Hyperglycemia Flags Poor Outcome After Cardiac Surgery in Infants

San Francisco — The longer infants experience hyperglycemia following cardiac surgery, the greater their morbidity and mortality, Dr. Andrew R. Yates reported in a poster presentation at the annual congress of the Society of Critical Care Medicine.

Infants who have hyperglycemia for 7 days or more have close to a 100% chance of morbidity and a 50%-60% chance of mortality according to Dr. Yates and his colleagues from Ohio State University, Columbus.

Their retrospective chart review involved 184 patients younger than 1 year who underwent cardiac surgery requiring cardiopulmonary bypass. At baseline, infants who weighed less than 2 kg, those with liver or renal insufficiency, or diabetes; or those requiring extracorporeal circulation membrane oxygenation (ECMO) were excluded.

The average age of the infants was 4.3 months, and their average weight was 4.9 kg. Of the 184 patients, 21 (11.4%) died. Duration of hyperglycemia was significantly associated with liver insufficiency, renal insufficiency, infection, CNS events, the need for dialysis, the need for ECMO, and a composite measure of morbidity.

Two other measures of hyperglycemia—initial glucose level and peak glucose level—had somewhat weaker associations with the composite morbidity measure. However, higher glucose levels did differ significantly between survivors and nonsurvivors.

In addition, the level of glucose was increased 78% in patients with neurocognitive decline, compared to 29% in their counterparts who did not show a decline.

There exists a significant association between the magnitude and persistence of the perioperative inflammatory response and neurocognitive decline in this cohort, Dr. Yates said. “This association is likely mediated by axonal damage.”

According to the medical literature, the incidence of neurocognitive decline is 20%-60% in the first 2 weeks after cardiac surgery. It can range from 5% to 40% for periods up to 5 years after surgery, he said, adding that the etiology of this complication is not known. “It is likely a multifactorial problem,” Dr. Yates said. “Several theories have been assessed. The most obvious one is ischemia. Any microemboli might cause this.”

Other possible factors include anesthetics, perioperative hypothermia, and low level of education.

While there have been certain markers of brain injury following cardiopulmonary bypass, very few have been associated with clinical outcomes and neurocognitive decline, he said. “Tau protein, on the other hand, assesses axonal damage and has not been studied in cardiac surgery before.”

ACP Aids Survival in High-Risk Neonates

Chicago — Antegrade cerebral perfusion offers a survival advantage for high-risk newborns undergoing single-ventricle palliation, Dr. Robert Hannan said at the annual meeting of the Society of Thoracic Surgeons.

He reported on a retrospective analysis of 126 consecutively performed category 6 patients who underwent stage 1 palliation of hypoplastic or nonhypoplastic left heart syndrome or a Damus-Kaye-Stansel procedure with either deep hypothermic circulatory arrest or antegrade cerebral perfusion at the Congenital Heart Institute in Miami Children’s Hospital from 1995 to 2004.

In early 2001, hospital staff decided to limit the use of deep hypothermic circulatory arrest (DHCA) because of reports on the efficacy and safety of antegrade cerebral perfusion (ACP), and because of what Dr. Hannan called, “persuasive evidence that prolonged periods of deep hypothermic circulatory arrest lead to higher short- and long-term morbidity.”

A total of 67 patients were repaired with prolonged DHCA, and 59 with ACP and a short period of DHCA. Dr. Hannan and colleagues further stratified the groups into a high-risk (weight less than 2.5 kg or other cardiac diagnosis) and usual-risk groups.

Patients were typically perfused through a shunt at the subclavian-innominate junction during arch reconstruction. Pulmonary artery transection was performed with the body perfused and the heart beating, he said. Circulatory arrest was used for changing the position of the cannulas and the atriectomy.

The 30-day survival was significantly higher in the ACP group than in the DHCA group (98% vs 70%). The high-risk ACP patients had a trend toward increased survival, compared with their DHCA counterparts (80% [12/15] vs. 62% [8/13]). But the difference was not significant.

At 1 year, the ACP group continued to have a significant survival advantage over the DHCA group (76% vs 54%).

Dr. Hannan acknowledged that multiple changes were made during the study period in the hospital’s perfusion strategy, ICU management, and anesthesia practices that confounded the effect of ACP. Perfusion changes included the adoption of a single antegrade cerebral perfusion strategy to manage acid base status, increased hematocrit while on bypass, and hyperoxygenation.

Clampless CABG May Lower Risk of Postoperative Stroke

ORLANDO — Performing a coronary artery bypass graft without the aortic clamp appears to minimize the risk of postoperative cerebrovascular accidents independent of the use of cardiopulmonary bypass, said Dr. Michael F. Gibson at the annual meeting of the Southern Thoracic Surgery Association.

Neurologic dysfunction is a common complication after cardiac surgery. Despite significant advances in cardiopulmonary bypass (CPB) technology, surgical techniques, and anesthesia management, central nervous system complications occur in a large number of patients undergoing surgery requiring CPB, he said.

Many comparisons between traditionally arrested heart coronary artery bypass graft (CABG) and off-pump coronary artery bypass (OPCAB) have therefore concentrated on the contribution of the cardiopulmonary bypass machine to the potential adverse outcomes, said Dr. Gibson, of the University of Oklahoma Health Sciences Center, Oklahoma City. In contrast, in a recent investigation, Dr. Gibson and his colleagues evaluated the clinical neurologic outcomes in patients undergoing arrested-heart CABG, beating-heart coronary bypass CABG (BH-CAB), and OPCAB in whom no aortic clamp was used to restrict blood flow to the graft area.

The study included 424 patients who underwent coronary artery bypass surgery at the Health Sciences Center between July 2000 and April 2004. All were operated on without the use of an aortic clamp, and all were started as OPCAB and converted to BH-CAB as required by the clinical situation, he said.

Of the 424 patients, 213 underwent CABG, 134 underwent OPCAB, and 77 underwent BH-CAB. During the study period, no BH-CAB or OPCAB patients were converted to CABG.

All of the patients were evaluated postoperatively for clinical neurologic outcomes. Of the patients, six who underwent OPCAB, and who underwent BH-CAB or OPCAB experienced clinically obvious cerebrovascular accidents (CVAs) in the immediate postoperative period.

“There is no immediate postoperative CVAs in the off-pump and beating-heart CPB patients implies that the application of the aortic clamp, rather than the use of cardiopulmonary bypass, is the more important culprit for such adverse outcomes in CABG surgery,” said Dr. Gibson. “Routine clampless surgery minimizes the CVA risk and may be the most important improvement that is easily obtainable with the use of off-pump and beating-heart surgery techniques.”