Percent Body Fat Predicts Surgical Infections

Patients with percent body fat greater than 37% were two times more likely to develop an SSI.

BY DAMIAN McNAMARA

MIAMI BEACH — Preoperative percent body fat is an independent predictor of surgical site infection risk and is a more accurate way to define obesity than is body mass index, according to preliminary results of a prospective, ongoing trial.

Surgical site infections (SSIs) develop in an estimated 290,000 of the 27 million procedures performed annually in the United States, data from the Centers for Disease Control and Prevention indicate. Previous research has linked obesity—as well as type of procedure, patient comorbidity, immunosuppression, and cigarette smoking—to an increased risk of such infections (Dis. Colon Rectum 2007;50:2223-37; J. Cardiovasc. Surg. 2007;48:641-6).

In the initial cohort of 194 patients in this study, Harvard medical student Emily Waisbren and her associates in the departments of anesthesiology and surgery at Brigham and Women's Hospital in Boston measured percent body fat using bioelectrical impedance analysis and body mass index (BMI) using the standard height and weight formula.

Patients ranged in age from 18 years to 64 years (mean age, 49), and 66% were women. The mean BMI was 29.5 kg/m^2, while overall mean body fat was 34%. Patients were considered obese if their BMI exceeded 30 kg/m^2 and if body fat exceeded 25% (in men) or 31% (in women), based on the definition from the American Council on Exercise. "This has an accuracy of 2% plus or minus compared to water immersion studies, which are the gold standard," Ms. Waisbren said at the meeting on perioperative medicine at the University of Miami.

According to the percent body fat cutoffs, infections occurred in 4.7% of nonobese patients and in 18.5% of obese patients.

A total of 130 patients (67%) were obese according to the body fat criterion, compared with 74 (38%) using the BMI definition.

Participants were assessed before, during, and 30 days after elective surgery (primarily general, orthopedic, and obstetric procedures) on the basis of medical records, questionnaires, and follow-up telephone interviews. A total of 31% of the patients were taking antihypertensive medication, and 18% were current smokers. Most patients had an American Society of Anesthesiologists (ASA) score of 2, "so they were relatively healthy," Ms. Waisbren said.

SSIs developed in 27 patients (14%). According to the percent body fat cutoffs, infections occurred in 4.7% of nonobese patients and in 18.5% of obese patients. In contrast, when the BMI cutoff was used, 14.2% of the nonobese and 13.5% of obese patients developed SSIs.

As percent body fat increased, there was a statistically significant increase in SSIs. For example, patients with percent body fat greater than 37% were two times more likely to develop an SSI, Ms. Waisbren said. "An association with increased SSI risk was seen with BMI also, but it was not statistically significant."

Although there were no deaths related to these infections, Ms. Waisbren said that patients with an SSI experienced more adverse outcomes, including wound dehiscence, seroma, and hematoma, than did those without infections.

A meeting attendee asked if patients were possibly overlabeled as obese because two-thirds met the percent body fat definition. "There have been very little data to define the cutoff point," Ms. Waisbren said. "But you raise the point of how appropriate the American Council on Exercise definition is."

When a meeting attendee asked why the hip-to-waist ratio was not assessed, Ms. Waisbren said the investigators believed BMI was more accurate than hip-to-waist ratio.

However, she said, "BMI misses an important difference in body composition." For example, a male body builder and an overweight woman with the same height and weight would have the same BMI, but very different body fat percentages.

Percent body fat was an independent predictor of SSI, according to a univariate analysis. Pedal edema, recent surgery, higher National Nosocomial Infection Surveillance score, and class 2 (clean-contaminated) or higher wound ratings were other predictors.

A multivariate assessment is planned as part of the ongoing study, Ms. Waisbren said.

This study was awarded the best research abstract at the meeting. Data collected for a total of 436 patients in this ongoing study concur with the initial cohort findings, Ms. Waisbren said.

She added that the plan is to enroll 600 elective surgery patients in the final assessment. ■

Good Glycemic Control Can Reduce Postoperative Risks

BY DAMIAN McNAMARA

MIAMI BEACH — Using physiologic insulin replacement strategies, physicians can manage glycemia throughout the perioperative period and optimize patient outcomes.

"We have a number of options to improve glycemic control … and a number of strategies for transitioning the patient after surgery," Dr. Luigi F. Meneghini said during a meeting on perioperative medicine sponsored by the University of Miami. He explained how to use basal insulin, supplemental scale boluses, and/or prandial insulin during the preoperative, intraoperative, and postoperative periods.

