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ARTICLE OF THE MONTH

Airway Management with a Sterotactic Headframe in Situ: A Mannequin Study

Brockerville M, Unger Z, Rowland NC, Sammartino F, Manninen PH, Venkatraghavan L. *J Neurosurg Anesthesiol*. January 2018. 30(1): 44-48.

Welcome to the March 2018 installment of SNACC's Article of the Month. This month's selection addresses emergent airway management during stereotactic neurosurgical procedures, a potentially complicated and precarious clinical scenario.

Article selection and expert commentary are provided by Shilpa Rao, MD. Dr. Rao is an assistant professor of anesthesiology at Yale School of Medicine and Yale New Haven Hospital. She is an active member of SNACC and holds a position on SNACC's Trainee Engagement Subcommittee.

Readers are welcome to join us for further discussion on the **LinkedIn** feed, the **Twitter** feed or on **Facebook**.

~ Adrian Pichurko, MD, Nina Schloemerkemper, MD, and Oana Maties, MD

Commentary

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Deep Brain stimulator (DBS) insertion is increasingly being performed at tertiary level institutions as a standard treatment for patients with Parkinson's disease and other movement disorders such as essential tremor. Often this is performed in an awake patient under local anesthesia and intravenous sedation as tolerated. The surgery involves placing a stereotactic headframe which limits the anesthesiologists' access to the airway; CT-guided confirmation of external coordinates, microelectrode recording, and stimulation to test for accuracy.

Emergency airway rescue may be required in situations involving respiratory obstruction due to excessive sedation leading to unintentional apnea, secretions, bronchospasm, laryngospasm, or a combination of the above factors while the patient is still in the stereotactic headframe. This observational study attempts to analyze the time taken for emergency airway management in a mannequin, with and without the headframe.

The participants involved 30 anesthesia personnel from different levels of training. The stereotactic headframe was applied on the mannequin, simulating a real life scenario. The participants were asked to first insert a #4 Laryngeal Mask airway (LMA) in a simulated surgical position, facing the patient. The participants then intubated

the mannequin using the direct and video laryngoscopy (DL and VL), using the MAC #3 blade and C-MAC #3 blade respectively. These maneuvers were repeated without the headframe.

The elapsed time was noted from the opening of the package containing either the LMA or the endotracheal tube until bilateral lung expansion. With the headframe *in situ*, 97% of participants successfully inserted a laryngeal mask on their first attempt. Similarly, 93% and 97% of participants were able to intubate the mannequin using DL and VL respectively on their first attempt. All the participants were able to insert the laryngeal mask and intubate the mannequin using both DL and VL during their first attempt without the headframe.

Time to securing the airway was compared between groups of participants (residents, fellows, and consultants) because the level of expertise may affect performance times. It took residents longer to secure the airway using VL when compared with fellows and consultants. There were no other significant differences between the groups. This may be due to either unfamiliarity with the equipment or the lack of experience because the majority of the residents were in their second year of training.

This study showed that the LMA is the quickest airway device to insert in the standard surgical position. Respectively, LMA placement, VL, and DL averaged 39, 55, and 58 seconds. A physiologic model by Farmery suggests that, depending on various patient characteristics (size, severity of illness), critical desaturation during apnea (SpO2 of 85%) occurs in a range of 41-84 seconds on room air and 171-502 seconds if completely preoxygenated (FAO2 0.87) [1]. Taenzer *et al* [2] showed that in postoperative spontaneously breathing patients with obstructive sleep apnea (OSA), time taken to desaturate from SpO2 > 92% to 80-84% on room air was 2.6 min (1.4-4.8) and with 1-6 liters of supplemental oxygen was 4.6 min (2.5-8.7). By these numbers, an apneic patient on room air may critically desaturate before establishing a secure airway; it may be important in these surgeries to use supplemental oxygen to afford time in case airway management is needed.

Some of the limitations of this study include the fact that the mannequin may not adequately represent the real patient at all times, such as the inability to produce cough, secretions, airway edema, and anatomical variations of the patient's airway. Nevertheless, this is still an important attempt to improve the preparedness of the anesthesia personnel and to better equip them to deal with a similar scenario in real life.

Future trends could include simulation sessions where the participants can focus on emergency airway management in a less stressful scenario, which better prepares them to handle an actual airway emergency in this setting.

References:

1. Farmery AD, Roe PG. A model to describe the rate of oxyhaemoglobin desaturation during apneoa. *Br J Anaesth*. 1996 Jun;76(2):284-91.
2. Taenzer et al. Characteristics of Desaturation and Respiratory Rate in Postoperative Patients Breathing Room Air Versus Supplemental Oxygen: Are They Different? *Anesth Analg*. 2018 Mar;126(3):826-832