Hyperglycemia and Acute Coronary Syndromes: Clinical Implications and Management Recommendations

Implications of Hyperglycemia in ACS

Hyperglycemia is common among patients who are admitted to the hospital for acute coronary syndrome (ACS), and studies have shown that this condition is associated with increased mortality and a greater risk for adverse clinical outcomes.

Mikhail Kosiborod, MD, Mid America Heart Institute, Kansas City, MO, noted that over 50% of patients who are admitted with ACS experience hyperglycemia, and there is a powerful relationship between elevated glucose levels and higher mortality in patients with ACS – particularly among those who do not have a known history of diabetes. Moreover, studies show that patients with persistently elevated glucose levels during an ACS hospitalization experience particularly poor outcomes, whereas those whose glucose levels improve following admission have better survival.

In practice, many patients with ACS and markedly elevated glucose levels do not receive glucose-lowering treatment. Dr. Kosiborod noted several barriers to better glucose control. First, he said, there are conflicting results from randomized clinical trials and confusion about the evidence base. Second, many physicians are unfamiliar with glucose management and fear the development of hypoglycemia. Lastly, he said, there is a perceived lack of effective tools for glucose control with demonstrated feasibility, efficacy, and safety.

Darren K. McGuire, MD, MHSc, University of Texas Southwestern Medical Center, Dallas, TX, agreed that clinical trial data are inconclusive. Dr. McGuire noted that there have been no adequately powered outcomes studies to date about normalization of blood glucose with insulin in patients with ACS. Recommendations are based largely on biological plausibility, expert opinion, and extrapolation of data from other clinical cohorts, said Dr. McGuire. In an effort to provide guidance on glucose management, in 2008 the AHA published a scientific statement on the in-hospital treatment of hyperglycemia among patients with ACS [Deedwania et al. *Circulation* 2008]. The statement suggests that for patients who are admitted to an intensive care unit with acute coronary syndrome, a reasonable glucose target is >180 mg/dL (regardless of diabetes history), and that a more aggressive target toward normalization of glucose (ie, target of 90-140 mg/dL) is reasonable only if hypoglycemia can be systematically avoided.

Because of the risks of hypoglycemia with intensive glucose management, close glucose monitoring (every 1-2 hours) is advocated, suggested Silvio E. Inzucchi, MD, Yale University School of Medicine, New Haven, CT. Dr. Inzucchi commented that close management of glucose in patients with ACS is facilitated by a validated insulin infusion protocol, an adequate glucose monitoring program, a data analysis system to track quality, and a multidisciplinary team. Several factors contribute to a successful intravenous insulin protocol, he said (Table 1).

Table 1. Elements of a Successful Intravenous Insulin Protocol.

- Reaches and maintains blood glucose level successfully within a prespecified target range
- Includes a clear algorithm for making temporary corrective changes in the IV insulin rate, as patient requirements change
- Incorporates the rate of change in the glucose level, not just the absolute values
- Incorporates the current intravenous infusion rate of insulin
- Minimizes hypoglycemia and provides specific directions for its treatment when it occurs
- Provides specific guidelines for timing and selection of doses for the transition to SQ insulin

Hospitalized patients often require high insulin doses to achieve desired target glucose levels, said Vivian Fonseca, MD, Tulane University, New Orleans, LA, and he emphasized the point that effective insulin therapy must provide both basal and nutritional coverage to achieve target goals. In addition, supplemental or correction insulin for treatment of unexpected hyperglycemia also may be needed. He discouraged the use of so-called "sliding scale" insulin alone, because such regimens are ineffective and may result in unacceptably high rates of hyperglycemia, hypoglycemia, and iatrogenic diabetic ketoacidosis in hospitalized patients. Instead, scheduled prandial insulin doses should be given in relation to meals and should be adjusted according to point-of-care blood glucose levels.

Glucose control also involves appropriate transition from intravenous to subcutaneous insulin. Dr. Fonseca suggested continuing IV insulin until the patient is able to tolerate solid food and for at least 2 hours after the first subcutaneous insulin injection is given. He also emphasized the need for discharge planning and patient education.