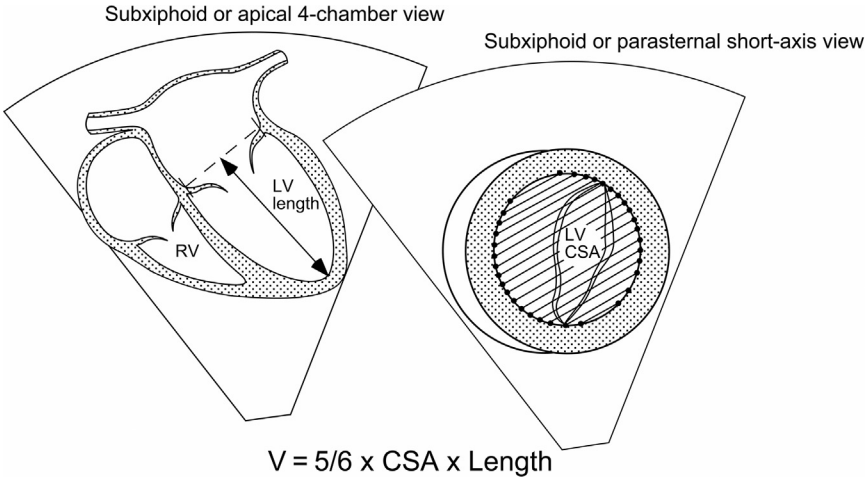

Figure 30 Bullet (5/6 area-length) method to estimate left ventricular (LV) volumes from measurements of LV long-axis length and short-axis area. Reproduced with permission from Lopez *et al*.[2] *CSA*, Cross-sectional area; *RV*, right ventricle.

flow and differentiate CAs from coronary veins or artifact. Still images alone do not provide adequate diagnostic information. In fact, both 2DE and color mapping in parasternal short-axis views are needed to confirm normal origins of the right and left CAs. Doppler interrogation of flow should be performed with a real-time electrocardiogram to confirm timing of flow during the cardiac cycle. Flow reversal is suggestive of anomalous origin from the PA or coronary ostial atresia.[112]

Aorta. Serial aortic assessment is essential in the management of (1) aortic dilation as seen in connective tissue disease (Marfan or Loeys-Dietz syndrome), genetic disorders (Turner syndrome), and bicuspid AoVs[113-116]; (2) supravalvar aortic stenosis as seen in Williams syndrome or other mutations of the *ELN* gene; or (3) aortic arch anomalies in isolation or with other cardiac abnormalities. The parasternal long-axis view should be used to visualize the proximal aorta, including the aortic root (at the sinuses of Valsalva), sinotubular junction, and ascending aorta (at the level of the right PA; Figure 33). High left or right parasternal views may provide better visualization of the proximal aorta. Aortic diameters in children should be measured from inner edge to inner edge at their maximum dimension during peak flow in mid-systole.[2] This guideline is distinct from those in adult echocardiography that recommend measurement of aortic diameters from leading edge to leading edge in diastole,[35] particularly because pediatric aortic *Z* scores are all based on systolic measurements. In addition, the maximum effect of vascular size on vessel function occurs during peak flow, such that peak systolic wall stress becomes the primary determinant of dissection or rupture in patients with aortic dilation. Aortic diameters should be measured consistently so that they can be compared with prior studies and trends can be followed over time.

The aortic arch should be evaluated in suprasternal views with hyperextension of the neck. Both 2D imaging and color mapping during a superior sweep in the short-axis view can establish arch sidedness and display the innominate artery as it bifurcates into the carotid and subclavian arteries. Absence of this bifurcation raises the suspicion for an aberrant subclavian artery and its associated clinical implications. The suprasternal long-axis view should be used to visualize the transverse aortic arch, arch branches, and proximal descending aorta, with diameter measurements performed at the proximal and distal transverse arch and the aortic isthmus (Figure 14B). Increased distance between the left common carotid and left subclavian arteries, tapering or a posterior muscular shelf at the isthmus, and flow turbulence with color mapping should raise suspicion for aortic coarctation. Sweeps with color mapping in a high parasternal sagittal or suprasternal long-axis view

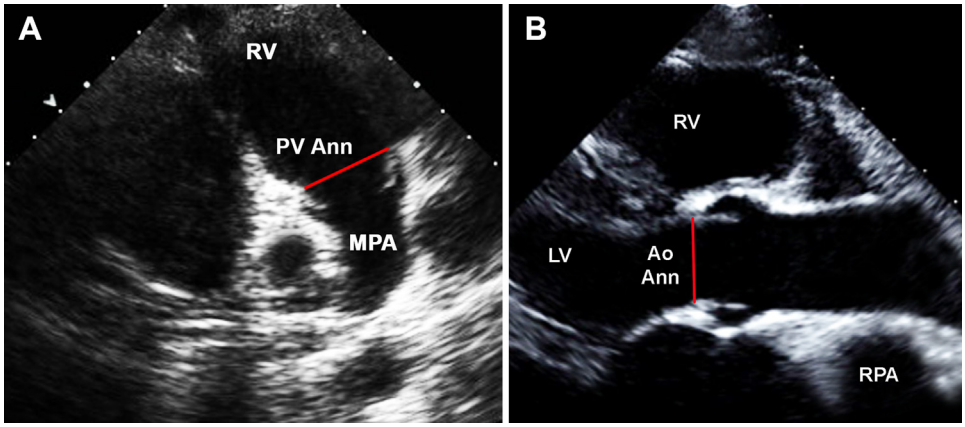

Figure 31 Aortic valve and pulmonary valve (PV) annular diameter measurements during maximal valve opening in early to mid-systole: **(A)** PV annular diameter from the parasternal long-axis view with anterosuperior tilting and **(B)** Aortic valve annular diameter from the parasternal long-axis view. Reproduced with permission from Lopez *et al*.[2] *Ann*, Annulus; *Ao*, aortic; *LV*, left ventricle; *MPA*, main pulmonary artery; *RPA*, right PA; *RV*, right ventricle.