



# Video-assisted versus robotic-assisted thymectomy: equality of outcomes, inequality of cost

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The feasibility of minimally invasive techniques in the treatment of thymomas continues to expand, including strategies employing both video-assisted thoracoscopic surgery (VATS) and robotic-assisted thoracoscopic surgery (RATS) platforms (1). Preliminary studies comparing outcomes between open and minimally invasive resections have demonstrated that minimally invasive techniques are not inferior to open, and, moreover, may be superior for some outcomes, including length of stay and blood loss (2,3). As there have been no randomized controlled trials comparing these operative approaches, the available evidence is largely retrospective. Further limiting the generalizability of these studies, minimally invasive cohorts usually encompass heterogeneous groups of procedures performed using both VATS and RATS techniques. This limitation of lumping may be largely in part due to the more widespread uptake of RATS only in more recent years.

The article by Seo and colleagues in *The Annals of Thoracic Surgery* aims to address the knowledge gap associated with the use of VATS versus RATS (4). This objective was addressed by using propensity-score based analyses to compare patients with thymomas who had undergone open, VATS, and RATS resections between 2008 and 2014. Outcomes included overall complication rates, length of stay, and overall cost.

Seo and colleagues found a significant increase in use of minimally invasive techniques during the study period: 8% to 21% for VATS, 1% to 22% for RATS. Conversely, there was an expected parallel decrease in open procedures

from 78% to 53%. This trend held true when stratifying by surgical indication, though most pronounced for patients with benign indications for surgery. For example, for myasthenia gravis, the changes were particularly dramatic (open reduced from 81% to 43%; RATS increased from 1.5% to 29%).

In both univariate and propensity-score analyses, Seo and colleagues found no differences in outcomes of mortality and length of stay. RATS procedures were found to have a lower rate of post-operative cardiac complications and hemorrhage—although there were no differences in the overall complication rates. In addition, of the three options, RATS was associated with a higher hospitalization cost and VATS with a lower cost. Interestingly, over time, open technique was associated with higher costs per year, without a change for VATS and RATS.

Previous studies have identified a similar increase over time in minimally invasive techniques, although to a lesser extent (2,5). Open versus minimally invasive techniques have demonstrated similar, if not improved short-term outcomes for VATS and RATS and no difference in long-term outcomes (6,7). When comparing VATS to RATS, outcomes have been demonstrated to be equivalent (8-10). Lastly, few studies have previously evaluated cost in this setting. Those that have align with the work by Seo and colleagues that RATS is more expensive, but to a greater degree (11).

The first major strength of this work is the focus on VATS versus RATS. As previously mentioned, prior studies

have grouped these minimally invasive techniques together. As this study represents one of the largest cohorts on this topic, the authors were able to evaluate each platform separately, and in comparison, with the other. The second major strength is the focus on cost. Again, few studies have evaluated the differences in cost between surgical techniques in the setting of thymectomy. Although it can be hypothesized that the cost of RATS will decrease, as has occurred in other settings, it is important to identify these trends over time (12). Lastly, the third major strength is the use of propensity-score matching, allowing the investigators to address confounders which may influence surgical decision making for each patient. This study does suffer from the absence of staging information, but the authors attempt to address this through additional adjustments, including surgical indication.

Overall, this study adds substantially to our comprehension of the current state of techniques available and their benefits and drawbacks. Future studies should focus on longer term outcomes, along with adjustments for additional confounders, such as volume, which may influence outcomes and cost.

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