# Preoperative Fasting Guidelines: Why Are We Not Following Them?: The Time to Act Is NOW

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Your patients should be drinking clear liquids until 2 hours before surgery. If they are not, you should stop reading and change your hospital practices. Your patients will thank you. They will be less thirsty, be less anxious, and have improved patient satisfaction without an increase in the rate of pulmonary aspiration.[1] These practices have been recommended by the American Society of Anesthesiologists preoperative fasting guidelines since 1999. Therefore, the question is "why are not we doing this?" The accompanying manuscript by Shiraishi et al[2] provides evidence that you should feel safe in allowing your patients to do so. The interesting questions that follow are (1) What should patients drink preoperatively? (2) What are the outcome benefits of preoperative oral hydration?

In this trial, magnetic resonance imaging studies were conducted preoperatively to measure gastric volumes. The study enrolled 10 normal weight and 10 morbidly obese patients (average body mass index 45 kg/m$^2$). After a 9-hour fast, the morbidly obese patient had larger volumes of gastric content (73 vs 31 mL). However, 2 hours after drinking 500 mL of a carbohydrate beverage (OS-1), stomach volumes had returned to baseline levels (50 and 30 mL) in both the obese and nonobese patients, respectively. In fact, gastric content volume was significantly lower at 2 hours after fluid ingestion than that at preingestion, after a 9-hour fast, in the morbidly obese group. This study suggests that gastric emptying may not be delayed in the morbidly obese, and a preoperative carbohydrate beverage decreases gastric volume in these patients compared with an overnight fast.

These authors used a carbohydrate beverage, OS-1, typically used for rehydration, which is only available in Japan. This potentially limits the generalizability of these results to other countries. Another drawback of this study is its small sample size. In addition, OS-1 is a simple carbohydrate beverage of fructose and glucose, and these results may not apply to the maltodextrin-containing solutions with complex carbohydrate used in various enhanced recovery after surgery (ERAS) protocols. In addition, we also cannot necessarily assume that these findings will apply to the superobese patients (body mass index >50 kg/m$^2$).

ERAS is defined as the development of multidisciplinary perioperative protocols that incorporate multiple best practices to improve patient outcomes.[3] One of the key principles of ERAS is to reduce the stress of surgery to a patient. Allowing patients to drink clear fluids 2 hours before surgery decreases their thirst, anxiety, and improves their strength.[1] With a patient who is nil per os (NPO) after midnight, we are essentially starving our patients of food and drink and then challenging them with the stress of surgery. Carbohydrate beverages given preoperatively have the benefit of decreasing the catabolic state associated with starvation.[4] Studies have shown decreased insulin resistance and decreased hyperglycemia after a preoperative carbohydrate beverage.[5,6] This is important for our surgical patients because elevated glucose levels in the postoperative period are associated with increased surgical complications.[7]

The American Society of Anesthesiologists guidelines for preoperative fasting state that it is appropriate to fast from intake of clear liquids at least 2 hours before elective procedures requiring anesthesia.[8] Surveys have shown that only a few hospitals still keep their patients NPO after midnight, but any culture change in medicine is a slow process.[9] Surveys at 2 US hospitals in 2004 and 2008 reported preoperative fasting times of 6 to 11 hours for liquids and 11 to 14 hours for solids.[10,11] A 2010 survey of German anesthesiologists found only a few (7%) hospitals practiced strict NPO after midnight, but only one-third (34%) followed the full preoperative fasting guidelines of 2 hours for clear liquids and 6 hours for solid food.[12] Most followed a more relaxed regimen in between these 2 options. A 2015 study in Iran found that patients undergoing elective surgery were kept NPO from liquids for 11.54 hours and from a light meal for 12.46 hours.[13] These studies show that we have been slow to adopt the 2-hour allowance of clear liquids before surgery.

