Title: CARDIOVASCULAR CHANGES DURING AWAKE RIGID AND FIBEROPTIC LARYNGOSCOPY

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Introduction: There are many clinical situations in which awake tracheal intubation is advantageous and, at times, necessary. Among techniques available to perform this task are so-called "blind" methods, fiberoptic methods, and methods using rigid laryngoscopes. This institutionally approved study compares oral fiberoptic and rigid laryngoscopy for awake tracheal intubation to assess relative success rates and changes in heart rate and blood pressure observed during the two different techniques.

Methods: Informed consent was obtained from 40 adult male patients who were scheduled to undergo elective surgery requiring a general anesthestic and oral endotracheal tube. Patients were excluded from the study if they had uncontrolled hypertension, experienced unstable angina, took more than two cardiac medications, had symptoms of CHF, or were judged to have a difficult airway. All patients received comparable doses of atropine and diazepam one-half hour before surgery. Routine monitoring alone with an indwelling radial artery catheter were placed. IV sedation was given as incremental doses of fentanyl (2ug/kg) and diazepam (70ug/kg). Arterial blood gas samples (FiO_2=0.21) were obtained at the beginning and end of the sedation period. After sedation, topical anesthesia was applied to the posterior pharynx and tongue. In addition, 4 ml of 4% lidocaine was injected into the larynx through the cricothyroid membrane. Evaluations of the adequacy of sedation and topical anesthesia were made for each patient. Once sedation and topical anesthesia had been administered, a sealed envelope was opened to reveal the patient's random assignment to either the rigid or fiberoptic group. Equipment for both types of laryngoscopy was available at the beginning of each case. All intubations were performed by the same anesthesiologist. Criteria for a failed intubation were established as 1) inability to intubate the trachea after three attempts and/or 2) the patient's rejection of the procedure by either verbal remarks or bodily movements. A standarized post-operative evaluation to assess recall and satisfaction with the particular method of intubation was done by an anesthesiologist who had no knowledge of the type of intubation performed. Heart rates (HR) and blood pressures (BP) were continuously recorded throughout the study period. From these recordings, representative values were determined for each of these intervals: 1) after the monitors had been placed, 2) after sedation, 3) following the application of topical anesthesia. 4) immediately before intubation, 5) during laryngoscopy, and 6) immediately after intubation. Statistical analysis consisted of a Fisher's exact test, Mann Whitney U test, uncorrected non-paired T-test, and 2 factor ANOVA with repeat measures on 1 factor followed by a post hoc t-test with the Bonferonni correction as appropriate; criteria for rejection of the null hypothesis was a p value of less than 0.05 using 2 tailed criteria.

Results: The two groups of 20 patients did not differ in age, weight, ASA physical status, or in the number of cardiac medications taken. The endotracheal tube was successfully placed in 15 of 20 patients where a rigid laryngoscope was used and in all 20 of the fiberoptic intubations. The average intubation times as well as the ranges of these times were comparable for the two groups. In addition, patients in each group had similar levels of sedation, arteral oxygenation after sedation, and satisfaction with the procedure. Tables 1 and 2 list the mean HR and MAP values for the two groups over the four time periods noted. Only data for patients who were successfully intubated are included. All statistical comparisons were made relative to the pre-intubation values because the study was designed to look at cardiovascular changes resulting from laryngoscopy rather than from sedation. There were no statistically nor clinically significant increases in HR in either group during the period studied (table 1). Furthermore, there were no significant differences found between the groups at these times. During the rigid laryngoscopy, there was a statistically significant increase in MAP between the pre-intubation and laryngoscopy time periods (table 2). There were no similar increases noted in the fiberoptic group. And, as with the HR changes, there were no significant differences between the groups at these times.

Conclusions: Awake fiberoptic laryngoscopy was more successful than rigid laryngoscopy. Under a controlled situation in which adequate IV sedation and topical anesthesia have been given, the awake fiberoptic method is a more dependable means of securing the airway. Although neither the fiberoptic nor the rigid laryngoscopy caused a significant increase in HR, rigid laryngoscopy produced a statistically significant increase in blood pressures. Whether or not this is clinically significant is open to interpretation. Overall, the fiberoptic method appears to be the superior technique by minimizing HR and BP changes during awake oral endotracheal intubation.

Table 1 HEART RATE (bpm)

	Rigid Mean (± SD)	F/O Mean (± SD)
Baseline	85.9 (14.8)	75.8 (15.1)
Pre-intubation	90.4 (15.3)	79.4 (11.5)
During laryngoscopy	90.5 (15.9)	81.3 (12.9)
Post-intubation	90.1 (16.4)	81.0 (12.8)

Table 2 MEAN ARTERIAL PRESSURE (mm Hg)

	Rigid Mean (± SD)	F/O Mean (± SD)
Baseline	98.7 (17.4)	109.7 (14.6)
Pre-intubation	99.6 (23.9)*	103.4 (16.6)
During laryngoscopy	110.6 (28.8)*	105.8 (17.1)
Post-intubation	109.4 (28.3)	106.9 (15.6)

* p <0.05