

Anesthesiology  
78:468-476, 1993  
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## Unintentional Hypothermia Is Associated with Postoperative Myocardial Ischemia

Steven M. Frank, M.D.,\* Charles Beattie, M.D., Ph.D.,† Rose Christopherson, M.D., Ph.D.,\* Edward J. Norris, M.D.,‡  
Bruce A. Perler, M.D.,§ G. Melville Williams, M.D.,|| Sidney O. Gottlieb, M.D.,#  
The Perioperative Ischemia Randomized Anesthesia Trial Study Group¶

**Background:** Hypothermia occurs commonly during surgery and can be associated with increased metabolic demands during rewarming in the postoperative period. Although cardiac complications remain the leading cause of morbidity after anesthesia and surgery, the relationship between unintentional hypothermia and myocardial ischemia during the perioperative period has not been studied.

**Methods:** One hundred patients undergoing lower extremity vascular reconstruction received continuous Holter monitoring throughout the first 24 h postoperatively. Myocardial ischemia was determined by a cardiologist masked to clinical variables. The patient's sublingual temperature on arrival at the intensive care unit immediately after the surgical proce-

dures was used to divide the patients into two groups: hypothermic (temperature, < 35° C; n = 33) and normothermic (temperature, ≥ 35° C; n = 67). The relationship between unintentional hypothermia and myocardial ischemia occurring during the first postoperative day was evaluated by univariate and multivariate analyses.

**Results:** A greater percentage of patients had electrocardiographic changes consistent with myocardial ischemia in the hypothermic group (36%, 12 of 33) compared with those in the normothermic group (13%, 9 of 67,  $P = 0.008$ ). Preoperative risk factors for perioperative cardiac morbidity were similar between the two groups, except for patient age. The mean age was  $70 \pm 2$  yr and  $62 \pm 1$  yr in the hypothermic and normothermic groups, respectively ( $P = 0.001$ ). When subgroup and multivariate analyses were used to adjust for differences in age, temperature remained an independent predictor of ischemia (odds ratio, 1.82 per degree Celsius; 95% confidence interval, 1.09–3.02). The incidence of postoperative angina was greater in the hypothermic group (18%, 6 of 33) than in the normothermic group (1.5%, 1 of 67,  $P = 0.002$ ). The incidence of  $\text{Pa}_{\text{O}_2} < 80$  mmHg in the arterial blood was greater in the hypothermic group (52%, 17 of 33) than in the normothermic group (30%, 20 of 67,  $P = 0.03$ ).

**Conclusions:** Unintentional hypothermia is associated with myocardial ischemia, angina, and  $\text{Pa}_{\text{O}_2} < 80$  mmHg during the early postoperative period in patients undergoing lower extremity vascular surgery. (Key words: Complications: ischemia. Heart, ischemia: postoperative. Temperature, hypothermia: perioperative; complications.)

This article is accompanied by a Highlight. Please see:  
ANESTHESIOLOGY 78:25A–26A, 1993.

\* Assistant Professor, Department of Anesthesiology.

† Associate Professor, Department of Anesthesiology.

‡ Instructor, Department of Anesthesiology.

§ Associate Professor, Department of Surgery.

|| Professor, Department of Surgery.

# Associate Professor, Department of Cardiology.

¶ The PIRAT study group consists of: Charles Beattie, Ph.D., M.D., principal investigator; Rose Christopherson, M.D., Ph.D., principal co-investigator; Steven M. Frank, M.D., Sidney O. Gottlieb, M.D., Curtis Meinert, Ph.D., Edward J. Norris, M.D., Peter Rock, M.D., Stephen Parker, M.D., Helen Yates, M.D., Bruce Perler, M.D., and G. Melville Williams, M.D., associate investigators; Michael Breslow, M.D., Brian Rosenfeld, M.D., Donald Taylor, M.D., Barry Brasfield, M.D., and Denis Bourke, M.D., consultants; Pamela Bezirdjian, R.N., research associate; Sharon Paul, B.S., data management; Steven Achuff, M.D., Timothy Buchman, Ph.D., M.D., Eugenie Heitmiller, M.D., Daniel Nyhan, M.D., James Sitzman, M.D., and Robert L. Stevenson, M.D., monitoring committee.

Received from the Johns Hopkins Medical Institutions, Baltimore, Maryland. Accepted for publication November 16, 1992. Supported by the National Institutes of Health (Bethesda, Maryland) grant GM 38177. Presented in part at the annual meeting of the American Society of Anesthesiologists, New Orleans, Louisiana, October 1992.

Address reprint requests to Dr. Frank: Johns Hopkins Hospital, 600 North Wolfe Street, Carnegie, Baltimore, Maryland 21287.

HYPOTHERMIA is common during the perioperative period and is known to have both favorable and unfavorable physiologic effects. By reducing metabolic requirements and oxygen consumption, moderate hypothermia has a protective effect during periods of tissue ischemia<sup>1-3</sup> and is used commonly during many cardiac and neurosurgical procedures. The adverse effects of hypothermia are numerous, including cardiac arrhythmias, increased vascular resistance, and a left shift in the hemoglobin-oxygen saturation curve, resulting in decreased oxygen delivery to the tissues.<sup>4</sup> In addition to these effects, the metabolic changes associated with rewarming during the postoperative period place demands on the cardiovascular system,<sup>5-11</sup> which

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