Transthoracic versus transhiatal esophagectomy for the treatment of esophagogastric cancer: a meta-analysis
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CRD summary
The authors concluded that transthoracic and transhiatal oesophagectomy for cancer demonstrated no difference in five-year survival. Lymphadenectomy and reported surgical quality was suboptimal in both groups and the transthoracic group had significantly more advanced cancer. Therefore, the finding of equivalent survival should be viewed with caution. The authors’ cautious conclusions reflect the evidence presented and seem reliable.

Authors' objectives
To compare the differences in short- and long-term outcomes of transthoracic oesophagectomy and transhiatal oesophagectomy for cancer of the oesophagus.

Searching
EMBASE (1947 to 2010), MEDLINE (1950 to 2010), PsycINFO (1806 to 2010) and The Cochrane Library (1800 to 2010) databases published in English language were searched. Basic search terms were reported in the supplementary section of the article. Relevant reference lists from identified articles were handsearched for additional studies.

Study selection
Studies that examined potentially curative transthoracic oesophagectomy and transhiatal oesophagectomy for the treatment of gastroesophageal cancer were included. Patients with clinical stage IV disease who underwent palliative surgery were excluded.

The primary outcome was five-year survival and secondary outcomes were lymph node clearance, operating time, operative blood loss, length of hospital stay, postoperative mortality, respiratory and cardiac morbidity, anastomotic leak, vocal cord palsy, postoperative haemorrhage, wound infection and anastomotic stricture.

Studies were conducted during 1981 to 2009 in different continents: Europe, North and South America, Asia, and Australia published. Mean age of participants ranged from 51.7 to 74.2 years (where reported), of which 78% were male. Transthoracic oesophagectomy was used more often to resect middle oesophagus. Transhiatal oesophagectomy was used more often for early pathologic stage 0/I tumours while transthoracic oesophagectomy was used more often for advanced pathological stage IV tumours.

Two reviewers screened the titles and abstracts of the identified studies.

Assessment of study quality
The quality of the studies were assessed using the criteria adapted from Yakoub et al. Studies were awarded stars based on study design, comparability of patients groups, reporting of outcome data and the quality of follow-up. The possible scores were ranged from 0 to 16 stars.

Surgical Quality
Surgical quality was assessed based on: surgeon case load; hospital volume; lymph nodes; technical complications; anastomotic leak; early mortality (less than 30 day or in-hospital). Each criterion was rated as 0 star to 2 stars with 2 stars indicating higher quality. In order to qualify, a minimum of one star was required in every category (further details reported in supplementary documents).

The authors did not report how many reviewers were involved in assessing the quality of the included studies.

Data extraction
Data were extracted to calculate odds ratios (ORs) and mean differences, along with 95% confidence intervals (CIs).
Two reviewers were involved in extracting the studies.

**Methods of synthesis**
A random-effects model was used to calculate the odd ratios for categorical data and weighted mean difference (WMD) for continuous data with their 95% confidence intervals. Statistical heterogeneity was assessed using $I^2$ (tau-squared), $X^2$ and $I^2$ statistic. Heterogeneity was regarded as significant if $T^2$ was greater than zero, $X^2$ less than 0.10 or $I^2$ greater than 30%. Funnel plots were used to examine the publication bias of each outcome.

Subgroup analyses were performed for the studies of randomised controlled trials and the studies published after and including the year 2000. Sensitivity analyses were performed for the studies scoring 11 stars or more for methodological quality and studies that met the minimum reported surgical quality threshold.

**Results of the review**
Fifty-two studies (five randomised controlled trials, seven prospective studies, forty retrospective studies) were eligible for inclusion (5,905 participants, range 19 to 868, of which 57.4% underwent transthoracic oesophagectomy and 42.6% underwent transhiatal oesophagectomy). No study met the minimum surgical quality standard.

Transthoracic oesophagectomy took a mean of 85 minutes longer (WMD 84.57, 95% CI 39.69 to 129.45; 12 studies) and associated with longer length of stay (WMD 3.86 95% CI 1.11 to 6.61; 12 studies) compared with transhiatal oesophagectomy. A significant heterogeneity was observed for these outcomes (operating time $I^2=96\%$ and hospital stay $I^2=75\%$).

Transthoracic oesophagectomy has higher incidence of respiratory complications (OR 1.32, 95% CI 1.05 to 1.66; 42 studies; $I^2=48\%$), pneumonia (OR 1.37, 95% CI 1.05 to 1.79; 24 studies; $I^2=48\%$), wound infections (OR 1.89, 95% CI 1.35 to 2.64; 20 studies; $I^2=0\%$) and early postoperative mortality (OR 1.48, 95% CI 1.20 to 1.83; 48 studies; $I^2=0\%$) compared with transhiatal oesophagectomy. However anastomotic leak (OR 0.69, 95% CI 0.53 to 0.89; 39 studies; $I^2=26\%$), anastomotic stricture (OR 0.58, 95% CI 0.43 to 0.79; 16 studies; $I^2=21\%$) and vocal cord paralysis (OR 0.57, 95% CI 0.38 to 0.84; 29 studies; $I^2=27\%$) were significantly higher in transhiatal oesophagectomy group.

Lymph node retrieval was significantly greater in the transthoracic oesophagectomy group by on average eight lymph nodes (WMD 7.67, 95% CI 1.12 to 14.21; four studies; significant heterogeneity $I^2=94\%$). There was no significant difference between two groups regarding five-year survival (26 studies) or other outcomes (fully reported in the review).

Subgroup and sensitivity analyses showed no significant differences in five-year survival between the two groups and were consistently associated with significant heterogeneity.

Subgroup analyses of randomised controlled trials altered some of the findings (fully reported in the review) and sensitivity analyses of studies with 11 stars or more for methodological quality were no longer statistically significant. Other findings were reported in the review.

**Authors’ conclusions**
Studies that compared transthoracic with transhiatal oesophagectomy for cancer demonstrated no difference in five-year survival. Lymphadenectomy and reported surgical quality was suboptimal in both groups and the transthoracic group had significantly more advanced cancer. The finding of equivalent survival should be viewed with caution.

**CRD commentary**
The review addressed a clear question and was supported by appropriate inclusion criteria. Several relevant data sources were searched with restriction to studies published in English. Appropriate methods to reduce reviewer error and bias were used for study selection process and data extraction, but it was unclear whether similar methods were used for quality assessment.

Appropriate methods were used to combine studies and assess statistical heterogeneity.

The authors appropriately highlighted weaknesses in the studies which included possible selection bias (as transhiatal oesophagectomy was chosen for early stage and transthoracic oesophagectomy for advanced stage tumour), surgical...
quality weaknesses and the presence of significant heterogeneity in the results. The authors’ cautious conclusions reflect
the evidence presented and seem reliable.

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

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

**Research:** The authors stated that further studies should report surgeon caseload (annual and cumulative), hospital
volume (annual), mean lymph node retrieval, resection rate, technical complication rate and early mortality rate (30-day
and in-hospital).

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