During endovascular stroke treatment, controlling for hypotension or baseline stroke severity with ASPECTS eliminates the advantage of sedation over general anesthesia

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Introduction

Retrospective studies of intra-arterial therapy (IAT) for acute stroke have noted an association between use of general anesthesia (GA) and poor neurologic outcome,[1-4] possibly due to hypotension during the induction or maintenance of GA.[1] These studies attempt to control for stroke severity using a clinical scoring system called the NIH stroke scale (NIHSS). GA patients have higher baseline NIHSS in these studies and this clinical scale may not fully capture the severity of strokes. The Alberta Stroke Program Early CT Score (ASPECTS) provides an imaging measure of stroke severity. In phase 1 of our analysis we found that the advantage for sedation disappeared when ASPECTS was incorporated into the risk model. In phase 2 we found that controlling for hypotension also eliminated a statistically significant effect of sedation on outcome.

Methods

After IRB approval, we retrospectively reviewed our institutional endovascular database of patients treated for anterior circulation strokes. In phase 1 we examined over 40 variables in 216 consecutive patients treated between September 2010 and July 2012. Binary logistic regression was performed using variables with a p-value < 0.15 in univariate modeling to determine the independent predictors of a favorable neurologic outcome at 90 days (defined as modified Rankin Score 0-2, i.e. patient independent with ADLs). We then performed an analysis on the subgroup of 186 patients for whom ASPECT scores were available.

In phase 2 we focused on variables which were significant in the phase 1 univariate analysis and expanded the dataset to the 381 patients treated from September 2010 through October 2013. Few ASPECTS scores were available for the 165 patients treated since phase 1, so we focused on intraprocedure hemodynamics in this group.

Results

Table 1: Binary logistic regression model for good neurologic outcome (phase 1)

Variable	OR (95% CI)	P-value
Age	0.96 (0.93-0.98)	<0.001
NIHSS>15	0.29 (0.15-0.59)	0.001
Successful Reperfusion	4.66 (1.76-12.38)	0.002
MAC Sedation	2.09 (1.05-4.15)	0.035

Homser-Lemeshow test depicts goodness of fit to the model; χ^2=6.0; P=0.65).

•Consistent with prior studies, binary regression of phase 1 data using only NIHSS showed an association between MAC and good outcome (Table 1)

•Patients treated with MAC had less severe strokes as measured by NIHSS and ASPECTS (Figure 1).

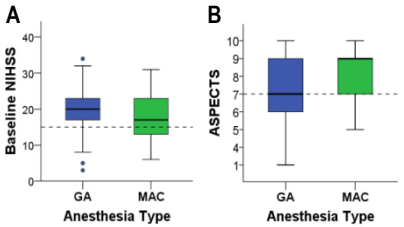

Figure 1. Box plots showing median and interquartile ranges for NIHSS (A, n=213) and ASPECTS (B, n=186) in phase 1 patients separated by anesthesia type. Groups differed by Mann-Whitney U test for both measures at P < 0.05

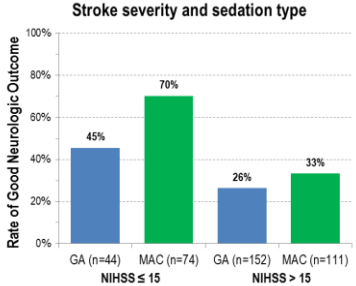

Figure 2. Among all 381 patients, the highest rates of good outcome were seen in patients with baseline NIHSS≤15 who received MAC anesthesia.

Table 2: Binary logistic regression model for good outcome incorporating ASPECTS

Variable	OR (95% CI)	P-value
Age	0.97 (0.95-0.98)	<0.001
NIHSS>15	0.338 (0.16-0.72)	0.005
ASPECTS>7	4.47 (2.04-9.79)	<0.001
Successful Reperfusion	4.90 (1.74-13.78)	0.003
MAC Sedation	1.34 (0.63-2.85)	0.445

Homser-Lemeshow test depicts goodness of fit to the model; χ^2=8.2; P=0.41).

•In both phases, MAC appeared to offer greater benefit in patients with less severe strokes (Figure 2)

•When ASPECTS>7 was added to the regression model, MAC no longer had a statistically significant association with outcome (Table 2)

•In phase 1, a recorded MAP≤70 during the IAT procedure was associated with worse outcome (Figure 3)

•In the full dataset, adding lowest MAP>70 to the regression model led to P>0.05 for MAC sedation even without ASPECTS (Table 3)

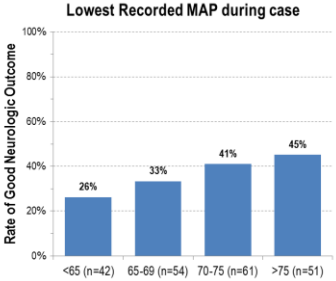

Figure 3. In phase 1, increases in the lowest MAP during IAT correlated with better outcomes (n=208)

Table 3: Binary logistic regression model for good outcome incorporating lowest MAP

Variable	OR (95% CI)	P-value
Age	0.97 (0.96-0.98)	<0.001
NIHSS>15	0.293 (0.17-0.49)	<0.001
MAP_{min}>70	2.04 (1.26-3.32)	0.004
Successful Reperfusion	7.30 (3.52-15.11)	<0.001
MAC Sedation	1.64 (0.99-2.69)	0.053

Homser-Lemeshow test depicts goodness of fit to the model; χ^2=9.2; P=0.32). N=369.

Conclusions

1. Future studies of the effect of anesthesia on stroke outcomes after IAT should incorporate ASPECTS or some other imaging measure of baseline stroke severity
2. Hypotension during the induction or maintenance of GA may contribute to worse outcomes and account for some of the benefits of MAC seen in earlier studies. Our data support and extend those reported by Davis et al.1
3. Future prospective trials should be designed to determine if aggressive use of vasopressors during IAT can increase favorable outcomes .

References

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