Clinical Correlates and Reference Intervals for Pulmonary Artery Systolic Pressure Among Echocardiographically Normal Subjects

To the Editor:

We read with great interest the article by McQuillan et al describing the clinical and echocardiographic correlates and range of pulmonary artery systolic pressure (PASP) in echocardiographically normal subjects. This subject has garnered renewed interest of late with the increasing prevalence of obesity, the high use of anorectic agents, and their subsequent effect on the development of pulmonary hypertension. Additionally, with the improvements in echocardiography, our ability to detect even small degrees of tricuspid regurgitation in normal subjects has improved. A mild "elevation" of PASP is now a common finding in the echocardiography laboratory, resulting in concern as to whether this represents true pathology. Previous definitions of pulmonary hypertension suggested that PASP exceeding 30 mm Hg was pathological; however, these data were often derived from small numbers of subjects.

McQuillan and colleagues have established a range of PASP found in normal hearts in what is the largest (n=3790) database published to date, with a mean PASP of 28.3±4.9 mm Hg. Increases in PASP were associated with age, body mass index (BMI), male sex, and posterior wall thickness. They further note that a PASP >40 mm Hg was found in 6% of patients >50 years of age and in 5% of patients with a BMI exceeding 30 kg/m².

We have analyzed our echocardiographic database of 34,333 subjects from a geographically dissimilar population (New Orleans versus Boston) to ascertain any differences from their findings. Applying the same definition of "echocardiographic normals" as McQuillan et al, we found 2312 subjects, 58% of whom were women, which is similar to their reported sex distribution with age. Our subjects, however, were older (mean age 46.4 years) and more obese (BMI 27.0±4.9 mm Hg) than the population from the Boston area. Our mean PASP was considerably higher at 32.9±7.9 mm Hg, and we found correlations with age (P=0.0001), male sex (P=0.0025), septal wall thickness (P=0.0001), and posterior wall thickness (P=0.0001). Only in women was there even a weak correlation with BMI (r=0.07; P=0.03). Interestingly, 60% of our "normal" population had a PASP >30 mm Hg. Moreover, 22% of those older than 50 years and 20% of those with BMI >30 kg/m² had a PASP >40 mm Hg.

Our finding of "elevated" PASP in normal hearts confirms the findings of McQuillan et al. In our population of older and more obese subjects, however, the mean PASP was higher, as would be suggested by their data correlating PASP with age and BMI. We found a higher prevalence of elevated PASP (>40 mm Hg) among our population over 50 years of age. Previous definitions of normal PASP should be revised to adjust for age.

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Response

We wish to thank Dr Milani and colleagues for their comments. They have noted several associations with pulmonary artery systolic pressure (PASP) similar to our own observations. Age, male sex, and left ventricular septal and posterior wall thickness (even within the normal range) were predictive of PASP in both cohorts. Their population was older and had a higher mean body mass index (BMI) and mean PASP (32.9±7.9 versus 28.3±4.9 mm Hg). Although the age range of their patients was not stated, we assume that some of these differences might exist because our population included children ≥1 year, whereas theirs was likely limited to adults. Milani and colleagues also note a much weaker association between BMI and PASP among their older, heavier subjects. This difference is more difficult to explain. As we note in our paper, others have previously reported an association between BMI and pulmonary artery pressure. In addition, in 5 large cohorts studied to determine whether there was an association between anorexigen use and valvular regurgitation (n=1515), there was a weak but statistically significant correlation between BMI and right ventricular systolic pressure (RVSP) in each cohort (0.1 to 0.4 mm Hg for each unit increase in BMI).

Milani et al also note that 22% of their patients >50 years and 20% of those with a BMI >30 kg/m² had an RVSP >40 mm Hg (assuming a constant of 10 mm Hg for right arterial [RA] pressure). In our data, the upper bound for the 95% population confidence interval for a male >60 years of age was 43.6 mm Hg. Thus, echo values in the low 40s for older, heavier "echo normals" meet the statistical definition of normality. Although these values are based on an assumed constant of 10 mm Hg for RA pressure (which yields the best correlation between echo and catheter PASP across the full range encountered clinically), this constant overestimates RA pressure at the lower end of the scale (normal 1 to 5 mm Hg). If one accounts for this overestimation and the small gradient between the RV and PA required to move blood forward, then these values are within the upper limit of normal of 35 mm Hg for PASP used by many catheter laboratories (including our own). These data reinforce the need for all echo laboratories to state the constant used for RA pressure and for clinicians to understand how these numbers are derived.

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