Normal Diameter of the Ascending Aorta in Adults: The Impact of Stricter Criteria on Selection of Subjects Free of Disease

Background
- Transthoracic aortic aneurysm and dissection (TAAD) involves significantly high mortality rates.
- Overall mortality of ruptured thoracic aortic aneurysms has been estimated to be up to 100%, with 59% of patients dying before reaching the hospital.
- The American Society of Echocardiography 2015 guidelines for measurement of the aorta utilized studies, including one by Devereaux et al., that suffered from smaller sample sizes and lax criteria for selection of normal subjects, using absence of clinical etiologies of aortic aneurysm without consideration of echocardiographic normality.

Hypothesis
- This study was carried out to determine the normal dimension of the ascending thoracic aorta in a large population using stricter selection criteria.

Study Population
- We identified 49,235 patients who had undergone echocardiography since at Aurora health care system, Milwaukee, WI.
- We further queried the ICD-9 based EMR database at Aurora Health Care system for 28 risk factors of dilated aorta as described in 2015 American Heart Association guidelines. Echocardiograms were reviewed to exclude any cardiovascular disease (Goldstein, Evangelista et al. 2015).

Methods
- The dimensions of the mid-ascending thoracic aorta were measured by standardized echocardiography in a plane perpendicular to that of the long axis of the aorta, at end-diastole, using leading edge-to-leading edge technique.
- We also used a clinical and echocardiographic criteria based on the 2010 American Heart Association guidelines to exclude any subjects with the presence of risk factors for dilated aorta.

Results
- 2,234 normal subjects included.
- 31.5% were male with a mean age of 37.5 ± 14.9.
- The mean ± SD of mid ascending aorta in the entire population was 3.22 ± 0.48 cm.
- The absolute upper limits of normal was 3.72 cm (mean + 2SD) in men and 3.42 cm (mean + 2SD) in women. This was significantly lower than the values suggested by Lang’s criteria (3.8 cm in men and 3.5 cm in women).
- The BSA indexed upper limits of normal were 1.86 cm in men and 1.94 cm in women.
- These values were also lower than the BSA indexed upper limits of normal based on Lang’s criteria. (1.9 cm in men and 2.2 cm in women).
- The prevalence of dilated mid ascending aorta increases from 15.4% to 23.2% based on published criteria versus our criteria, respectively.
- The BSA indexed prevalence of dilated mid ascending aorta also increases from 9.4% to 15.4% based on published criteria versus our criteria, respectively.
- Increased prevalence based on our definition is also observed in men and women sub group comparison.

Limitations
- Retrospective study
- Selection bias

Strengths
- Actual echocardiographic images were used for measurement of aorta instead of chart review.
- Stricter clinical and echocardiographic criteria was applied compared to prior studies.
- The present study has more participants than in all three prior studies (Figure 3).
- Can be applied to routine clinical practice.

Conclusions
These data suggest that in a larger population with more stringent criteria for normalcy, the prevalence of dilated aorta will be higher than those suggested by the current guidelines, if the suggested cutoffs are applied.

References