

CASE 7.1
Type 2 Diabetes Mellitus | Level 1

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1. What is the subjective and objective evidence for the diagnosis of T2DM?

SUBJECTIVE FINDINGS: The patient did not report any subjective findings of T2DM as he denied polydipsia, polyuria, and fatigue. He may be experiencing polyphagia as he tends to overeat and has large portion sizes, but this appears to be an ongoing issue from before the onset of diabetes.

OBJECTIVE FINDINGS: The objective evidence of T2DM includes fasting plasma glucose of 185 mg/dL and HbA_{1c} of 8.2%, which satisfy diagnostic criteria for diabetes. Although islet cell antibodies were not obtained in this patient, there are indications that he has T2DM such as elevated fasting insulin and C-peptide, acanthosis nigricans (a symptom of insulin resistance), morbid obesity, strong family history, and he belongs to an ethnic group that has a high risk for T2DM.

2. Assess the need for therapy for dyslipidemia and prehypertension for this patient.

The complications of T2DM include microvascular and macrovascular disease. Microvascular complications include retinopathy, nephropathy, and neuropathy, whereas macrovascular complications include peripheral, cardiovascular, and cerebrovascular diseases. Other complications can include recurrent infections. Because the onset of T2DM in children is a relatively new phenomenon, little data exist on the natural history of the disease. However, several studies have reported an earlier onset of microalbuminuria and higher risk of kidney disease compared to children with type 1 diabetes. One study predicts that children diagnosed with T2DM early in life can expect a 15-year reduction of life and advanced complications by the age of 40. The patient should be treated to prevent complications of diabetes and early mortality.

Because diabetes is a risk factor for cardiovascular and cerebrovascular disease, the management of dyslipidemia or hypertension is important. The patient should have two fasting lipid profiles separated by at least 2 weeks but no more than 3 months because he is considered high risk for cardiovascular disease due to the diagnosis of diabetes and obesity. He may also be at risk secondary to a strong family history, but further information must be gathered including if any family member has had a history of premature vascular disease (e.g., stroke, myocardial infarction). Nonpharmacologic treatment

strategies should be employed to improve the lipid profile as treatment with pharmacologic therapy is not indicated until the LDL concentrations are greater than 130 mg/dL.

The patient is currently classified as having prehypertension as his current blood pressure is between the 90th and 95th percentile for his height, age, and gender. The diagnosis of hypertension requires repeated accurate measurements of blood pressure (with an appropriately sized cuff) or with ambulatory blood pressure monitoring. Pharmacologic therapy would be indicated if he is prehypertensive because of his diagnosis of T2DM. In addition, an echocardiogram should be considered to determine if left ventricular hypertrophy (LVH) (evidence of target organ damage) is present.

3. Develop a pharmacologic regimen for the treatment of T2DM.

Food and Drug Administration (FDA) approved treatment options for T2DM in children and adolescents are limited to insulin and metformin. In this patient, the drug of choice is metformin because his blood glucose is less than 250 mg/dL and his HbA_{1c} is less than 9%. In patients that exceed the above values, insulin is preferred in order to gain glucose control more rapidly. Benefits to using insulin initially may allow the pancreas to rest from the overproduction of insulin and may lead to improved compliance in the child or adolescent long term because of the perceived gravity of a disease that requires daily injections.

Although lifestyle modifications will have to be addressed, it is recommended to initiate therapy with metformin at diagnosis due to the challenges related to diet and exercise in the adolescent population. The dose should be initiated at 500 mg po daily, increasing by 500 mg on a weekly basis (if not tolerated, every 2 weeks) up to a maximum dose of 1,000 mg twice daily. Little efficacy has been noted in doses greater than 2 g per day. The benefits of metformin include proven efficacy of decreasing the HbA_{1c} by 1% to 2%, potential weight loss and improvement of lipids, and safety profile. The goal for the patient would be an HbA_{1c} less than 7%. His fasting serum glucose concentrations should be between 70 and 130 mg/dL.

The patient should have an HbA_{1c} monitored every 3 months. He should also be instructed to do self-monitoring of blood glucose (SMBG) before meals (including a fasting AM) and before bedtime to determine efficacy of the metformin and lifestyle modifications. Once the patient achieves the therapeutic goals, the frequency of testing can be decreased as metformin monotherapy does not cause hypoglycemia. Prior to initiation of therapy and then yearly, a serum creatinine, hepatic function tests, and a CBC should be obtained. Adverse reactions related to metformin include diarrhea, which is minimized with a slow titration of the agent and decreases with time.

If the patient is unable to achieve control with metformin monotherapy, the addition of long-acting insulin (e.g., glargine) nightly may be necessary.

4. Determine an appropriate treatment strategy for morbid obesity in this patient.

The patient must be counseled on diet and exercise for the treatment of obesity, diabetes, and improvement of his LDL and HDL cholesterol. He is considered to be morbidly obese as his BMI falls above the 99th percentile for his sex and age. Because he also has comorbid conditions (diabetes), a weight-loss treatment plan is indicated. He would benefit from a structured weight management program, comprehensive multidisciplinary intervention, or tertiary center intervention based on program availability. The patient and family should be referred to a nutritionist to discuss healthy food options, if available.

Ideally, the patient should restrict his caloric intake to 1,200 calories per day with less than 30% of calories from fat. However, this may be a challenging goal. Some strategies to decrease caloric intake is to eat regularly scheduled meals and snacks, limit portion sizes, eliminate soda from diet, and increase fruits and vegetables. It is critical to work with the family for weight loss strategies. Setting small goals each week or visit may be a useful approach and more achievable by the patient and family.

The patient should be encouraged to increase physical activity. The goal is to have moderate-