JVIN Journal of Vascular and Interventional Neurology
OFFICIAL JOURNAL OF THE ZEENAT QURESHI STROKE INSTITUTE

A survey of preprocedural intubation practices for endovascular treatment of acute ischemic stroke

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Abstract

Background—In the absence of specific guidelines, there is considerable variance in preprocedural intubation practices for endovascular treatment of acute ischemic stroke. The purpose of this study is to understand and characterize the variance in preprocedural intubation practices and identify the reasons that influence the choice of preprocedural intubation practices among treating physicians.

Methods—We selected 10 random cases from a prospective database of patients undergoing endovascular treatment for acute ischemic stroke and prepared a case summary providing pertinent demographic, clinical, and imaging data. Twenty clinicians independently reviewed the case summaries and responded to whether they would intubate any of the 10 patients and identified the reasons for their choices. Clinicians were also asked to identify their training background (neurology-, neurosurgery-, or radiology-trained endovascular specialist, vascular neurologist or neurointensivist). Reasons for intubation and agreement between clinicians for each case were ascertained.

Results—The decision to intubate the patient was made in 63 of 200 total clinical scenarios. The major reasons identified by the physicians for preprocedural intubation were high National Institute of Health stroke scale scores on admission 26.9% (*n* = 17), labored breathing or desaturation 23.8% (*n* = 15), less than optimal respiratory status of patients combined with drowsiness or reduced level of consciousness 14.3% (*n* = 9), inability to follow command due to aphasia 12.7% (*n* = 8), seizures 1.6% (*n* = 1), and no reason 20.6% (*n* = 13). Overall agreement between clinicians regarding decision of preprocedural intubation among the 10 case scenarios was 30.1% (standard error [SE] 2.3%). The agreement between neurosurgeons was 37.5% (SE = 31.6), interventional neurologist 19.8% (SE = 4.7), and vascular neurologist/neurointensivist 39.3% (SE = 5.9).

Conclusion—The decision of preprocedural intubation varies widely among clinicians. Because of recent data that suggests that decision of preprocedural intubation may impact on patients' outcomes, better standardization of such practices is required.

Key words

Intubation criteria; endovascular procedure; mechanical ventilation; general anesthesia

Introduction

There are no guidelines for preprocedural intubation in patients undergoing endovascular treatment for acute ischemic stroke. Practices among clinicians may vary widely and is often determined by training background, local believes, clinical presentation of individual patients, and availability of anesthesia resources. The issue has been highlighted in multiple reports that identify preprocedural intubation as one of the factors increasing the rate of poor outcomes in treated patients [1–4]. It is reasonable to suspect that certain practices may be adversely affecting the outcome of acute ischemic stroke patients treated with endovascular treatment. However, without further assessment of preprocedure intubation practices, standardization, and evidence based changes are not possible. The purpose of this study is to understand and characterize the variance in preproce-

Published September, 2014.

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Table 1. The frequency of reasons cited for preprocedural intubation.

Decision for intubation	*N*	Percent (%)
High NIH stroke scale score	17	26.9
Respiratory complications	15	23.8
Respiratory complications + LOC	9	14.3
No reason	13	20.6
aphasia	8	12.7
Seizure	1	1.6
Total	63	100

Abbreviations used: NIH: National Institution of Health, LOC: Level of consciousness.

Table 2. Interobserver agreement for elective intubation for neuroendovascular procedures among different specialties.

Specialty	Kappa agreement	Standard error for Kappa
Interventional neurologist (*n* = 10)	19.8%	4.7%
Neuroendovascular (neurosurgery) (*n* = 2)	37.5%	31.6%
Vascular neurologists/neurointensivists (*n* = 8)	39.3%	5.9%
Overall (20)	30.1%	2.3%

dural intubation practices and identify the reasons that influence the choices in preprocedural intubation practices among treating physicians.

