It is unclear if age should be considered a factor in the choice of treatment for gastroesophageal reflux disease (GERD), and if fundoplication in elderly patients is as safe and effective as it is in younger patients. We hypothesized that the outcome of laparoscopic antireflux operations in patients younger than 65 years is similar to that of patients 65 years and older.

**Hypothesis:**
It is unclear if age should be considered a factor in the choice of treatment for gastroesophageal reflux disease (GERD) and if fundoplication in elderly patients is as safe and effective as it is in younger patients. We hypothesized that the outcome of laparoscopic antireflux operations in patients younger than 65 years is similar to that of patients 65 years and older.

**Design:** Retrospective review of findings from a prospectively acquired database.

**Setting:** University-based tertiary care center.

**Patients:** Three hundred four consecutive patients underwent laparoscopic fundoplication for GERD. Two hundred forty-one patients were younger than 65 years (group A; median age, 46 years), and 63 patients were 65 years or older (group B; median age, 69 years).

**Main Outcome Measures:** Presence, duration, and severity of GERD symptoms; presence of a hiatal hernia or esophageal stricture; duration of operation; incidence of complications; and length of hospital stay.

**Results:** Elderly patients more often had regurgitation and respiratory symptoms in addition to heartburn. Hiatal hernias were more common among elderly patients (77% vs 51%). The duration of the operation was similar for the 2 groups. The incidence of intraoperative and postoperative complications was low and similar in the 2 groups. The median hospital stay was 24 hours for each group. Heartburn resolved in approximately 90% of patients in each group.

**Conclusions:** Elderly patients more often had hiatal hernias and respiratory symptoms. Laparoscopic antireflux surgery was as safe in elderly patients as it was in younger patients, and clinical outcomes were as good.

Arch Surg. 2006;141:289-292
Table 1. Preoperative Symptom Assessment

<table>
<thead>
<tr>
<th>Symptom</th>
<th>No. (% of Patients)</th>
<th>Group A (&lt;65 Years)</th>
<th>Group B (&gt;65 Years)</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heartburn</td>
<td>209 (86)</td>
<td>45 (47)</td>
<td>.001</td>
<td></td>
</tr>
<tr>
<td>Dysphagia</td>
<td>92 (38)</td>
<td>28 (35)</td>
<td>.77</td>
<td></td>
</tr>
<tr>
<td>Regurgitation</td>
<td>113 (47)</td>
<td>46 (71)</td>
<td>.001</td>
<td></td>
</tr>
<tr>
<td>Chest pain</td>
<td>97 (39)</td>
<td>18 (28)</td>
<td>.13</td>
<td></td>
</tr>
<tr>
<td>Cough</td>
<td>89 (37)</td>
<td>42 (67)</td>
<td>.001</td>
<td></td>
</tr>
<tr>
<td>Response to proton pump</td>
<td>70</td>
<td>75</td>
<td>.53</td>
<td></td>
</tr>
</tbody>
</table>

*Percentage of patients.

Table 2. Preoperative Manometric and pH Monitoring Profile

<table>
<thead>
<tr>
<th>Group A (&lt;65 Years)</th>
<th>Group B (&gt;65 Years)</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>LES pressure, mm Hg</td>
<td>11 ± 6</td>
<td>12 ± 6</td>
</tr>
<tr>
<td>DEA, mm Hg</td>
<td>85 ± 46</td>
<td>85 ± 46</td>
</tr>
<tr>
<td>UES pressure, mm Hg</td>
<td>79 ± 32</td>
<td>77 ± 31</td>
</tr>
<tr>
<td>Time at pH &lt; 4, %</td>
<td>17 ± 15</td>
<td>14 ± 13</td>
</tr>
<tr>
<td>DeMeester score</td>
<td>63 ± 44</td>
<td>54 ± 33</td>
</tr>
</tbody>
</table>

Abbreviations: DEA, distal esophageal amplitude (3 and 8 cm above lower esophageal sphincter [LES]); UES, upper esophageal sphincter.

*Data are presented as mean ± SD unless otherwise indicated.

The study was performed by placing a pH probe 5 cm above the upper border of the manometrically determined lower esophageal sphincter. Data were incorporated into a composite score (ie, DeMeester score); a score greater than 14.7 was considered to be abnormal based on data obtained from healthy, asymptomatic volunteers.*

Surgical Technique

Anesthetic and surgical risk was estimated using the American Society of Anesthesiologists (ASA) assessment. The operations were performed with the patients under general anesthesia using standard ASA monitoring. Invasive monitoring, such as measuring arterial blood pressure via a radial artery cannula, was used in patients with significant lung or cardiac disease. Total (360°) laparoscopic fundoplication was performed in all patients and included the following steps: (1) mobilizing the distal esophagus in the posterior mediastinum; (2) dividing all short gastric vessels; (3) approximating the right and left pillars of the crus behind the esophagus; (4) creating a 360° fundoplication wrap around a 56F bougie; and (5) placing 2 collar stitches around the wrap, esophagus, and right or left pillar of the crus (in the 3- and 9-o'clock positions with respect to the esophageal circumference) and a posterior gastropexy stitch between the posterior aspect of the wrap and the reapproximated crus pillars.

