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Original Contribution

Observational study of Mallampati changes after prone spinal surgery☆,☆☆,☆☆☆,★,★★,★★★,★★★★

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Abstract

Study Objective: To evaluate airway changes in patients undergoing surgery in the prone position.
Design: Single-arm observational study.
Patients: Patients between 18 to 65 years old, scheduled for prone spinal surgery; 74 patients were enrolled and 54 patients were analyzed.
Intervention: The initial airway examination was graded according to the Samsoon and Young modification of the Mallampati classification (MMP). Airway photographs were obtained in a standardized manner and were repeated 20 minutes after extubation. The photographs were then randomized.
Measurements: Subjects' age, gender, race, weight, duration of surgery, amount of crystalloid fluid given, and estimated blood loss were recorded. Three senior anesthesiologists who were blinded to the origin of the photographs analyzed and graded the airways.
Main Results: All statistical tests showed significance between preMMP and postMMP scores ($P < 0.001$). There was no difference between pre and post interobserver MMP scores. The MMPs of 12 patients (22%) did not change and MMP scores were changed in 42 patients (78%): 30 (71%) patients by one class, 10 (24%) patients by two classes, and two patients (5%) by three classes. There was no correlation between patients whose MMP was changed and length of surgery or crystalloid administered.
Conclusion: Modified Mallampati scores increased in the majority of patients after spinal surgery in the prone position.

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☆☆ Presented in part at the New England Anesthesia Residents Conference at Boston University, April 3, 2010.
☆☆☆ This study was conducted with written informed consent from the study subjects.
★ This report describes an observational clinical study.
★★ Information for LWW regarding depositing manuscript into PubMed Central: This paper does not need to be deposited in PubMed Central.
★★★ This report describes human research. IRB contact information: University of Vermont Institutional Review Board, Burlington, VT. Director, Nancy.Stalnaker@uvm.edu.
★★★★ Link to Title Page: http://www.aaauthor.org/pages/7374-2013-Jun-10.

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1. Introduction

Death or brain injury from respiratory complications during anesthesia appears to be decreasing over the last three decades [1]. In spite of these improvements, the ASA closed claims analysis of the difficult airway over the last decade has shown no significant improvements in postoperative airway catastrophes [2]. This trend was mirrored in the most recent national audit of airway complications from the United Kingdom, which demonstrated that nearly 30% of serious anesthetic airway complications occurred after induction [3]. The cause of postoperative airway catastrophes is most likely multifactorial. The Difficult Airway Society recently published the first guidelines for management of tracheal extubation and included a list of anatomic, physiologic, and human factors that may contribute to difficult extubation [4]. They state that "patient position (prone or prolonged Trendelenburg positions), duration of surgery, fluid overload, and anaphylaxis may contribute to airway edema."

Anaphylaxis and hereditary angioedema are obvious examples of how the airway change may be so profound as to require an emergent surgical airway. Due to the nature of such events, objective volumetric data cannot be collected. Changes to the airway during head and neck surgery have been known to occur (eg, carotid surgery, thyroid surgery), but intraoperative airway changes from the surgery itself, the underlying condition, or position are less well quantified [5–7]. Recently, Kodali et al showed that during labor, parturients' Modified Mallampati (MMP) classification increased by at least one grade in 38% of women and that total oral volume decreased [8]. Pilkington et al showed in a cohort study of 242 pregnant women that the number of grade 4 MMP cases increased by 34% as pregnancy progressed [9].[9]

However, patient position and its relation to intraoperative airway changes have not been well studied. To our knowledge, there are no prospective studies that have evaluated airway changes that occur during prone surgery. Hypothesizing that prone positioning would cause quantifiable airway edema, airway changes in patients undergoing surgery in the prone position was assessed by modified MMP scores. In addition, length of surgery and quantity of intravenous (IV) fluid administered during surgery were recorded for analysis as covariates.

2. Materials and methods

This study was approved by the University of Vermont's Institutional Review Board, Burlington, Vermont. After obtaining written, informed consent, we enrolled 74 patients between the ages of 18 to 65 years. The patient's anesthesia team performed their own airway examination. For this study, the initial airway examination was graded according to the MMP. Patients were asked to open their mouth as wide as they could without phonation. Inclusion criteria were all patients scheduled for lumbar back surgery in the prone position. Exclusion criteria were patient refusal, history of a difficult intubation, Mallampati Class 4 airway, history of difficult mask ventilation, or the inability to open the mouth for assessment.

For reference, in a Class 1 airway, the soft palate, uvula, fauces, and pillars are visible; Class 2: soft palate, uvula, and fauces are visible; Class 3: soft palate, and base of uvula are visible, and Class 4: only the hard palate is visible.

Airway photographs were obtained using a Cybershot DSC T-100 (Sony Electronics Inc., Tokyo, Japan) with patients in a sitting position and the camera held horizontal to the ground at the level of the uvula. The photographs were taken at 7.5 cm from the philtrum to the lens. The same procedure for taking photographs was performed 20 minutes after extubation in the postanesthesia care unit after regaining an adequate level of consciousness, defined by orientation to time place and person, and the ability to follow a one-step command in either the supine or sitting position. Photographs were taken between 15 and 25 minutes after extubation. The photograph file names were then coded and randomized using Excel (Microsoft, Seattle, WA). Typical blinded pre and post photographs are shown in Fig. 1a, b. All subjects received general anesthesia with ASA standard monitoring. Duration of surgery, amount

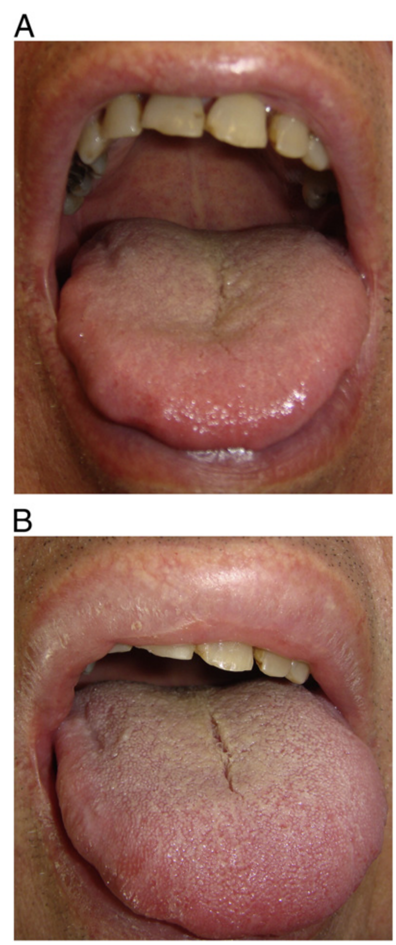

Fig. 1 **(A)** Typical patient's photograph before surgery. **(B)** Same patient after 104 minutes of surgery and 15 minutes after extubation.