

Management of Diabetes and Pancreatic Cancer

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A 54-year-old male patient named D.N. developed type 2 diabetes mellitus (T2DM) 10 months ago. At the time, he weighed 225 pounds and had a body mass index of 35.2. D.N. was started on metformin with poor control and, within two months, glimepiride was added to his regimen. Six months later, D.N.'s hemoglobin A1c (HbA1c) was still above 8% (normal is less than 6%), so his endocrinologist added exenatide. He had a fairly well controlled fasting blood glucose and HbA1c ranging from 6.5%–7.3% after exenatide was added. One month later, however, D.N. developed abdominal pain and anorexia with a 20-pound weight loss. His blood glucose became extremely labile despite his poor oral intake and good compliance with his oral hypoglycemic agents.

A few days later, D.N. presented to the emergency room with severe abdominal pain and difficulty eating. An abdominal ultrasound revealed a normal pancreas, but a computed tomography (CT) scan showed evidence of pancreatitis and a possible mass in the tail of the pancreas. D.N. was first treated for pancreatitis and then underwent an endoscopic ultrasound that revealed an irregular partially cystic mass that was 2 × 3 cm in size. Multiple biopsies showed atypical cells. A distal pancreatectomy was performed and pathology revealed pancreatic intraepithelial neoplasia with high-grade dysplasia with a question of invasive adenocarcinoma; findings by two independent pathologists were inconclusive. Thirteen peripancreatic lymph nodes were negative for metastatic tumor. D.N. was observed for two months and a repeat CT scan revealed a recurrent mass in the pancreatic surgical bed with invasion of the hepatic artery and superior mesenteric vein. An ultrasound-guided biopsy confirmed adenocarcinoma, and D.N. was referred to a medical oncologist for treatment

options. Diabetes management also was very difficult at this point as his blood glucose was consistently greater than 300 mg/dl (normal is less than 125 mg/dl) despite oral medications and a 70-pound weight loss. Pancreatic insufficiency caused by his surgery and disease resulted in chronic diarrhea and further malnutrition.

The decision was made with the patient and family to initiate fluorouracil, leucovorin, and oxaliplatin chemotherapy. This regimen presented a few challenges because oxaliplatin and all supportive fluids are mixed in dextrose and the recommended antiemetic regimen includes dexamethasone, a glucocorticoid. This combination puts additional burden on glucose metabolism.

Although nausea can be fairly well controlled, anorexia and taste changes can reduce caloric intake and affect insulin and oral hypoglycemic medication requirements. D.N. tolerated the first cycle well with minimal nausea, but his blood sugar rose above 500 mg/dl and his lactic acid level was elevated; therefore, he was hospitalized for stabilization of his glucose. Working with his endocrinologist, D.N. was initiated on a regimen with sliding scale regular insulin (humulin) and metformin, which helped maintain glucose control.

Type 2 Diabetes and Pancreatic Cancer

The case study illustrates a few of the many interactions between diabetes, specifically T2DM, and pancreatic cancer. As in the case study, the onset of diabetes within two years of pancreatic cancer may be related to the cause of the pancreatic cancer or a result of its development. Pancreatic cancer can induce diabetes through islet cell destruction and increasing insulin resistance by elevating plasma levels of islet amyloid polypeptide, a hormone that may cause

insulin resistance (Permert et al., 1994). T2DM is a disease of insulin resistance, impaired insulin production, and increased glucose production (Singer, 2007).

Assessment

When a patient is first diagnosed with pancreatic cancer, a thorough assessment is performed to identify comorbidities and issues that will help determine treatment strategy. Patients should be assessed for risk factors associated with the development of diabetes prior to the initiation of cancer therapy. These risk factors include age, obesity, family history of diabetes, history of gestational diabetes, and a previously abnormal fasting glucose or glucose tolerance test. If the patient has any of these risk factors, fasting glucose and HbA1c should be included in the initial blood work.

A patient with both diabetes and pancreatic cancer requires additional assessment so therapy can be selected based on careful consideration of the patient's glycemic state. Oral hypoglycemic agents (OHAs) are reviewed to determine whether the patient's renal or hepatic status precludes the use of the medication. Metformin or sulfonylureas should be substituted with another medication if renal insufficiency or significant hepatic impairment are present.

Pancreatic insufficiency from surgery and tumor cause abdominal pain, bloating, and diarrhea, particularly after eating. Pancreatic insufficiency is the syndrome that results from a deficiency in pancreatic enzymes that are required to properly digest food. This also is a syndrome associated with T1DM and T2DM (Hardt & Ewald, 2011). Gastrointestinal issues such as nausea, anorexia, and diarrhea from pancreatic insufficiency will affect glycemic control and, therefore, medications should be