Methods

We selected 10 random cases from a prospective database of patients undergoing endovascular treatment of acute ischemic stroke and prepared a case summary for each case. The case summary provided information on demographics, initial vital signs, and presenting symptoms with initial National Institutes of Health (NIH) stroke scale scores, relevant past medical history, initial imaging findings and whether intravenous Tissue plasminogen activator (tPA) was already given. A questionnaire based survey was prepared for each of the 10 cases with the above information and 20 clinicians were asked to choose whether they would intubate and mechanically ventilate prior to the patients undergoing endovascular procedures for each case scenario. The participants included all practicing faculty regardless of training background who had attended the first International Congress of Interventional Neurology in Minneapolis, MN. Clinicians were asked to identify why they would choose general endotracheal anesthesia for each case if they had made the choice for preprocedural intubation. They were also inquired to identify their training background (neurology-, neurosurgery-, or radiology-trained endovascular specialist, vascular neurologist or neurointensivist). We determined the [kappa] value for agreement between the all physicians and between physicians of different specialties including interventional neurologist, neurosurgeon and vascular neurologist. Reasons for intubation were summarized and agreement between clinicians for the decision in preprocedural intubation for each case was estimated using SAS 9.1 software (SAS Institute, Inc. Cary, NC).

Result

Twenty physicians [interventional neurologist (*n* = 10), neurosurgeons (*n* = 2), vascular neurologist/neurointensivists (*n* = 8)] participated in the survey to make decisions on 10 randomly selected cases from a retrospective database of patients undergoing endovascular treatment for acute ischemic stroke. The decision to intubate the patient was made in 63 of 200 total clinical scenarios. Preprocedural intubation was selected for a maximum of eight case scenarios by one clinician and for none of the cases by one clinician. The median rate of selecting preprocedure intubation was 3 of 10 case scenarios. The most frequently cited reason for intubation was high NIH stroke scale scores on admission 26.9% (*n* = 17), followed by respiratory status of patients on presentation such as labored breathing or desaturation 23.8% (*n* = 15), less than optimal respiratory status of patients combined with drowsiness or reduced level of consciousness 14.3% (*n* = 9), inability to follow command due to aphasia 12.7% (*n* = 8), seizures 1.6% (*n* = 1), and no reason 20.6% (*n* = 13). Table 1 shows the frequency of reasons for intubation. Overall agreement between clinicians regarding decision of preprocedural intubation among the 10 case scenarios was 30.1% (SE = 2.3%). The agreement between neurosurgeons was 37.5% (SE = 31.6), interventional neurologist 19.8% (SE = 4.7), and vascular neurologist/neurointensivists 39.3% (SE = 5.9). Table 2 lists the agreement between clinicians of different specialties.

Discussion

We found that considerable variation exists regarding the choice of for preprocedural intubation in patients undergoing endovascular treatment of acute ischemic stroke. While recent attention has been paid to standardi-

zation and good patient selection criteria for improving effectiveness of endovascular therapy for stroke, there are no guidelines on indications for endotracheal intubation and mechanical ventilation [5]. Most of the surveyed clinicians cited the following reasons for intubation: respiratory status of patients on presentation such as labored breathing or desaturation, drowsiness or reduced level of consciousness, inability to follow commands, and high NIH stroke scale. The degree of variation in preprocedure intubation practices is probably related to absence of any standardized criteria and lack of data from controlled clinical studies that can help define the patient population who could benefit from preprocedural intubation.

Previous studies have demonstrated that endovascular procedures can be successfully performed in awake patients with local anesthesia. Qureshi *et al* reported successful Guglielmi detachable coil embolization of both ruptured and unruptured cerebral aneurysms in 123 of 150 procedures in awake patients [6]. In those who had unruptured aneurysms (92 procedures in 80 patients), embolization was attempted and successfully completed without complications in 75 cases (82%) of awake patients with only one of the procedures being aborted owing to patient uncooperativeness. Emergent conversion to general anesthesia was required in one patient who underwent a complicated procedure that was subsequently aborted. In those who had ruptured aneurysms, embolization was attempted and successfully completed without complications in 48 (83%) of the 58 procedures. Induction of general anesthesia was required during the procedure in two of the five cases with complications [6]. Schumacher *et al* [4] reviewed a large body of literature on angioplasty or stent-assisted angioplasty of cerebral arteries, and recommended that the procedure has been performed successfully under local anesthesia. If the procedure is performed under general anesthesia, each patient will be continuously evaluated by a neuroanesthesiologist which will also provide monitoring of blood pressure for the avoidance of hypotension and the prevention of hypertension during and immediately after the procedure. This report also recommended that basilar artery lesions should be treated under general anesthesia because occlusion of the artery during balloon inflation may result in loss of consciousness and apnea [4]. Such reports suggest that the rate of preprocedural intubation maybe excessive and perhaps more procedures can be performed without preprocedure intubation.