Results

Three hundred four patients were included in this study. There were 168 men and 136 women (mean age, 57 years) who had been symptomatic for an average of 60 months. Patients were divided into 2 groups based on their ages at the time of the operation. Group A included 241 patients younger than 65 years (median age, 46 years; age range, 14-64 years). There were 133 men and 108 women in group A. The mean ± SD duration of follow-up was 15 ± 21 months (range, 1-48 months). Group B included 63 patients 65 years or older (median age, 69 years; age range, 65-88 years). There were 35 men and 28 women in group B. The mean ± SD duration of follow-up was 26 ± 25 months (range, 1-60 months).

Symptoms and Findings

Preoperatively, heartburn was more frequent in group A than in group B. The incidence of dysphagia and chest pain was similar in the 2 groups. Regurgitation and cough were more frequent in group B. The response to proton pump inhibitors was good and similar in the 2 groups (Table 1). A sliding hiatal hernia was more frequent in patients in group B (77% vs 51%; P = .007). Three patients in group B had a distal esophageal stricture, which required preoperative dilation. Barrett esophagus was present in 12% of group A patients and 15% of group B patients (P = .68). Both the manometric and reflux profiles were similar between the 2 groups (Table 2).

Laparoscopic Total Fundoplication

All patients underwent 360° fundoplication. The ASA score for group B was higher (2.8 vs 2.2; P = .72). From an anesthetic point of view, an arterial cannula for blood pressure monitoring was used more often in group B. In addition, the intraperitoneal pressure had to be decreased to 10 to 11 mm Hg (from the initial 15 mm Hg) more often in group B, but this did not affect the duration or outcome of the operation. The operation was converted to a laparotomy in 2.0% of group A patients and 1.6% of group B patients (Table 3). The duration of the operation was similar in the 2 groups. Intraoperative complications occurred in 6 patients (2.5%) in group A (2 splenic injuries not requiring splenectomy, 1 gastric perforation, and 3 pneumothoraces) and in no patients in group B. Postoperative complications occurred in 6 patients (2.5%) in group A (1 pneumonia, 1 pleural effusion, 1 wound infection, and 3 urinary retention) and 2 patients (3.2%) in group B (1 myocardial infarction and 1 pleural effusion). There were no deaths in either group. The median length of hospital stay was 24 hours in each group. The time to resumption of regular activity was 17 days for group A and 19 days for group B (P = .68). No patient in either group required admission to a skilled nursing facility after discharge.

The Figure shows the outcome of the operation in the 2 groups. Overall, heartburn resolved in 214 patients (89%)
in group A. Of the 27 patients with residual heartburn, 20 (8.3%) were treated with acid-reducing medications and 2 (0.8%) required a second operation. In contrast, among the 63 patients in group B, 57 (90%) were free of heartburn. Of the remaining 6 patients (9.5%), 3 were treated with acid-reducing medications and 3 required a second operation (4.7%). Regurgitation resolved or improved in 94% of group A patients and 97% of group B patients. De novo dysphagia developed postoperatively in 22 patients (9%) in group A (7 patients required dilation) and in 6 patients (9.5%) in group B (none required dilation). Table 4 gives the postoperative symptom scores in the 2 groups of patients.

A separate analysis was performed for patients in each group who had weak peristalsis preoperatively (amplitude in the distal esophagus <40 mm Hg). There were 31 of these patients in group A and 8 patients in group B. De novo dysphagia developed in 6% and 12% of patients, respectively (P = .80).

![Figure](http://archsurg.jamanetwork.com/)

These results show that compared with younger patients (<65 years), elderly patients (≥65 years) with GERD present more often with regurgitation and respiratory symptoms, do not have a higher incidence of intraoperative or postoperative complications, and have excellent outcomes after laparoscopic fundoplication.

GERD IN ELDERLY PATIENTS: CLINICAL PRESENTATION

The clinical presentation in elderly patients with GERD differed from that of younger patients. Although the incidence and severity of heartburn were similar, regurgitation was more frequent and severe, and it was often the main symptom. In addition, elderly patients more often reported extraesophageal symptoms such as cough, which was often associated with regurgitation. Proton pump inhibitors relieved the heartburn in both groups, but they had little effect on regurgitation and respiratory symptoms. Hiatal hernia was more common among elderly patients, and hiatal hernias are usually associated with more severe disease (eg, regurgitation and respiratory symptoms). This is important because it shows that symptoms and the response to proton pump inhibitors rather than age should be the most important factors governing the choice of treatment. Recent studies using esophageal impedance show that acid-reducing medications often do little for patients with regurgitation and respiratory symptoms, because gastric contents with a neutral pH still reflux through the incompetent sphincter. Fundoplication stops the reflux and regurgitation; it should be performed before the lungs become irreversibly damaged.

