meta-analysis of total MIE versus open TTE (two studies) showed no statistical benefit of MIE.

**Pulmonary complications (seven studies):** Meta-analysis of total MIE versus open TTE (two studies) and thoracoscropy and laparoscopy MIE versus open TTE (three studies) showed no statistical difference between the MIE procedure and the open procedure.

**Anastomotic leakage (five studies):** Meta-analysis of thoracoscropy and laparoscopy MIE versus open TTE (three studies) showed a significant decrease in anastomotic leakages in the thoracoscropy and laparoscopy MIE group (OR 0.51, 95% CI 0.28 to 0.95).

**Mortality (eight studies):** Meta-analysis of total MIE versus open TTE (two studies) did not show a difference between mortality.

**Length of hospital stay (six studies):** No meta-analysis was undertaken.

A range of secondary outcomes was presented in the paper.

**Cost information**
Cost data were sought but none were found.

**Authors’ conclusions**
Faster postoperative recovery and a reduction in morbidity can be achieved by MIE, and a reduction in mortality may also be realised.

**CRD commentary**
This review addressed a broadly defined question. Several relevant databases were searched. There was no attempt to locate unpublished studies, which may mean that relevant studies were missed. There was no assessment of publication bias. There was a risk of language bias as six studies were excluded because they were not in English. Error and bias may have been introduced into the analysis as it was unclear how many reviewers performed study selection and data extraction. Quality assessment was undertaken. But, the tool utilised was for randomised controlled trials rather than non-randomised studies and may not have been appropriate as most of the included studies were case-control studies (generally considered to be more susceptible to bias than randomised studies). Sample sizes of the included studies were generally small and there was variation between some of the studies; however, there was no indication of heterogeneity in any of the analyses. Meta-analysis was undertaken, but these analyses were mostly overlooked in favour of results of individual studies, which were not a robust source of evidence due to their small size and often non-randomised design. The authors’ conclusions seemed inconsistent with the meta-analyses presented. This, together with the potential for bias and error in the review, means the conclusions may not be reliable.

**Implications of the review for practice and research**

**Practice:** The authors did not state any implications for practice.

**Research:** The authors stated that randomised trials that compared MIE with open esophagectomy were needed.

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