Echocardiography in Pathologies of the Thoracic Aorta

Jamil Mattar Valente
Universidade Federal de Santa Catarina, Florianópolis SC, Brazil.

Transesophageal echocardiography demonstrates superiority in relation to transthoracic echocardiography to evaluate the thoracic aorta, from the aortic valvar ring to the diaphragm muscle. Transthoracic echocardiography though, is cheaper, easier, and provides a great number of information.

The normal aorta
Two-dimensional transthoracic echocardiography displays in an appropriate way, the root of the aorta with the sinus of Valsalva and part of the ascending aorta. The remaining of the artery is usually visualized also, though it depends on the patient's echocardiographic window. The normal limit of the diameter of the thoracic aorta in its ascending portion is 3.8 cm.

The M mode has the possibility to analyze the movement of the root of the aorta. This movement provides us information regarding the systolic and diastolic functions of the left ventricle [1-3]. The wall of the root of the aorta moves around 7 mm anteriorly during the systole, and in the beginning of the diastole it almost totally returns to the initial point. The presystolic contribution to the movement of the root of the aorta is small in the normal individual.

The aortic arch and the descending aorta have a difficult visualization through transthoracic echocardiography. They are very well visualized through transesophageal echocardiography, however sometimes we don't see parts of the aortic arch. The transthoracic echocardiography can evaluate the caliber of these segments most of the time and this information is of great importance, since in most of the situations in that there is disease of this area, the diameter of the artery is increased.

Abnormal movement of the root of the aorta
When the thoracic aorta shows increased movement, with great amplitude of opening of the aortic valve leaflets, usually a situation of high cardiac output is present. An increased movement of the aorta,
reduced opening of the aortic valve leaflets, is compatible with important mitral insufficiency, since with regurgitation of part of the flow to the interior of the left atrium, there will be a decreased flow that will be ejected through the aortic valve. In the initial portion of the diastole, when we have a slow movement of the wall of the root of the aorta, a decrease of the relaxation of the left ventricle is present. A reduced movement of the aorta walls, means that there is reduced cardiac output, or restrictive cardiomyopathy, or rigid and calcified aorta.

Aneurysm of the sinus of Valsalva
It is almost always well visualized to the transthoracic echocardiography. When there is rupture of the aneurysm, usually color Doppler shows a fistula to the right chambers, mainly for the right atrium. More rarely, it should rupture to the left ventricle or to the left atrium. In the Marfan syndrome, occurs a symmetrical dilation of the three sinuses, and soon after the sinotubular junction, usually the aorta starts a normal caliber. In aortic aneurysm for atherosclerotic disease, the exaggeratedly dilated aorta frequently is prolonged for a larger extension [4-5].

Aortic ectasia
Atherosclerosis, aortic dissection, aortic stenosis, Marfan syndrome, pulmonary emphysema, syphilis and aortitis (Takayasu's arteritis), they can cause dilation of the thoracic aorta. The dilation is well visualized with transthoracic echocardiography, though atherosclerosis or dissection signs are seen best with transesophageal echocardiography. The ascending aorta when shows a diameter from 3.9 to 4.4 cm we consider as mild ectasia, 4.5 to 4.9 cm moderate ectasia, and when it presents a diameter larger than 4.9 cm we consider aneurysm of the aorta.

Marfan syndrome
The transthoracic echocardiography can measure accurately the root of the aorta and the first half of the ascending aorta diameters. A diameter of 5,5 cm can be used as a cut point for indication for surgical correction [6-8]. This same criterion is used for aneurysm of thoracic aorta of other causes. Transthoracic echocardiography evaluates the aortic insufficiency that frequently is present.

Atherosclerosis
This disease can be well visualized through transesophageal echocardiography. It can show plane, salient or irregular atherosclerotic plaques, mobile, pedunculated or ulcerated plaques, and thrombi. Aortic atherosclerosis is a great cause of vascular systemic embolic accident. Transesophageal echocardiography is a powerful marker of coronary atherosclerotic disease, because the presence of atherosclerotic plaques in the thoracic aorta predicts the existence of coronary atherosclerotic disease with a sensibility around 90%. On the other hand, absence of atherosclerotic plaques in the thoracic aorta, rules out significant coronary atherosclerotic disease with 90% of specificity.

Aortic dissection
Transthoracic echocardiography has a significantly smaller sensibility than transesophageal echocardiography, especially on type III dissection [9-11]. Visualization of the intimae flapping in the thoracic aorta is more difficult with transthoracic echocardiography.

Magnetic resonance, computerized tomography and transesophageal echocardiography has a sensibility around 98%, while transthoracic echocardiography has a sensibility of 60% for detection of aortic dissection. The finding of a normal caliber of the thoracic aorta on transthoracic echocardiogram is an important negative information, since aortic ectasia is frequently present when there is dissection. Transthoracic echocardiography is more useful in the evaluation of the aortic dissection complications, as aortic insufficiency, pericardial fluid, cardiac tamponade, regional systolic dysfunction of the left ventricle (function and ischemia differentiation).

The differential diagnosis should be made with acute coronary insufficiency, aortic stenosis, pulmonary thromboembolism and pericarditis. In the postoperative evaluation of aortic dissection correction, the persistence of the flapping with flow in the false lumen has a bad prognosis. Sometimes the surgeon closes the entrance orifice, staying a distal flapping without flow in the false lumen and this doesn't have implication of bad prognosis.

**Spontaneous contrast in descending aorta with transesophageal echocardiography.**

It is a flow dependent phenomenon. Is more frequent when there is aortic ectasia and with aortic dissection. It is sometimes associated with mural thrombosis of the aorta. But this spontaneous contrast is found sometimes without significant aortic disease and some studies in these cases, didn't show increase in the incidence of embolic accidents related to this phenomenon.

**Coarctation of the aorta**

Two-dimensional echocardiography visualizes the coarctation and its location. Doppler evaluation quantifies the degree of narrowing. It can also evaluate the presence of restenosis. Transesophageal echocardiography sometimes offers a better visualization than the transthoracic echocardiography, though in a minority of adult individuals, the visualization can be difficult so much as through the transthoracic echocardiography, and in this situation, magnetic resonance or computerized tomography can be superior.

**References**