The results should be interpreted with the understanding that preprocedural intubations may increase the rate of poor outcomes among patients undergoing endovascular treatment for acute ischemic stroke. Hassan *et al* looked at the rate of poor outcome in 136 acute ischemic stroke patients who received endovascular treatment (83 of whom received local sedation without intubation and 53 of whom were intubated) and found that after adjusting for age, gender, and NIH stroke scale score, poor outcome at discharge (defined as modified Rankin Score (mRS) score ≥3) (OR 2.9, 95% CI 1.2–7.4, P = 0.0243) and in-hospital mortality (OR 4.5, 95% CI 1.5–12.5, *P* = 0.0.0046) were significantly higher among intubated patients [1]. In addition, after adjusting for pneumonia, the effect of intubation on poor outcome at discharge (OR 2.7, CI 1.1–7.1, *P* = 0.0006) and in-hospital mortality (OR 4.4, CI 1.6–12.5, P = 0.00051) remained significant concluding that this increased rate is not explained by higher rates of subsequent aspiration pneumonia [1]. Jumma *et al* studied 126 consecutive patients with acute stroke owing to middle cerebral artery (M1 segment occlusion) treated with endovascular therapy and found that intubated patients had significantly higher NIH stroke scale score at baseline (17.6 versus 15.1, *P* = 0.004), longer length of stay in the ICU (6.5 days versus 3.2 days, P = 0.0008), higher incidence of early (within 7 days) pneumonia (30% versus 13.7%, *P* = 0.024) compared with nonintubated patients [2]. In addition, age (OR 0.92, *P* < 0.001), admission NIH stroke scale score (OR 0.88, *P* = 0.036), successful recanalization (OR 8.6, *P* = 0.015), and conscious sedation (OR 3.06, *P* = 0.042) were found to be independently associated with favorable outcome [2]. Nichols *et al* found that of 75 patients with recorded sedation methods in the Interventional Management of Stroke (IMS) II Trial, 53% (*N* = 40) were given no sedation and 23% (*N* = 17) were intubated/paralyzed and those who were heavily sedated or intubated/paralyzed had more severe strokes as evidenced by their higher baseline NIH stroke scale score and those who were not sedated or had mild sedation had better outcomes, more frequent reperfusion rates, and lower mortality [3]. Sedation level was a predictor of poor outcome on multivariate analysis controlling for baseline NIH stroke scale score. Abou-Chebl *et al* also reported that in a retrospective review of 980 endovascular acute stroke cases performed at multiple centers, patients who received general anesthesia had worse neurologic outcomes [OR 2.33 (95% [CI] 1.63–3.44), *p* = 0.0001] and higher mortality [OR 1.68(95% CI 1.23–2.30), *p* = 0.0001] compared with those given conscious sedation [7]. Although it is difficult to determine any cause-and-effect relationship between sedation and outcome, different studies demonstrate that patients have better outcomes if minimal sedation is used for these procedures. Although there are a variety of sedation

approaches, choices are commonly left to the physician and may be guided primarily by other cardio- and cerebrovascular considerations [8].

A survey of 49 interventional neuroradiologists by McDonagh *et al* found that most respondents rated general anesthesia as their preferred method of anesthesia during acute ischemic stroke interventions particularly for procedures associated with mechanical manipulation including thrombectomy, angioplasty, and/or stenting. The clinicians' perceived complications of awake procedures were agitation, airway loss, aspiration, and patient movement resulting in injury requiring acute conversion to general anesthesia [9]. There is no direct data to validate the perceived concerns among neurointerventionalists. The only data available is from randomized trial that randomized 50 patients to undergo percutaneous transluminal coronary angioplasty (PTCA) for acute myocardial infarction either under general anesthesia or intravenous sedation found that there was no procedure delay as a result of anesthesia, and anesthetic induction did not change hemodynamic parameters (heart rate and blood pressure) throughout the procedure once steady-state anesthesia had been attained [10].

Conclusion

Our sample size is small and may not be representative of all practices of practitioners from different training backgrounds. The decision to intubate and mechanically ventilate acute ischemic stroke patients who are undergoing emergent endovascular treatment varies widely among clinicians. Further studies are needed to objectively identify and standardize indications for preprocedural intubation among acute ischemic stroke patients.

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