Letters to the Editor

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Response to Letter by Hemmer et al

Response:

We appreciate the commentary on our recent publication by Hemmer et al, but would like to help clarify some of the concerns raised. It is important to understand that we performed an exploratory analysis in a retrospective manner and have acknowledged the limitations as such in the articles and thus have not “condemned” general anesthesia (GA) as the editorial would suggest. The major finding of this study is that patients who undergo acute interventions with conscious sedation do not appear to be at higher risk for intracranial hemorrhagic complications, particularly wire perforation attributable to patient movement, compared to GA. This is reassuring to operators who would suggest. The major finding of this study is that patients who undergo acute interventions with conscious sedation do not appear to be at higher risk for intracranial hemorrhagic complications, particularly wire perforation attributable to patient movement, compared to GA. This is reassuring to operators who perform these procedures with minimal sedation.

The second concern raised was that we did not report the univariate and multivariate models comparing GA to conscious sedation and instead reported comparisons of outcomes. We have stated in the statistics section that this analysis was performed comparing GA to conscious sedation directly but, because of space limitations in the journal, we were not able to publish all tables. The following variables were more frequently noted in the GA group with univariate analysis (P<0.10): longer time to puncture from symptom onset, diabetic patients, carotid terminus occlusions, patients receiving intravenous tissue plasminogen activator before intervention, the use of angioplasty, and poor clinical outcomes (see Table).

Moreover, we performed an additional analysis of patients with isolated M1 middle cerebral artery occlusions and adjusted for the variables that were potential confounders from the univariate analysis to show that the same result occurs with a more homogeneous population. We do not have data on cerebral perfusion pressure because this would be difficult given that intracranial pressure is not typically monitored during acute stroke interventions and the retrospective nature of this study. Recently, the use of propensity score matching has gained acceptance in the medical literature, but the use of regression analysis is acceptable with large sample sizes and a common outcome. A medical review of 25 medical articles comparing propensity score matching to regression modeling showed no difference in the results. Both models have limitations and we recognize that, particularly in a retrospective study, there will be limits regarding adjusting for all unmeasured confounders, but this will exist with either statistical model. It is worthy to note that there have been 3 other studies that have reported an association with the intubated state or GA and worse clinical outcomes and larger infarct volumes.

Our hypothesis-generating article was written to help shed light on an important topic in the endovascular arena. The focus of stroke care has typically surrounded the emergency department and the critical care units, but there are few studies analyzing the medical management in the endovascular suite. It is known that patients presenting with acute strokes often have concomitant medical issues including, but not limited to, congestive heart failure with or without valvulopathy, chronic obstructive pulmonary disease, coronary artery disease that may be active, cardiac dysrhythmias, and others. These conditions would place the patient at a particularly high risk for mechanical ventilation and, because of time constraints, each of these factors cannot be often considered before intubation. There are time delays and hemodynamic fluctuations that can occur with induction of anesthesia, and these effects are not well-understood in the setting of an acute stroke. Hemmer et al refer to immobility and neuroprotection as being benefits of anesthesia, but to our knowledge there are no human clinical studies that have found a clinical benefit, particularly in the setting of an acute ischemic stroke. Unfortunately, we are not able to assess what percent of patients had early withdrawal of care, but patients who come back from these procedures performed late at night typically do not undergo extubation early. Families may be more prone to withdraw care for an intubated patient with a severe neurological disability, and thus the mortality rate becomes a self-fulfilling prophecy.

In conclusion, we have shown that performing acute stroke interventions with conscious sedation appears as safe as GA as it is currently being performed in large-volume centers. We hope that this will continue to generate discussion and further research, particularly in ongoing clinical trials. Moreover, we concur that if a patient is in need of airway protection, then mechanical ventilatory support would be appropriate for that individual. If a patient is in stable condition and does not require ventilator support, then endovascular procedures can be performed with conscious sedation as safely as with GA. Each center must analyze their protocols and outcomes and come to their own “judgment” as more data continue to be presented showing the potential link of poor outcomes with GA.

Disclosures

R.G. is a consultant/scientific advisory board for Concentric Medical and CoAxia. A.A.-C. has no disclosures.

Table. Binary Logistic Regression Model Showing Variables Associated With General Anesthesia During Endovascular Therapy for Acute Ischemic Stroke

<table>
<thead>
<tr>
<th>Variable</th>
<th>OR</th>
<th>95% CI</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carotid terminus occlusion</td>
<td>1.72</td>
<td>1.18–2.5</td>
<td>0.005</td>
</tr>
<tr>
<td>Poor clinical outcome</td>
<td>2.23</td>
<td>1.61–3.08</td>
<td>0.0001</td>
</tr>
<tr>
<td>Intravenous tissue plasminogen activator before procedure</td>
<td>1.89</td>
<td>1.37–2.63</td>
<td>0.001</td>
</tr>
</tbody>
</table>

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