OBSERVATIONS

Hypoglycemia in Patients With Diabetes on Antidiabetic Medications Who Fast for Laboratory Tests

We would like to report the results of a pilot study that we undertook to evaluate the risk of hypoglycemia in patients with diabetes on antidiabetic medications because of the repeated calls from our laboratory reporting critical glucose results, typically after patients who had come earlier for blood tests had already left the laboratory. We have become increasingly concerned about these occurrences and realized that our patients may not be adequately educated on the proper preparation for tests requiring overnight fasting.

Patients with diabetes are generally given instructions regarding medication adjustments when they fast overnight for surgical or diagnostic procedures, but we became concerned that there may not be such instructions for overnight fasting for laboratory tests. It could be argued that some clinicians may take the initiative of providing such instructions. However, being diabetes specialists ourselves, we acknowledge that we had not paid adequate attention to this issue. Similarly, from talking with diabetes educators (S.A., personal communications), we realized that this educational piece is not included in traditional curricula. Extensive literature search retrieved no publications on this critical issue or educational guidelines on how to prepare patients with diabetes for overnight fasting for laboratory tests. (The literature search was undertaken by senior and experienced librarians at both libraries of the Saint Francis Medical Center, Cape Girardeau, Missouri, and the Sparrow Hospital, Lansing, Michigan.) Hence, we hypothesized that this could be an overlooked quality assurance problem and subsequently undertook this retrospective study.

Over a 21-month period, our laboratory (which does not record fasting status) identified 55 patients with hypoglycemia between 8:00 A.M. to 12:00 P.M. Upon retrospective chart reviews and telephone interviews, 39 of these patients were found to be on antidiabetic medications: 15 recalled being fasting, 4 nonfasting, and 20 were uncertain. The range of hypoglycemia in the patients who recalled being fasting or possibly fasting ($n = 35$) was 69–30 mg/dL: 23 results <60, 11 <50, and 6 <40 mg/dL (66, 31, and 17%, respectively). Seven patients recalled having autonomic hypoglycemic symptoms but none had a change in their level of consciousness, and none needed assistance. No patients recalled making adjustments to their antidiabetic medications the night before or the morning of the test.

These findings indicate that patients on antidiabetic medications are at risk for developing hypoglycemia while fasting for laboratory testing. While we are not certain of the causes of hypoglycemia in our patients, a possible explanation for the ensuing hypoglycemia is the lingering effects of antidiabetic medications during a prolonged fast, as hepatic glycogen stores may begin to wane, and release of hepatic glucose may get impaired.

We believe that while the liver can provide glucose during prolonged fasting, this usually is physiologically facilitated by significant reductions in insulin secretion to the nadir. In patients on insulin, especially basal insulin the night before, or on long-acting sulphonylurias, this protective physiologic mechanism is impaired or eliminated, and release of glucose from the liver is thus impaired. We believe that this is particularly more likely to occur in patients with long-standing diabetes who are vulnerable to have impaired glucagon secretion, and in patients with autonomic neuropathy who are at risk of impaired epinephrine release.

Since we realized these recurring events in our patients, we implemented the following educational program at our practice: *1*) more frequent glucose monitoring during the morning hours (until the fasting is broken) and cancelling the laboratory tests if necessary; *2*) avoiding any type of insulin, whether short- or long-acting, on the morning of the test (patients are routinely instructed to skip scheduled short-acting insulin when skipping a meal but are not always certain about basal insulin); *3*) taking less long-acting insulin at night; and *4*) reducing or omitting evening doses of sulphonylurias.

In conclusion, we believe that hypoglycemia resulting from fasting for laboratory tests is an overlooked problem. The potential serious harm to patients should be of particular interest to risk managers, laboratories, clinicians, and diabetes educators. Clinicians and diabetes educators should instruct their patients about preparation for fasting for laboratory tests including close glucose monitoring and adjustment of antidiabetic medications.

SALEH ALDASOUQI, MD, FACE, FACP, ECNU
AHMAD SHEIKH, MD, ECNU
PAM KLOSTERMAN, RN, CDE, BC-FNP
SHEILA KNIESTEDT, LPN
LISA SCHUBERT, LPN
ROSIE DANKER, RN, BSN, CDE
MARY AUSTIN, MA, RD, CDE, FAADE

From Cape Diabetes and Endocrinology, Saint Francis Medical Center, Cape Girardeau, Missouri.
Corresponding author: Saleh Aldasouqi, saldasouqi@pol.net.
DOI: 10.2337/dc10-2402

Acknowledgments—S.A., A.S., and P.K. received research support from Amylin for an observational 2-year multicenter study on exenatide that ended in January 2010. However, the whole compensation for the study was donated to a research fund at Saint Francis Medical Center, Cape Girardeau, Missouri. S.A. also received honoraria from Takeda. A.S. also received honoraria from Abbott. R.D. has a part-time working contract with Medtronic for patient training on insulin pumps. No other potential conflicts of interest relevant to this article were reported.

S.A. designed the study, searched the literature, researched data, contributed to discussion, and wrote, reviewed, and edited the manuscript. A.S., P.K., S.K., L.S., and R.D. contributed to the study planning and conduction and research discussion. S.K. performed the data collection and telephone interviews. M.A. contributed to the concept and research discussion.

Parts of this study were submitted in abstract form to the 2011 annual meeting of the American Association of Clinical Endocrinologists, San Diego, California, 13–17 April 2011.

The authors would like to thank Laura Smith, Mike Simmons, and Steve Kalis (Medical Library of Sparrow Hospital, Lansing, Michigan), and Faith Chrutcheon (Medical Library of Saint Francis Medical Center, Cape Girardeau, Missouri) for their efforts in searching the literature for any possible references related to our research issue. The authors would also like to thank Kim Mathew (Chemistry Section of the Saint Francis Medical Center Laboratory, Cape Girardeau, Missouri) for her assistance with laboratory data retrieval.