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A long-term smoker with right-sided weakness and "heaviness" in one leg

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CASE

A 47-year-old African-American woman presented to the emergency department (ED) with right-sided weakness and what she described as feelings of "heaviness" in the right leg. She also complained of mild abdominal discomfort. These symptoms had been present for a few days. Her history was significant for smoking one pack of cigarettes per day for 25 years, and she also had a history of gastroesophageal reflux disease and arthritis. She denied shortness of breath or chest pain.

The patient had a grade III/VI systolic ejection murmur, but the heart rate and rhythm were regular. The lungs were clear. Neurologically, the right leg was weaker than the left, but normal sensation was maintained. Otherwise, the neurologic examination was unremarkable. The abdominal examination was negative except for mild, nonlocalized tenderness.

The ED physician suspected that the patient had had a stroke and ordered appropriate testing. The tests included CT of the head and a carotid artery sonogram. The results of the CT were negative, but the carotid sonogram showed bilateral carotid artery dissection. As a consequence, the physician ordered CT of the chest and abdomen with intravenous contrast enhancement. **What do these CT scans show (see Figure 1)?**

DISCUSSION

The CT scans show an aortic dissection. Notice the line coursing through the ascending and descending aorta. This is called an "intimal flap" because it is the intimal layer of the artery wall, which has separated from the medial layer. The abdominal portion of the CT shows vascular compromise of the right kidney as well. This could explain the patient's abdominal pain. Although not demonstrated on CT, if the lumbar artery branches of the aorta were also compromised, this could account for the leg weakness. *Continued on page 76*

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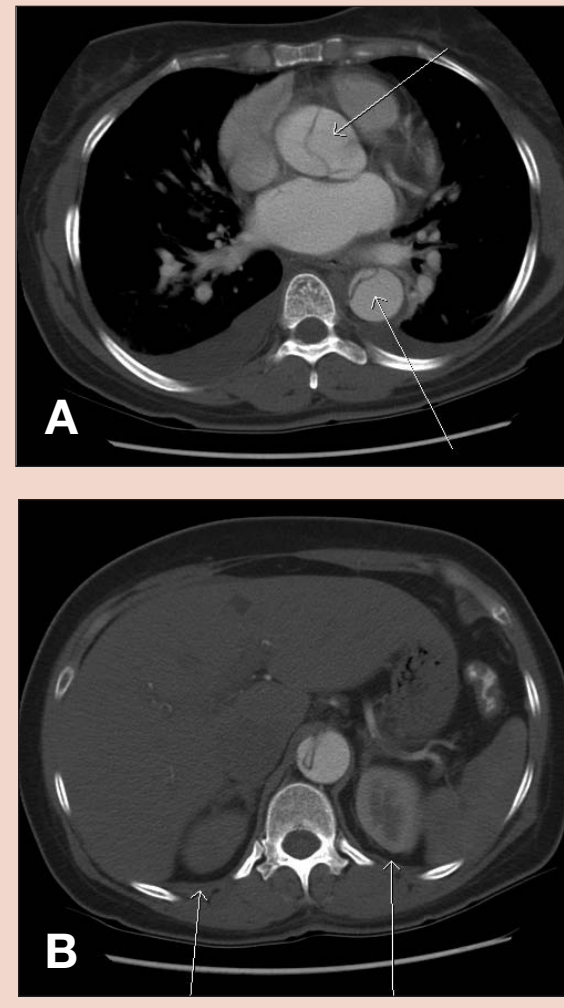
FIGURE 1



In these CT images of the abdomen and the chest, the intimal flap in the ascending and descending aorta is clearly visible (a, arrows). Hypoperfusion is also noted in the right kidney compared to the left (b, arrows). The hypoperfusion is secondary to the intimal flap, as it involves the take-off of the right renal artery from the aorta.

In aortic dissection, the intimal layer is torn, forming a true and a false lumen within the artery. Most tears occur within 10 cm of the aortic valve and can extend in either direction. A subintimal hematoma can form in the false lumen and can compromise blood flow to branch arteries of the aorta, causing a variety of symptoms.

Symptoms typically include chest pain, which is often described as sharp, severe, stabbing, tearing, and ripping. The pain usually comes on abruptly and is maximal at onset. The location of the pain can migrate as the dissection progresses. Neurologic deficits are not uncommon, occuring in approximately 20% of cases, usually with syncope or altered mental status as a major consequence. Other indicators are anxiety, tachycardia, sweating, nausea, vomiting, shortness of breath, and hypertension or hypotension. Physical signs may include asymmetric pulses or blood pressures, neurologic deficits, and murmurs or bruits. Aortic dissection can mimic MI or stroke.