LAPAROSCOPIC SURGERY IN ELDERLY PATIENTS: HOSPITAL COURSE

Questions have been raised about the wisdom of recommending elective surgery for elderly patients with benign non-emergent conditions, such as GERD, based on concerns about increased risks from comorbid conditions. However, substantial data to the contrary show that laparoscopic operations do not have the same degree of increased risks in the face of comorbidities as do open operations.

Concern about antireflux surgery in elderly patients comes mostly from data by Flum et al. In a study that assessed the nationwide frequency of major adverse outcomes in antireflux surgery between 1992 and 1997, they found that the incidence of intraoperative complications increased with age. The mortality rate increased as follows: age 50 to 59 years, 0.28%; age 60 to 69 years, 0.97%; and age 70 to 79 years, 2.16%. These findings conflict with other findings that show that laparoscopic antireflux surgery in patients older than 65 years is as safe as in younger patients. The differences between the findings of Flum et al and the others is probably attributable to selection. The study by Flum and colleagues was a population study; the other reports were from highly experienced experts in tertiary care centers.

We found that even among elderly patients with higher ASA scores, no difference occurred in the incidence of intraoperative and postoperative complications, length of hospital stay, or time to return to regular activities. The elderly patients recovered well and returned to the same level of function after the operation as they had occupied before the operation. The evidence suggests, therefore, that in tertiary care centers, a higher level of expertise among surgeons and anesthesiologists allows antireflux surgery to be performed safely, independent of the patient’s age. Similar observations have been made in patients undergoing esophagectomies.

LAPAROSCOPIC FUNDOPPLICATION IN ELDERLY PATIENTS: CLINICAL OUTCOME

The outcome was excellent in most patients and was independent of age. Approximately 90% of patients in each group noted resolution or improvement of heartburn, and they dis-

### Table 4. Postoperative Symptom Scores*

<table>
<thead>
<tr>
<th>Symptom</th>
<th>Group A</th>
<th>Group B</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heartburn</td>
<td>0.3 ± 0.8</td>
<td>0.2 ± 0.8</td>
<td>.37</td>
</tr>
<tr>
<td>Dysphagia</td>
<td>0.3 ± 0.8</td>
<td>0.2 ± 0.8</td>
<td>.37</td>
</tr>
<tr>
<td>Regurgitation</td>
<td>0.2 ± 0.6</td>
<td>0.2 ± 0.7</td>
<td>&gt;.99</td>
</tr>
<tr>
<td>Chest pain</td>
<td>0.1 ± 0.5</td>
<td>0.1 ± 0.5</td>
<td>&gt;.99</td>
</tr>
<tr>
<td>Cough</td>
<td>0.1 ± 0.6</td>
<td>0.1 ± 0.5</td>
<td>&gt;.99</td>
</tr>
</tbody>
</table>

*Data are presented as mean ± SD unless otherwise indicated.
continued taking acid-reducing medications. The good results among the elderly patients were not obtained at a cost of more complications. Postoperative dysphagia was similar among the 2 groups, and no patient required a second operation because of persistent dysphagia. The strength of peristalsis as measured by preoperative manometry studies was unrelated to postoperative dysphagia. The operation was particularly helpful for patients with regurgitation and respiratory symptoms. Most often the cough resolved or improved, even though proton pump inhibitors had little effect preoperatively. The data show that respiratory symptoms were well controlled by laparoscopic fundoplication. 12

In conclusion, laparoscopic fundoplication in elderly patients with GERD is as safe and effective as it is in younger patients. This finding suggests that age should not be a factor in deciding whether to recommend laparoscopic fundoplication for treatment.

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Previous Presentation: This study was presented as a poster at the 76th Annual Meeting of the Pacific Coast Surgical Association; February 19, 2005; Dana Point, Calif.

REFERENCES


Invited Critique

Tedesco et al1 put forward a cogent argument for offering laparoscopic antireflux surgery to patients regardless of age. Their retrospective review of their own large database reveals some interesting and pertinent trends, including the finding that elderly patients (defined as those ≥65 years) were more likely to experience symptoms of regurgitation and cough than were younger patients. These symptoms do not respond as well to medical management as does the symptom of heartburn, so surgery is particularly appealing in this group. The authors assert that laparoscopic antireflux surgery is as safe in elderly patients as in the younger population, but is that correct? The outcomes reported in this article, including resolution of preoperative complaints, intraoperative complications, and postoperative complications of urinary retention, myocardial infarction, pneumonia, wound infection, and pleural effusion, were similar between age groups. Although the authors note that no patient in either group required admission to a skilled nursing facility after discharge, they do not specifically comment on cognitive function. We know that one quarter of patients 65 years or older experience delirium during hospitalization,2 and there is strong suspicion that this number underestimates the true rate.3 The long-term sequelae of postoperative delirium can be significant. If we extrapolate from the medical population, only one third of patients who experience delirium in the hospital will still live independently in the community 2 years later.4 Other studies have shown that the only predictor of postoperative cognitive dysfunction is age.5 As surgeons, we may be guilty of ascribing a little postoperative confusion to narcotics and preexisting mild dementia. If we do not look for it and define it as a postoperative complication, we may do our older patients a disservice. A higher degree of attention to postoperative mental changes may be warranted in the future.

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