Safety of Hot and Cold Liquids in Patients with Acute Myocardial Infarction*

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Patients with acute myocardial infarction are frequently not fed hot and cold liquids because of possible deleterious effects on heart rate, blood pressure, and cardiac rhythm. In an attempt to identify and quantify such changes, hot liquid with a temperature in excess of 70°C and cold liquid at an average temperature of 7°C were ingested by 20 patients within 36 hours of documented myocardial infarction and by 11 control patients with severe anginal episodes or chest wall syndromes. Heart rate and rhythm were continuously monitored during ingestion of the hot and cold liquids, and blood pressure was recorded intermittently. No patient in either group had a change in cardiac rhythm or an increase in ectopy during ingestion of the hot or cold liquids. Changes in blood pressure and heart rate were also not significant during liquid ingestion by patients with infarction and control patients. The practice of avoiding ingestion of hot and cold liquids by patients with acute myocardial infarction is not supported by these observations.

Many practices performed in the routine care of patients with acute myocardial infarction lack scientific basis. In an informal questionnaire sent by us to over 200 coronary care units in the United States, a significant number of the respondents indicated that hot and cold liquids are to be avoided by patients with acute myocardial infarction. Washington University's Manual of Medical Therapeutics contains a warning against hot and cold beverages in the patient with an acute myocardial infarction. Christakis and Winston reference two personal communications regarding the avoidance of hot and cold liquids in the coronary care units of the Peter Bent Brigham Hospital and the National Institutes of Health Clinical Center. Presumably, this caution is due to possible deleterious effects on blood pressure, heart rate, and cardiac rhythm which might arise from the ingestion of hot or cold liquids. The purpose of this study was to determine whether the ingestion of hot and cold liquids by patients with acute myocardial infarction does, in fact, produce such changes.

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Materials and Methods

Thirty-one consecutive patients admitted to the coronary care unit with suspected acute myocardial infarction were studied within 36 hours of admission. Patients initially consumed 6 oz of hot liquid (Sanka) with a temperature in excess of 70°C over a five-minute period of observation and subsequently consumed 6 oz of ice water (average temperature, 7°C) over a similar period. Heart rate and rhythm were monitored continuously, and blood pressure was recorded during each testing period, as well as during five-minute control periods before and after each ingestion. Most patients consumed the liquids in considerably less than five minutes. Blood pressure was recorded near the end of the ingestions.

Twenty patients had sustained myocardial infarctions by standard clinical, electrocardiographic, and enzymatic criteria. Eleven patients with chest wall syndromes and angina pectoris who had been admitted to the coronary care unit to "rule out" myocardial infarction served as a control group.

Results

Changes in blood pressure and heart rate for patients with myocardial infarction and the control group during ingestion of both hot and cold liquids are shown in Table 1. The mean change for each group is also shown. Utilizing the randomized group t-test, none of the changes was significant at the level of P = 0.05, with the exception of the changes in heart rate in the control group with ingestion of the cold liquid.

No patient in either group had a change in cardiac rhythm during the study. No patient in either
group who was free of ectopy during the control period experienced ectopy during either period of ingestion. Patients in the group with myocardial infarction who had premature ventricular contractions during the control period experienced no significant change in their frequency during ingestion of hot or cold liquid. One patient who had 21 and 28 premature ventricular contractions during the two control periods had 24 premature ventricular contractions during ingestion of the hot liquid.

**DISCUSSION**

Recently, Houser\(^6\) studied the effects of ingestion of ice water in ten patients with acute myocardial infarction. These patients were tested three or four days after myocardial infarction, and no change was noted in their blood pressure, heart rate, ST segment, or pain response following ingestion of either ice or tap water; however, a consideration of the combined results of previous studies\(^4,5\) has suggested a possible deleterious effect of the ingestion of ice water in patients with acute myocardial infarction. Fitzmaurice\(^4\) demonstrated that ingestion of ice water can affect the temperature environment of the posterior wall of the heart. She recorded rapid declines in esophageal and stomach temperatures shortly after infusion of 150 ml of ice water into the distal esophagus of dogs whose esophageal and stomach size approximated that of man.

Other studies\(^6,8\) have demonstrated that a cold stimulus applied locally or diffusely to the skin or the inhalation of cold air can induce angina and changes in systemic blood pressure, heart rate, and cardiac rhythm. Sudden immersion of one hand into ice water is capable of producing a vasopressor response in 30 to 60 seconds in normal and hypertensive patients; however, no change greater than 20/20 mm Hg was noted in that study.\(^8\) Inhalation of cold air for four minutes at rest elicited angina pectoris in four of 17 patients with coronary arterial disease.\(^8\) It is of interest that no increase in myocardial oxygen consumption could be documented in these patients and that concomitant increases in heart rate and blood pressure were not significant. Neill et al\(^8\) applied a cold stimulus to the skin of 19 patients with coronary arterial disease during cardiac catheterization. Five of the 19 patients experienced angina during this stimulation.\(^5\)

The diving reflex would appear to be another response to cold which can be elicited by breathing, together with facial stimulation with cold. This reflex results in bradycardia and affects both the sinus and atrioventricular nodes. It has been reported to convert episodes of paroxysmal atrial tachycardia.\(^7,8\)

The effect on the cardiovascular system of a hot stimulus applied to large areas of the body is tachycardia and an increased myocardial oxygen consumption which occurs with the increase in heart rate. Myocardial oxygen consumption may increase without an increase in total-body oxygen consumption. In addition, the frequency of extrasystoles may also increase.\(^10\)

The present study resulted in no significant change in cardiac rhythm or the frequency of premature ventricular contractions during the ingestion of hot and cold liquids by 20 patients within
36 hours of acute myocardial infarction. It also demonstrated that ingestion of hot and cold liquids resulted in no significant change in heart rate or systemic blood pressure in these patients. We conclude that the possible deleterious effects of cutaneous hot and cold stimuli noted in earlier studies do not apply to the ingestion of hot and cold liquids in patients with acute myocardial infarction. Therefore, it seems unnecessary to avoid the use of hot and cold liquids in the coronary care unit.

REFERENCES
8 Hattenhauer M, Neill WA: Effect of cold air inhalation on angina pectoris and myocardial oxygen supply. Circulation 51:1053-1058, 1975