National Trends in Lung Volume Reduction Surgery in the United States 2000 to 2010

To the Editor:

Lung volume reduction surgery (LVRS) is used to treat advanced emphysema that is refractory to maximal medical therapy. 1 The National Emphysema Treatment Trials (NETT) have shown their efficacy in improving 6-min walk distance, maximal exercise capacity, and quality of life, although the mortality benefit may be limited to the upper-lobe predominance, low-baseline exercise group. 2,3 We, therefore, examined the newer trends in LVRS from 2000 to 2010 to see if LVRS is still popular in United States.

Using the Nationwide Inpatient Sample (NIS) database, we performed a retrospective cross-sectional study based on admissions of adult patients (aged ≥ 18 years) who underwent LVRS (International Classification of Diseases, Ninth Revision, Clinical Modification [ICD-9-CM] code 32.22) from 2000 to 2010. The NIS database is an administrative dataset created by the Agency for Healthcare Research and Quality that contains data from all community hospitals in the United States. Using the discharge weights in the NIS, national estimates can be obtained. 4 The primary outcome measure was all-cause in-hospital mortality. Factors associated with in-hospital mortality were examined by a multivariable logistic regression model. We used ICD-9-CM codes to identify comorbid conditions and rates of tracheostomy (ICD-9-CM procedure codes 31.1, 31.2, 31.21, 31.29).

An estimated 3,307 LVRSs were performed from 2000 to 2010. The number of LVRSs declined through years 2000 to 2010 (Fig 1). A logarithmic trend line was the best fit, with \( r^2 \) of 0.51.

The in-hospital mortality was 6.1% and did not change significantly with time. Of those patients undergoing LVRS, 7.9% required tracheostomy. The median length of hospital stay was 9 days (interquartile range, 5-15 days), and this did not change during the 10 years.

Age ≥ 65 years was the strongest predictor for in-hospital mortality in those undergoing LVRS (Table 1). Other variables associated with higher in-hospital mortality were the presence of interstitial lung disease (OR, 2.81; 95% CI, 1.33-5.93) and malnutrition (OR, 2.74; 95% CI, 1.09-6.90).

Although there has been a decline in the annual number of LVRSs performed in the past decade, the in-hospital mortality has remained at around 6%. LVRS, age ≥ 65 years, the presence of interstitial lung disease, and malnutrition were strongly associated with mortality in the postoperative period. Use of newer endobronchial methods to achieve lung volume reduction may be useful in this group. 5

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TABLE 1 Variables Associated With Higher Mortality in People Undergoing LVRS

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Univariate, OR (95% CI)</th>
<th>Multivariate, OR (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 65 y</td>
<td>Reference</td>
<td>Reference</td>
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<tr>
<td>≥ 65 y</td>
<td>2.80 (1.50-5.22)</td>
<td>2.83 (1.51-5.32)</td>
</tr>
<tr>
<td>Individual comorbidities</td>
<td></td>
<td></td>
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<tr>
<td>Interstitial lung disease</td>
<td>2.71 (1.29-5.67)</td>
<td>2.81 (1.33-5.93)</td>
</tr>
<tr>
<td>Malnutrition</td>
<td>3.02 (1.19-7.65)</td>
<td>2.74 (1.09-6.90)</td>
</tr>
</tbody>
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LVRS = lung volume reduction surgery.

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References