The condition occurs more commonly in men than in women and usually manifests at age 40 to 70 years, with a peak at age 50 to 65 years. Aortic dissection is also more common in blacks than in whites. Risk factors include atherosclerosis, hypertension, blunt trauma, Marfan syndrome, Ehlers-Danlos syndrome, aortic aneurysm, pregnancy, aortic insufficiency or bicuspid aortic valve, coarctation of the aorta, syphilis, crack cocaine use, and iatrogenic factors, such as cardiac catheterization.

Aortic angiography is invasive, requires transport of the patient, and carries the risks associated with the use of intravenous contrast.

Evaluation Several tests can help the clinician to diagnose aortic dissection, including echocardiography (transthoracic or transesophageal), chest radiography, CT or MRI of the chest, aortic angiography, and Doppler ultrasonography. Of course, all have their pitfalls and benefits.

Transthoracic echocardiography can detect most ascending dissections and cardiac tamponade, and it can also be used to evaluate for aortic regurgitation. If the aortic valve is involved, the valve is typically replaced when the dissection is repaired. Transthoracic echocardiography is rapid and can be performed at the bedside.

Transesophageal echocardiography is also quick. It can be used to assess involvement of the coronary arteries, as well as to detect cardiac tamponade and aortic insufficiency. Unfortunately, the value of the test is strongly dependent on operator experience, and false-positive results can occur from artifacts or when areas are not well visualized.

Chest radiography may demonstrate mediastinal widening, tracheal deviation, a left apical cap, a depressed left mainstem bronchus, esophageal deviation, or loss of the paratracheal stripe. There may also be a "ring" sign, which is displacement of the aortic shadow more than 5 mm past the calcified aortic intima (in a patient with atherosclerosis). Most of these findings are not specific for dissection. Of course, the more of these findings there are, the more likely dissection is to be present.

CT is fast, but it requires transporting the patient to the radiology department. CT can aid in surgical planning and be used to evaluate the extent of the dissection, as well as to detect potential arterial compromise to organs supplied by the branches of the aorta. The disadvantages of CT include the use of IV contrast, which carries the risks of allergic reaction and of kidney failure in patients with renal compromise or diabetes. CT also cannot provide information about the functioning of the aortic valve.

MRI can demonstrate the site, type, and extent of the dissection, and it does not require the use of contrast or ionizing radiation. However, a long time is needed to acquire the images, and MRI cannot be used in patients with pacemakers.

Aortic angiography can detect aortic dissection in approximately 95% of cases. It aids in surgical planning and can usually identify the true and false lumens, and it serves to evaluate involvement of the coronary arteries and aortic regurgitation. Aortic angiography is invasive, requires transport of the patient, and carries the risks associated with the use of intravenous contrast. False-negative results are also possible if the false lumen is thrombosed and missed.

Doppler ultrasonography can detect the intimal flap and evaluate blood flow. It can also be performed at the bedside. However, in the abdomen, visualization of the aorta can be obscured by bowel gas. The accuracy of this study is also dependent on the expertise of the technologist performing the study.

Classification There are two methods of classifying aortic dissections. These include the Stanford and the DeBakey classifications. A Stanford A dissection involves the ascending aorta and usually requires surgical repair. If the aortic valve is involved, it is usually replaced when surgery for the dissection is performed. A Stanford B dissection involves only the descending aorta.

The 5-year survival rate has been reported at approximately 75%, whether the dissection is treated medically or surgically.

A DeBakey type I dissection involves the ascending aorta, the aortic arch, and the descending aorta. A type II dissection involves the ascending aorta only, and a type III dissection involves the descending aorta distal to the left subclavian artery. Type III dissections have been broken down further into two types. A type IIIa dissection extends distally and proximally above the diaphragm, whereas a type IIIb dissection extends only distally and below the diaphragm.

A dissection is usually considered acute if it has been present for less than 2 weeks. After that, it is considered chronic.

Treatment, prognosis, and follow-up The goal of treatment is to prevent the complications that are associated with aortic dissection. These include bleeding, rupture (which can lead to shock), clot formation, decreased circulation distal to the dissection, kidney failure (with dissections that involve the renal artery), stroke, MI, cardiac tamponade, aneurysm, and redissection.

Dissections involving the ascending aorta are surgically repaired. This surgery may also include repair or replacement of the involved portion of the aorta, as well as aortic valve replacement and possible coronary artery bypass grafting if these procedures are deemed necessary.

Descending aortic dissections are usually treated medically, mostly to control hypertension. Surgery may be performed if there is leaking, rupture, or vascular compromise. If a dissection is left untreated, death usually occurs at a rate of 1% per hour within the first 48 hours.

The 5-year survival rate for patients with aortic dissection has been reported at approximately 75%, whether the dissection is treated medically or surgically. The 10-year survival rate is 40% to 69%. Before current treatment options were available, however, the 1-year survival rate was an abysmal 5% to 10%. As follow-up, patients with dissections that were treated successfully usually undergo imaging every 3 months for the first year, every 6 months for the next 2 years, and annually thereafter. □