CARDIOVASCULAR COMPLICATIONS

Cardiovascular disease (CVD) is the leading cause of death among people with diabetes mellitus. Compared to people without diabetes, those with diabetes have a higher prevalence of CVD and are more likely to have myocardial infarctions or silent myocardial ischemia. Diabetes is an independent risk factor for CVD, but also acts synergistically with other cardiovascular risk factors (hypertension, smoking, hyperlipidemia, age, and family history) to further increase cardiovascular morbidity and mortality. Although it is not yet clear why diabetes increases one’s risk of CVD, it is believed that hyperglycemia, hyperinsulinism (in those with type 2 diabetes), and/or dyslipidemia may play a role. In fact, dyslipidemia is a major contributor to atherosclerosis: not only do people with diabetes have less HDL ("good") cholesterol to help protect against oxidative damage, but their LDL particles are also smaller and more dense than in people without diabetes, making these particles more vulnerable to oxidation and thus more capable of contributing to atherosclerosis. Compare a normal coronary artery in Figure 1 to that in Figure 2, which has extensive blockage from atherosclerosis. Such advanced atherosclerosis in the vasculature of the heart leads to coronary artery disease (CAD), a major complication of diabetes.

More information about the cardiovascular complications of diabetes is discussed in the following articles:


History:
A patient with CAD will most commonly present with angina. Because CAD may lead to congestive heart failure (CHF), patients with this advanced condition may complain of fatigue and breathlessness.

Physical Exam:
Myocardial ischemia may produce an S4 from left ventricular wall stiffness. If CHF with reduced cardiac output is present, there may be an increased jugular venous pressure, as well as edema in the lower extremities. Pulmonary edema may also be present and will result in crackles that are heard upon lung auscultation. Also in CHF, elevated left ventricular filling pressures will result in an S3 that is heard upon cardiac auscultation.

Tests:
To evaluate the presence of current ischemia or past myocardial infarctions, an ECG should be ordered. It is important to note that a baseline ECG should be considered in older patients whether angina is present or not because patients with diabetes have a higher prevalence of "silent ischemia". Patients with “silent ischemia” may even have myocardial infarctions without accompanying chest pain (this is thought to occur because of denervation of the heart, similar to the nerve damage that is seen in diabetic peripheral neuropathy); thus, ECG is critical to detect such events. To test for inducible ischemia, a stress test may be performed.

If suspicion of CHF exists, the patient will likely get an echocardiogram to evaluate left ventricular function.

Treatment:
First and foremost, the doctor and patient must work together to gain control of the diabetes and any concomitant modifiable cardiovascular risk factors (hypertension, hyperlipidemia, and smoking). Pharmacologic management may be started, with use of one or more of the following medications: aspirin and beta blockers if CAD is present; lipid-lowering agents such as “statins” to decrease the LDL cholesterol to less than 100 mg/dL; ACE inhibitors as a first line agent for hypertension; and if symptomatic CHF exists, diuretics and possibly digoxin. Finally, if the CAD continues to cause ischemia despite medical therapy, revascularization may be necessary, with either angioplasty or CABG.

Self Assessments:
A 55 year-old woman with type 2 diabetes presents to your clinic. Which of the following parts of the clinical encounter would be MOST suggestive of congestive heart failure (CHF) in this patient?
A. History reveals angina on exertion, but is otherwise unremarkable  
B. Cardiac auscultation reveals physiological splitting of S2  
C. Examination of the neck reveals no distention of the jugular veins at 30 degrees  
D. Lung auscultation reveals inspiratory crackles

Explanations:
A. Incorrect. Angina on exertion is indicative of CAD, but not CHF. Fatigue and breathlessness would be common complaints of CHF.  
B. Incorrect. Physiological splitting of S2 is a completely normal phenomenon that occurs during inspiration as the venous return to the right side of the heart increases. In CHF, due to elevated left ventricular filling pressures, an S3 may be heard.  
C. Incorrect. Patients with CHF typically have elevated JVP reflecting increased preload; the findings of flat jugular veins at 30 degrees suggest that preload is decreased.  
D. Correct! Inspiratory crackles are a sign of pulmonary edema, a common feature of CHF.

Which of the following is MOST CORRECT regarding diabetes mellitus and cardiovascular disease (CVD)?

A. Characteristic large LDL particles in a person with diabetes will clump together to contribute to atherosclerosis  
B. Diabetes acts synergistically with other risk factors to further increase one’s risk of CVD  
C. Diabetes will ultimately lead to CHF, regardless of how well one’s blood sugar is controlled  
D. In and of itself, diabetes is not a risk factor for cardiovascular events

Explanations:
A. Incorrect. The LDL particles in diabetes are small and dense, thus making them more vulnerable to oxidation and thus more capable of contributing to atherosclerosis.  
B. Correct!  
C. Incorrect. One who maintains good control of their diabetes will not only decrease their risk of progressing to CHF, but may never develop symptomatic cardiovascular issues at all.  
D. Incorrect.

A 67 year-old woman presents to her physician for a routine check-up. She has had type 2 diabetes for over 20 years. An ECG is obtained and shows evidence of myocardial infarct in the inferior leads. These findings are new since an ECG one year ago. She denies any symptoms. You suggest:

A. No further work-up. The ECG must be wrong.  
B. No further work-up as she doesn’t have any symptoms of CAD  
C. A stress test

Explanations:
A. Incorrect. The ECG might be wrong, mislabeling of records can happen. But this shouldn’t be presumed!  
B. Incorrect. Patients with diabetes are at risk for “silent ischemia” and may not have classic symptoms of chest pain with angina or myocardial infarctions.  
C. Correct! Patients with diabetes are at risk for “silent ischemia” and may not have classic symptoms of chest pain with angina or myocardial infarctions. She may have additional myocardium at risk for injury, so some additional investigation is warranted.