

Letter to the Editor

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Response by Brinjikji et al to Letter Regarding Article, “Anesthesia-Related Outcomes for Stroke Revascularization: A Systematic Review and Meta-Analysis”

In Response:

We would like to thank the SAGA (SIESTA-AnStroke-GOLIATH-Association) investigators for their letter regarding our recently published article titled “Anesthesia-Related Outcomes for Stroke Revascularization: A Systematic Review and Meta-analysis.”¹

Overall, we agree wholeheartedly with the notion that there are substantial limitations to the current literature. Retrospective studies and post hoc analyses of randomized controlled trials are prone to substantial selection bias. Furthermore, marked heterogeneity in definition of general anesthesia as well as devices and techniques use during thrombectomy (pre- versus post-stent retriever era) further cloud inferences. For these reasons, we performed meta-regression analyses adjusting for baseline National Institutes of Health Stroke Scale as well as sensitivity analyses, including studies from the modern era and the recently published SAGA trials. Overall, we found that when one includes all studies published in the literature, general anesthesia seems to be associated with worse outcomes. However, when we only included studies from the stent-retriever era, there was no statistically significant difference in outcome. Interestingly, when we included the 3 recently published/presented randomized trials, we found that general anesthesia was associated with higher odds of good functional outcome, the complete opposite of our initial finding.

The authors imply that only including randomized controlled trials in our meta-analysis would result in a nonbiased study. However, we do not necessarily think that is the case. Randomized controlled trials, particularly those which are based out of single centers, are also prone to biases which can significantly influence results. For example, consider the role that provider bias may have played in SAGA trials.²⁻⁴ It is unclear how thrombectomy was performed at the centers involved before the initiation of the single-center trials. If neurointerventionalists were primarily performing stroke intervention in intubated patients before the trial and then asked to perform the procedure in awake patients as part of the trials, this could introduce substantial biases because the operator was not working under his or her ideal conditions. Provider bias is suggested by the high rate of conversion from sedation to general anesthesia seen in SIESTA (Sedation vs Intubation for Endovascular Stroke Treatment) and AnSTROKE (Anesthesia During Stroke) ($\approx 15\%$). This rate is substantially higher than the rates seen in various real world experiences. These high rates of

conversion also undoubtedly influence outcomes in intention-to-treat analyses because patients who undergo conversion may be more likely to experience poor outcomes because of procedure delays and intubation-related complications.

Given the possible biases in the SAGA randomized controlled trials as well as the biases present in retrospective studies and post hoc analyses, there is definitely a need for more prospective data in the form of multicenter randomized controlled trials. We would like to thank the SAGA investigators for getting the ball rolling.

Disclosures

None.

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