Real-time, Three-dimensional Transesophageal Echocardiography in the Evaluation of Thoracic Aortic Atherosclerosis

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Background

Real-time, three-dimensional (RT3D) transesophageal echocardiography (TEE) probe is currently commercially available. Thoracic aortic atherosclerosis (ATH) demonstrated by conventional two dimensional (2D) echocardiography is associated with stroke and other embolic events. This study was performed to evaluate the feasibility and the added value of RT3D TEE in the evaluation of ATH.

Methods

48 patients underwent TEE for clinical indications using a 2D/3D TEE probe. All patient underwent 2D TEE, which included evaluation of the thoracic aorta, as well as RT3D using the 3D zoom acquisition mode. The severity of ATH by 2D was graded I-V as defined by Katz *et al*. (*J Am Coll Cardiol.* 1992;20:70-7). To obtain an en face view of the aortic intima in proper anatomic orientation, the initial RT3D image was tilted down to reveal the intimal surface. The image is then rotated 180° in the Z axis to place the cranial end of the descending thoracic aorta along the upper border of the monitor (Figure 1). The TEE probe is then slowly withdrawn to visualized the entire descending aorta and the arch in 3D zoom mode (Figure 2). In this manner, RD3D is the only modality required to image the aortic atherosclerosis.

FIGURE 1: Tilt-and-Rotate Maneuver

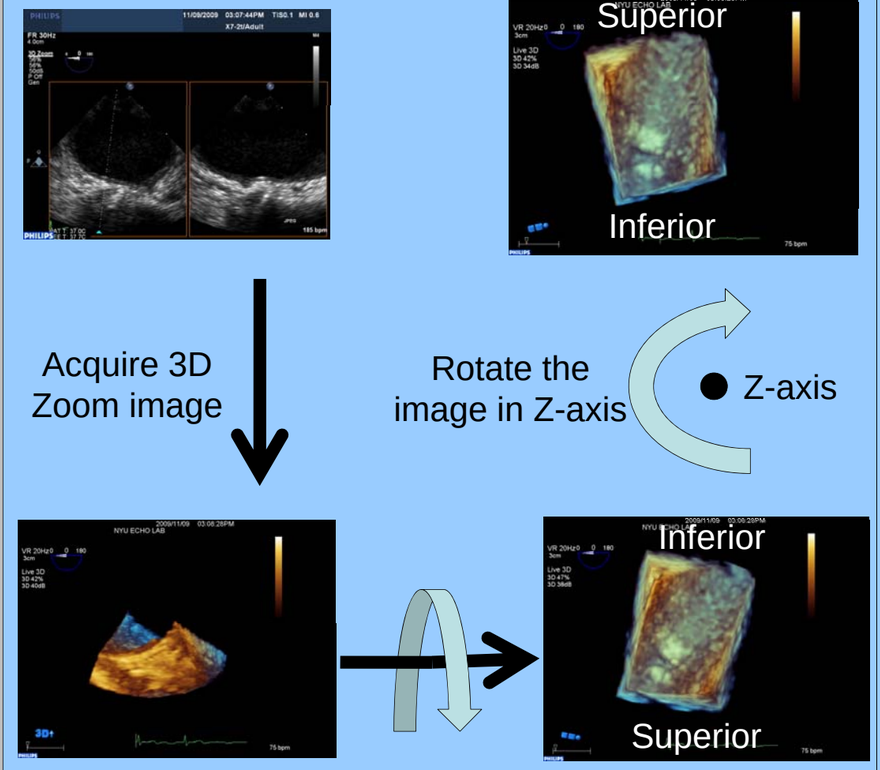
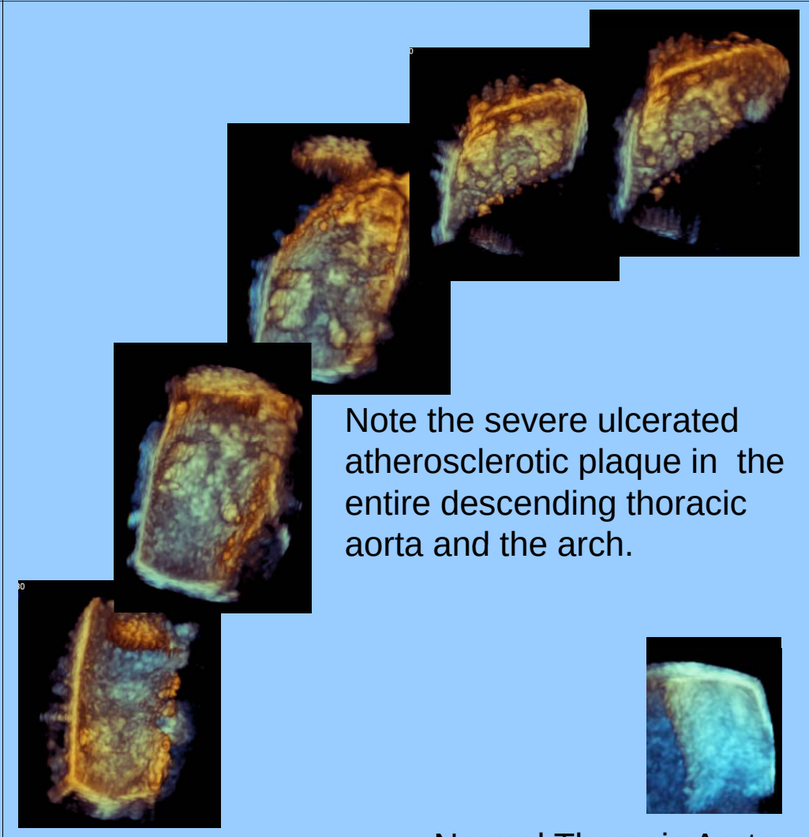


FIGURE 2: Composite RT3D Image of Thoracic Aorta



Note the severe ulcerated atherosclerotic plaque in the entire descending thoracic aorta and the arch.

Normal Thoracic Aorta

Results

RT3D images of the descending aorta were obtained in 47/48 patients (98%) and of the aortic arch in 45/48 patients (94%). With the turning of the image toward the observer, the entire surface of the aortic intima was demonstrated. Normal intima appeared smooth and homogenous (left panel) while atherosclerotic aorta revealed a grossly irregular surface (above). The size, shape and mobility (when present) of each plaque could be assessed. Intimal ulcerations could be defined and mapped. Clear evidence of aortic plaque was found by RT3D in 5 patients considered to have normal aorta by 2D.

Conclusions

Evaluation of the aortic arch and the descending thoracic aorta is highly feasible by RT3D TEE. This method appears more sensitive than 2D TEE, and may prove to be the echo technology of choice for the evaluation of ATH.