Acute Aortic Syndromes: Improving outcomes with TEE

Steven N. Konstadt, M.D., F.A.C.C., Professor and Chair
Dept of Anesthesiology
Maimonides Medical Center, New York, NY 10029

I. Introduction:
Acute dissection of the ascending aorta is a true medical emergency, often necessitating immediate surgical repair. The key to instituting appropriate therapy in acute dissection of the ascending aorta, therefore, is an accurate and rapid diagnosis and anatomical assessment of the aorta.

Aortic Dissection

A. Pathophysiology
Blood accumulation in the medial layer is the characteristic feature of aortic dissection. The dissection of the medial layer may either be localized or split longitudinally. The plane of dissection usually courses along the greater curvature of the ascending and arch of the aorta, while in the descending aorta it is mainly located lateral to the true lumen but may also spiral along its longitudinal axis. Most often, the dissection starts at a tear (rent) in the intimal layer that allows blood to flow between the intimal and medial/adventitial layers. Also, a dissection can occur without any evidence of an intimal tear. It is proposed that this type of aortic dissection is due to medial layer weakness and hemorrhage of vessels in the vasa vasorum.

B. Classification
Aortic dissections may be described by either the DeBakey or Stanford (Daily) classification systems. The simpler Stanford system divides dissections into two groups: type A or type B. Type A describes those dissections that involve the ascending aorta, regardless of the origin of the tear or the extent of dissection (DeBakey types I and II are both included). Type B dissections involve only the descending aorta. Many clinicians have adopted the use of the simplified Stanford classification because it delineates two distinct risk groups and therapeutic approaches. Stanford type A accounts for 50-85% of cases of aortic dissection and is associated with a mortality of 90-95% without surgical intervention. The acute mortality rate of a Stanford type B dissection is about 40% and, accordingly, the therapeutic approach is more conservative.
C. Diagnostic Modalities

A computerized tomography (CT) scan, especially with contrast image enhancement, can aid in determining the extent of the dissection and in detecting the true and false lumina. It can also detect aortic wall thickness and calcium deposits within the aortic wall. The CT scan can also visualize the pericardial and pleural spaces to reveal if there are collections, suggestive of leakage of blood, compression of major structures. The test is relatively rapid and noninvasive. However, there are the associated risks of contrast dye reactions and dye-induced renal insufficiency. Another significant problem of this diagnostic modality is that it lacks the temporal resolution to identify the site of intimal tear or delineate branch involvement in a reliable fashion. It is also impractical to perform CT scanning on critically ill patients who are hemodynamically unstable.

Magnetic resonance imaging (MRI) produces unrestricted high resolution views of the aorta in the transverse, sagittal and coronal planes. Because of its higher quality images, MRI provides better delineation of the origin and extent of the aortic dissection. Like the CT scan, MRI can obtain images of structures surrounding the aorta that may be acutely affected by the dissection process. Also, cine MRI has the capability to detect aortic insufficiency. MRI has overcome some of the drawbacks of CT scanning in that it is minimally invasive and does not require contrast dye. The major limitations are that it is time consuming and the facilities are not always available or on-site. For patients who are hemodynamically unstable and/or in respiratory failure, MRI may prove very difficult. These patients need to be transported with appropriate monitoring. During the study, only limited access is afforded to the patient for examination because they are required to lie within a small housing and for an extended period of time. TEE has overcome some of the major disadvantages of the CT and MRI. It is a minimally invasive procedure that has a proven safety record. An examination can be performed within about fifteen to twenty minutes and a diagnosis can usually be obtained at the same time. The test is easily performed at the bedside in critically ill patients. The close anatomic relationship of the esophagus to the aorta and the heart allows TEE to provide excellent high quality images without significant interference from the overlying structures (lungs and chest wall). With the introduction of biplane and multiplane TEE probes, a more complete definition of the distal ascending aorta and aortic arch are possible. TEE is performed in real time allowing for its unique ability to give functional and hemodynamic information.
D. SECONDARY DIAGNOSES

In addition to revealing the presence and extent of an aortic dissection, special features of the TEE can be used to diagnose and define several important aspects of the dissection. TEE is one of the best methods for accurately identifying the structural and functional status (using DCFI and CW Doppler) of the aortic valve, which has important surgical implications. TEE is also valuable for assessing the degree of involvement and integrity of the coronary arteries in aortic dissection. TEE visualizes approximately 70-88% and 25-50% of the left and right coronary artery ostia, respectively. There are situations, however, where coronary angiography is required to define the need for CABG or coronary angioplasty (e.g., ascending aortic dissection with an acute MI). Aortography should obviously be performed if cardiac catheterization is planned. Flow patterns of the true and false lumina and the location of intimal tears can be further assessed using DCFI and PW Doppler. This can lead to identification of patients at risk for malperfusion. The diagnosis of a left pleural or pericardial effusion or even blood clots in the pericardium can be obtained more rapidly with TEE compared to CT or MRI. TEE can also give real time analysis of cardiac function, which is very critical for medical, surgical and anesthetic management. Rare complications of aortic dissections have also been reported that were diagnosed by TEE and was missed by other modalities. An example is aortic intussusception, where the intimal flap partially or totally separates from the aorta and migrates distally causing obstruction of blood flow to extremities or major organs.

References: