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SOCIETY FOR NEUROSCIENCE IN ANESTHESIOLOGY AND CRITICAL CARE

ARTICLE OF THE MONTH

Intubation Biomechanics: Laryngoscope Force and Cervical Spine Motion during Intubation with Macintosh and Airtraq Laryngoscopes

Hindman BJ, Santoni BG, Puttlitz CM, From RP, Todd MM.
Anesthesiology. 2014 Aug;121(2):260-71. PMID: 24739996

In this month's installment of the SNACC Article of the Month, the discussion centers around an issue which is of general importance to all anesthesiologists, but may be particularly important to those of us who "think" about the cervical spine more often, namely the force and motion applied by varying means of endotracheal intubation. Over the past few years, many new "airway toys" have come to market, and objective evaluation of these instruments as they relate to the cervical spine are forthcoming, and in many cases unavailable. This paper by Hindman et al., a group well-known for this sort of evaluation, deals with the cervical spine effects of traditional rigid laryngoscopy (Macintosh blade) versus laryngoscopy by means of the Airtraq® laryngoscope. Our expert this month is Dr. Mazen Maktabi, a long-time SNACC member and truly an expert in the varying effects/success rates of intubation by various means (especially fiberoptic), having published extensively in this field. A key point made by Hindman et al., and by Dr. Maktabi, is that the results of this study show that less force DOES NOT EQUAL less motion. We hope you will enjoy the December 2014 Article of the Month, and we ask you to jump into the conversation on the ***SNACC LinkedIn Feed*** so we can hear (or see?) your thoughts!

~John F. Bebawy, MD

Commentary

Comments by: Mazen Maktabi, MD
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Endotraceal intubation is an essential skill that anesthesia providers master and perform frequently and routinely. Placing an endotracheal tube in the trachea, using direct laryngoscopy or video laryngoscopy, has an impact on cervical spine motion and the relationship of the cervical spine to the occiput of the skull. A significant body of literature describes the impact of direct laryngoscopy (with curved or straight metallic blades) and video laryngoscopes with differing line of sights on cervical spine motion. However, what we don't know much about is the effect of the force applied during laryngoscopy and intubation to the soft tissues of the airway and its vicinity, and the cervical spine and how does this force affect cervical spine motion. This research by Hindman et al

studied the relationship between laryngoscope force and cervical spine motion (Occiput-C5) using two laryngoscopes (Macintosh and Airtraq, in a carefully randomized fashion) in patients who were expected to be easy to intubate, have a known stable cervical spine and a body mass index of 30.0 kg/m2. Please refer to the text of the article for the complete list of exclusion and inclusion criteria.

The outcome measures were (1) maximal laryngoscope force application, and (2) maximal overall (Oc-C5) cervical spine motion (extension). Referring to previous work by the authors, a cohort of 14 patients was projected to have an adequate power (two-sided [alpha] = 0.05, 1-[beta] = 0.80) to detect differences as follows: (1) force application: 50% difference relative to control (Macintosh SD = 33 to 47%); (2) Oc-C5 extension: 10 to 15% difference relative to control (Macintosh SD = 34%). C arm fluoroscopy was used to assess the outcome measures at the following intervals: preintubation baseline (stage 1) and the changes that took place at stage 2 (laryngoscope introduction); stage 3 (best glottic view); and stage 4 (endotracheal tube in trachea). The major results are (a) significantly greater laryngoscope force was needed to achieve a best glottic view with Macintosh blades vs. Airtraq (48.8 ± 15.8 versus 10.4 ± 2.8 Newtons, respectively, P = 0.0001) and (b) significantly greater extension of Occiput-C5 occurred while using the Macintosh vs. Airtraq at the point of the best glottic exposure 29.5 ± 8.5 versus 19.1 ± 8.7 degrees, respectively, P = 0.0023 and (c) between stages 2 and 3, the motion/force ratio differed between Macintosh and Airtraq: 0.5 ± 0.2 versus 2.0 ± 1.4 degrees/Newton, respectively; P = 0.0006.

The author concluded that the forces needed to be applied during laryngoscopy with both devices change in a non linear fashion during the process of laryngoscopy and intubation. They also concluded that despite the fact that the force exerted during the use of the Airtraq was about 20% of the force needed during intubation with a Macintosh blade, 67% as much motion occurred during intubation with Airtraq. These results clearly suggest that less force during laryngoscopy does not mean that less cervical spine motion takes place. These results apply only to patients with expected easy intubation (based on preoperative assessment) and stable cervical spines. The results, therefore, should not be extrapolated to patients with unstable cervical spines. More research is needed to address the same questions in patients with unstable cervical spines.