Even surgical patients not diagnosed with diabetes can experience hyperglycemia and associated perioperative and postoperative risks, said Dr. Meneghini, director of clinical operations, division of endocrinology, diabetes and metabolism at the University of Miami.

Why is the perioperative period such a risky time for people with diabetes? Surgery and anesthesia can increase levels of stress hormones, epinephrine, cortisol, growth hormones, and inflammatory cytokines such as interleukin-6 and tumor necrosis factor–alpha. Also, general anesthesia, bypass surgery, sepsis, parenteral nutrition, and use of steroids can alter insulin resistance, decrease insulin secretion, and cause lipolysis and protein catabolism. "This all makes perioperative management of diabetes so much more difficult," he said.

Perioperative glycemic control can be achieved through implementation of the following strategies before, during, or after surgery:

► **Preoperatively.** The goal is to stabilize glycemia, in many cases with subcutaneous insulin. However, if the patient has type 1 diabetes, continue basal insulin, "no questions asked," Dr. Meneghini said.

Discontinue all oral agents prior to surgery, perform a finger-stick glucose test every 4-6 hours, and use a supplemental scale for additional insulin if blood glucose levels exceed target values.

"You will need some basal insulin replacement. Insulin needs are still there when you are fasting; you can give [basal insulin] to anyone whether they are NPO [nothing by mouth] or not," Dr. Meneghini said.

The American Diabetes Association recommends a glycemic target of about 110 mg/dL to less than 140 mg/dL for critically ill patients. For patients who are not critically ill, fasting blood glucose levels of less than 126 mg/dL or random blood glucose levels less than 180-200 mg/dL are recommended (Diabetes Care 2008;31[suppl. 1]:S12-54).

Several preoperative factors should be checked, but at least do an ECG, basic metabolic panel (BMP), and hemoglobin A_{1c} assay, Dr. Meneghini said. "The [Hb]A_{1c} before surgery may be useful for assessing risk and to determine if preoperative glycemic control is adequate."

► **Intraoperatively.** Intraoperative management depends on the length of the procedure, Dr. Meneghini said. "For a 1- to 2-hour surgery, you can probably continue preoperative glucose management orders." However, for a longer or more complex surgery, switch to intravenous drip insulin, ideally before surgery in order to stabilize glucose. Physicians can use the Modified Markovitz Protocol (Endocr. Pract. 2002;8:10-8) to calculate glycemic control intraoperatively.

Intravenous regular insulin has a half-life of 7 minutes, and by half an hour there is no more on board, "which can be very handy," Dr. Meneghini said. "This is why we usually go to [intravenous] regular insulin for the perioperative period or critical care."

► **Postoperatively.** After surgery, transition patients from intravenous to subcutaneous insulin management, Dr. Meneghini advised. "And that is a tricky passage in many cases. … We need to deal with inconsistent PO intake, stress, infection, and increased insulin resistance."

Ensure adequate basal insulin levels during the transition to subcutaneous insulin, especially in type 1 diabetes patients. Basal insulin replacement can start at any time, Dr. Meneghini said. "I recommend you start 24 hours prior to discontinuation of the [intravenous] insulin drip. This ensures adequate basal coverage during the transition."

Replace insulin according to physiologic needs. Match the basal replacement to hepatic glucose output, for example. Also match the prandial glucose to carbohydrate intake, and correct hyperglycemia as needed using a supplemental scale.

Postoperative nutrition should be taken into account. For example, if a patient is receiving total parenteral nutrition, start 1 U of regular insulin subcutaneously per 10-15 g of dextrose in the bag, Dr. Meneghini said. If the patient is on continuous enteral feeding, administer regular insulin every 6 hours or a rapid-acting insulin analog every 4 hours. Also, start 1 U of subcutaneous insulin to cover every 10-15 g of carbohydrates. If the enteral feed is a bolus, start 1 U of insulin subcutaneous per 10-15 g of carbohydrates and inject 15-20 minutes prior to the bolus.

If the patient is eating, use regular insulin or an insulin analog (preferred to minimize stacking) to cover meals, Dr. Meneghini said. Start 1 U of insulin subcutaneously to cover 10-15 g of carbohydrates and use what he calls the "Miami 4/12 Rule," whereby the basal insulin replacement dose is calculated by taking the patient's weight in kilograms and dividing it by 4 and the prandial coverage is calculated by dividing the patient's weight in kilograms by 12. ■