Fasting Versus a Heart-Healthy Diet Before Cardiac Catheterization: A Randomized Controlled Trial

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Background Patients undergoing cardiac catheterization are ordered to take nothing by mouth after midnight before their procedure with no evidence to support this practice.
Objective To identify best practice for fasting requirements before cardiac catheterization through comparative evaluation in a prospective randomized controlled study.
Methods The study included a convenience sample of 197 patients undergoing elective cardiac catheterization in a progressive inpatient cardiac unit at a regional heart institute in the midwestern United States. The patients were randomized into 2 groups. Patients in the heart-healthy diet group could eat a specified diet with low-acid options until the scheduled procedure. Patients in the fasting group were restricted to nothing by mouth after midnight except for sips of water with medications until the scheduled procedure. Outcome measures included patient-reported satisfaction and complications.
Results Compared with patients in the fasting group, those in the heart-healthy diet group had significantly more satisfaction with the preprocedural diet. Patients in the heart-healthy diet group had less thirst and hunger before and after the procedure. No patients experienced pneumonia, aspiration, intubation, or hypoglycemia after the procedure. Fatigue, glucose level, gastrointestinal issues, and loading dose of antiplatelet medication did not differ between the groups.
Conclusions Allowing patients to eat before elective cardiac catheterization posed no safety risk and benefited patient satisfaction and overall care. The results of this study may help identify best practice for allowing patients to eat before elective procedures using conscious sedation. (*American Journal of Critical Care.* 2024;33:29-33)

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Patients scheduled for coronary artery catheterization typically have orders to take nothing by mouth after midnight before the procedure, requiring them to fast for 6 hours or longer depending on the time of the procedure. Requiring patients to fast has negative effects such as general discomfort, irritability, dehydration, increased thirst and hunger, and hypoglycemia.[1] Currently, no evidence supports the fasting requirements for patients at low to medium risk who are scheduled for cardiac catheterization.

The risk for gastric content regurgitation, aspiration pneumonia, and emergency endotracheal intubation for an emergency coronary artery bypass graft procedure ranges from less than 0.1% to 0.4%, and the risk for cardiac arrest is less than 1%.[2] Available data show no major differences in gastric complications between patients who fasted for only 2 hours before an intervention and those who fasted after midnight before the intervention.[3] Warner et al[4] concluded that pulmonary aspiration was rare, with a risk of 0.02% for elective procedures and of 0.01% for emergency procedures.

Limited data regarding the potential risks and benefits of current fasting practices are available other than mentions of perceived safety risks for medical interventions and lack of adherence to evidence-based practice.[3] Several studies have determined that prolonged fasting may be unnecessary. Sorita et al[3] studied 3641 patients with fasting orders for a median duration of 12.8 hours, leading to 2 missed meals. Fifteen percent of fasting orders were placed for proposed procedures, but 90% of those proposed procedures were never scheduled.[3] Maqbali[5] showed that 169 patients fasted for 7 to 19 hours, longer than the American Society of Anesthesiologists recommends. The American Society of Anesthesiologists recommends that patients fast from intake of clear liquids for 2 hours and from intake of solid food for 6 hours before a procedure[6]; this recommendation is also supported by the Association of Anaesthetists of Great Britain and Ireland and the Royal College of Anaesthetists.

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In one study,[2] preprocedural fasting was correlated with coronary artery procedures. This retrospective study included 1916 patients who underwent percutaneous coronary intervention for acute coronary syndrome and stable angina during a 3-year period. No patients required emergency endotracheal intubation or had intraprocedural or postprocedural aspiration pneumonia. The authors concluded that patients scheduled for cardiac catheterization do not need to fast before their procedures.[2]

In another study, researchers compared requiring patients to fast with allowing them to eat before elective cardiac catheterization. The authors found that allowing patients to eat was not inferior to the usual fasting strategy and posed no risk to patient safety.[7]

Because of the minimal data supporting fasting before cardiac catheterization, we developed this study to evaluate the need to require patients to fast before elective procedures. At the onset of our trial, only 1 study had investigated the safety and risks associated with current fasting guidelines for patients undergoing cardiac catheterization. We conducted this study to add to the body of knowledge regarding treatment of patients undergoing conscious sedation for cardiac catheterization.

Methods

This prospective randomized controlled study, approved by the institutional review board, was conducted on a progressive inpatient cardiac unit at a regional heart institute with 82 beds in the midwestern United States. The primary aim was to compare the safety of consumption of a heart-healthy, low-acid diet with standard fasting guidelines. For this study, a heart-healthy diet consisted of solid food that was low in fat, cholesterol, and sodium. A secondary aim was to evaluate patient comfort and satisfaction while ensuring patient safety.

