Evidence-based appraisal in laparoscopic Nissen and Toupet fundoplications for gastroesophageal reflux disease
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CRD summary
This review concluded that laparoscopic Toupet fundoplication surgery for gastro-oesophageal reflux disease offered equivalent symptom relief to laparoscopic Nissen fundoplication, with reduced adverse effects. These conclusions should be interpreted with caution, due to the unknown quality of the included studies, the potential for bias in the review and unexplained significant variation between study results.

Authors’ objectives
To demonstrate the optimal surgical procedure for gastro-oesophageal reflux disease.

Searching
MEDLINE, EMBASE, Science Direct and SpringerLink were searched from January 1994 to November 2009. Some search terms were reported. A 'related articles' search was conducted. Reference lists of acquired articles were handsearched. Studies reported in languages other than English were excluded from the review.

Study selection
Controlled clinical trials that compared laparoscopic Nissen fundoplication with laparoscopic Toupet fundoplication surgery for patients with gastro-oesophageal reflux disease were eligible for inclusion. Studies had to report exact data for dichotomous outcomes and continuous data along with standard deviations for continuous outcomes relating to efficacy and adverse effects. Studies that compared total and non-posterior partial fundoplication, studies in which fundoplications were carried out with laparotomy, and studies that included patients under 16 years of age were excluded from the review.

The average age of patients in the included studies ranged from 44.2 to 61.7 years (where reported). The degree of partial fundoplication for laparoscopic Nissen fundoplication procedures was 270° in most studies, where reported (range 180 to 300°).

Two reviewers performed study selection.

Assessment of study quality
The authors did not report that they assessed validity, but adequacy of concealment of allocation was reported for the trials included in the meta-analyses.

Data extraction
Two reviewers independently extracted data on surgical efficacy and postoperative adverse effects. Data were extracted to calculate odds ratios (ORs) for dichotomous data and mean differences (MDs) for continuous data, with 95% confidence intervals (CIs).

Studies reported in multiple publications were data extracted using the most recent publication. Studies with multiple comparison groups were split so that each trial had two comparison groups. For studies that reported results at different follow-up periods, the longest follow-up results were extracted.

Methods of synthesis
Statistical heterogeneity was assessed using the $\chi^2$ test and $I^2$ statistic. Summary odds ratios and mean differences, with 95% confidence intervals were estimated using a fixed-effect model in the absence of statistically significant heterogeneity, or a random-effects model in the presence of heterogeneity. Subgroup analyses were conducted according to whether patients had normal or abnormal oesophageal peristalsis.
Results of the review

Twenty-nine controlled trials (reported in 32 publications) were included in the review (n=6,236 patients); these included seven randomised controlled trials (RCTs), seven prospective cohort studies and fifteen retrospective studies. Sample sizes ranged from 19 to 1,470; most studies included over 100 patients. Length of follow-up ranged from three months to ten years; most studies followed patients for over one year. Concealment of allocation was adequate in nine of the studies, not adequate in 15 studies, and not reported for the other five studies.

The increase in lower oesophageal sphincter pressure was significantly higher after laparoscopic Nissen fundoplication than after laparoscopic Toupet fundoplication (OR 2.76, 95% CI 1.57 to 3.95; 13 studies).

Compared with laparoscopic Toupet fundoplication, laparoscopic Nissen fundoplication was associated with an increase in the prevalence of dysphagia (OR 1.68, 95% CI 1.12 to 2.52; 24 studies), moderate-to-severe dysphagia (OR 3.11, 95% CI 1.90 to 5.00; number of studies not reported), severe dysphagia requiring bougie dilatation (OR 3.67, 95% CI 1.90 to 7.09; number of studies not reported), gas bloating (OR 2.42, 95% CI 1.37 to 4.26; 12 studies) and inability to belch (OR 3.02, 95% CI 1.14 to 7.95; nine studies).

In subgroup analysis, the prevalence of dysphagia was not significantly different between laparoscopic Nissen and Toupet fundoplication in patients with normal motility prior to surgery (seven studies), but was significantly higher among patients with abnormal motility prior to surgery (OR 1.75, 95% CI 1.04 to 2.94; six studies). There was evidence of statistical heterogeneity for the analysis based on the prevalence of dysphagia ($I^2=65\%$), gas bloating ($I^2=64\%$), inability to belch ($I^2=81\%$) and for the prevalence of dysphagia in patients with normal motility prior to surgery ($I^2=72\%$).

There was no significant difference between laparoscopic Nissen and Toupet fundoplication for patient satisfaction (15 studies), remission of moderate-to-severe oesophagitis (five studies), perioperative complications (11 studies), postoperative heartburn (11 studies), reflux recurrence (nine studies) or reoperation (15 studies).

Authors' conclusions

Laparoscopic Toupet fundoplication offered equivalent symptom relief to laparoscopic Nissen fundoplication for gastro-oesophageal reflux disease, with reduced adverse effects.

CRD commentary

The review addressed a clear question and was supported by appropriate inclusion criteria. Relevant databases were searched and reference lists were checked to identify relevant studies. However, no attempts were made to identify unpublished data. Studies reported in languages other than English were excluded from the review. Consequently, publication and language biases may be present in the review. Appropriate steps were taken to minimise bias and errors during the review process.

The authors did not state that they assessed the quality of the included studies, although adequacy of concealment of allocation was displayed in Forest plots. No other description of the quality of the included studies was reported. The authors pooled studies regardless of whether there was significant heterogeneity between them, which may not have been appropriate. Forest plots and results of tests for statistical heterogeneity were only reported for some outcomes. There was no investigation of the possible reasons for significant heterogeneity when present. The authors did not conduct a subgroup analysis based on study design, to identify whether results from RCTs were consistent with those from other study designs.

In view of the potential for publication bias and language bias, the lack of quality assessment of the included studies and unexplained significant heterogeneity between study results, the authors’ conclusions should be interpreted with caution.

Implications of the review for practice and research

Practice: The authors stated that laparoscopic Toupet fundoplication might be the current procedure of choice to treat gastro-oesophageal reflux disease.

Research: The authors stated that additional multicentre randomised controlled trials are required to confirm the value
of laparoscopic Nissen fundoplication and laparoscopic Toupet fundoplication for gastro-oesophageal reflux disease; such trials such include the use of objective outcome assessment.

**Funding**
Not stated.

**Bibliographic details**

**PubMedID**
20572311

**DOI**

**Original Paper URL**

**Indexing Status**
Subject indexing assigned by NLM

**MeSH**
Clinical Trials as Topic; Databases, Factual; Fundoplication /adverse effects /methods; Gastroesophageal Reflux /physiopathology /surgery; Humans; Laparoscopy /adverse effects /methods; Treatment Outcome

**AccessionNumber**
12010005347

**Date bibliographic record published**
15/09/2010

**Date abstract record published**
29/06/2011

**Record Status**
This is a critical abstract of a systematic review that meets the criteria for inclusion on DARE. Each critical abstract contains a brief summary of the review methods, results and conclusions followed by a detailed critical assessment on the reliability of the review and the conclusions drawn.