The Heat and Moisture Exchanger Does Not Preserve Body Temperature or Reduce Recovery Time in Outpatients Undergoing Surgery and Anesthesia

MICHAEL E. GOLDBERG, M.D.,* REHANA JAN, M.D.,† CHARLES E. GRIEGG, M.D.,‡ ROBERT BERKO, M.D.,* ALEXANDER T. MARR, C.R.N.A.,§ GHASSEM E. LARIJANI, PHARM.D.††

Conahan et al.† have demonstrated reduced recovery time and increased patient comfort with the use of a heated humidifier during outpatient surgical procedures of intermediate duration. They implied that the time saved in terms of recovery would result in a significant reduction of cost. The set-up of a heated humidifier can be time consuming and expensive. We, therefore, examined what effect the use of a heat and moisture exchanger (HME) might have on body temperature, patient comfort (feelings of cold), recovery, and discharge time in patients undergoing surgical procedures of intermediate duration in the outpatient setting.

MATERIALS AND METHODS

This study was approved by our institutional review board and informed consent was obtained. Twenty-nine female ASA Class I–III outpatients ages 18–60 yr, who were scheduled for laparoscopic procedures lasting more than 30 min but not greater than 90 min, were studied. Patients were assigned utilizing a random table to receive a HME** or no device. Sublingual temperatures, utilizing an electronic thermometer,†† were determined 5 min prior to anesthetic induction, every 15 min intraoperatively, upon arrival in the recovery room, every 15 min until discharge from the recovery room, and on discharge from the short procedure unit.

Induction of anesthesia consisted of 3 mg of d-tubocurarine followed by 5 mg/kg of thiopental iv after breathing oxygen for 3 min. Succinylcholine 1.5 mg/kg iv was given to facilitate endotracheal intubation. Maintenance of anesthesia consisted of 60% nitrous oxide in oxygen at 6 l/min total flow, with up to 1.2% end-tidal isoflurane and fentanyl 1–3 μg/kg iv. End-tidal concentration of gases were monitored by infrared analysis with a Beckman LB-3® analyzer. Once recovery from succinylcholine was demonstrated, skeletal muscle paralysis was achieved with vecuronium 0.04 mg/kg iv. At the conclusion of the procedure, residual neuromuscular blockade was antagonized with neostigmine 2.5 mg and glycopyrrolate 0.5 mg iv. Operating and recovery room ambient temperatures were noted, but were allowed to vary. Warmed iv solutions and warming blankets were not utilized. The recovery room staff was blinded as to patient treatment, and was asked to evaluate the patient's status in terms of shivering or complaints of feeling cold. Standard criteria for discharge from the recovery room and short procedure unit (i.e., ambulation, ability to void, tolerate p.o.) were followed. Body temperature is not a criteria for discharge from either unit. Statistical analysis consisted of multivariate analysis of variance with Duncan's multiple range test and Fisher exact probability test. A P value < 0.05 was considered to be statistically significant.

RESULTS

There was no significant difference between the two groups for age, ASA physical status, weight, surgical length, and ambient temperature of the operating or recovery rooms (table 1). There also was no significant difference in baseline temperature, recovery room ad

* Assistant Professor.
† Clinical Assistant Professor.
§ Instructor in Anesthesiology.
‖ Assistant Professor of Anesthesiology/Pharmacology.
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Address reprint requests to Dr. Goldberg: Thomas Jefferson University Hospital, Department of Anesthesiology, 111 S. 11th Street—Suite 6275, Philadelphia, Pennsylvania 19107.
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** Pall Biomedical Products Corporation, East Hills, L.I., New York 11548.
†† FILAC Corporation, Subsidiary of Chesebrough-Pond's Inc. Hospital Products Division, Greenwich, CT 06830.
ing cold (table 1). Within each group, the recovery room admittance temperature was significantly decreased from the preoperative baseline. \(P < 0.05\)

**Discussion**

Multiple heat and moisture exchange devices are on the market which have been thoroughly evaluated in the laboratory for their ability to maintain humidity.\(^2,3\) Very few studies, however, have examined the ability of these devices to maintain body temperature.\(^4-5\) Chalon et al.,\(^3\) in a small clinical study, demonstrated that patients undergoing surgery of approximately 150 min duration maintained temperature significantly better with an HME than without one. Their study was not performed on outpatients, and does not mention recovery or discharge times and, hence, no conclusion can be drawn concerning speed of patient recovery when a HME is utilized.

Conahan et al.\(^1\) found that outpatients undergoing procedures of 65–70 min in duration were significantly warmer, recovered faster, and were discharged earlier when heated humidification of gases was used. In view of this finding, and as a result of Chalon et al.'s\(^3\) findings, we undertook a study to determine if the HME will prevent the fall in body temperature that occurs during surgery and if the use of this device might speed recovery and discharge of our outpatients. We found that the use of HME did not prevent a decrease in body temperature or allow quicker discharge from the recovery room when compared to patients who received no device. These findings might be due to a difference in the ability of the HME and heated humidifier to maintain body temperature. Other factors, however, need to be considered. The discrepancy might be the result of a shorter duration of surgery in our study (45 min) as opposed that of Conahan et al. (65 min) and Chalon et al. (150 min). Perhaps a critical time is required before any benefit is seen from heating and humidifying inspired gases, despite the fact that most of the decrease in body temperature which occurs is in the first hour of surgery.\(^7\) In Conahan et al.'s\(^1\) study, end-tidal concentration of anesthetic was not monitored, and bias might have been introduced in that the control group could have received a higher concentration of agent resulting in greater vasodilatation and a resultant lower body temperature. The doses of fentanyl and vecuronium were standardized in both groups and were the same.

There was a decrease in body temperature from the start of the case to the time the patient was admitted to the recovery room. This indicates that body temperature will decrease in both cases; however, with longer duration of surgery, the HME might prevent further decreases which would occur without the use of the device, and this might be clinically significant. Although the trend was for the HME patients to have a higher temperature on admission to the recovery room, this was not statistically significant.

In conclusion, the HME had no advantage in preserving body temperature in outpatients undergoing laparoscopic procedures of approximately 45 min. Furthermore, there was no difference demonstrated in recovery or discharge times, or on the incidence of shivering and discomfort between the two groups. Further study is required to determine if, in fact, a critical duration of time is necessary for the HME to be proven beneficial in terms of maintenance of body temperature.

**References**