Participants

We enrolled a convenience sample of 197 patients from an inpatient cardiac unit. Patients were included if they were at least 18 years old, admitted to the inpatient cardiac unit, and scheduled for elective cardiac catheterization with conscious sedation and

analgesia. A member of the research team screened patients daily for potential participation in the study. Study participants were male and female patients of various ethnicities and ages. Patients were excluded if they had coexisting diseases or conditions affecting gastric emptying, such as chronic nausea or vomiting; had a large hiatal hernia; were receiving enteral tube feeding; or required emergency cardiac catheterization.

Procedures

Patients enrolled were randomly assigned to 1 of 2 protocol groups by using a blinded envelope. Patients in the heart-healthy diet group could eat a specified diet low in fat, cholesterol, sodium, and acidity until the scheduled procedure. Patients in the fasting group were restricted to nothing by mouth after midnight except for sips of water with medications until the scheduled procedure.

Each patient received education on diet types and restrictions according to their randomized group. Data collected from each patient before and after sedation included nausea, vomiting, pain, thirst, hunger, fatigue, blood glucose level if diabetic, and gastrointestinal symptoms (acid reflux, heartburn, belching, and bloating). Pain, thirst, hunger, and fatigue were measured with a 100-mm visual analog scale. Other variables measured included postprocedure aspiration, hospital-acquired pneumonia, emergency endotracheal intubation, blood glucose level, procedure findings, and use of a loading dose of antiplatelet medication during the procedure. We continued to collect patients' data for the duration of the standard postprocedural checks, which included assessments of the groin, vital signs, pulse, and pain level. If a patient was transferred to the intensive care unit after the procedure, we continued to collect data throughout the postprocedural checks.

Demographic information collected for all study participants included age, sex, race, diagnosis, admission date, and discharge date. We found no reliable and valid measurement tool for assessing cardiac catheterization complications. Therefore, we used an investigator-developed tool to assess patient satisfaction and complications before and after cardiac catheterization. Patients were asked to complete a satisfaction survey at discharge. We used independent *t* tests to compare continuous measures and χ^2 tests of independence to compare categorical measures between the 2 groups.

Results

The final sample for analysis consisted of 197 patients (100 in the heart-healthy diet group and 97 in the fasting group). Patients' demographic characteristics did not differ between the 2 groups (Table 1).

Table 1
Characteristics of the 197 patients in the final study sample

Characteristic	No. (%) of patients[a]
Age, mean (SD), y	62.7 (12.7)
Sex	
Female	74 (37.6)
Male	123 (62.4)
Race and ethnicity	
Black	4 (2.0)
White	189 (95.9)
Hispanic	3 (1.5)
Indian	1 (0.5)
Type of cardiac catheterization (n = 195)	
Diagnostic	112 (57.4)
Intervention[b]	83 (42.6)
Diagnosis	
Chest pain	139 (70.6)
Non–ST-segment elevation myocardial infarction	26 (13.2)
Unstable angina	12 (6.1)
Other	20 (10.2)
Group	
Heart-healthy diet	100 (50.8)
Fasting	97 (49.2)

[a] Unless otherwise indicated.
[b] Intervention included patient receiving a stent or a percutaneous coronary angioplasty.

Comparisons between the heart-healthy diet and fasting groups are shown in Table 2. Satisfaction with the preprocedural diet was significantly higher and thirst and hunger were lower in the heart-healthy diet group. Thirst and hunger before and after the procedure were lower in the heart-healthy diet group. No patients experienced postprocedural pneumonia, aspiration, intubation, or hypoglycemia. Fatigue, glucose level, gastrointestinal issues, and use of loading dose of antiplatelet medication did not differ between the groups.

Discussion

Anesthesia guidelines for procedures requiring conscious sedation have remained the same for decades because no specific randomized controlled studies have suggested otherwise. In addition to anesthesia guidelines, enhanced recovery after surgery protocols, which include recommendations for perioperative nutrition and a change in fasting time, have been developed to improve patient outcomes. Enhanced recovery after surgery protocols have decreased the fasting period from the traditional 12 hours to 6 to 8 hours while encouraging consumption of clear liquids up to 2 hours preoperatively. However, implementation of these protocols has been slow.[8] In

Table 2
Summary of comparisons between patients who ate a heart-healthy diet and patients who fasted before cardiac catheterization

