CONTINUOUS GASTRIC SUCTIONING DECREASES MEASURED ESOPHAGEAL TEMPERATURE DURING GENERAL ANESTHESIA
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ABSTRACT. Objective. This study sought to determine whether continuous gastric suctioning influences esophageal temperature measurements. Methods. This study evaluated 21 patients scheduled for extremity or lower abdominal surgery. After induction of general endotracheal anesthesia, an orogastric tube, and esophageal and nasopharyngeal temperature probes were placed in functional positions. Baseline esophageal (Tes) and nasopharyngeal (Tnas) temperatures were recorded and the orogastric tube was placed on continuous suction. After the first 11 patients (Group I) were studied, 10 additional patients (Group II) were studied with more frequent data collection to improve the time resolution of temperature changes. Temperatures were recorded for patients in Group I at 2 and 10 min with suctioning and 10 min after cessation of suctioning. In Group II, temperatures were recorded at 1, 2, 5 and 10 min with suctioning and 10 min after cessation of suctioning. Analysis of data was performed using repeated measures analysis of variance and paired t-tests with the Bonferroni correction. Results. In Group I, Tes decreased significantly from 35.9 ± 0.2 °C (mean ± SE) to 35.1 ± 0.4 °C at 2 min and 34.8 ± 0.3 °C at 10 min of suctioning (p < 0.01). Ten minutes after cessation of suctioning, Tes was not significantly different from the baseline measurement. Tnas did not change significantly over the 20 min observation period. In Group II, Tes continually decreased from 36.2 ± 0.1 °C to 34.8 ± 0.3 °C after 10 min of suctioning (p < 0.006) and returned to near baseline 10 min after cessation of suctioning. There was no significant change in Tnas over the 20 min observation period. Conclusion. We conclude that continuous gastric suctioning decreases esophageal temperature measurements. This phenomenon should be recognized as an artifactual change in esophageal temperature and not a reflection of core temperature.


INTRODUCTION
Monitoring temperature during general anesthesia provides an estimate of core temperature and aids in the diagnosis of intraoperative temperature aberrations [1, 2]. Aggressive management of intraoperative hypothermia is often pursued to avoid postoperative discomfort and increases in myocardial oxygen demand due to shivering. Interventions to prevent hypothermia include warming blankets, fluid warmers, heating pads, airway humidifiers and heating lamps [3]. In addition to increased costs, some methods of hypothermia prevention and treatment are associated with patient morbidity such as thermal burns from warming blankets [4]. Accurate assessment of core temperature is desirable to guide rational use of warming methods.
Recently, we observed fluctuations in measured esophageal temperatures during continuous gastric suctioning. This study was designed to determine whether continuous gastric suctioning decreases measured esophageal temperature in the absence of true changes in core temperature.

**METHODS AND MATERIALS**

Following Institutional Review Board approval, we enrolled 21 patients in the study. All patients (age >17 years) were American Society of Anesthesiologists Class I or II and scheduled for extremity or lower abdominal surgery under general anesthesia with placement of an endotracheal tube. After induction of general anesthesia and endotracheal intubation, anesthesia was maintained with isoflurane, nitrous oxide-oxygen, fentanyl, and vecuronium or pancuronium. We inserted an 18-French vented orogastric tube (OGT) (Sherwood Medical, St. Louis, MO) and confirmed placement by suctioning of gastric contents and auscultation over the gastric region. An 18-French esophageal stethoscope with a temperature sensor (Respiratory Support Products Inc., Irvine, CA) was placed approximately in the distal third of the esophagus by advancing the stethoscope 10–16 cm beyond the best auscultated heart sounds [5]. An additional temperature sensor (Respiratory Support Products Inc., Irvine, CA) was placed approximately 6–8 cm into the nasopharynx to provide a reference temperature. Both temperatures were monitored on a Surgical Monitoring System (Marquette Electronics Series 7000). Initial measurements were made between 10–15 min after induction, skin preparation, and draping.

Group I was comprised of the first 11 patients. Esophageal temperature (Tes) and nasopharyngeal temperature (Tnas) were recorded after placement of the OGT and temperature monitors. Continuous wall suction was then attached to the OGT and suctioning was confirmed by listening for air flow through the sump channel. Air flow through the sump channel produced an audible “whistling,” which was rechecked every 2 min during data collection. In five cases, the OGT required minor changes in position when audible flow was absent. Tes and Tnas were recorded at 2 and 10 min following the start of orogastric suctioning. Suction was then stopped and both Tes and Tnas were recorded 10 min later. To better evaluate the change in Tes with suctioning, 10 additional patients (Group II) were studied. Temperatures in Group II patients were recorded at 1, 2, 5 and 10 min after suction was started and 1, 2, 5 and 10 min after suction was stopped.

No active or passive warming of patients other than surgical draping was performed during the study period. Repeated measures ANOVA was used to determine whether or not the differences observed between the temperature measurements at each time point were statistically significant. Paired t-tests with the Bonferroni correction were used as a follow-up test.

**RESULTS**

Both groups demonstrated a significant decrease in measured esophageal temperature with gastric suctioning. In Group I, Tes decreased from 35.9 ± 0.2 °C (mean ± SE) to 35.1 ± 0.4 °C at 2 min and 34.8 ± 0.3 °C at 10 min following the institution of orogastric suctioning (p < 0.01). Tes returned to 35.6 ± 0.2 °C 10 min after suctioning was discontinued (NS compared to baseline). Tnas did not change significantly during the 20 minute study period (36.1 ± 0.1 °C

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Fig 1. Effect of continuous orogastric suctioning on esophageal (○) and nasopharyngeal (●) temperature measurements over time in Group I (mean ± SE, *p < 0.01 compared to baseline Tes and Tnas).