Systematic review and meta-analysis of laparoscopic Nissen (posterior total) versus Toupet (posterior partial) fundoplication for gastro-oesophageal reflux disease

CRD summary
This well-conducted review concluded that laparoscopic Toupet fundoplication reduced postoperative dysphagia, postoperative dilatation for dysphagia, reoperation rate and gas-related symptoms compared with laparoscopic Nissen fundoplication for patients with gastro-oesophageal reflux disease; both procedures have similar effects on reflux control. Evidence appeared to support the authors’ conclusions, although the limited quality of included trials may weaken the strength of the findings.

Authors’ objectives
To compare laparoscopic Nissen fundoplication with laparoscopic Toupet fundoplication in patients with gastro-oesophageal reflux disease.

Searching
MEDLINE, EMBASE, the Cochrane Library and Web of Knowledge Conference Proceedings Citation Index were searched for studies reported in any language in a peer-reviewed journal. Search dates ranged from 1960 to December 2009. Search terms were reported. Reference lists were also searched. Abstracts were excluded.

Study selection
Randomised controlled trials (RCTs) in adults with established gastro-oesophageal reflux disease undergoing anti-reflux surgery were eligible for inclusion. Eligible interventions were clearly described laparoscopic Nissen fundoplication (or posterior total fundoplication of 360 degrees, with or without division of short gastric vessels) compared with laparoscopic Toupet fundoplication (or posterior partial fundoplication covering the oesophagus 200 to 270 degrees). Eligible trials had to report at least one of the following outcomes: recurrent or persistent pathological acid exposure on pH monitoring; endoscopic oesophagitis; dysphagia; postoperative dilatation for dysphagia; reoperation rate; inability to belch; gas bloating; hyperflatulence; subjective reflux persistence and/or recurrence; satisfaction; mean lower oesophageal sphincter pressure on manometry; operating time; mortality; in-hospital complications; and length of hospital stay. Only data from at least one-year follow-up were included.

In all included patients, a standardised total (360 degrees) or laparoscopic Toupet fundoplication with a circumferential range of 200 to 270 degrees was used. Fundoplication length ranged from 1cm to 4cms among trials, but was similar within all but one of the trials. The mean age of included patients ranged from 44 to 62 years; in most trials, the majority were male (where reported). Trials included patients with and without oesophageal dysmotility. Included trials were published between 1997 and 2010.

Two reviewers independently selected studies and resolved disagreements on inclusions by reaching consensus with a third reviewer.

Assessment of study quality
Validity was assessed using the Jadad criteria (randomisation, blinding and withdrawals) and the tool of the Cochrane Collaboration; Jadad scores ranged from 1 to 5 points.

The authors did not state how many reviewers assessed validity.

Data extraction
Numbers of events were extracted for dichotomous outcomes to calculate risk ratios (RRs) with 95% confidence intervals (CIs). For continuous outcomes, means and standard deviations were extracted to calculate mean differences.
with 95% confidence intervals. Authors were contacted for missing data if required.

Two reviewers independently extracted data. Disagreements were resolved by reaching consensus with a third reviewer.

**Methods of synthesis**
The trial results were combined in meta-analyses where two or more trials reported an outcome. Pooled risk ratios and weighted mean differences (WMDs) were calculated using a random-effects model in the presence of significant heterogeneity; otherwise a fixed-effect model was used. The value of 0.5 was added to all cells in 2x2 tables in trials with zero events in one treatment group; trials with no events in intervention and control groups were excluded from meta-analyses. Heterogeneity was assessed using the $X^2$ and the $I^2$ statistics. Where heterogeneity was found, data were checked and potential causes were explored using sensitivity analyses.

The potential for publication bias was assessed using a funnel plot.

**Results of the review**
Seven RCTs were included in the review (n=792 operations). Trial quality ranged from poor to excellent; one trial scored 5 points, one trial scored 3 points, three trials scored 2 points and two trials scored 1 point. Methodological flaws included inadequate reporting of randomisation method, lack of double-blinding and no reporting of reasons for withdrawals and drop-outs. None of the trials reported sample size calculation. Duration of follow-up ranged from 12 to 60 months.

There was no statistically significant difference between laparoscopic Nissen and laparoscopic Toupet fundoplication in the proportion of patients with recurrent pathological acid exposure, oesophagitis, subjective reflux recurrence, satisfaction with the intervention or in-hospital complications.

Compared with laparoscopic Toupet fundoplication, laparoscopic Nissen fundoplication was associated with a statistically significant increase in postoperative dysphagia (13.5% versus 8.6%; RR 1.61, 95% CI 1.06 to 2.44; six RCTs), postoperative dilatation for dysphagia (6.9% versus 2.7%; RR 2.45, 95% CI 1.06 to 5.68; three RCTs), the number of surgical re-interventions (7% versus 3.1%; RR 2.19, 95% CI 1.09 to 4.40; five RCTs), inability to belch (RR 2.04, 95% CI 1.19 to 3.49; three RCTs), and gas bloating (RR 1.58, 95% CI 1.21 to 2.05; four RCTs). No significant heterogeneity was found for any of these analyses.

The lower oesophageal sphincter pressure was significantly higher in laparoscopic Nissen fundoplication groups compared with Toupet fundoplication groups (WMD 1.98mmHg, 95% CI 0.58 to 3.37; five RCTs; $I^2=62\%)$.

There was no significant difference between interventions for operating time ($I^2=80\%$).

Heterogeneity was reduced by confining the analysis to trials with short gastric vessel division.

No clear evidence of publication bias was shown in funnel plots.

**Authors' conclusions**
Laparoscopic Toupet fundoplication reduced postoperative dysphagia, postoperative dilatation for dysphagia, reoperation rate and gas-related symptoms compared with laparoscopic Nissen fundoplication in patients with gastro-oesophageal reflux disease; the two procedures have similar effects on reflux control.

**CRD commentary**
The review question was clearly stated and inclusion criteria were appropriately defined. Several relevant sources were searched. Attempts were made to minimise language, but not publication bias; no clear evidence of publication bias was found. Methods were used to minimise reviewer errors and bias in the selection of studies and extraction of data, but it was not clear whether similar steps were taken for the validity assessment.

Study quality was assessed and results were reported in full. Appropriate methods were used for the meta-analyses.
Heterogeneity was assessed.

The review was well conducted and evidence appeared to support the authors’ conclusions, although the limited quality of the included trials may weaken the strength of the findings.

Implications of the review for practice and research

Practice: The authors stated that review findings provide support for the use of laparoscopic Toupet fundoplication as the posterior fundoplication of choice in patients with gastro-oesophageal reflux disease

Research: The authors did not state any implications for further research.

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