Variable[a]	All patients (N = 197)	Heart-healthy diet (n = 100)	Fasting (n = 97)	*P*
Patient satisfaction with diet,[b] mean (SD)	2.1 (1.4)	1.3 (0.7)	3.1 (1.5)	<.001
Thirst,[c] mean (SD)				
Before procedure	38.7 (28.4)	29.2 (26.4)	48.7 (27.2)	<.001
After procedure	55.8 (32.3)	49.8 (31.7)	62.1 (31.8)	.007
Hunger,[c] mean (SD)				
Before procedure	42.5 (35.3)	22.6 (26.2)	63.2 (31.5)	<.001
After procedure	55.7 (32.8)	40.4 (29.3)	71.6 (28.5)	<.001
Fatigue,[c] mean (SD)				
Before procedure	36.6 (31.4)	33.1 (31.3)	40.2 (31.3)	.11
After procedure	46.8 (32.3)	44.2 (33.5)	49.5 (31.0)	.25
Blood glucose level,[d] mean (SD), mg/dL				
Before procedure	175.3 (55.2)	177.8 (53.4)	172.7 (58.2)	.74
After procedure	161.1 (62.3)	157.2 (61.1)	165.3 (64.7)	.65
Change	−17.5 (58.7)	−23.5 (63.6)	−11.0 (53.5)	.46
Gastrointestinal issues, No. (%) of patients				
Before procedure	28 (14.2)	15 (15.0)	13 (13.4)	.75
After procedure	16 (8.1)	9 (9.0)	7 (7.2)	.65
Loading dose of antiplatelet medication, No. (%) of patients	74 (37.6)	38 (38.0)	36 (37.1)	.90

[a] No patients in either group died or had pneumonia, aspiration, intubation, or hypoglycemia.
[b] Scored as 1 = strongly agree to 5 = strongly disagree with the statement that they were satisfied with the diet.
[c] Measured on a 100-mm visual analog scale.
[d] Only patients with diabetes mellitus had glucose levels recorded (n = 52 before the procedure, n = 50 after the procedure); change in glucose level was calculated by subtracting the level before the procedure from the level after the procedure.

our randomized controlled trial, allowing patients to eat before cardiac catheterization caused no harm from aspiration, hospital-acquired pneumonia, emergency endotracheal intubation, hypoglycemia, or mortality. Allowing patients to eat resulted in significant patient satisfaction without any procedural complications.

Mishra et al[7] published the results of the CHOW NOW (Strict Versus No Fasting Prior to Cardiac Catheterization) randomized controlled trial after we completed our study. The authors identified no harm to patients with regard to aspiration pneumonia, nausea, vomiting, hypoglycemia, or mortality, similar to our findings. However, unlike the CHOW NOW study, our study showed that patients who were able to eat before their procedure had significantly more satisfaction than those who could not eat.

Nursing Implications

Nurses should advocate for evidence-based practices for nutrition and patient safety for procedures that involve conscious sedation. Patients can safely continue oral intake until the time of the procedure, improving their satisfaction and comfort without adverse events. Patient care can be compromised by inadequate preoperative nutrition, and patients' experiences are also affected when they fast for prolonged periods.[9] Requiring patients to fast before cardiac catheterization resulted in discomfort and frustration for patients. The practice of unnecessarily requiring patients to fast without supporting evidence has been less than patient centric for decades.

In addition to dissatisfaction, fasting patients can have clinical complications such as hypoglycemia, dehydration, and malnutrition, leading to increased thirst and hunger, contrast-induced nephropathy, and fatigue. By allowing patients to eat before procedures, these complications can be mitigated.

Limitations

The COVID-19 pandemic was a study limitation because it affected our sample size and time frame. Our organization, like many others, stopped performing elective procedures at the beginning of the pandemic. When elective procedures were resumed, the food options for patients were changed due to food availability. Additional time was needed to ensure the research diet was available for the study.

Another limitation of our study was that most patients in the convenience sample were White men. Although this demographic is representative of the facility's patient population, it may limit generalizability of the findings.

Future Research

Future research with a larger, more diverse sample is needed to ensure generalizability. In addition,

future research should include other patient populations receiving conscious sedation with fasting protocols. For example, tunneled central venous catheters are typically inserted using conscious sedation and patients are required to fast. Although the focus of this study was patients receiving conscious sedation, future research could include patients receiving other forms of anesthesia.

Conclusion

The results of this study provide initial evidence that allowing patients to eat before elective cardiac catheterization is safe. This study should guide practices for fasting protocols across organizations and has changed the practice at our organization for inpatients and outpatients. Our research reinforces that patient comfort and satisfaction can safely be put at the forefront of care. Recommendations in professional society guidelines should be reviewed for possible changes.

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FINANCIAL DISCLOSURES
None reported.

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