PERIOPERATIVE EXAMINATION OF THE THORACIC AORTA

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The examination of the thoracic aorta is an essential component of the routine perioperative examination by transeophageal echocardiography (TOE). The thoracic aorta is divided into six zones which correspond to segments of potential manipulation during cardiac surgery. It is important to use a systemic approach to the examination of the thoracic aorta. Unfortunately not all aortic zones can be reliably imaged by TOE due to the intervening air filled trachea and left main bronchus. Meticulous systemic examination of the thoracic aorta can always rule out aortic atheroma. Dislodgement of aortic atheroma has been identified as the leading cause of stroke following cardiac surgery. Severe adverse neurological outcome occur in 1-6% of patients following cardiac surgery. More subtle cognition damage, intellectual deterioration and personality changes occur in 30-70% patients undergoing conventional coronary artery bypass surgery. Initially echocardiographically atheroma is identified by thickening of the intima, but as it progresses it becomes more extensive, complex in shape and rough in appearance. Despite the limitation of TOE in visualizing distal ascending aorta and proximal arch, there is evidence that mobile atheroma detected in descending thoracic aorta is predictive of postoperative stroke. Furthermore, in one study, the absence of moderate to severe atheroma in the parts of the aorta visualized by TOE was associated with very low risk of stroke.

Aortic Aneurysm are easily diagnosed by TOE. An aneurysm is a dilatation of the aorta to 50% or more above normal size. Aneurysmal dilatation of the aorta may be associated with dissections or ruptures. The main indications for surgical interventions are increasing size and progressive aortic regurgitation. The decision to operate will vary amongst surgeons and institutions but as a rough guide a fusiform aneurysm >5cm, a marfanoid aneurysm > 4.5, or a saccular aneurysm > 3-5 cm may warrant surgery. Ascending aortic aneurysm often occur in combination with AV pathology. Dilatation of aortic root may be seen distal to a stenotic aortic AV. Aortic dilatation that involves the sinotubular junction is commonly associated with aortic regurgitation. In this instance it is important to differentiate normal and abnormal aortic cusps morphology as normal valves may be suitable for aortic sparing procedures. In descending aortic aneurysm a key issue is whether the aneurysm arises above or below the origin of left subclavian artery. If the neck of aneurysm is proximal to the left subclavian artery, deep hypothermic circulatory arrest will be required for repair. However aneurysm of the descending thoracic aorta distal to origin of the left subclavian artery, it may be possible to clamp the aorta distal to the common carotid artery and perform the operation with left- heart bypass.

Sinus of valsalva aneurysm is another aortic disorder that can be easily diagnosed with TOE. The right sinus is the most commonly affected by a saccular dilatation projecting into the right atrium. Associated findings include aortic regurgitation, ventricular septal defect, valvular or subvalvular pulmonary stenosis and compression of the RVOT. If rupture occurs it is most commonly in the RA producing a left-to-right shunt.
Aortic dissection is an acute surgical condition best diagnosed by TOE. The sensitivity of TOE is similar to that of magnetic resonance imaging and computed tomography. Aortic dissection is identified echocardiographically by the presence of an intimal flap. The TOE appearance are usually dramatic: the intimal flap can be seen moving freely in the proximal aorta and may infrequently prolapse through the aortic valve into the LVOT. The diagnosis of aortic dissection may be less clear if the false lumen is obliterated by a hematoma. In such a condition the dissection is said to hemodynamically stabilize itself. Entry and exit points may be identified by colour flow Doppler. True and false lumens can be also differentiated by some experience. Beside identification of the site and extent of dissection itself, the presence and severity of aortic regurgitation, presence of pericardial effusion and tamponade, involvement of coronary ostia, left and right global and segmental ventricular function and true lumen flow identification during commencement of cardiopulmonary bypass to detect “malperfusion” syndrome are detected by TOE.

Limitation of TOE in the assessment of the aorta include reverberation artifacts which can occur from calcification of the aortic wall or from vascular catheters. Inaccuracy in the measurements of aortic dimensions can occur due to oblique or off-axis imaging.

References:

5. konstadt SN, Kahn R et al. TOE can be used to screen ascending aortic atherosclerosis. Anesthesia and Analgesia 1995;81:225-228.