One barrier to allowing patients to drink before surgery has been the fear of pulmonary aspiration. A concern is that oral intake before surgery will increase residual gastric volume and a decrease in gastric pH, causing a higher risk of aspiration pneumonitis. However, studies have found that ingestion of clear liquids 2 hours before surgery results in smaller residual gastric volumes and higher gastric pH levels compared with longer fasts.[8] In multiple trials, there was no occurrence of pulmonary complications with preoperative carbohydrate beverage treatment.[5] In healthy

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volunteers, gastric content returned to baseline in 120 minutes after receiving a clear carbohydrate beverage preoperatively.[14] However, the addition of protein in the preoperative solution lengthened the time to baseline gastric volume to 3 hours. This study by Shiraishi et al[2] provides evidence that is consistent with these previous findings. All patients had residual gastric volumes that were similar or less than an overnight fast after drinking 2 hours before surgery. It further provides evidence that gastric emptying to clear liquids is not delayed in the morbidly obese patient. Barrier pressure, the difference between lower esophageal sphincter pressure and gastric pressure, remains positive in obese patients throughout the induction of anesthesia.[15] All of these studies suggest that fasting obese patients are at low risk of aspiration, similar to nonobese patients.

The second barrier has been in determining what is the optimal drink for patients to have before surgery. Complex carbohydrate beverages with maltodextrin have been shown to decrease insulin resistance. The American Society of Enhanced Recovery published a consensus statement for colorectal surgery recommending unrestricted access to clear fluids up to 2 hours before surgery to maintain hydration. They recommend oral hydration with solutions containing 45 g of carbohydrate to improve insulin sensitivity, preferably complex carbohydrate (maltodextrin).[16] A Cochrane review including 1976 participants in 27 trials found preoperative carbohydrate loading (>45 g of either simple or complex carbohydrates) before surgery trended toward improved postoperative insulin resistance.[17] Preoperative carbohydrate beverages may also be associated with decreased length of stay after major abdominal surgery.[5] Historically, recommendations for preoperative carbohydrate beverage treatment have excluded diabetic patients; however, this may be incorrect. Gustafsson et al[18] found that patients with type 2 diabetes showed no signs of delayed gastric emptying and that a carbohydrate-rich drink could be administered 180 minutes before anesthesia without risk of hyperglycemia or aspiration.

One of the drawbacks of maltodextrin carbohydrate solutions is their cost. Sports drinks or rehydration fluid are less expensive and have been suggested as an alternative source for preoperative carbohydrates. OS-1, used in the study by Shiraishi et al,[2] is a rehydration solution recommended for use with vomiting, diarrhea, fever, or excess sweating. Comparing the two, sports beverages typically contain higher carbohydrate amounts compared with rehydration fluids. OS-1 has a carbohydrate content of 2.5 g/100 mL, whereas a typical sports drink such as Gatorade has a carbohydrate content of 6 g/100 mL. What is not known is the effect of these preoperative simple carbohydrate solutions on insulin resistance after surgery and the incidence of postoperative hyperglycemia. Seven-day exposure of sucrose, but not glucose, in healthy volunteers was associated with decreased insulin sensitivity.[19]

The question about appropriate oral intake also includes the labor and delivery ward. Starving pregnant mothers results in increased ketoacidosis, which is decreased when given carbohydrate fluids. Ingestion of sports drink when in labor was not found to increase gastric volumes.[20] Oral intake of modest amounts of clear liquid in uncomplicated patients is recommended by the American College of Obstetrics and Gynecology.[21] Restrictive oral intake policies and NPO policies during labor put in place because of concerns of aspiration should be re-evaluated.

The American Society of Anesthesiologists guidelines allowing for clear liquids until 2 hours before surgery have been in place since 1999. These authors should be commended for providing further evidence of the safety of oral hydration 2 hours before surgery. To determine if this is an issue in your hospital, ask your next patient how long they have fasted. If it has been longer than 2 hours, you should change your practice. The time to act is NOW.

## DISCLOSURES

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