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Periprocedural management of the diabetic patient undergoing coronary angiography: current practice

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Despite advances in procedural technique and pharmacotherapy, diabetic patients experience worse outcomes than nondiabetic patients undergoing percutaneous coronary intervention (PCI).[1] Periprocedural hyperglycemia is associated with adverse clinical outcomes in patients undergoing PCI,[2–5] and studies have suggested that treating periprocedural hyperglycemia may improve outcomes by attenuating glucose-mediated ischemic injury at the time of PCI.[6–7] Simple preventive strategies such as continuing long-acting hypoglycemic medications have not been evaluated and there are no guidelines for periprocedural use of these medications.

We conducted an anonymous electronic survey of cardiologists referring patients for coronary angiography using the American Heart Association Cardiology Fellows Society of Greater New York and the Society of Cardiovascular Angiography and Interventions from March through July 2011. Of the 144 survey responders, 24% are fellows-in-training and 33% are faculty at a medical school. Among this cohort, 60% believe hyperglycemia at the time of PCI is harmful, and 94% believe hypoglycemia at the time of PCI is harmful.

While a majority of clinicians routinely hold oral hypoglycemic medications prior to angiography, substantial numbers do not, with nearly half routinely continuing thiazolidinediones on the morning of coronary angiography (see Table). Clinicians are more

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B.S. contributed in designing the survey, analyzing the data, and writing the manuscript. A.D. assisted in reviewing/editing the manuscript. M.R. assisted in reviewing/editing the manuscript. L.R. reviewed the survey design to ensure statistical validity and in reviewing/editing the manuscript. S.P.S. contributed in designing the survey and reviewing/editing the manuscript. The Principal Investigator, S.P.S., had full access to all of the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis.

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likely to continue insulin based regimens than oral medications, but again there is no uniformity of practice. In patients with uncontrolled diabetes mellitus (glycosylated hemoglobin >10% or blood glucose levels >200mg/dL), a little more than one-third of physicians reported they would change their usual practice and continue hypoglycemic medications prior to coronary angiography.

The risk of hypoglycemia appears to be a major factor preventing physicians from continuing long-acting hypoglycemic medications prior to PCI. Delays in scheduled cardiac catheterization procedures frequently occur, and therefore, there is uncertainty regarding how long a patient will be fasting prior to their coronary angiogram. However, hypoglycemia is not likely to complicate routine coronary angiography since patients with a late afternoon scheduled procedure are usually given permission to have a light breakfast and to eat relatively soon after the procedure is completed even when conscious sedation is administered. Furthermore there is substantial variability in eating patterns and stress levels on the day of PCI, which may lead to hyperglycemia at the time of arterial access. This may explain why the majority of physicians report continuing at least half the dose of long-acting insulin in all diabetic patients prior to angiography.

Our data suggest that physicians are influenced by the pharmacologic properties of the various hypoglycemic agents when designing management strategies for diabetic patients undergoing coronary angiography. For example, thiazolidinediones and glargine-insulin are unlikely to cause sudden hypoglycemia in the setting of variable eating patterns. Physicians are, therefore, less likely to hold thiazolidinediones compared to sulfonylureas prior to cardiac catheterization. Similarly, physicians are more likely to continue full dose glargine-insulin than NPH-insulin on the day of coronary angiography. Thus it is concerning that the management of patients treated with metformin reflects a lack of knowledge of the pharmacologic properties of this drug. Metformin is contraindicated in patients with chronic kidney disease due to the risk of lactic acidosis at very high metformin concentrations. However, in patients with normal kidney function, renal function is unlikely to change following angiography unless contrast-induced nephropathy develops, a complication that occurs 48 to 72 hours after contrast exposure. The half-life of metformin is between 2 to 5 hours, and, therefore, the drug label instructs patients to stop the medication for 48 hours after contrast exposure. Nevertheless, 88% of physicians in the current survey report holding metformin prior to coronary angiography. Furthermore, of these physicians, 28% report holding metformin for both 2 days before and 2 days after coronary angiography.

Although the response rate to this survey was low, and we have no data on non-responders, we obtained a sample of physicians at various stages of practice, including fellows-in-training and attending physicians, in both private practice and academics. Survey responders may also have self-selecting features. For example, only those who believe this is an important topic of discussion may have responded to the survey. However, we still demonstrate clinical equipoise in the management of hypoglycemic medications in the diabetic patient undergoing coronary angiography.

We conclude there is considerable variability in the management of hypoglycemic medications by cardiologists sending patients for coronary angiography. An evidence base to better establish optimal goals for glycemic control in the setting of PCI and education of physicians to avoid premature discontinuation of diabetes therapies is needed. Furthermore, prospective randomized studies are warranted to determine if continuing long-acting hypoglycemic medications prior to PCI is safe and has a beneficial effect on long-term clinical outcomes.

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References

1. Mathew V, Gersh BJ, Williams BA, Laskey WK, Willerson JT, Tilbury RT, Davis BR, Holmes DR Jr. Outcomes in patients with diabetes mellitus undergoing percutaneous coronary intervention in the current era. Circulation. 2004; 109:476–480. [PubMed: 14732749]
2. Muhlestein JB, et al. Effect of fasting glucose levels on mortality rate in patients with and without diabetes mellitus and coronary artery disease undergoing percutaneous coronary intervention. American Heart Journal. 2003; 146:351–358. [PubMed: 12891207]
3. Robertson BJ, et al. Usefulness of hyperglycemia in predicting renal and myocardial injury in patients with diabetes mellitus undergoing percutaneous coronary intervention. American Journal of Cardiology. 2004; 94:1027–1029. [PubMed: 15476617]
4. Wilson SR, et al. Effects of diabetes on long-term mortality following contemporary percutaneous coronary intervention: analysis of 4,284 cases. Diabetes Care. 2004; 27:1137–1142. [PubMed: 15111534]
5. Shah B, et al. Relation of Elevated Periprocedural Blood Glucose to Long-Term Survival After Percutaneous Coronary Intervention. The American Journal of Cardiology. 2005; 96:543–546. [PubMed: 16098309]
6. Corpus RA, et al. Optimal glycemic control is associated with a lower rate of target vessel revascularization in treated type II diabetic patients undergoing elective percutaneous coronary intervention. JACC. 2004; 43:8–14. [PubMed: 14715174]
7. Yazici M, et al. Effect of glucose-insulin-potassium infusion on myocardial damage due to percutaneous coronary revascularization. American Journal of Cardiology. 2005; 96:1517–1520. [PubMed: 16310433]

Table

Percent of survey responders who report routinely holding hypoglycemic medications prior to procedure in diabetic patients referred for coronary angiography (Percent of those who routinely hold but will continue medication in uncontrolled diabetes mellitus, defined as glycosylated hemoglobin >10% or blood glucose levels >200mg/dL)

Sulfonylurea	Metformin	TZD	NPH-insulin		NPH component of 70/30 insulin*	Glargine-insulin	
			Hold dose	Continue half-dose		Hold dose	Continue half-dose
70% (39%)	88%** (12%)	55% (34%)	26% (35%)	72%	63% (55%)	16% (32%)	60%

*70/30 insulin consists of 70% long-acting NPH and 30% short-acting or rapid-acting insulin

**28% hold metformin for 48 hours before and 48 hours after procedure

TZD = Thiazolidinedione