Total vs Partial Fundoplication in the Treatment of Gastroesophageal Reflux Disease

A Meta-analysis

Oswald Varin, MD; Berit Velstra, MD; Stijn De Sutter, MD; Wim Ceelen, MD

**Objective:** To perform a meta-analysis of randomized trials comparing partial fundoplication (PF) with total (Nissen) fundoplication (TF) for gastroesophageal reflux disease in terms of morbidity, efficacy, and long-term symptomatology.

**Data Sources:** A structured Medline search for published studies.

**Study Selection:** The available literature from 1975 until June 2007 was searched using the Medical Subject Headings of the National Library of Medicine term fundoplication and the free-text terms fundoplication, surgery, and reflux. Data were analyzed using Review Manager software (Cochrane Collaboration, Oxford, England).

**Data Extraction:** Eleven trials were identified comparing TF with PF in 991 patients.

**Data Synthesis:** Total fundoplication resulted in a significantly higher incidence of postoperative dysphagia (odds ratio [OR], 1.82-3.93; \( P < .001 \)), bloating (OR, 1.07-2.56; \( P = .02 \)), and flatulence (OR, 1.66-3.96; \( P < .001 \)). No significant differences were noted in the incidence of esophagitis (OR, 0.72-2.7; \( P = .33 \)), heartburn (OR, 0.48-1.52; \( P = .58 \)), or persisting acid reflux (OR, 0.77-1.79; \( P = .45 \)). The reoperation rate was significantly higher after TF compared with PF (OR, 1.13-3.95; \( P = .02 \)). No significant differences were present in the proportion of patients experiencing a good or excellent long-term outcome (OR, 0.54-1.38; \( P = .53 \)) or in the proportion of patients with a Visick I or II score (OR, 0.62-1.59; \( P = .99 \)).

**Conclusions:** Partial fundoplication is a safe and effective alternative to TF, resulting in significantly fewer reoperations and a better functional outcome. The poor quality of the included trials warrants caution in the interpretation of the results of this meta-analysis.

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**METHODS**

We performed a systematic search of the literature using the Cochrane Central Register of Controlled Trials, the Institute for Scientific Information Web of Science (science citation in-
Gastroesophageal reflux disease and its long-term complications represent an important health care burden in the developed world, and there is evidence that the prevalence of GERD has increased during the past 2 decades, current contents), and PubMed from 1975 until June 2007 using the Medical Subject Headings of the National Library of Medicine term fundoplication and the free-text terms fundoplication, surgery, and reflux (Figure 1). Eleven studies randomized patients to either TF or PF. Studies that did not compare TF with PF and studies comparing fundoplication with Hill gastropexy were excluded. The following outcome parameters were analyzed: postoperative morbidity, mortality, incidence of symptomatic adverse events (dysphagia, bloating, flatulence, esophagitis, heartburn), reoperation rate, recurrence rate, and Visick score. Data were extracted from the selected studies and entered into the Review Manager software (Cochrane Collaboration, Oxford, England). Summary statistics were calculated using the odds ratio (OR) and associated 95% confidence intervals (CI). The methodological quality of the selected studies was assessed using the method of Jadad. Heterogeneity was tested using the $\chi^2$ statistic and assumed to be present when $P < .1$.

![Figure 1](quorum_diagram.png)

**Figure 1.** Quorum diagram showing study methodology. RCT indicates randomized controlled trial.

**Table.** Details of Prospective Randomized Trials Comparing TF With PF in the Treatment of Patients With Gastroesophageal Reflux Disease

<table>
<thead>
<tr>
<th>Source</th>
<th>Score</th>
<th>Type</th>
<th>Patients With TF, No.</th>
<th>Patients With PF, No.</th>
<th>$^a$PF</th>
<th>FU</th>
</tr>
</thead>
<tbody>
<tr>
<td>Segol et al, 1989</td>
<td>1</td>
<td>Open</td>
<td>20</td>
<td>18</td>
<td>180</td>
<td>24</td>
</tr>
<tr>
<td>Thor et al, 1989</td>
<td>1</td>
<td>Open</td>
<td>12</td>
<td>19</td>
<td>180-200</td>
<td>60</td>
</tr>
<tr>
<td>Lundell et al, 1991</td>
<td>2</td>
<td>Open</td>
<td>65</td>
<td>72</td>
<td>180-200</td>
<td>138</td>
</tr>
<tr>
<td>Walker et al, 1992</td>
<td>1</td>
<td>Open</td>
<td>26</td>
<td>26</td>
<td>300</td>
<td>13</td>
</tr>
<tr>
<td>Laws et al, 1997</td>
<td>1</td>
<td>Laparoscopic</td>
<td>23</td>
<td>16</td>
<td>200</td>
<td>27</td>
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<tr>
<td>Watson et al, 1999</td>
<td>5</td>
<td>Laparoscopic</td>
<td>53</td>
<td>54</td>
<td>180</td>
<td>6</td>
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<tr>
<td>Fibbe et al, 2001</td>
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<td>Laparoscopic</td>
<td>100</td>
<td>100</td>
<td>270</td>
<td>4</td>
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<tr>
<td>Chrysos et al, 2003</td>
<td>3</td>
<td>Laparoscopic</td>
<td>14</td>
<td>19</td>
<td>270</td>
<td>12</td>
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<tr>
<td>Watson et al, 2004</td>
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<td>Laparoscopic</td>
<td>52</td>
<td>60</td>
<td>90</td>
<td>6</td>
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<tr>
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<td>Laparoscopic</td>
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<tr>
<td>Spence et al, 2006</td>
<td>5</td>
<td>Laparoscopic</td>
<td>39</td>
<td>40</td>
<td>90</td>
<td>12</td>
</tr>
</tbody>
</table>

Abbreviations: FU, mean follow-up time in months; PF, partial fundoplication; $^a$PF, circumferential degrees of the partial wrap; TF, total (Nissen) fundoplication.

**RESULTS**

Eleven prospective randomized trials were identified comparing TF with PF, including a total of 991 patients. Two studies comparing TF with Hill gastropexy were left out of the analysis. The characteristics of the studies are detailed in the Table. Overall, the methodological quality of the identified trials was low, with 7 of the 11 trials having a Jadad score of 3 or less. All trials recruited a small number of patients, while no formal primary endpoint identification, sample size calculation, or power calculation was reported in any of the identified trials.

Postoperative mortality was not present in any of the included trials. No significant differences were observed in postoperative morbidity (Figure 2). The functional outcome parameters are detailed in Figure 3. Compared with PF, TF resulted in a significantly higher incidence of postoperative dysphagia (OR, 1.82-3.93; $P < .001$), bloating (OR, 1.07-2.56; $P = .02$), and flatulence (OR, 1.66-3.96; $P < .001$). Figure 4 highlights the postoperative parameters related to the efficacy of surgery. No significant differences were noted between PF and TF in the incidence of esophagitis (OR, 0.72-2.7; $P = .33$), heartburn (OR, 0.48-1.52; $P = .58$), or persisting acid reflux (OR, 0.77-1.79; $P = .45$). There was, however, significant heterogeneity associated with the pooled analysis of the incidence of persistent reflux. Long-term outcome parameters are given in Figure 5. The reoperation rate was significantly higher after TF compared with PF (OR, 1.13-3.95; $P = .02$). However, significant heterogeneity was identified between trials. No significant differences were present in the proportion of patients experiencing a good or excellent long-term outcome (OR, 0.54-1.38; $P = .53$) or in the proportion of patients with a Visick I or II score (OR, 0.62-1.59; $P = .99$).

**COMMENT**

![Figure 2](table.png)

**Table.** Details of Prospective Randomized Trials Comparing TF With PF in the Treatment of Patients With Gastroesophageal Reflux Disease

$^a$Jadad methodological quality score (range, 1-5).
The mainstay of therapy consists of lifestyle and dietary modification, acid suppression therapy, and, in selected patients, surgery. Recently, a variety of endoscopic antireflux procedures have been introduced in clinical practice. Owing to questions regarding the safety, efficacy, and durability of endoscopic procedures, their routine use is at present not recommended. The exact place of surgery in the management of GERD remains a matter of debate. Accepted indications for surgery include anatomic abnormalities such as a large hiatus hernia, persistent regurgitation despite adequate medical therapy, and incomplete response to medical therapy in...
patients with proven reflux.\textsuperscript{28} Recent evidence suggests that, compared with medical therapy, surgery is associated with a higher probability of regression of Barrett’s metaplasia, although the risk of malignant change does not seem to differ.\textsuperscript{29} Fundoplication procedures are nowadays usually performed using a minimally invasive approach. The evidence comparing open with laparoscopic fundoplication is equivocal. Some randomized comparisons have not been able to show any difference in outcome, with the possible exception of shorter hospital stay, lower cost, and less wound morbidity.\textsuperscript{30} Others were unable to demonstrate any difference in outcome, and one prospective trial was terminated early when a significantly higher complication rate in the laparoscopic group was detected at interim analysis.\textsuperscript{31-33} Most authors agree, however, that the subjective and symptomatic outcome is similar following open or laparoscopic fundoplication.

One of the drawbacks of surgery is the risk of long-term adverse functional effects due to the imposed mechanical obstruction of the lower esophagus.\textsuperscript{34} Partial fundoplication techniques have been proposed to prevent postoperative dysphagia and retain the ability to belch. The current meta-analysis confirms that dysphagia, bloating, and flatulence are all significantly less common after PF when compared with TF. It should be noted, however, that the exact length of the Nissen wrap in the analyzed trials could not be identified. It is possible that a short (1 cm) gastric wrap, as identified in the current meta-analysis, might coexist with a significantly higher reoperation rate, although reoperation may be related to other variables such as presence of a hiatal hernia and closure thereof. De-
present meta-analysis suggest that PF is the procedure of choice in patients with GERD selected for surgery. Several limitations should, however, be taken into account. First, the general methodological quality of the included trials is low owing to small patient numbers, inadequate trial design or methodology, lack of standardization, and lack of objective outcome assessment. Second, the validity of several of the reported pooled analyses is hampered by statistically significant heterogeneity related to small sample sizes. Therefore, the individual decision as to what type of anti-reflux barrier to create should be tailored according to the available (limited) evidence, the experience of the operator, and to specific patient-related variables such as preexisting dysphagia, extent of acid reflux, hiatal anatomy, and manometry data. Preoperative manometry could be helpful in the surgical decision-making process. Large scale, multicenter, randomized trials including objective outcome assessment will be required to definitely establish the value of partial vs total fundoplication.

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REFERENCES


